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# GENERAL KNOWLEDGE

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# 2018

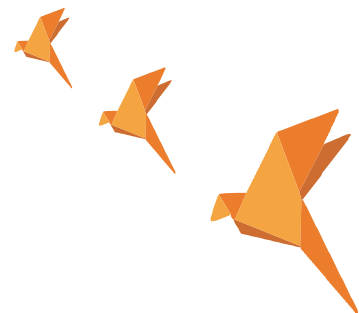
INDIA & WORLD

## A COMPLETE GENERAL KNOWLEDGE BOOK

- Useful for SSC, Bank, Railway, Police, NDA/CDS & other exams.
- Useful and Concept clear tables, figures and graphics
- Point-to-point descriptions
- Error free and accurate facts

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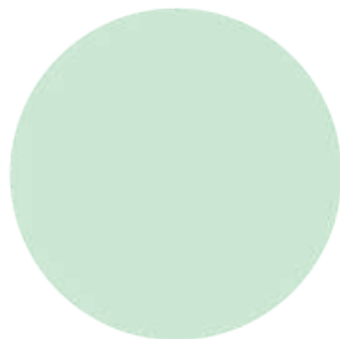
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# CURRENT AFFAIRS



## CURRENT AFFAIRS

### UNION BUDGET 2017-18

On 1st February 2017, Arun Jaitley the Finance Minister of India presented Union Budget 2017, to set out the government's policies for the next year. This follows the Economic Survey presented on 31st January in the Budget Session of the parliament. Here are the key-points from India's Union Budget 2017. This Union Budget will also include this year's Railway Budget.

#### Key Highlights from Union Budget 2017

- Agenda of this year's budget is: "Transform, energise and clean India" i.e. "TEC-India"
- Allocation for infrastructure stands at Rs.3,96,135 crore.
- Total government expenditure is Rs. 21.47 lakh crore.

#### India is Growing

- International Monetary Fund estimates that the world GDP will grow by 3.1% in 2016 and 3.4% in 2017.
- The advanced economies are expected to increase their growth by 1.6%-1.9%.
- The emerging economies are expected to increase their growth by 4.1%-4.5%.
- IMF predicts India's GDP will grow by 7.2% in 2017 and by 7.7% in 2018.
- World Bank projects India's GDP growth rate as 7% in 2016-17, 7.6% in 2017-18 and 7.8% in 2017-19.

#### Indian Economy in Numbers

- CPI inflation fell from 6% in July 2016 to 2.4% in December 2016.
- The Current Account Deficit has fallen to 0.3% of GDP from 1% In H1FY17.
- There has been a 36% increase in FDI flow.
- India's foreign exchange reserves are at \$361 billion as of January 2017. This is enough to cover 12 months needs.
- Fiscal Deficit for 2017-18 pegged at 3.2% of GDP.
- Revenue deficit will be reduced to 2.1% for 2017-18 from 2.3% in the previous year.

#### FDI increased from Rs.1.07 lakh crores in first half of last year to Rs.1.45 lakh crores in first half of 2016-17.

- Net market borrowing would be Rs.3.48 lakh crore in 2017-18 from 4.1% in the current fiscal.
- FRBM Review Panel headed by former Revenue Secretary N K Singh had recommended debt to GDP ratio of 60 per cent by 2023 and fiscal deficit for next 3 years at 3%.

#### Demonetization in Union Budget 2017

- Negative effects of demonetization not expected to be felt in 2017-18.
- Surplus liquidity due to demonetization will lower borrowing cost and increase access to credit.
- This will lead to growth.

#### Aadhaar Pay & Transaction Related Info in Union Budget 2017

- Black money SIT, headed by Justice MB Shah (retired), has suggested no cash transaction above Rs 3.00 lakh
- The government has accepted this recommendation, starting 1st April 2017.
- Aadhaar enabled payment service will be launched soon.
- Banks have targeted to introduce additional 10 lakh Point-of-Sale terminals by March of 2017.
- This number is set to hit 20 lakh by September 2017.
- Two new schemes will be launched to boost the adoption of BHIM (Bharat Interface for Money)

- Digital payment app. These will be a referral bonus and a cash back scheme for merchants.
- Nearly 1.25 crore people have already adopted the BHIM app.

### **Infrastructure & Development in Union Budget 2017**

- Transport sector allocated Rs.2.41 lakh crore.
- Bharat Net Project allocated Rs.10,000 crore.
- Allocation for infrastructure stands at a record Rs.3,96,135 crore.
- Roads & Highways in Union Budget 2017
- Rs.64,000 crore will be allocated for the development of National Highways.
- 133 kms of roads will be constructed per day in rural areas under Pradhan Mantri Gram Sadak Yojana. Compare this against 73 kms of road per day in the period from 2011-14 constructed in rural areas.
- Rs.27,000 crore will be allocated for rural roads in the financial year 2017-18 against Rs.19,000 crore in 2016-17.

### **Agriculture & Allied Sectors and Rural Development**

- Agriculture sector is set to grow at 4.6%.
- Expenditure in agriculture is targeted at Rs.10 lakh crore.
- Total allocation for rural, agricultural and allied sectors for 2017-18 is Rs.1,87,223 crore. This is 24% more than the allocated amount last year.
- The government is committed to double farmers' incomes in 5 years.
- Target for agricultural credit in 2017-18 fixed at Rs.10 lakh per person.
- The government will issue soil health cards and will setup a mini lab in Krishi Vigyan Kendras.
- Fasal Bima Yojana coverage will be increased to 40% in 2017-18 and 50% in 2018-19 from 30% of crop area in 2016-17. This for security against natural disasters.
- Budget provision for Fasal Bima Yojana of Rs.5500 crore from Budget Estimate of

2016 was increased to Rs.13,240 crore in 2016-17 to settle arrears claims.

- A dedicated micro-irrigation fund will be set up by NABARD to achieve the goal of 'Per Drop More Crop'. Its initial corpus will be Rs. 5000 crore.
- Dairy processing infrastructure fund will be set up under NABARD, with fund of Rs.8000 crore.
- Infrastructure funds for dairy will generate extra rural income of Rs.50,000 crore per annum.
- 100% electrification of villages will be achieved by May 1, 2019.
- 50,000 Gram Panchayats will be made "poverty free" in the next year.
- Mahila Shakti Kendra at village level for rural women empowerment will be initiated in this financial year.
- The Cabinet approved extension of tenure of loans under Credit Linked Subsidy Scheme of Pradhan Mantri Awas Yojana from 15 to 20 years.
- Pradhan Mantri Awas Yojana allocation raised from Rs.15,000 crore to Rs.23,000 crore.
- Open defecation free villages are now being given priority for pipe to water supply.
- 60 days interest waiver on loans from cooperative credit societies.
- Computerization of loan disbursement from primary agricultural societies by NABARD.
- Integration of 63000 functional PACs with core banking support and district cooperative banks over 3 years at cost of Rs.1900 crores. This will be done with support from state governments.

### **Manufacturing & Industries**

- India is the 6th biggest manufacturer this last fiscal, up 3 places from last FY.
- The country will be turned into an electronics hub.
- Housing & Amenities in Union Budget 2017



- The government is targeting 1 crore houses for poor and homeless and those living in kachcha housing by 2019.
- 23,000 crore has been allocated for rural housing in 2017-18 against 15,000 crore allocated last year.
- The government will introduce safe drinking water to cover 28,000 arsenic and fluoride-affected habitations over the next four years.
- Affordable Housing has now been given 'Infrastructure' status.
- Instead of built up area, carpet area of 30 to 60 sq meters will be applicable for affordable housing.
- The holding period for capital gains tax for immovable property has been reduced from 3 years to 2 years.
- Real estate developers will now get tax relief on unsold stock as liability. They need to pay capital gains only from the year that the project is completed.
- Government will provide education through digital platform.
- Access to SWAYAM education portal online, which will be introduced with 350 online courses.
- Skill strengthening to be implemented from this year with a budget of Rs 2,200 crore.
- PM Kaushal Kendras to be extended to 600 districts.
- 3.5 crore youth to be trained under Sankalp programme launched by government.
- Quality and market relevance will be noted in vocational training.
- National Testing Agency will be conducting major entrance examinations.
- CBSE will be freed from conducting examinations, and will focus majorly on academics.
- UGC will be reformed for higher education, whereas colleges and institutions will be given more autonomy. Greater autonomy will be provided to major institutes.

### **Health & Social Security**

- For senior citizens, Aadhar cards stating their health condition will be introduced.
- Two new All India Institute of Medical Sciences (AIIMS) to be set up. One in Jharkhand and another in Gujarat.
- The government has targeted to eliminate Kala Azar by 2017, Leprosy by 2018 and Tuberculosis by 2020 as part of the health policies.
- The government wants to bring down the MMR from 167 in 2011-13 to 100 between 2018-2020.
- Existing health sub centres will be converted into Health Wellness Centres.
- The government has decided to start DNB (Diplomate National Board) courses in many of the hospitals across the country.

### **Education**

- Government will focus on the true potential of the youth.
- Good quality institutions will be focused on which will possess better quality and education.

### **Employment**

- Allocation under MNREGA increased to Rs.48,000 crore from Rs.38,500 crore. This is highest ever allocation for this rural employment scheme.
- Under MNREGA scheme, participation of women has increased from 45% to 55%.
- Mahila Shakti Kendra at village level for rural women empowerment will be initiated in this financial year.
- For better monitoring, geo-tagging of all MGNREGA assets is being done and space technology will be used for better transparency.
- 5 lakh farm ponds and 10 lakh pits were fully achieved in 2016-17 and about 10 lakh farm ponds will be completed by March 2017 under MGNREGA.
- The new metro rail policy is expected to open up new jobs for the youth.
- Job-creating packages will be introduced for textile sector.
- 100 international centres will be launched across the country for the youth to seek jobs outside India.

- Big employment opportunities to come up in tourism sector. Additional opportunities for employment of women to open up through model shops and establishment bill

### **Startups**

Firms incorporated after 31 March 2016 could now avail of a three-year tax holiday in the first seven years of their existence.

### **Taxation**

- The income tax rate for the tax slab of Rs.250,000 to Rs.500,000 from 10% to 5%.
- This is expected to reduce the tax liability of all persons earning up to Rs.5 lakh, to zero with rebate or half.
- To avoid duplication of benefit, the existing rebate to the same group of beneficiaries will be reduced to Rs.2500, available to assesseees having income up to Rs.3.5 lakh.
- Combined effects of these mean that there will be no tax liability of individuals earning up to Rs.3 lakhs.
- Tax liability of only Rs.2500 for those earning between Rs.3-3.5 lakhs.
- Individuals earning up to Rs.4.5 lakhs will have no tax if they use the full limit of Rs.1.5 lakh in investment under Sec. 80c.
- All other taxpaying individuals in subsequent brackets will get a uniform benefit of Rs.12,500 per person.
- There will be a 10% surcharge for those whose annual income is Rs.50 lakh to Rs.1 crore.
- The existing 15% surcharge for those whose annual income is above Rs.1 crore will continue.
- Small firms with turnover up to Rs.50 crore will now only need to pay 25% tax instead of 30%.
- Firms incorporated after 31st March 2016 could now avail of a three-year tax holiday in the first seven years of their existence.
- Out of 3.7 crore who filed tax returns in 2015-16, only 24 lakh persons showed income above Rs.10 lakh.
- Of 76 lakh individuals who reported income of over Rs.5 lakh, Rs.56 lakh are salaried.

- There is also a proposal to allow a carry forward of Minimum Alternative Tax for a period of 15 years up from the current 10 years now.

### **Income Slab Tax Rate**

- Upto Rs. 3 lakhs Nil
- Rs.3 lakhs to Rs.5 lakhs 5%
- Rs.5 lakh to Rs.10 lakh 20%
- Rs.10 lakh to Rs.50 lakh 30%
- Rs.50 lakh to Rs.1 crore 30% + 10% surcharge
- Above Rs.1 crore 30% + 15% surcharge

### **Energy**

- The government proposes to set up strategic crude oil reserves in Odisha and Rajasthan.
- The government has allocated Rs.4,843 crore for electrification in financial year 2017-18.
- 100% electrification of villages will be achieved by May 1, 2019.

### **Defense**

- Defence budget is getting 11% hike over last year.
- Defence expenditure excluding pension is set at Rs. 2.74 lakh crore.
- The allocation is about 12.78 percent of the total government expenditure of Rs.21.47 lakh crore.
- The capital acquisition component of the defence allocation for the coming fiscal is just over Rs.86,400 crore, compared to about Rs.78,500 crore last year. However, the Defence Ministry had returned close to Rs.36,000 crore of the funds allocated to it for capital acquisition last year.

### **Miscellaneous**

- The Foreign Investment Promotion Board (FIPB) will be abolished.
- Trade Infrastructure Export Scheme to be launched in 2017-18.

- The government is considering introduction of a new law to confiscate assets of offenders who escape the country.
- Maximum cash donation that any party can receive from one source will be set at Rs.2000.
- Political parties will be entitled to receive donations by cheques or digital modes.
- An amendment is being proposed to RBI Act to enable the issuance of electoral bonds for political funding.

## Railway Budget 2017-18

- A 22% rise in the Railways Budget was announced.
- Total capital and developmental expenditure of Rs. 1.31 lakh crore have been allocated for Railways in 2017-18, including Rs. 55,000 crore to be provided by the government.
- 3500 kms of railway lines will be constructed.
- Service charge on rail tickets booked through IRCTC will be withdrawn.
- A rail safety fund with corpus of Rs.100,000 crore will be created over a period of 5 years.
- 500 rail stations to be made friendly to the differently abled by providing lifts and escalators.
- Steps will be taken to launch dedicated trains for pilgrimage and tourism.
- At least 25 train stations are expected to be awarded during 2017-18.
- By 2019, all coaches of the Indian Railways will be fitted with bio-toilets.
- Railways will integrate end to end transport solutions for selected commodities through partnerships.
- Unmanned railway level crossings to be eliminated by 2020.

### Metro Rail Policy

- The Union Cabinet chaired by Prime Minister Shri Narendra Modi today approved a new Metro Rail Policy that seeks to enable realization of growing metro rail aspirations of a large number of cities but in a responsible manner.
  - It focused on giving clarity on development of projects, collaborations, participation, standardising norms, financing and creating a procurement mechanism so that the projects can be implemented effectively.
  - According to the new policy, the Metro rail projects will be approved and aided by the Central government only if their is private participation and the projects ensures last-mile connectivity for commuters. The policy allows respective states to formulate rules and regulations and it empowers them to establish permanent fare fixation authorities.
  - Further, the projects will now be cleared on the basis on economic internal rate of return of 14%. This is considered one of the widely followed best practices. It will alter the system that runs on the current financial internal rate of return of 8%.
  - The policy was proposed by the Union Ministry of Urban Development and provides models for states seeking to develop Metro projects with help by the Centre.
- The three models are outlined in the policy:**
1. Public-Private Partnership with Central assistance. This will be part of the Union Finance Ministry's viability gap funding scheme.
  2. Grant by Centre whereby 10% of Metro project cost will be provided by the Central government as lump sum amount.
  3. 50-50% Equity sharing model taken between the Centre and state.
- All three models have a mandatory requirement of private participation.
- Since Metro projects require huge capital, they were usually financed by the Centre and states

with equity and grants. Some amount is usually raised by investment bodies like in the case of Delhi Metro, Japan International Cooperation Agency pooled in massive investment.

However, the new policy says that the states will now have to come up with innovative ways to raise funds through means like value capture finance tools. They will also have to issue corporate bonds for metro projects for enabling low-cost debt capital.

One of the key aspects of the policy is the last mile connectivity that lays down a catchment area of 5km. The feeder services will require a commitment from the government to be

provided via feeders, walkways, pathways and para transport means.

In the last four years, the Centre has sanctioned at least Rs 30,653 crore to Metro projects across the country. A large portion of it, Rs 12,345 crore, was sanctioned to overseeing companies. The current fiscal allotment for Metro rail projects till the end of quarter ended June stands at Rs 17,960. However, in the same period, the expenditure has only been Rs 4,650 crore. The figures given out by the Union Ministry for Urban Development were of Delhi NCR, Uttar Pradesh, Rajasthan, Maharashtra, Gujarat, Karnataka, Tamil Nadu and Kerala.

## Economic Survey 2016-2017

*The Economic Survey 2017 of India, for the period 2016-2017, was tabled in the Parliament on 31st January, 2017. It was presented by Finance Minister Arun Jaitley before the Parliament prior to the Indian Budget. The survey was prepared by Chief Economic Adviser Arvind Subramanian.*

### Predictions from Economic Survey 2017

- Growth this fiscal (2016-17) to be 6.5%. The Statistics Department had earlier projected the growth rate for 2016-17 as 7.1%.
- Projected the economy to grow between 6.75% and 7.5% in 2017-18. International Monetary Fund (IMF) has projected rate of 6.6% in 2016-17 and 7.2% in 2017-18.
- GST and other structural reforms can take the trend growth rate to 8-10%. However, fiscal gains from GST will take time to realize.
- Farm sector to grow at 4.1% this fiscal, up from 1.2% last year.
- Industrial Sector growth rate to be 5.2% this fiscal, from 7.4% of last fiscal.

### Inflation

- Consumer Price Index (CPI) averaged 4.9% during April-December 2016 contributed substantially to the decline in CPI inflation which reached 3.4% at December end.

- Reversal of WPI inflation from a trough of (-)5.1% in August 2015 to 3.4% by end of December 2016 on the back of rising international oil prices.

### Fiscal Targets

- Central government is committed to achieve its fiscal deficit target of 3.5% of GDP this year.
- Consolidated deficit of the states has increased steadily in recent years, rising from 2.5% of GDP in 2014-15 to 3.6% of GDP in 2015-16, in part because of the UDAY scheme.
- For the government as a whole, there is an improvement in the fiscal deficit.

### Deficits

- Current account deficit declined to about 0.3% of GDP in the first half of FY2017.
- Foreign exchange reserves are at comfortable levels, having risen from around US\$350 billion at end-January 2016 to US\$360 billion at end-December 2016.

- The trade deficit declined by 23.5% in April-December 2016 compared to corresponding period in previous year.

### **Government Debt**

Government debt to GDP in 2016 seen at 68.5%, down from 69.1% in 2015.

### **On Demonetization**

- Demonetization to affect growth rate by 0.25-0.5%, but to have long-term benefits.
- Demonetization may affect supplies of certain agricultural products like sugar, milk, potatoes and onions.
- Demonetization effects to return to normal as new currency comes in circulation.

### **On Universal Basic Income (UBI)**

- Universal Basic Income (UBI) proposal a powerful idea, but not ready for implementation.
- UBI an alternative to plethora of state subsidies for poverty alleviation.
- UBI would cost between 4% and 5% of GDP.

### **Current Problems**

- Highlights difficulties in privatizing public enterprises.
- Lists challenges that might impede country's progress:
  - Ambivalence about property rights and the private sector.
  - Deficiencies in state capacity in delivering essential services
  - Inefficient redistribution.

### **Suggestions from Economic Survey 2017**

- Suggests the need to further privatize the Civil Aviation, Banking and Fertilizer sectors.
- Prescribes cut in individual I-T rates, real estate stamp duties.

- Tax administration to be improved to reduce discretion and improve accountability.
- Suggests gradual widening of Income Tax net by encompassing all high income earners.
- Efforts to collect taxes on disclosed and undisclosed wealth should not lead to tax harassment.
- Suggests setting up Public Sector Asset Rehabilitation Agency (PSARA) to take charge of bad loans.

### **Outlook for 2016-17 according to Economic Survey 2017**

#### **Effects of Demonetisation:**

- An aggregate demand shock due to reduction in Supply of Money.
- Uncertainty shock due to uncertainty over the magnitude and duration of the cash shortage and the policy responses.

#### **In the third quarter of FY2017 (when demonetisation was introduced):**

- Cash declined by 9.4%.
- Demand Deposits increased by 43%.
- Growth in the sum of the two by 11.3%.
- Corresponding figures of the previous year were 12.5%, 10.5% and 11.7%, respectively.

As of January 15, 2017, aggregate sowing of the two major Rabi crops; Wheat and Pulses exceeded last year's planting by 7.1% and 10.7%, respectively.

GDP growth expected to be in the 6¾ to 7½% range in FY2018.

Fiscal windfall likely from Pradhan Mantri Garib Kalyan Yojana, low oil prices.

India to remain the fastest growing major economy in the world.

## WHO'S WHO

President of India	Ram Nath Kovind
Vice-President of India	Venkaiah Naidu
Prime Minister of India	Narendra Modi

## Chief Minister and Governors

State	Chief Minister	Governor
Andhra Pradesh	Shri. Nara Chandrababu Naidu	Shri E.S Lakshmi Narasimhan
Arunachal Pradesh	Shri Pema Khandu	Brig. (Dr.) B. D. Mishra (Retd.)
Assam	Shri Sarbananda Sonowal	Prof. Jagdish Mukhi
Bihar	Shri Nitish Kumar	Shri Satya Pal Malik
Chhattisgarh	Dr. Raman Singh	Shri Balramji Dass Tandon
Delhi (NCT)	Shri Arvind Kejriwal	-
Goa	Shri Manohar Parrikar	Smt. Mridula Sinha
Gujarat	Shri Vijaybhai R. Rupani	Shri Om Prakash Kohli
Haryana	Shri Manohar Lal	Prof. Kaptan Singh Solanki
Himachal Pradesh	Shri Virbhadra Singh	Shri Acharya Dev Vrat
Jammu and Kashmir	Mehbooba Mufti Sayeed	Shri N. N. Vohra
Jharkhand	Shri Raghubar Das	Shrimati Droupadi Murmu
Karnataka	Shri Siddaramaiah	Shri Vajubhai Vala
Kerala	Shri Pinarayi Vijayan	Shri Justice (Retd.) Palaniswamy Sathasivam
Madhya Pradesh	Shri Shivraj Singh Chouhan	Shri Om Prakash Kohli (Add. Charge)
Maharashtra	Shri Devendra Fadnavis	Shri Chennamaneni Vidyasagar Rao
Manipur	Shri N. Biren Singh	Dr. Najma A. Heptulla
Meghalaya	Dr. Mukul Sangma	Shri Ganga Prasad
Mizoram	Shri Lal Thanhawla	Lt. General (Retd.) Nirbhay Sharma
Nagaland	Shri T. R. Zeliang	Shri Padmanabha Balakrishna Acharya
Odisha	Shri Naveen Patnaik	Dr. S. C. Jamir
Puducherry (UT)	Shri. V. Narayanasamy	-
Punjab	Shri Capt. Amarinder Singh	Shri V.P. Singh Badnore
Rajasthan	Smt. Vasundhara Raje	Shri Kalyan Singh
Sikkim	Shri Pawan Kumar Chamling	Shri Shrinivas Dadasaheb Patil
Tamil Nadu	Shri Thiru Edappadi K. Palaniswami	Shri Banwarilal Purohit
Telangana	Shri K Chandrasekhar Rao	Shri E.S Lakshmi Narasimhan (Add. Charge)
Tripura	Shri Manik Sarkar	Shri Tathagata Roy
Uttar Pradesh	Shri Yogi Aditya Nath	Shri Ram Naik
Uttarakhand	Shri Trivendra Singh Rawat	Dr. Krishan Kant Paul
West Bengal	Km. Mamata Banerjee	Shri Keshari Nath Tripathi

## Lt. Governors & Administrators

Union Territory	Lt. Governor & Administrator
Andaman and Nicobar Island (UT)	Prof. Jagdish Mukhi (Lieutenant Governor)
Chandigarh (UT)	Shri.V.P. Singh Badnore (Administrator)
Dadra and Nagar Haveli (UT)	Shri Praful Patel (Administrator)
Daman and Diu (UT)	Shri Praful Patel (Administrator)
Delhi (NCT)	Shri Anil Bajjal (Lieutenant Governor)
Lakshadweep (UT)	Shri Farooq Khan, IPS, (Retd.) (Administrator)
Puducherry (UT)	Dr. Kiran Bedi, IPS, (Retd.) (Lieutenant Governor)

## Cabinet Ministers

Portfolio	Minister
Prime Minister Ministry of Personnel, Public Grievances and Pensions Department of Atomic Energy Department of Space All important policy issues and all other portfolios not allocated to any Minister.	Narendra Modi
Minister of Home Affairs	Rajnath Singh
Minister of External Affairs	Sushma Swaraj
Ministry of Overseas Indian Affairs	Sushma Swaraj
Minister of Finance Minister of Corporate Affairs	Arun Jaitley
Minister of Defence	Nirmala Sitharaman
Minister of Information and Broadcasting	Smriti Irani
Minister of Railways	Piyush Goyal
Minister of Urban Development Minister of Housing and Urban Poverty Alleviation	Narendra Singh Tomar
Minister of Road Transport and Highways Minister of Shipping	Nitin Gadkari
Minister of Law and Justice	Ravi Shankar Prasad
Minister of Electronics and Information Technology	Alphons Kannanthanam
Minister of Water Resources, River Development and Ganga Rejuvenation	Nitin Gadkari
Minister of Drinking Water and Sanitation	Uma Bharati
Minister of Minority Affairs	Mukhtar Abbas Naqvi
Minister of Rural Development Minister of Panchayati Raj	Narendra Singh Tomar
Minister of Mines	Narendra Singh Tomar
Minister of Consumer Affairs, Food and Public Distribution	Ram Vilas Paswan
Minister of Micro, Small and Medium Enterprises	Kalraj Mishra
Minister of Women and Child Development	Maneka Gandhi
Minister of Parliamentary Affairs	Ananth Kumar
Minister of Chemicals and Fertilizers	Ananth Kumar
Minister of Civil Aviation	Ashok Gajapathi Raju Pusapati
Minister of Heavy Industries and Public Enterprises	Anant Geete
Minister of Food Processing Industries	Harsimrat Kaur Badal
Minister of Steel	Chaudhary Birender Singh
Minister of Labour and Employment	Bandaru Dattatreya
Minister of Tribal Affairs	Jual Oram
Minister of Agriculture and Farmers Welfare	Radha Mohan Singh
Minister of Social Justice and Empowerment	Thawar Chand Gehlot
Minister of Human Resource Development	Prakash Javadekar
Minister of Science and Technology	Harsh Vardhan
Minister of Health and Family Welfare	Jagat Prakash Nadda
Minister of Textiles	Smriti Irani
Minister of Statistics and Programme Implementation	D. V. Sadananda Gowda
Minister of Commerce and Industry	Suresh Prabhu
Minister of Coal	Piyush Goyal
Minister of Petroleum and Natural Gas	Dharmendra Pradhan

## Ministers of State (Independent Charges)

Minister	Portfolio
Rao Inderjit Singh	Minister of State (Independent Charge) of the Ministry of Planning; and Minister of State in the Ministry of Chemicals and Fertilizers
Santosh Kumar Gangwar	Minister of State (Independent Charge) of the Ministry of Labour and Employment
Shripad Yasso Naik	Minister of State (Independent Charge) of the Ministry of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH)
Dr. Jitendra Singh	Minister of State (Independent Charge) of the Ministry of Development of North Eastern Region; Minister of State in the Prime Minister's Office; Minister of State in the Ministry of Personnel, Public Grievances and Pensions; Minister of State in the Department of Atomic Energy; and Minister of State in the Department of Space
Dr. Mahesh Sharma	Minister of State (Independent Charge) of the Ministry of Culture; and Minister of State in the Ministry of Environment, Forest and Climate Change.
Giriraj Singh	Minister of State (Independent Charge) of the Ministry of Micro, Small and Medium Enterprises.
Manoj Sinha	Minister of State (Independent Charge) of the Ministry of Communications; and Minister of State in the Ministry of Railways.
Col. Rajyavardhan Singh Rathore	Minister of State (Independent Charge) of the Ministry of Youth Affairs and Sports; and Minister of State in the Ministry of Information and Broadcasting.
R. K. Singh	Minister of State (Independent Charge) of the Ministry of Power; and Minister of State (Independent Charge) of the Ministry of New and Renewable Energy.
Hardeep Singh Puri	Minister of State (Independent Charge) of the Ministry of Housing and Urban Affairs.
Alphons Kannanthanam	Minister of State (Independent Charge) of the Ministry of Tourism; and Minister of State in the Ministry of Electronics and Information Technology.

## Ministers of State

Minister	Portfolio
Vijay Goel	Minister of State in the Ministry of Parliamentary Affairs; and Minister of State in the Ministry of Statistics and Programme Implementation.
Pon Radhakrishnan	Minister of State in the Ministry of Finance; and Minister of State in the Ministry of Shipping.
S.S. Ahluwalia	Minister of State in the Ministry of Drinking Water and Sanitation.
Ramesh Jigajinagi	Minister of State in the Ministry of Drinking Water and Sanitation.
Ramdas Athawale	Minister of State in the Ministry of Social Justice and Empowerment.
Vishnu Deo Sai	Minister of State in the Ministry of Steel.
Ram Kripal Yadav	Minister of State in the Ministry of Rural Development.
Hansraj Ahir	Minister of State in the Ministry of Home Affairs.
Haribhai Parthibhai Chaudhary	Minister of State in the Ministry of Mines; and Minister of State in the Ministry of Coal.
Rajen Gohain	Minister of State in the Ministry of Railways.



General (Retd.) V. K. Singh	Minister of State in the Ministry of External Affairs.
Parsottambhai Rupala	Minister of State in the Ministry of Agriculture and Farmers Welfare; and Minister of State in the Ministry of Panchayati Raj.
Jayant Sinha	Civil Aviation
Krishan Pal Gurjar	Minister of State in the Ministry of Social Justice and Empowerment.
Jasvantsinh Sumanbhai Bhabhor	Minister of State in the Ministry of Tribal Affairs.
Shiv Pratap Shukla	Minister of State in the Ministry of Finance.
Ashwini Kumar Choubey	Minister of State in the Ministry of Health and Family Welfare.
Sudarshan Bhagat	Minister of State in the Ministry of Tribal Affairs.
Kiren Rijju	Minister of State in the Ministry of Home Affairs.
Upendra Kushwaha	Minister of State in the Ministry of Human Resource Development.
Dr. Virendra Kumar	Minister of State in the Ministry of Women and Child Development; and Minister of State in the Ministry of Minority Affairs.
Anupriya Patel	Minister of State in the Ministry of Health & Family Welfare
M. J. Akbar	Minister of State in the Ministry of External Affairs.
Anant Kumar Hegde	Minister of State in the Ministry of Skill Development and Entrepreneurship.
Sadhvi Niranjan Jyoti	Minister of State in the Ministry of Food Processing Industries.
Y. S. Chowdary	Minister of State in the Ministry of Science and Technology; and Minister of State in the Ministry of Earth Sciences.
Jayant Sinha	Minister of State in the Ministry of Civil Aviation.
Babul Supriyo	Minister of State in the Ministry of Heavy Industries and Public Enterprises.
Arjun Ram Meghwal	Minister of State in the Ministry of Parliamentary Affairs; and Minister of State in the Ministry of Water Resources, River Development and Ganga Rejuvenation.
Vijay Sampla	Minister of State in the Ministry of Social Justice and Empowerment.
Ajay Tamta	Minister of State in the Ministry of Textiles.
Krishna Raj	Minister of State in the Ministry of Agriculture and Farmers Welfare.
Chhotu Ram Chaudhary	Minister of State in the Ministry of Consumer Affairs, Food and Public Distribution; and Minister of State in the Ministry of Commerce and Industry.
P. P. Chaudhary	Minister of State in the Ministry of Law and Justice; and Minister of State in the Ministry of Corporate Affairs.
Dr. Subhash Ramrao Bhamre	Minister of State in the Ministry of Defence.
Gajendra Singh Shekhawat	Minister of State in the Ministry of Agriculture and Farmers Welfare.
Dr. Satya Pal Singh	Minister of State in the Ministry of Human Resource Development; and Minister of State in the Ministry of Water Resources, River Development and Ganga Rejuvenation.

## Judiciary Officials

Chief Justice of India	Dipak Misra
Attorney General of India	K. K. Venugopal
Solicitor General of India	Ranjit Kumar

## Chief of Armed Forces

Supreme Commander of Armed Forces	Ram Nath Kovind
Chief of the Army Staff	Bipin Rawat
Chief of the Air Staff	Birender Singh Dhanoa
Chief of the Naval Staff	Sunil Lanba

## Constitutional Heads

Chairperson of Rajya Sabha	Venkaiah Naidu
Deputy Chairperson of Rajya Sabha	P J Kurien
Speaker of Lok Sabha	Sumitra Mahajan
Deputy Speaker of Lok Sabha	M Thambidurai
Chief Election Commissioner	Achal Kumar Jyoti
Comptroller and Auditor General of India	Rajiv Mehrishi

## Important Government Officials

Registrar – General of India and Census Commissioner	Sailesh
Central Vigilance Commissioner	K V Chowdary
Chief Information Commissioner	R K Mathur
National Security Advisor	Ajit Kumar Doval
Chief Economic Advisor	Arvind Subramanian
Principal Scientific Advisor to Government	R Chidambaram
Scientific Advisor to Defence Minister	G Satheesh Reddy
Cabinet Secretary	Pradeep Kumar Sinha
Foreign Secretary	S Jaishankar
Finance Secretary	Ashok Lavasa
Revenue Secretary	Hasmukh Adhia

## Central Armed Police Forces

Director General of Border Security Force (BSF)	K K Sharma
Director General of Central Reserve Police Force (CRPF)	Rajiv Rai Bhatnagar
Director General of Central Industrial Security Force (CISF)	O P Singh
Director General of Indo-Tibetan Border Police (ITBP)	R K Pachnanda
Director General of National Security Guard (NSG)	Sudhir Pratap Singh
Director General of Sashastra Seema Bal (SSB)	Archana Ramasundaram
Director General Assam Rifles (AR)	Lt. Gen Shokin Chauhan

## Heads of Intelligence Agencies

Director General of National Investigation Agency (NIA)	Sharad Kumar
Director of Intelligence Bureau (IB)	Rajiv Jain
Director of Central Bureau of Investigation (CBI)	Alok Verma
Director of Research Analysis Wing (RAW)	Anil Dhasmana
Director General of Directorate of Revenue Intelligence	Debi Prasad Dash

## Heads of Important Commissions

Chairperson of Atomic Energy Commission	Sekhar Basu
Chairperson of 21st Law Commission	Justice B S Chauhan
Chairperson of 14th Finance Commission	Y V Reddy
Chairperson of National Commission for Minorities	Syed Ghayorul Hasan Rizvi
Chairperson of National Commission for Scheduled Castes	Ramshankar Katheria
Chairperson of National Commission for Scheduled Tribes	Nand Kumar Sai
Chairperson of National Commission for Backward Classes	Justice Vangala Eshwaraiah
Chairperson of National Commission for Women	Lalitha Kumaramangalam
Chairperson of National Human Rights Commission	Justice H L Dattu
President of National Consumer Disputes Redressal Commission	Justice D K Jain
Chairperson of University Grants Commission (UGC)	V. S. Chauhan
Chairperson of UPSC	David R. Syiemlieh
Chairperson of SSC	Ashim Khurana

## Heads of Scientific Organisations

Chairperson of Indian Space Research Organisation (ISRO)	A S Kiran Kumar
Chairperson of Defence Research and Development Organisation (DRDO)	S Christopher
Chairperson of Atomic Energy Regulatory Board (AERB)	Shiv Abhilash Bhardwaj
Director General of Indian Council of Medical Research (ICMR)	Soumya Swaminathan
Director General of Indian Council of Agricultural Research (ICAR)	Trilochan Mohapatra
Director General of Council of Scientific and Industrial Research (CSIR)	Girish Sahni

## Heads of Financial Organisations

Governor of Reserve Bank of India (RBI)	Urjit Patel
Chairperson of Central Board of Direct Taxes (CBDT)	Sushil Chandra
Chairperson of Central Board of Excise and Customs	Vanaja Sarna
Director General of Foreign Trade (DGFT)	Ajay Kumar Bhalla
Chairperson of Securities and Exchange Board of India (SEBI)	Ajay Tyagi
Chairperson of Insurance Regulatory and Development Authority (IRDA)	T S Vijayan
Chairperson of National Bank for Agriculture and Rural Development (NABARD)	Harsh Kumar Bhanwala

## Heads of Boards and Councils

Chairperson of Central Pollution Control Board	S P Singh Parihar
Chairperson of Railway Board	Ashwani Lohani
Chairperson of Bank Board Bureau (BBB)	Vinod Rai
Chairperson of Indian Council of Historical Research (ICHR)	Yellapragada Sudershan Rao
Director of National Council of Educational Research and Training (NCERT)	Hrushikesh Senapaty
Chairperson of National Dairy Development Board (NDDB)	Dilip Rath
Chairperson of Central Board of Secondary Education (CBSE)	Rakesh Kumar Chaturvedi
Chairperson of All India Council of Technical Education (AICTE)	Anil Sahasrabudhe

## Heads of Arts/Films/Sports/Press Organisations

President of Sahitya Akademi	Vishwanath Prasad Tiwari
Chairperson of Sangeet Natak Akademi	Shekhar Sen
Chairperson of Lalit Kala Akademi	C S Krishna Setty
Managing Director of National Film Development Corporation	Nina Lath Gupta
Chairperson of Central Board of Film Certification	Prasoon Joshi
Director of Film and Television Institute of India (FTII)	Bhuedra Kainthola
Director General of Doordarshan	Supriya Sahu
President of Indian Olympic Association	Narayana Ramachandran
Chief Executive Officer of Board of Control for Cricket in India	Rahul Johri
Registrar of Newspapers for India – Head of Department	K. Ganesan
Chairperson of Press Council of India	Justice Chandramauli Kumar Prasad
Chairperson of Press Trust of India	Viveck Goenka
President of Indian Newspaper Society	Somesh Sharma

## Important Office Bearers of India

Director General of Indian Coast Guard	Rejendra Singh
Director General of National Cadet Corp (NCC)	Lt.Gen Vinod Vashisht
Director of Enforcement Directorate (ED)	Karnal Singh
Director General of Railway Protection Force (RPF)	Dharmendra Kumar
Chairperson of NITI Aayog	Narendra Modi
Vice – Chairperson of NITI Aayog	Rajiv Kumar
Chairperson of Telecom Regulatory Authority of India (TRAI)	Ram Sewak Sharma
Head of Food Safety and Standards Authority of India (FSSAI)	Ashish Bahuguna
India's Permanent Representative to United Nations	Rajiv Kumar Chander
India's Ambassador and Permanent Representative to WTO	J. S. Deepak
Vice-Chancellor of Indira Gandhi National Open University (IGNOU)	Ravindra Kumar
Chairperson of National Green Tribunal (NGT)	Justice Swatenter Kumar
Surveyor General of India	Swarna Subba Rao

## Who is Who – World

Secretary General of United Nations (UN)	Antonio Guterres
Director General of United Nations Educational, Scientific and Cultural Organization (UNESCO)	Irina Bokova
Director General of Food and Agriculture Organisation (FAO)	José Graziano da Silva
Executive Director of United Nations Children's Fund (UNICEF)	Anthony Lake
Director General of International Labour Organisation (ILO)	Guy Ryder
Director General of World Health Organisation (WHO)	Tedros Adhanom
UN High Commissioner for Refugees	Filippo Grandi
Administrator of United Nations Development Programme (UNDP)	Achim Steiner
Secretary General of Organisation of Economic Cooperation and Development (OECD)	José Ángel Gurría
President of International Court of Justice	Ronny Abraham
President of European Commission	Jean-Claude Juncker
Director General of International Atomic Energy Agency (IAEA)	Yukiya Amano
Secretary General of North Atlantic Treaty Organization (NATO)	Jens Stoltenberg
Secretary General of South Asian Association for Regional Cooperation (SAARC)	Amjad Hussain B. Sial
Director General of World Trade Organisation (WTO)	Roberto Azevêdo
President of World Bank	Jim Yong Kim
Managing Director of International Monetary Fund (IMF)	Christine Lagarde
President of Asian Development Bank (ADB)	Takehiko Nakao
President of New Development Bank (NDB)	K.V. Kamath
President of Asian Infrastructure and Investment Bank (AIIB)	Jin Liqun
President of International Olympic Committee (IOC)	Thomas Bach
Chairperson of International Cricket Council (ICC)	Shashank Manohar
President of International Cricket Council (ICC)	Zaheer Abbas
President of FIFA	Gianni Infantino

## NATIONAL EVENTS

- The **first-ever** meeting of newly-constituted **Economic Advisory Council to Prime Minister** (EAC-PM) was held at NITI Aayog, in New Delhi on Oct 12, 2017. It was chaired by Dr. Bibey Debroy, Member NITI Aayog.
- **India's first Sewage Treatment Plant** (STP) under Hybrid Annuity Mode will come up in Haridwar (Uttarakhand) and Varanasi (Uttar Pradesh).
- The **Supreme Court** has **criminalised sex** between man and his underage wife below 18 years provided the woman files a complaint within a year.
- The **first BIMSTEC Disaster Management Exercise-2017** (DMEx-2017) was held in New Delhi, India from October 10-13, 2017.
- Cabinet approves renaming of **Kandla Port** as **Deendayal Port**.
- India received **first ever shipment of US crude oil** of 1.6 million barrels, purchased by state-run Indian Oil Corporation (IOC) at Paradip Port in Odisha on Oct. 2017.
- The Asian Development Bank (ADB) has decided to increase its annual lending to India to maximum of \$4 billion between 2018 and 2022 to help fasten inclusive economic transformation towards upper middle income status.
- According to **World Nuclear Industry Status Report 2017**, India with six installed nuclear reactors ranks **third** in world, while China is leading at 20 installed nuclear reactors.
- **Tribal Cooperative Marketing Development Federation of India Limited** (TRIFED) has inked MoU with e-commerce giant **Amazon** for selling tribal products.
- Eminent Scientist and Bharat Ratna **Prof C.N.R. Rao** was awarded 2017 Von Hippel Award, the **highest international prize in materials research**. He is **first Indian** and **first Asian** to win this honour.
- The Film Federation of India (FFI) has selected Hindi film **Newton**, a black comedy on foibles of democracy to represent India in Best Foreign Language category at **90th Academy Awards** (Oscars) to be held in February 2018.
- The Union Ministry of Home Affairs has launched full-fledged intelligence wing of **Sashastra Seema Bal** (SSB). It is paramilitary force that guards India's borders with **Bhutan** and **Nepal**.
- The Ministry of External Affairs has started **Operation Insaniyat** to provide assistance to Bangladesh in response to humanitarian crisis being faced by it due to large influx of **Rohingya refugees** from **Myanmar**.
- India's **first advanced Homoeopathy Virology** lab inaugurated in **Kolkata**.
- The **Union Cabinet** has given approved introduction of the **Payment of Gratuity** (Amendment) Bill, 2017 in the Parliament. The Bill seeks to amend Payment of Gratuity Act, 1972.
- **Bharat Petroleum Corporation** (BPCL) is all set to become a Maharatna company. Presently it is having Navratna status.
- In World University Rankings 2018, **Indian Institute of Science** (IISc) ranked highest from India.
- The **Indian Computer Emergency Response Team** (CERT-In) has issued an alert about spread of new ransomware (malicious software) '**Locky**' that can lock computers and **demand ransom** for unlocking them.
- The **Geographical Indications Registry** (GIR) has granted geographical indication (GI) status to **Gobindobhog rice**, a speciality from Burdwan district of **West Bengal**.
- The Union Ministry of External Affairs (MEA) launched country's **first Videsh Bhavan** by assimilating all Regional Passport Offices and allied department

- under a single roof at the Bandra Kurla Complex (BKC) in Mumbai, Maharashtra.
- The nine-judge Constitution Bench of the Supreme Court headed by Chief Justice of India JS Khehar in a landmark unanimous decision has declared **right to privacy a fundamental right** under the constitution.
  - The Union Finance Ministry on the recommendations of the Central Board of Directors of the Reserve Bank of India (RBI) has notified currency notes of **Rs.200**.
  - The Union Cabinet has approved a Memorandum of Understanding (MoU) between **India** and **Nepal** for starting construction of a new Bridge over **Mechi River** at **India-Nepal border**.
  - The National Institution for Transforming India (NITI) Aayog has launched Mentor India Campaign, a strategic nation building initiative to engage leaders for guiding and mentoring students at Atal Tinkering Labs.
  - The Supreme Court of Indian has declared Islamic practice of instant divorce through **triple talaq** as unconstitutional, illegal and void and not protected by Article 25 (freedom of religion) of the Constitution.
  - **Climate change** costs India **\$10 billion** every year.
  - The Reserve Bank of India (RBI) will shortly issue new banknotes of **Rs.50** denomination in the Mahatma Gandhi (New) Series. The base colour of the new notes will be **fluorescent blue**.
  - India is going to host the next steering committee meeting of the proposed **1,814 kilometre-long Turkmenistan-Afghanistan-Pakistan-India (TAPI)** gas pipeline.
  - **Odisha government** and social networking giant **Facebook** has launched **'SheMeansBusiness'** programme to train women entrepreneurs in the state. It was launched in partnership between Odisha's **MSME** (micro, small and medium enterprises) department and **Project Mission Shakti**.
  - The **National Mission for Clean Ganga** (NMCG) has approved ten projects in **Uttar Pradesh, Bihar** and **West Bengal** to the tune of about **Rs. 2,033 crore**.
  - The Union Home Ministry has merged three-decade old National Crime Records Bureau (NCRB) with Bureau of Police Research and Development (BPRD).
  - **ISRO** and **NASA** are jointly working on the **NASA-ISRO Synthetic Aperture Radar** (NISAR) mission to co-develop and launch a dual frequency synthetic aperture radar (SAR) satellite by 2021. The satellite will be **the world's most expensive earth-imaging satellite** till date, costing around \$1.5 billion. It aims to study global environmental change and natural disasters.
  - **World Bank** has allowed India to construct **Kishanganga, Ratle hydroelectric power** facilities on tributaries of the Jhelum and Chenab rivers with certain restrictions under the 1960 Indus Waters Treaty (IWT).
  - The Union Government has launched **e-Rashtriya Kisan Agri Mandi (e-RaKAM)** portal to provide a platform for farmers to sell agricultural produce.
  - OECD-FAO Agricultural Outlook 2017-2026 report, **India** is the world's **third-biggest exporter of beef**. Brazil was ranked as the world's top beef exporter of beef.
  - **India** is world's third-biggest **beef exporter**: OECD-FAO 2017-18 report.
  - The **Supreme Court** has ruled that the **police cannot arrest** the accused without conducting a preliminary inquiry under **dowry harassment cases**. The ruling was made by a SC bench of Justices **A K Goel** and **UU Lalit**.
  - 2017 **BRICS** Labour and Employment Ministers' meeting held in **Chongqing**.
  - Government approves **first housing project** on private land under **Pradhan Mantri Awas Yojana**. It has approved construction of 30,000 affordable houses in **Maharashtra's Sholapur** district.

- Government launches **Aarambh mobile app** for road maintenance.
- **India** witnessed **third highest terror attacks** in 2016-17: US. The six countries that faced highest number of terrorist attacks in 2016 are Iraq (2,965 terrorist attacks), Afghanistan (1,340), India (927), Pakistan (734), Philippines (482), Nigeria (466).
- **Lok Sabha** passes **The Right of Children to Free and Compulsory Education (Amendment) Bill, 2017**.
- **India, Japan** civil **nuclear deal** comes into force. The deal would enable Japan to export nuclear power plant technology as well as provide finance for nuclear power plants in India. It will also assist India in nuclear waste management and could undertake joint manufacture of nuclear power plant components under the Make in India initiative.
- The Union Environment Ministry approved three projects for **climate change adaptation** in three states viz. **Rajasthan, Gujarat** and **Sikkim** for funding under the **National Adaptation Fund for Climate Change (NAFCC)**.
- **UIDAI** launches **mAadhaar app** for Aadhaar data on phone.
- **Indian Railways** has launched **India's first solar powered diesel multiple unit (DEMU)** broad gauge train. It is 1600 Horse Power (HP) train with all solar powered coaches. The train will run from Sarai Rohilla in Delhi to Farukh Nagar in **Haryana**.
- **India** has been ranked low **116** out of 157 nations on the 2017 **Sustainable Development Goal (SDG) Index**.
- India to host **8th International Theatre Olympics** in 2018.
- India to become **largest milk producer** in 2026: OECD-FAO report.
- **World Bank** clears **\$250-million loan** for **Skill India Mission**.
- **India** becomes **Fourth Largest Foreign Investor** into UK, published by the UK's Department for International Trade.
- **Indian Oil, Bharat Petroleum** and **Hindustan Petroleum** has have signed the joint venture agreement to jointly set up the **world's largest refinery** and petrochemical complex in **Ratnagiri** district of **Maharashtra**.
- **National Board of Wildlife** Clears **Rutland Island** for DRDO's Missile Testing Project.
- **Vizianagaram** bags **MGNREGA National Award**.
- **India** has become **world's second largest LPG importer**, a position that was previously occupied by **Japan**. **China** remains as the world's top importer.

## INTERNATIONAL EVENTS

- **India** is collaborating with **Russia** to build **Rooppur nuclear power plant** in **Bangladesh**. It will be **first** initiative under an India-Russia nuclear deal to undertake atomic energy projects in third countries. It will also be **India's first** atomic energy venture abroad.
- **India** and **Japan** have agreed to ink open sky arrangement to allow airlines from both countries to operate unlimited number of flights.
- **US** withdraws from **UNESCO** accusing it for **anti-Israel bias**.
- The **United Nations Security Council (UNSC)** has unanimously passed new set of tougher sanctions against **North Korea** over its sixth and most powerful powerful nuclear test (claimed to be **Hydrogen bomb**).
- **Jordan**, a water-poor country that is 90% desert, has launched **Sahara Forest Project** near the southern port city of



Aqaba to turn desert land into farming land to produce food using sun and sea water.



- According to the 2017 Global Liveability Report compiled by the **Economist Intelligence Unit (EIU)**, Australian city **Melbourne** is the most liveable city.
- **Qatar** to become **first Arab state** to offer **permanent residency** to some non-citizens.
- **Sri Lanka, China** sign \$1.1 billion **Hambantota port deal**.



- **Okinoshima** Island, Japan's men-only island was declared as a **UNESCO** world heritage site.

- The **World Health Organization (WHO)** has declared the **end** of the most recent outbreak of **Ebola virus** disease (EVD) in the Democratic Republic of **Congo**.
- **Carrie Lam** sworn in as **first female Chief Executive of Hong Kong**.
- **China** has launched its most powerful naval destroyer, the **Type 055**, at the **Shanghai port**. The naval destroyer is one among the **largest warships** in the world.
- The **European Union's** competition watchdog has fined **Google** a record **2.42 billion euro** for breaching the anti-trust rules by illegally favouring its shopping service.
- US to declare **China** among **Worst Human Trafficking Offenders**.
- **China** has unveiled **world's first train** that runs on a **virtual track** making use of sensor technology instead of metal rails.
- **Panama** has established formal diplomatic ties with **China** and broke all of its relationship with **Taiwan** in a move that is seen as a victory for **China** in its drive to isolate **Taiwan** from the rest of the world. China claims Taiwan as its own territory.
- **Sher Bahadur Deuba** elected as **40th Prime Minister** of Nepal for the **fourth time**.
- **Airlander 10**, the **world's largest aircraft** has successfully completed a test flight by flying for a total of 180 minutes in Cardington, UK.
- **Hassan Rouhani** has been re-elected as the **President of Iran**. He was elected as president for his first term in 2013.

## ECONOMY AND BANKING

- **Index of Industrial Production (IIP)** has grown nine-month high to 4.3% in August 2017.
- The **International Monetary Fund (IMF)** in its October **World Economic Outlook (WEO)** has lowered India's economic

growth forecast at **6.7%** in **2017** and **7.4 %** in **2018**.

- **Core sector** growth rises to **4.9%** in August 2017.
- India was placed at **40th** spot among 137 countries in **World Economic Forum's**

- (WEF) **Global Competitiveness Index (GCI) 2017-18**. India has slipped by one position compared to 39th spot in 2016 GCI.
- **State Bank of India (SBI)** along with FTSE Russell, global index and data provider launched FTSE SBI Bond Index series at London Stock Exchange (LSE). It is **India's first bond** index series for overseas investors.
  - **India's foreign exchange (Forex)** reserves have crossed **\$400 billion** mark for the **first** time, According to Reserve Bank of India (RBI).
  - **Indian Commodity Exchange (ICEX)** launches world's first diamond futures contracts.
  - The **Union Government** has notified the **Banking Regulation (Amendment) Act, 2017**. The Parliament had approved the Banking Regulation (Amendment) Bill, 2017 which replaced an ordinance in this regard.
  - **MCX** gets **SEBI approval** to launch **India's first gold** options contract.
  - **Reliance Industries** market capitalisation hits **Rs 5 lakh crore** mark.
  - **RBI** has issued directions on 'Customer Protection – Limiting Liability of Customers in unauthorised Electronic Banking Transactions'. RBI has issued the revised directions amidst a recent increase in customer grievances related to unauthorised transactions.
  - **India** placed **88th** in money hoarded in **Swiss banks**.
  - **Reliance Jio Infocomm** has launched the **Asia-Africa-Europe (AAE-1)** submarine cable system. It is claimed to be **world's longest 100Gbps technology-based** submarine system. It stretches for over **25,000km** from **Marseille, France** to **Hong Kong**.
  - **India** continues to remain as a **favourite destination** for **FDI** even though tax related concerns remain as a deterrent for the foreign investors, according to UNCTAD's World Investment Report 2017.
  - The 2017 **Global Retail Development Index (GRDI)** titled '**The Age of Focus**' has placed India at the top position among 30 developing countries on ease of doing business in the retail sector.
  - **Gujarat Cooperative Milk Marketing Federation (GCMMF)** which markets its product under the brand name '**Amul**' has signed an MoU with **ISRO** for fodder acreage assessment using satellite observation and space technology.
  - Google's vice-president for South East Asia and India, **Rajan Anandan** has been appointed as the new chairman of Internet and Mobile Association of India (IAMAI). Rajan will succeed FreeCharge's co-founder and chief executive officer Kunal Shah.
  - The **Union Cabinet** has approved the **abolition of 25 year old FIPB**. Henceforth, concerned ministries will be responsible for direct approval of foreign investment proposals. The decision falls in line with Finance Minister Arun Jaitley's proposal to scrap FIPB in this year's Union Budget.
  - The GST Council headed by finance Minister Arun Jaitley has finalised a 4-slab service tax structure at the rates of 5, 12, 18 and 28 per cent as against the single rate of 15% levied on all taxable services.
  - Brand finance in its 2017 report that lists **India's 100 most valuable brands** has named **Tata Group** as the most valuable brand in India at an estimated brand value of \$13.1 billion.
  - **BSNL** has inked agreements with **Facebook** and **MobiKwik** in order to popularize the internet and its value added services among its customers. Further, BSNL has also signed a third MoU with Disney Land India to offer premium online gaming services to its mobile customers.
  - US-based think tank **Global Financial Integrity (GFI)** in its report titled '**Illicit Financial Flows to and from Developing**

**Countries: 2005-2014**, has estimated that **\$770 billion** worth of black money entered India during 2005-2014.

- The **IMF** has predicted that the global economy would grow at **3.5%** in **2017**, up from 3.1 % last year, and 3.6% in 2018.

## SCIENCE AND TECHNOLOGY

- **World's largest combustion research centre** inaugurated at **IIT Madras**, Tamil Nadu.
- **United States Food and Drug Administration (FDA)** has approved '**Cbas Zika test**' for detecting Zika virus in donated blood. It is first of kind test approved by FDA for detecting Zika virus in donated blood.
- **ISRO's** globally acclaimed **Mars Orbiter Mission (MOM)** also known as Mangalyaan completed three years in Martian orbit. It has outlived its original lifespan and is still in good health and continues to work as expected.
- The **world's largest** all-composite airplane **Stratolaunch** in terms of wingspan successfully completed its initial engine tests. It is designed for launching for sending satellite-carrying rockets into low-Earth orbit. The plane has biggest wingspan ever built, measuring **118 m** from one end to the other, longer than a professional football field. It weighs about **227,000 kg**.
- **NASA's** asteroid-chasing spacecraft **Osiris-Rex** successfully swung by Earth to put it on desired trajectory towards near earth asteroid Bennu using Earth's gravity. It passed within 17,237 kilometres from Earth above Antarctica.
- **Scientists** from University of Manchester have created **world's first 'molecular robot'** — millionth of a millimetre in size. It can be used to build molecules and may help discover novel drugs.
- Scientists from Brown University in US have created **first map of water trapped** in uppermost layer of Moon's soil. The was build using NASA's Moon Mineralogy Mapper onboard of **India's Chandrayaan-1** spacecraft.
- The **International Astronomical Union (IAU)** has named two mountain ranges on icy dwarf planet Pluto as **Tenzing Montes** and **Hillary Montes** after **Tenzing Norgay** and **Edmund Hillary**. Indian/Nepali Sherpa Tenzing Norgay (1914-1986) and New Zealand Edmund Hillary (1919-2008) were the first mountaineer to reach the summit of Mount Everest and return safely in 1953.
- Researchers have discovered **new species of edible freshwater fish** in **Pampa river** in Pathanamthitta, Kerala. It has been named as Labeo filiferus (L.filiferus) and belongs to Labeo genus.
- **India's first Hyperloop project** will come up in **Andhra Pradesh**, connecting its city centres, Vijayawada and Amaravati.
- The **world's largest and powerful X-ray laser**- European X-ray Free Electron Laser (XFEL) was unveiled in Hamburg, Germany. The first beams from XFEL were accelerated in April 2017 and first x-ray beams were produced in May 2017. It will help scientists penetrate the inner workings of atoms, viruses and chemical reactions.
- Indian scientists have discovered **Nasikabatrachus bhupathi**, a **new species of frog** that has a snout-shaped nose, just like a pig in West Ghats. It has been named after the Indian herpetologist S. Bhupathy.
- **Versius: world's smallest surgical robot** developed by UK scientists.
- **India's first calf delivered** by a surrogate or recipient cow through In Vitro Fertilisation (IVF) technology carried out in a mobile laboratory was born in Indapur,

Pune (Maharashtra). It has been named as Vijay.

- NSAS has successfully launched Tracking and Data Relay Satellite-M (TDRS-M) into orbit. It was launched aboard a United Launch Alliance (ULA) Atlas V rocket.
- Scientists have developed a **super strong, flexible Bio-glue** for **wound healing** without causing toxicity. It has been inspired by an adhesive material (glue) secreted by slugs that sticks to biological tissues.
- Scientists have discovered **new species of glow-in-the-dark shark** living 1,000 feet below the Pacific Ocean off the coast of the northwestern **Hawaiian islands**. It has been named **Etmopterus lailae** and belongs to **lanternshark family**.
- The **world's first full—scale floating wind farm** is being built off the coast of **Scotland** in the North Sea. The wind farm, known as **Hywind** is a trial project which aims to bring power to 20,000 homes.
- **United States Navy** successfully tested the **world's first-ever active Laser Weapons System (LaWS)**.
- A team of **Indian astronomers** have identified previously unknown, extremely large supercluster of galaxies located in the direction of constellation Pisces. It has been named "**Saraswati**". It was discovered by astronomers from Inter University Centre for Astronomy and Astrophysics (IUCAA) and Indian Institute of Science Education

and Research (IISER), both in **Pune**, Maharashtra.

- Scientists from University of Cambridge, UK have discovered the **smallest star in the universe**. It has been named as **EBLM J0555-57Ab**. The star was identified by **SuperWASP**, a planet-finding experiment run by several universities.
- **NASA** is developing **Double Asteroid Redirection Test (DART)**, the **first-ever mission** that will deflect a near-Earth asteroid.
- **ISRO** has successfully launched **GSAT-17** communication Satellite onboard the Ariane-5 launch vehicle from the Guiana Space Center at French Guiana.
- **NASA** has launched **world's lightest satellite** weighing only **64 grams** designed by 18-year-old Indian boy Rifath Sharook from Tamil Nadu. The tiny satellite has been named as KalamSat after the former President **APJ Abdul Kalam**. The tiny satellite was launched into space on a sounding rocket from NASA's facility in **Wallops Island**.
- Scientists have discovered the **hottest known exoplanet**, designated **KELT-9b** which is warmer than most stars in the universe.
- The **world's first hybrid 'aeroboot'** which has been built by an Indo-Russian joint venture has been unveiled at a start-ups event organized by Russia's state-run Skolkovo Foundation.

## DEFENCE AND SECURITY

- **Indigenously-built anti-submarine warfare stealth corvette INS Kiltan** was commissioned into the **Indian Navy** at the **Eastern Naval Command** (Naval Dockyard) in Visakhapatnam, Andhra Pradesh. It is **India's first major warship** to have a superstructure of carbon fibre composite material resulting in improved

stealth features, lower top weight and maintenance costs.

- **Defence Ministry** has rolled out **ARPAN 3.0** (Army Record Office Process Automation 3.0), a **new automation software** for Defence Security Corps personnel to ease personal documentation and all issues related to their progression.

- **INS Tarasa (T94)**, the fourth and last ship in series of **Water Jet Fast Attack Craft (WJFAC)** was commissioned into Indian Navy at Naval Dockyard, **Mumbai**.
- **Indian Coast Guard's (ICG) new interceptor boat V-409** was launched in Mangaluru, Karnataka by Bharathi Defence and Infrastructure Limited (BDIL).
- The **advanced towed artillery gun system (ATAGS)** has set a **world record** in terms of range by hitting targets at distance of **48 km** during trial firings at Pokhran, Rajasthan.
- **India's first all-women crew circumnavigation expedition** named as **Navika Sagar Parikrama** was flagged off by Defence Minister Nirmala Sitharaman in Goa.
- The **Indian Army** has finalised plan to induct **women in military police**. The plan is seen as major step towards breaking gender barriers in force.
- **Indian Navy's** second CU (landing craft utility) **Mark IV L52** ship was commissioned at Port Blair, capital of Andaman and Nicobar Islands.
- The Union Defence Ministry has cleared a proposal to procure six **AH-64-E Apache attack helicopters** along with weapons systems from **American aerospace giant Boeing** for the Indian Army.
- **India's first private sector** missile sub-systems manufacturing facility **Kalyani Rafael Advanced Systems (KRAS)** plant was inaugurated near Hyderabad, capital of **Telangana**. It is 51:49 joint venture between India's **Kalyani Group** and Israel's **Rafael Advanced Defence Systems Ltd.**
- The Defence Research and Development Organisation (DRDO) has rolled out **Muntra, India's first unmanned, remotely operated tank** at its Chennai lab. It has been launched in three variants **Muntra-S, Muntra-M** and **Muntra-N** for surveillance, mine detection and reconnaissance in areas with nuclear and biological threats. It is also likely to be used in Naxal-hit areas.
- **Reliance Defence and Engineering Limited (RDEL)** launched the **first two Naval Offshore Patrol Vessels (NOPVs)** — **Shachi** and **Shruti** at their shipyard in Pipavav, Gujarat.
- The United States (US) Navy officially inducted **USS Gerald R Ford (CVN 78)**, the **world's largest nuclear-powered aircraft carrier** at Naval Station Norfolk, **Virginia**. It is the most advanced aircraft carrier in the world.
- **Indian Army** has received its **first batch of bullet-proof helmets**. The helmets were manufactured by Kanpur-based MKU Industries.

## ECOLOGY AND ENVIRONMENT

- Scientists for **first time** have **captured** images of **Snow Leopard** using camera trap at Thembang village's Community Conserved Area (CCA) in **West Kameng** district of Arunachal Pradesh.
- The Union Ministry of Water Resources has approved project to set up **Turtle sanctuary** in Allahabad along with River Biodiversity Park at Sangam in Allahabad, Uttar Pradesh under Namami Gange programme.
- **India's first electric bus** service was launched at **Rohtang Pass** area in **Himachal Pradesh**. It is first of its kind electric bus service for tourist spot in India and **first in world** at an altitude of 13,000 feet.
- Telangana Forest Department for **first time** has re-introduced '**mouse deer**' in the

forests of Nallamalla in Amrabad Tiger Reserve (ATR) bred at Nehru Zoological Park, Hyderabad.

- According to the latest census report, released by the Union Ministry of Environment, Forests and Climate Change (MoEFCC) the population estimation of **Asian elephant** in India is around **27,312**.
- Researchers from the **University of Edinburgh** in Britain have discovered the **largest volcanic region on Earth**, two km below the surface of the vast ice sheet in **West Antarctica**. They have found 91 previously unknown active volcanoes in the region known as the West Antarctic rift system, adding to the exiting 47 volcanoes that were discovered earlier. This makes it largest volcanic region on the Earth.
- The Executive Committee of National Mission for Clean Ganga (NMCG) in its 4th meeting has approved **seven projects** in

the sector of **sewage infrastructure**, ghat development and research.

- The **Delhi Metro Railway Corporation** (DMRC) has become the **world's first completely 'green' Metro system** for adhering to green building norms for its residential colonies.
- The **World Bank** has observed that **India** is emerging as a **frontrunner in the fight against climate change**. It has noted that India is gradually replacing coal energy with solar power as a source of energy.
- According to **NASA**, **May 2017** was the **second hottest month** in a span of 137 years when modern record-keeping of average global temperatures had commenced. The temperature of May 2017 was 0.88 degrees Celsius warmer than the mean May temperature from 1951-1980. May 2016 is the hottest on record with 0.93 degrees Celsius warmer than the May mean temperature.

## PLACES IN NEWS

- The 600-year-old **Walled City** in Gujarat's commercial capital Ahmedabad was formally accorded status of India's first World Heritage City by United Nations Educational, Scientific and Cultural Organization (UNESCO).
- **UNESCO** has named **Sharjah** as the **World Book Capital** for 2019. Sharjah was chosen for its efforts to make books accessible to its entire population.
- Mumbai's **Taj Mahal Palace** hotel has acquired an **'image trademark'** under the Trademark Act of 1999, making it is the **first building in the country** to acquire intellectual property rights protection for its architectural design.
- The **World's largest festival of light**, music and ideas, Vivid Sydney has entered into Guinness World Book of Records. The Guinness World Record have given the Vivid Sydney installation Dreamscape the

title for the **'Largest interactive lighting display'**.

- **Habibganj railway station** in the suburbs of Bhopal will become country's **first railway station** to be redeveloped in a **public-private partnership (PPP)** mode.
- **World Economic Forum** citing **UN-Habitat** data has named two Indian cities- **Mumbai** and **Kota** among the world's most crowded cities. **Dhaka** has topped the list followed by India's financial capital Mumbai. **Dhaka**, the capital of Bangladesh has a population density of 44,500 people per square kilometre. **Mumbai** has a population density of 31,700 people per square kilometre. Another Indian city **Kota** in Rajasthan with 12,100 people per square kilometre has been ranked seventh in the list.
- The two organizations **Afcons Transtunnelstroy** and **Kolkata Metro**

**Railway Corporation Ltd (KMCRL)** involved in implementing the **East West Metro** have completed boring the **India's first underwater tunnel** under the **Hooghly river** to link **Howrah** and **Kolkata**. The length of Kolkata's East West Metro is **16.6 km long**. Out of which a length of 502 metres is under the Hooghly river.

- **World's highest railway bridge** which will be 35 metres taller than the Eiffel

Tower is to come up over the **Chenab River** in Jammu and Kashmir at a cost of around Rs. 1,100 crore in around two years from now. The bridge will connect Bakkal (Katra) and Kauri (Srinagar).

- **Dubai** has become the **first city in the world** to have its own **Microsoft-designed font**. The font will have typeface both in **Latin** and **Arabic** script.

## PASSED AWAY PERSONS

- Veteran theatre, television and film actor **Tom Alter** passed away aged 67. He was best known for his performances in "Shatranj Ke Khilari", "Junoon" and "Kranti".
- Veteran molecular biologist **Pushpa Mitra Bhargava** passed away in Hyderabad. He was 89. Bhargava was the founding director of Hyderabad based Centre for Cellular and Molecular Biology (CCMB).
- Ustad **Hussain Sayeeduddin Dagar**, one of the foremost exponents and custodian of the venerable Dhrupad tradition of Hindustani classical music passed away in a Pune. He was 78.
- The sole Marshal of the Indian Air Force (IAF) **Arjan Singh** passed away following cardiac arrest in New Delhi. He was 98.
- Freedom fighter **K.E. Mammen** passed away due to age-related diseases in Neyyatinkara, Kerala. He was 96. He was a pacifist and adherent follower of Mahatma Gandhi.
- Internationally-renowned space scientist and former chairman of ISRO (Indian Space Research Organization), **Udupi Ramachandra Rao** passed away in Bengaluru. He was 85.
- China's most famous political prisoner, the Nobel laureate and democracy icon **Liu Xiaobo** passed away in custody following a battle with cancer. He was 61. Liu was awarded the 2010 Nobel Peace Prize for his long and non-violent struggle for fundamental human rights in China.
- Former German Chancellor **Helmut Kohl**, who is hailed as the father of German unification has passed away. He was responsible for unifying Germany after the 1989 fall of the Berlin Wall despite facing stiff resistance from Margaret Thatcher and Mikhail Gorbachev.
- Former Chief Justice of India **Prfullachandra Natwarlal Bhagwati** who is considered as a pioneer of Judicial Activism has passed away. He was 95 years old.
- Renowned Telugu poet and writer **Cingireddi Narayana Reddy** has passed away. In 1992, Reddy was awarded the country's third-highest civilian honour, Padma Bhushan.
- **KPS Gill**, an IPS officer of the Assam-Meghalaya cadre of the 1958 batch, who is often credited with rooting out militancy in Punjab has passed away at the age of 82.
- British actor **Roger Moore**, who played the much famed secret agent James Bond, has passed away at the age of 89.
- Union environment minister **Anil Madhav Dave** has passed away. He was 60.

- Justice **Leila Seth** who became the first woman Chief Justice of a State High Court has passed away at the age of 86.
- Veteran actor and politician **Vinod Khanna** has expired at the age of 70 due to cancer.
- **Robert Taylor**, a pioneer of Modern Computing and the Internet has passed away at the age of 85.
- Former Governor of Jammu and Kashmir **Girish Chandra Saxena** has passed away at the age of 90.
- Renowned Meteorologist and former director of the Indian Institute of Tropical Meteorology (Pune) **Dev Raj Sikka** passed away. He was 85.
- Veteran actor **Om Puri** passed away following massive cardiac arrest in Mumbai, Maharashtra. He was 66.

## PERSONALITY IN NEWS

- Former French Culture Minister **Audrey Azoulay** (45) was elected as new Director General of UNESCO – the UN’s education, science and culture agency. She becomes **first Jewish Director** of UNESCO.
- Veteran actor **Anupam Kher** (62) was appointed as new Chairman of the **Film and Television Institute of India** (FTII) in Pune.
- Former US Assistant Secretary of State for South and Central Asia **Nisha Desai Biswal** was appointed as President of US-India Business Council (USIBC).
- The Swedish Academy has selected Japanese-born English novelist **Kazuo Ishiguro** (62) for the 2017 **Nobel Prize in literature**.
- The Appointments Committee of the Cabinet (ACC) has appointed **Rajnish Kumar** (59) as the new **chairman** of **State Bank of India** (SBI). He succeeds **Arundhati Bhattacharya** who retired from the service.
- The **World Health Organization** (WHO) has appointed **Dr. Soumya Swaminathan** (58) as one of two deputy directors general. This is **first time** such second-highest position created within WHO and highest post held by Indian in WHO.
- The Appointments Committee of the Cabinet (ACC) has appointed senior IPS officer **Rajni Kant Mishra** (58) as new Director General of **Sashastra Seema Bal** (SSB).
- **Viveck Goenka**, chairman and managing director of Express Group was unanimously elected as Chairman of Press Trust of India (PTI).
- **Nirmala Sitharaman** (58) became **first full time woman Defence Minister** of India after she was promoted to the Union Cabinet.
- Noted economist **Rajiv Kumar** took over as the Vice-Chairman of government **National Institution for Transforming India** (NITI) Aayog.
- The Union Government has appointed former Information and Broadcasting secretary **Sunil Arora** (61) as **Election Commissioner**.
- Justice **Dipak Misra** (64) sworn in as the 45th **Chief Justice of India** (CJI). He succeeds Chief Justice **J S Khehar**.
- The Union Information and Broadcasting Ministry has appointed **Prasoon Joshi** as the new Chairman of **Central Board of Film Certification** (CBFC). He will replace **Pahlaj Nihalani** and shall have tenure of three years.
- The Appointments Committee of the Cabinet (ACC) has appointed senior IAS officer from Gujarat **S. Aparna** as Executive Director of the **World Bank**.



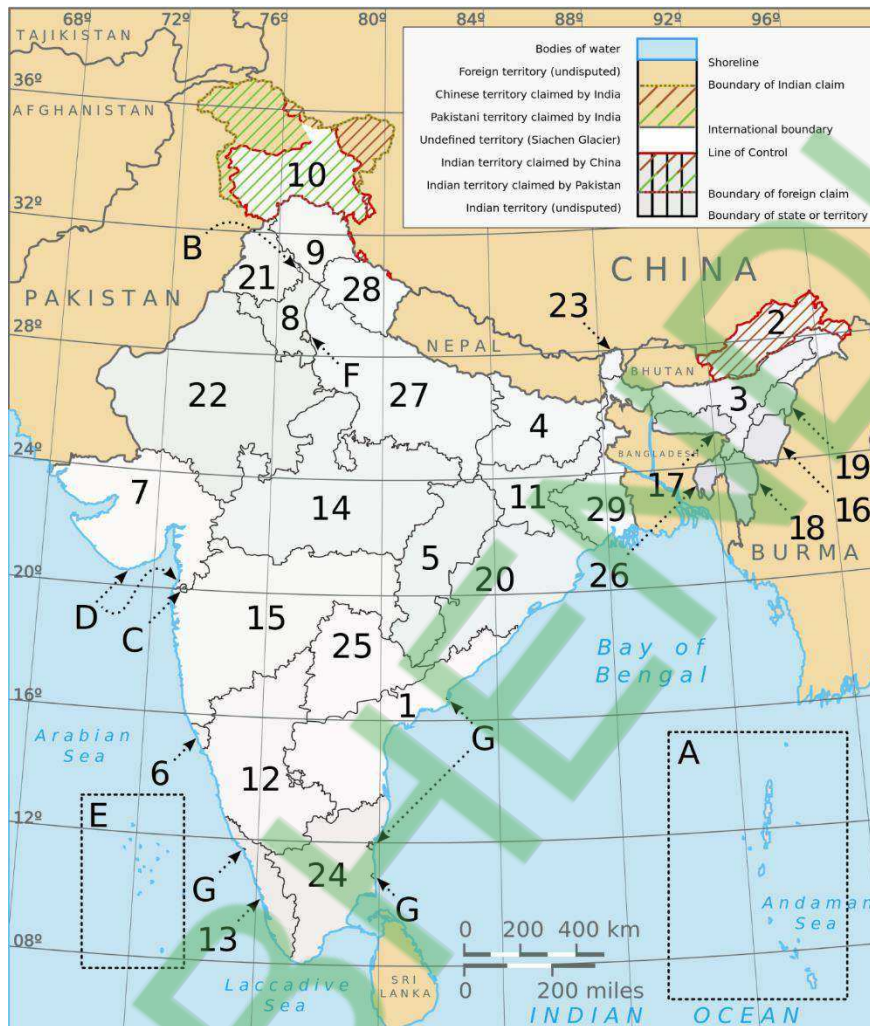
- Pakistan's Petroleum Minister **Shahid Khaqan Abbasi** was elected the **18th Prime Minister of Pakistan** by the National Assembly.
- Senior Naga People's Front (NPF) legislator **TR Zeliang** (65) was sworn in as the **19th chief minister** of Nagaland.
- **UK's first woman Sikh MP Preet Kaur Gill** elected to Home Affairs Select Committee.
- Senior IPS officer **Sanjay Kumar** was appointed as Director General (DG) of **National Disaster Response Force (NDRF)**.
- President Pranab Mukherjee has appointed election commissioner **Achal Kumar Joti** as the next **Chief Election Commissioner (CEC)**. He will continue as CEC till 17 January 2018.
- Senior IPS officer **R K Pachnanda** took charge as the new Director General of the **Indo-Tibetan Border Police (ITBP)**. He will be the 29th Chief of the ITBP.
- Anti-hunger activist **Ankit Kawatra** has been awarded the **Queen's Young Leaders Award** for 2017 by Queen Elizabeth II at a ceremony in the Buckingham Palace.
- **Kaushik Basu** has taken over as **president** of the **International Economic Association (IEA)**.
- Nashik's army doctor **Srinivas Gokulnath** and Nagpur's doctor **Amit Samarth** has created history by becoming the **first Indians** to complete the **4,900-km Race Across America (RAAM)** in the solo 18-59 age category.
- **Palbinder Kaur Shergill** has become the **first turbaned Sikh woman** to be appointed as **Canada's Supreme Court judge**.
- India's Skipper **Virat Kohli** has created a record by becoming the **quickest batsman to score 8000 runs in one-day international cricket** beating South Africa's AB de Villier's record by seven fewer innings.
- **Neeru Chadha** becomes **First Indian Women** to be elected to **International Tribunal for the Law of the Seas (ITLOS)**.
- **Sahithi Pingali**, a twelfth grader from Bengaluru will get a minor planet in Milky Way named after her as a reward for developing an integrated mobile phone app and lake monitoring kit to monitor pollution in water bodies.
- **Prashant Ranganathan** has emerged winner in the **world's largest pre-college science competition** in the environment engineering category for his work on biodegradation of pesticides.



# PROFILE *of* INDIA

# PROFILE OF INDIA

## INDIAN POLITICAL MAP



### STATES

1. Andhra Pradesh
2. Arunachal Pradesh
3. Assam
4. Bihar
5. Chhattisgarh
6. Goa
7. Gujarat
8. Haryana
9. Himachal Pradesh
10. Jammu and Kashmir
11. Jharkhand
12. Karnataka

13. Kerala
14. Madhya Pradesh
15. Maharashtra
16. Manipur
17. Meghalaya
18. Mizoram
19. Nagaland
20. Odisha
21. Punjab
22. Rajasthan
23. Sikkim
24. Tamil Nadu
25. Telangana
26. Tripura

27. Uttar Pradesh
28. Uttarakhand
29. West Bengal

### Union territories

- A. Andaman and Nicobar Islands
- B. Chandigarh
- C. Dadra and Nagar Haveli
- D. Daman and Diu
- E. Lakshadweep
- F. National Capital Territory of Delhi
- G. Puducherry

## INDIA AT A GLANCE

<b>Country Name</b>	: Republic of India; Bharat Ganrajya
<b>Natives</b>	: Indian
<b>Location</b>	: The Indian peninsula is separated from mainland Asia by the Himalayas. The Country is surrounded by the Bay of Bengal in the east, the Arabian Sea in the west, and the Indian Ocean to the south.
<b>Latitude</b>	: 8° 4' and 37° 6' north latitude
<b>Longitude</b>	: 68° 7' and 97° 25' east longitude
<b>Area - Total</b>	: 3,287,263 km <sup>2</sup> (Rank - 7 <sup>th</sup> in World), 3.3 Million sq. km
<b>Administrative Divisions</b>	: 29 States and 7 Union Territories.
<b>Capital</b>	: New Delhi, 28°36.8'N 77°12.5'E
<b>Largest City</b>	: Mumbai (Population/Area)
<b>Largest State</b>	: Rajasthan (Area)
<b>Smallest State</b>	: Goa (Area)
<b>Highest Point</b>	: Kanchenjunga : 8,586 m (28,169 ft)
<b>Population</b>	: 1,210,193,422 (Rank – 2 <sup>nd</sup> in World) (2011 census) (623.7 million Males and 586.4 million Females)
<b>Density</b>	: 386.9/km <sup>2</sup> (Rank – 31 <sup>st</sup> in World)
<b>Sex Ratio</b>	: 940 females per 1000 males according to 2011 census
<b>Birth Rate</b>	: 18.3
<b>Death Rate</b>	: 7.3
<b>Official languages</b>	: Hindi, English (Article 343(3) empowered Parliament to provide by law for continued use of English for official purposes.)
<b>Ethnic Groups</b>	: Australoid, Mongoloid, Europoid, Caucasian, and Negroid
<b>Independence</b>	: 15 August 1947
<b>Republic/Constitution</b>	: 26 January 1950
<b>Government Type</b>	: Sovereign Socialist Secular Democratic Republic with a Parliamentary system of Government.
<b>Legal System</b>	: The Constitution of India is the fountain source of the legal system in the Country.
<b>Legislature</b>	: Parliament of India
<b>Upper house</b>	: Rajya Sabha (Council of States)
<b>Lower house</b>	: Lok Sabha (House of the People)
<b>Executive Branch</b>	: The President of India is the Head of the State, while the Prime Minister is the Head of the Government, and runs office with the support of the Council of Ministers who form the Cabinet Ministry.
<b>Judicial Branch</b>	: The Supreme Court of India is the apex body of the Indian legal system, followed by other High Courts and subordinate Courts.
<b>National Days</b>	: 26th January (Republic Day) 15th August (Independence Day) 2nd October (Gandhi Jayanti; Mahatma Gandhi's Birthday)
<b>Indian Standard Time</b>	: GMT + 05:30
<b>Currency</b>	: Indian rupee (₹) (INR)
<b>Drives on the</b>	: Left side of Road
<b>Calling code</b>	: +91
<b>Internet TLD</b>	: .in other TLDs

## NATIONAL SYMBOLS

### NATIONAL FLAG



The **National Flag** is a horizontal tricolour flag.

**Top** : Deep saffron (kesaria) : **indicates** strength and courage of the country

**Middle** : White, in the centre of the white band is a navy-blue wheel which represents the chakra (24 spokes). : **indicates** peace and truth with Dharma Chakra.

**Bottom** : Dark green : **indicates** fertility, growth and auspiciousness of the land

The ratio of width of the flag to its length : 2:3



Designer of the Indian national flag : **Pingali Venkayya** (2 August 1876 – 4 July 1963), Indian freedom fighter

Design of the National Flag was adopted by the Constituent Assembly of India : **22 July 1947**

### NATIONAL EMBLEM



The emblem is an adaptation of the Lion Capital of Ashoka which was erected around 250 BC at Sarnath, near Varanasi in the north Indian state of Uttar Pradesh.

In the original, there are four lions, standing back to back, mounted on an abacus with a frieze carrying sculptures in high relief of an elephant, a galloping horse, a bull and a lion separated by intervening wheels over a bell-shaped lotus. Carved out of a single block of polished sandstone, the Capital is crowned by the Wheel of the Law (Dharma Chakra).

It was adopted on 26 January 1950, the day that India became a republic.

### NATIONAL MOTTO

**Sanskrit:** Satyameva Jayate

**English :** Truth Alone Triumphs

The origin of the motto is well-known mantra 3.1.6 from the **Mundaka Upanishad**. It is inscribed in **Devanagari script** at the base of the national emblem. The emblem and the words "Satyameva Jayate" are inscribed on one side of all Indian currency.

### In Devanāgarī

सत्यमेव जयते नानृतं

सत्येन पन्था विततो देवयानः |

येनाक्रमन्त्यृषयो ह्यास्रकामा

यत्र तत् सत्यस्य परमं निधानम् ||६||

### In English

Truth alone triumphs; not falsehood  
Through truth the divine path is spread  
out  
by which the sages whose desires have  
been completely fulfilled, reach  
where that supreme treasure of Truth  
resides.

### NATIONAL ANTHEM

**Hindi** : Jana Gana Mana

**English** : Thou Art the Ruler of the Minds  
of All People

**Lyrics** : Rabindranath Tagore, 1911

**Music** : Rabindranath Tagore, 1911

**Adopted** : by the Constituent Assembly on  
24 January 1950

**Written in:** Sanskritised (Tatsama) Bengali,  
it is the first of five stanzas of a Brahmo hymn  
**First sung in** : Calcutta Session of  
the INC on 27 December 1911

*Rabindranath Tagore translated "Jana Gana  
Mana" from Bengali to English and also set it  
to music in Madanapalle, a town located in  
the Chittoor district of Andhra Pradesh state,  
India.*



Jana-gana-mana-adhinayaka, jaya he,  
Bharata-bhagya-vidhata.  
Punjab-Sindhu-Gujarat-Maratha,  
Dravida-Utkala-Banga,  
Vindhya-Himachala-Yamuna-Ganga  
Uchchala-Jaladhi-taranga.  
Tava shubha name jage, Tava shubha asisa  
mage,  
Gahe tava jaya gatha,  
Jana-gana-mangala-dayaka jaya he Bharata-  
bhagya-vidhata.  
Jaya he, jaya he, jaya he, Jaya jaya jaya, jaya  
he!

*The following is a translation of  
Rabindranath Tagore's rendering of the  
stanza:*

"Thou art the ruler of the minds of all people,  
dispenser of India's destiny.  
The name rouses the hearts of Punjab, Sind,  
Gujarat and Maratha,  
of the Dravid and Odisha and Bengal;  
It echoes in the hills of the Vindhya and  
Himalayas,  
mingles in the music of the Yamuna and  
Ganga  
and is chanted by the waves of the Indian Sea.  
They pray for thy blessings and sing thy  
praise.

The salvation of all people is in thy hand,  
thou dispenser of India's destiny.  
Victory, victory, victory to thee."

### NATIONAL SONG

**Hindi** : Vande Mataram

**English** : I Bow to Thee, Mother

**Lyrics** : Bankim Chandra Chattopadhyay,  
Anandamath (1882)

**Music** : Jadunath Bhattacharya

**Adaptation** : Anandamath (Bankim  
Chandra Chattopadhyay's 1882 novel)

**Adopted** : 24 January 1950

**First sung** : by Rabindranath Tagore at the  
1896 session of the Indian National Congress



Vande Mataram!  
Sujalam, suphalam, malayaja shitalam,  
Shasyashyamalam, Mataram!  
Vande Mataram!  
Shubhrajyotsna pulakitayaminim,  
Phullakusumita drumadala shobhinim,  
Suhasinim sumadhura bhashinim,  
Sukhadam varadam, Mataram!  
Vande Mataram, Vande Mataram!

*The English translation of the stanza rendered by Sri Aurobindo in prose 1 is:*

I bow to thee, Mother,  
richly-watered, richly-fruited,  
cool with the winds of the south,  
dark with the crops of the harvests,  
The Mother!  
Her nights rejoicing in the glory of the  
moonlight,  
her lands clothed beautifully with her trees in  
flowering bloom,  
sweet of laughter, sweet of speech,  
The Mother, giver of boons, giver of bliss.

#### **NATIONAL CALENDAR**

The Indian national calendar, sometimes called the **Saka calendar**, is the official civil calendar in use in India. It is used, alongside the Gregorian calendar, by The Gazette of India, in news broadcasts by All India Radio and in calendars and communications issued by the Government of India.

Adopted from : 22 March 1957

**National Animal** : The Royal Bengal Tiger (Panthera tigris)

**National Bird** : The Indian Peacock (Pavo cristatus)

**National Flower** : Indian Lotus (Nelumbo Nucifera)

**National Tree** : Indian Banyan or Indian fig tree (Ficus bengalensis)

**National Fruit** : Mango (Manigifera indica)

**National River** : The Ganga or Ganges

**National Aquatic Animal** : Gangetic Dolphin (Platanista gangetica)

**National Currency Symbol** : The Indian Rupee symbol (₹) is an amalgam of Devanagari “Ra” and the Roman Capital “R” with two parallel horizontal stripes running at the top representing the national flag and also the “equal to” sign. **Adopted** : by the Government of India on 15th July, 2010. **Designed by** : Udaya Kumar

## STATES/UNION TERRITORY AND CAPITALS OF INDIA

No.	State	Administrative capital	Legislative capital	Judiciary capitals	Year of Est.
1	Andhra Pradesh	Hyderabad (de jure to 2024) Amaravati (de facto from 2017)	Amaravati	Hyderabad	1956 2017
2	Arunachal Pradesh	Itanagar	Itanagar	Guwahati	1987
3	Assam	Dispur	Guwahati	Guwahati	1975
4	Bihar	Patna	Patna	Patna	1935
5	Chhattisgarh	Raipur	Raipur	Bilaspur	2000
6	Goa	Panaji	Porvorim	Mumbai	1961
7	Gujarat	Gandhinagar	Gandhinagar	Ahmedabad	1960
8	Haryana	Chandigarh	Chandigarh	Chandigarh	1966
9	Himachal Pradesh	Shimla	Shimla	Shimla	1971
10	Jammu and Kashmir	Srinagar (S) Jammu (W)	Srinagar (S) Jammu (W)	Srinagar (S) Jammu (W)	1948
11	Jharkhand	Ranchi	Ranchi	Ranchi	2000
12	Karnataka	Bengaluru	Bengaluru	Bengaluru	1956
13	Kerala	Thiruvananthapuram	Thiruvananthapuram	Kochi	1956
14	Madhya Pradesh	Bhopal	Bhopal	Jabalpur	1956
15	Maharashtra	Mumbai Nagpur (W/2nd)	Mumbai (S+B) Nagpur (W)	Mumbai	1818 1960
16	Manipur	Imphal	Imphal	Imphal	1947
17	Meghalaya	Shillong	Shillong	Shillong	1970
18	Mizoram	Aizawl	Aizawl	Guwahati	1972
19	Nagaland	Kohima	Kohima	Guwahati	1963
20	Odisha	Bhubaneswar	Bhubaneswar	Cuttack	1948
21	Punjab	Chandigarh	Chandigarh	Chandigarh	1966
22	Rajasthan	Jaipur	Jaipur	Jodhpur	1948
23	Sikkim	Gangtok	Gangtok	Gangtok	1975
24	Tamil Nadu	Chennai	Chennai	Chennai	1956
25	Telangana	Hyderabad	Hyderabad	Hyderabad	2014
26	Tripura	Agartala	Agartala	Agartala	1956
27	Uttar Pradesh	Lucknow	Lucknow	Allahabad	1937
28	Uttarakhand	Dehradun	Dehradun	Nainital	2000
29	West Bengal	Kolkata	Kolkata	Kolkata	1947

\* After the formation of Telangana, as per the Andhra Pradesh Reorganisation Act, 2014, both states will share Hyderabad as their common capital for ten years. The new Andhra Pradesh Capital City capital is going to be Amaravati, decided by the Andhra Pradesh government in the month of April, 2015.

No.	Union territory	Administrative capital	Legislative capital	Judiciary capitals	Year of Est.
1	Andaman and Nicobar Islands	Port Blair	Port Blair	Kolkata (formerly Calcutta)	1956
2	Chandigarh	Chandigarh	—	Chandigarh	1966
3	Dadra and Nagar Haveli	Silvassa	—	Mumbai	1944
4	Daman and Diu	Daman	—	Mumbai	1987
5	Lakshadweep	Kavaratti	Kavaratti	Kochi	
6	National Capital Territory of Delhi	Delhi	Delhi		1952
7	Puducherry	Puducherry	Puducherry	Chennai	1954



## 2011 CENSUS OF INDIA

SN	Union Territory/ State Name	Type	Total Population	Percent(%) of Total Population of India	Males	Females
1	Andaman and Nicobar Islands	Union Territory	379,944	0.03	202,330	177,614
2	Andhra Pradesh	State	84,665,533	7.00	42,509,881	42,155,652
3	Arunachal Pradesh	State	1,382,611	0.11	720,232	662,379
4	Assam	State	31,169,272	2.68	15,954,927	15,214,345
5	Bihar	State	103,804,637	8.48	54,185,347	49,619,290
6	Chandigarh	Union Territory	1,054,686	0.09	580,282	474,404
7	Chhattisgarh	State	25,540,196	2.11	12,827,915	12,712,281
8	Dadra and Nagar Haveli	Union Territory	342,853	0.03	193,178	149,675
9	Daman and Diu	Union Territory	242,911	0.02	150,100	92,811
10	Delhi	Union Territory	16,753,235	1.38	8,976,410	7,776,900
11	Goa	State	1,457,723	0.12	740,711	717,012
12	Gujarat	State	60,383,628	4.99	31,482,282	28,901,346
13	Haryana	State	25,353,081	2.09	13,505,130	11,847,951
14	Himachal Pradesh	State	6,856,509	0.57	3,473,892	3,382,617
15	Jammu and Kashmir	State	12,548,926	1.04	6,665,561	5,883,365
16	Jharkhand	State	31,169,272	2.72	15,954,927	15,214,345
17	Karnataka	State	61,130,704	5.05	31,057,742	30,072,962
18	Kerala	State	33,387,677	2.76	16,021,290	17,366,387
19	Lakshadweep	Union Territory	64,429	0.01	33,106	31,323
20	Madhya Pradesh	State	72,597,565	6.00	37,612,920	34,984,645
21	Maharashtra	State	112,372,972	9.29	58,361,397	54,011,575
22	Manipur	State	2,721,756	0.22	1,369,764	1,351,992
23	Meghalaya	State	2,964,007	0.24	1,492,668	1,471,339
24	Mizoram	State	1,091,014	0.09	552,339	538,675
25	Nagaland	State	1,980,602	0.16	1,025,707	954,895
26	Odisha	State	41,947,358	3.47	21,201,678	20,745,680
27	Puducherry	Union Territory	1,244,464	0.10	610,485	633,979
28	Punjab	State	27,704,236	2.29	14,634,819	13,069,417
29	Rajasthan	State	68,621,012	5.67	35,620,086	33,000,926
30	Sikkim	State	607,688	0.05	321,661	286,027
31	Tamil Nadu	State	72,138,958	5.96	36,158,871	35,980,087
32	Tripura	State	3,671,032	0.30	1,871,867	1,799,165
33	Uttarakhand	State	10,116,752	0.84	5,154,178	4,962,574
34	Uttar Pradesh	State	199,581,477	16.49	104,596,415	94,985,062
35	West Bengal	State	91,347,736	7.55	46,927,389	44,420,347
	<b>TOTAL</b>		<b>1,210,569,573</b>	<b>100</b>	<b>623,724,248</b>	<b>585,649,569</b>

### Most Populated Metros

1. Mumbai 18,394,912
2. Delhi 16,349,831
3. Kolkata 14,035,959
4. Chennai 8,653,521
5. Bangalore 8,520,435

### Best Sex Ratio

1. Kerala 1084
2. Puducherry 1037
3. Tamil Nadu 996
4. Andhra Pradesh 993
5. Chhattisgarh 991

### Top Literate States

1. Kerala 94.00 %
2. Lakshadweep 91.85 %
3. Mizoram 91.33 %
4. Goa 88.70 %
5. Tripura 87.22 %

### Top Growth Rate

1. Dadra and Nagar Haveli 55.88 %
2. Daman and Diu 53.76 %
3. Puducherry 28.08 %
4. Meghalaya 27.95 %
5. Arunachal Pradesh 26.03

# INDIAN HISTORY



# INDIAN HISTORY

## ANCIENT INDIAN HISTORY



### Indian Prehistory and Stone Age

- A clue of the earliest human presence in India is directed by stone tools of about 250,000 BC obtained from the deposits. The recent artifacts from **Bori** in **Maharashtra** propose the appearance of human beings in India around 1.4 million years ago.

- From their first appearance to around **3000 BC** humans used only stone tools for different purposes.
- This period is, therefore, known as the **Stone Age**, which has been divided into **Paleolithic** (early or Old Stone) Age, **Mesolithic** (Middle Stone) Age, and **Neolithic** (New Stone) Age.

### Paleolithic Age (500,000 BC – 9000 BC)

- In India it developed in the **Pleistocene** period or the **Ice Age**.
- The Paleolithic sites are spread in practically all parts of India except the alluvial plains of Indus and Ganga.
- The people of this age were food gathering people who lived on hunting and gathering wild fruits and vegetables.
- They mainly used hand axes, cleavers, choppers, blades, scrapers and burin. Their tools were made of hard rock called **quartzite**. Hence Paleolithic men are also called **Quartzite Men**.
- **Homo sapiens** first appeared in the last of this phase.
- It has been pointed out that Paleolithic men belonged to the Negrito race.
- The Paleolithic Age in India has been divided into three phases according to the nature of stone tools used by the people and also according to the nature of change in the climate – **Early or lower Paleolithic, Middle Paleolithic and Upper Paleolithic**.
- **Early Paleolithic Age** covers the greater part of the Ice Age. Its characteristic tools are hand axes, cleavers and choppers. Such tools have been found in Soan and Sohan river valley (now in Pakistan) and in the Belan Valley in the Mirzapur district of UP. In this period climate became less humid.
- **Middle Paleolithic Age** is characterized by the use of stone tools made of flakes mainly scrapers, borers and blade like tools. The

sites are found in the valleys of Soan, Narmada and Tungabhadra rivers.

- **Upper Paleolithic Age**, the climate became warm and less humid. This stage is marked by burins and scrapers. Such tools have been found in Andhra Pradesh, Karnataka, Maharashtra, Bhopal and Chhota Nagpur plateau.

#### Lower Paleolithic Age Sites

Site	State
Belan Valley	MP & UP
Bhimbetaka, Jogdaha	Madhya Pradesh
Bagor, Budha Pushkar	Rajasthan
Patne, Nandipalle	Maharashtra
Renugunta, Kumool Caves	Andhra Pradesh
Singhbhum	Jharkhand

#### Middle Palaeolithic Age Sites

Site	State
Nevasa	Maharashtra
Bhimbetaka, Narmada Valley	Madhya Pradesh
Bagor, Karmali Valley, Didwana	Rajasthan
Singhbhum	Jharkhand

#### Upper Paleolithic Age Sites

Site	State
Sohan Valley	West Punjab (Pakistan)
Kurnool Caves	Andhra Pradesh
Belan Valley	MP and UP
Nevasa	Maharashtra
Sabarmati Valley	Gujarat
Singrauli	Madhya Pradesh
Gichhlor	Andhra Pradesh
Hungsi Valley	Karnataka
Attirampakam	Tamil Nadu
Pahalgam	Kashmir
Hathnora, Narmada Valley, Bhimbetaka, Adamgarh	Madhya Pradesh
Kortallayar Valley	Tamil Nadu

### Mesolithic Age (9000 BC – 4000 BC)

- In this age, climate became warm and dry. Climate changes brought about changes in fauna and flora and made it possible for human beings to move to new areas. Since

then, there haven't been major changes in the climate.

- The characteristic tools of the Mesolithic Age are known as **Microliths-pointed, crescentic blades, scrapers**, etc., all made of stone.
- The people lived on hunting, fishing and food gathering; at a later stage they also **domesticated animals**.
- The last phase of this age saw the beginning of plane cultivation.

Mesolithic Age Sites	State
Langhnaj	Gujarat
Tilwara, Bagor	Rajasthan
Patne, Hatkhamba	Maharashtra
Damdama, Chopani Mando	UP
Panchmarhi, Bhimbetaka, Adamgarh	MP
Sanganakallu	Karnataka
Gouri Gundam	AP

#### Neolithic Age (4000 BC – 1000 BC)

- During this phase people were again depending on stone implements. But now they used stones other than quartzite for making tools, which were more lethal, more finished and more polished.
- Neolithic men cultivated land and grew fruits and corn like **Ragi and Horse Gram**. They domesticated cattle, sheep and goat. They knew about making fire and making pottery, first by hand and then by potters wheel. They also painted and decorated their pottery.
- They lived in caves and decorated their walls with hunting and dancing scenes. They also knew the art of making boats. They could also weave cotton and wool to make cloth.

- In the later phase of Neolithic phase people led a more settled life and lived in circular and rectangular houses made of mud and reed.

Neolithic Age Sites	State
Burzahom, Gufkaral	Kashmir
Mehrgarh, Killi Ghul Mohd	Baluchistan
Daojali Hading	Assam
Chopani Mando, Mahagarha	UP
Chirand, Chechar	Bihar
Tekkalkota, Sanganakallu, Narsipur, Hallur, Kupgal, Kodekal, Brahmagiri	Karnataka
Nagarajunikonda, Piklihal	AP
Poyampalli	Tamil Nadu

#### Chalcolithic Period and Culture (2800 BC – 700 BC)

- In this period, the people used copper and bronze to make a range of utilitarian tools.
- Apart from stone tools, hand axes and other objects made of copperware also used.
- These people used different types of pottery of which black and red pottery was most popular. It was wheel made and painted with white line design.
- These people were not acquainted with burnt bricks. They generally lived in thatched houses.
- They venerated the mother goddess and worshiped the bull.
- **Ahar Culture** sites were Ahar (Rajasthan), balathal, gilund etc. The distinctive feature is black and red ware.
- **Kayatha Culture** is located in Chambal and its tributaries, the sturdy red slipped ware with chocolate designs is main feature.

- **Malwa Culture** sites were in Narmada and its tributaries in Gujarat. One of the largest Chalcolithic settlements.
- **Svalda Culture** sites were in Dhulia district of Maharashtra.
- **Prabhas and Rangpur Culture** are derived from the Harappa culture. The

polished red ware is the hall mark of this culture.

Chalcolithic Period Site	State
Banas/Ahar	Rajasthan
Kayatna, Malwa, Eran	MP
Nevasa, Diamabad, Inanyaon	Maharashtra

## INDUS VALLEY CIVILISATION (2500 – 1750 BC)



- The Indus Valley Civilization was an ancient civilization thriving along the Indus River and north-western India. Among other names for this civilization is the **Harappan Civilization**, in reference to its first excavated city of **Harappa**.
- The name '**India**' is derived from the river Indus, for India means the country of the Indus.
- The earliest literary evidence however, shows that the **first Aryan settlers** in India called the Indus, the **Sindhu**.
- An alternative term for the culture is **Saraswati-Sindhu Civilization**, based on the fact that most of the Indus Valley sites have been found at the **Halkra-Ghaggar River**.
- **R.B. Dayaram Sahni** first discovered **Harappa** (on Ravi) in 1921.
- **R.D. Banerjee** discovered **Mohenjodaro** or 'Mound of the Dead' (on Indus) in 1922.
- **Sir John Marshal** played a vital role in both (Harappa and Mohenjodaro) these.

### Geographical Extent and Limits

It consists the North-Western part of the Indian sub-continent. Many sites in Sindh formed the Central Zone of the Pre-Harappan Culture. The Central Zone of the Harappan Culture lay in Sindh and Punjab, mainly in the Indus Valley. The area formed a triangle and accounted for about 1299600 sq km, which is larger than Ancient Egypt and Mesopotamia. Nearly 1500,

Harappan sites are known so far in the subcontinent.

#### Following are Geographical limits

- Northernmost site : **Manda**
- Southern most site : **Daimabad**
- Western most site : **Sutkagendor**
- Easternmost site : **Alamgirpur**

### INDUS VALLEY CIVILIZATION CITIES

City	Province	River Bank	Discovery Year	Archaeologist(s)
Harappa	Pakistani Punjab	Ravi	1921	Daya Ram Sahni
Mohenjodaro	Sind	Indus	1922	RD Banerjee
Ropar	Indian Punjab	Sutlej	1953	YD Sharma
Lothal	Gujarat	Bhogava	1957	SR Rao
Kalibangan	Rajasthan	Ghaggar	1959	BB Bal
Chanhudaro	Sind	Indus	1931	MG Majumdar
Alamgirpur	Uttar Pradesh	Hindon	1974	YD Sharma
Sutkagendor	Baluchistan	Dasht	1931	Aurel Stein
Banawali	Haryana	Haggar	1974	RS Bist
Dholavira	Sindh	Rann of Katch	1958-90	RS Bist
Rangpur	Gujarat	Bhadur	1931	MS Vats

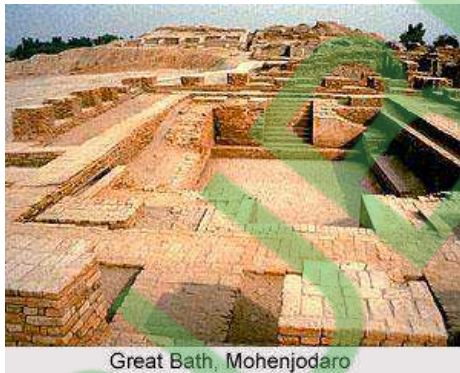
### INDUS VALLEY CIVILIZATION SITES

All \* (star) mark states belongs to Pakistan Country

Site	State	Excavations/Findings
Alamgirpur	Uttar Pradesh	Impression of cloth on trough
Banawali	Haryana	Barley, terracotta figure of plough
Chanhudaro	*Sindh	Bead making factory, use of lipstick, only Indus site without a citadel
Dholavira	Gujarat	Figure of chariot tied to a pair of bullocks and driven by a nude human, Water harvesting and number of reservoirs, use of rocks for constructions
Farmana	Haryana	Largest burial site of IVC, with 65 burials, found in India
Gola Dhoro	Gujarat	Production of shell bangles, semi-precious beads etc.
Harappa	*Punjab	Granaries, Important IVC Town, First town which is Excavated and studied in detail
Kalibangan	Rajasthan	Baked/burnt bangles, fire altars, small circular pits containing large urns and accompanied by pottery
Kerala-no-dhoro or Padri	Gujarat	Salt production centre, by evaporating sea water
Kunal, Haryana	Haryana	Earliest Pre-Harappan site, Copper smelting.
Kuntasi	Gujarat	Small port
Loteshwar	Gujarat	Ancient archaeological site
Lothal	Gujarat	Bead making factory, earliest cultivation of rice (1800 BC)
Manda, Jammu	Jammu & Kashmir	Northern Most Harappan site in Himalayan foothills
Mohenjo-Daro	*Sindh	Great Bath , Great granary, Pashupati seal
Rakhigarhi	Haryana	Terrecotta wheels, toys, figuries, pottery. Large site partially excavated.
Rangpur	Gujarat	Seaport
Sanauli	Uttar Pradesh	Burial site with 125 burials found
Surkotada	Gujarat	Bones of a horse (only site)
Sutkagan Dor	*Balochistan	Bangles of clay, Western most known site of IVC

## Town Planning

- Rich town-planning. It followed the Grid System. Used burnt bricks of good quality as the building material.
- Roads were well cut, dividing the town into large rectangular or square blocks.
- Lamp posts at intervals indicate the existence of street lightning. Flanking the streets, lanes and by-lanes were well-planned houses.
- Houses were quite monotonous a square courtyard with a number of rooms. No window faced the streets.
- Drains were made of mortar, lime and gypsum and covered with large brick slabs for easy cleaning.
- The towns were divided into 2 parts: **Upper part** or **Citadel** and **Lower Part**. The Citadel was an oblong artificial platform some 30-50 feet high and about 150-350 meter in area. It was enclosed by a thick crenelated mud-brick wall. In Citadel public buildings, granaries, important workshops and religious buildings were there. In lower part people used to live.



Great Bath, Mohenjodaro

- A big ritual public bath (Great Bath) has been found in Mohenjodaro, measuring 12m by 7m and 2.4m deep, has been found.

## Religious Life

- **Chief Female Diety** : Mother Goddess or Goddess of Earth : A terracotta figure where a plant is shown growing out of the embryo of a women.

- **Chief Male Diety** : Pashupati Mahadeva represented in seals as sitting in a yogic posture on a low throne and having three faces and two horns. He is surrounded by an elephant, a tiger and a rhinoceros, and below his throne is a buffalo. Near his feet are two deer.
- Phallus (lingam) and yoni worship was also prevalent.
- Many trees (pipal), animals (bull), birds (dove, pigeon) and stones were worshipped. Unicorn was also worshipped. However, no temple has been found, though idolatry was practiced.
- At Kalibangan and Lothal fire altars have been found.
- Indus people believed in ghosts and evil forces and used amulets as protection against them.
- Dead bodies were placed in the north-south orientation.

## Burial Practices

- **Harappa** : East-West axis; R-37 and H cemetery, coffin burial
- **Mohenjodaro** : Complete, fractional and post cremation
- **Kalibangan** : circular and rectangular grove.
- **Surkotada** : Pot-burial
- **Lothal** : Double burial

## Agriculture and Domestication

- The Indus people sowed seeds in the flood plains in winter, when the flood water receded, and reaped their harvests of wheat and barley in summer, before the advent of the next flood.
- Grew wheat, barley, rai, peas, sesamum, mustard, rice (in Lothal), cotton, dates, melon, etc.
- The Indus people were the first to produce cotton.
- In Kalibangan, fields were ploughed with wooden ploughs.
- Food grains were stored in granaries.



- A fragment of woven cotton cloth was found at Mohenjodaro. Indigo was evident from Rojdi, well irrigation from Alladinho, dams and irrigation canals from Dholavira. Sugarcane was not known to Indus people.
- They domesticated buffaloes, oxens, asses, goats, pigs, elephants, dogs and cats etc. Camel bones are reported at Kalibangan and remains of horse from Surkotada.

the famous dancing girl (identified as devadasi), found at Mohenjodaro.

- For their children, they made cattle-toys with movable heads, model monkeys which could slide down a string, little toy-carts, and whistles shaped like birds, all of terracotta.

### Major Imports by the Harappans

Material	Source
Gold	Afghanistan, Persia, Karnataka
Silver	Afghanistan, Iran
Copper	Baluchistan and Khetri (Rajasthan)
Tin	Afghanistan, Central Asia
Agates	Western India
Chalcedony	Saurashtra
Lead	Rajasthan, South India, Afghanistan, Iran
Lapis Lazuli	Badakshan and Kashmir
Turquoise	Central Asia, Iran
Amethyst	Maharashtra
Jade	Central Asia
Carnelian	Saurashtra



Jewellery in Indus Valley Civilization



Ornaments in Indus Valley Civilization

### Art and Craft

- This culture belongs to the Bronze Age. Bronze was made by mixing tin and copper. Tools were mostly made of copper and bronze.
- Potter's wheel was in use. Their pottery was red or black pottery.
- Cotton fabrics quite common. Woolen in winter.
- Very fond of ornaments (of gold, silver, ivory, copper, bronze, precious stones) and dressing up. Ornaments were worn by both men and women. Women wore heavy bangles in profusion, large necklaces, earrings, bracelets, figure-rings, girdles, nose studs and anklets.
- The Harappans most notable artistic achievement was their seal gravings, esp. those of animals. The red sandstone torso of a man is particularly impressive for its realism. However, the most impressive of the figurines is perhaps the bronze image of

### Script and Language

- The script is not alphabetical but pictographic (about 600 undeciphered pictographs).
- The script has not been deciphered so far, but overlaps of letters show that it was written from right to left in the first line and left to right in the second line. This style is called **Boustrophedon**.



### DECLINE OF INDUS VALLEY CIVILISATION: Different Views

Cause of Decline	Thinker
External Aggression	Wheeler, Piggot, Gordan-childe
Inundation	M R Sahani
Epidemic	KVR Kennedy
Tectonic Disturbances (e.g., Dholavira)	Marshall and Raikes
Sudden Decline	Wheeler
Climatic Change	RL Stein, AN Ghosh
Deforestation, scarcity of resources, ecological imbalances	Fairservis
Flood (e.g., Mohenjodaro)	Marshall, SR Rao, Maickey
The destruction due to change in course of river Ghaggar	GF Holes

## THE ARYANS AND VEDIC PERIOD IN INDIA



### Early Vedic Age

- The Vedic age began in India in about 1500 BC and extend up to 6000 BCE with the coming of **the Aryans**, who scattered on the plains of northern India.
- **Max Muller** believes that the relationship between the Aryan race and language of these people with the classical languages of Europe was established by a **Bavarian Franz Bopp in 1816**.
- **Vedas** was based on Vedic culture which is developed by Aryans. The meaning of Veda is "knowledge".

### Aryans arrival in India

- The Aryans came to India in several waves. The earliest wave is represented by the Rig Vedic people who appeared in the subcontinent in about 1500 BC.
- They came into conflict with the indigenous inhabitants called the **Dravidians** mentioned as **dasa** or **dasyus** in Rig Veda.
- The Rig Veda mentions the defeat of Sambara by Divodasa, who belonged to the **Bharata clan**. An Aryan chief who overpowered them was called **Trasadvasyu**.

- Some of the chief tribes of the period were Yadu, Turvasu, Druhyu, Anu, Puru, Kuru, Panchala, Bharata and Tritsu. Among the inter-tribal conflicts the most important was the 'Battle of the Ten Kings.'

### **Dravidians**

- Before the coming of the Aryans in India, the greater part of Northern and North-Western India was inhabited by a group of people known as **Dravidians**.
- On arrival of the Aryans, they unable to meet their challenge, they gradually moved southwards.
- In India, they were first to use rivers for navigation and irrigation.

### **Aryans**

- The group of Indo-Europeans who moved to Persia and India are known to Aryans.
- The Aryans are the original inhabitants of Central Asia.
- The region where the Aryans settled in India was called **Sapta Sindhu** (also referred to as the **Brahmavarta**)
- The Aryans established themselves in India by defeating the natives whom they called Dasas or Dasyus
- The Aryans spread to Indo-Gangetic plains in the later Vedic Period and this region came to be known as **Aryavarta** (1000 BC to 600 BC)
- The Aryans were the first people in India to know the use of iron and brought horses along with them.

### **Rig Vedic Polity**

- The administrative machinery of the Aryans in the Rig Vedic period worked with the tribal chief in the centre called as **Rajan**.
- The chief was the protector of the tribe or **Jana**
- Several tribal assemblies, such as **sabha**, **samiti**, **vidatha**, and **gana** mentioned in the Rig Veda exercised deliberative, military and religious functions. The political point of view important were the **sabha** and **samiti**.
- Women attended Sabha and Vidhata in Rig Vedic times.
- A few non-monarchical states (ganas), are described whose head was **Ganapati** or **Jyestha**.
- The most important functionary seems to have been the **Purohita**. The two priests who played a major part in the time of Rig Veda were **Vasishtha** and **Visvamitra**. The next important functionary seems to be the **Senani**. Princes received from the people voluntary offering called **Bali**.
- The officer who had authority over the pasture ground was called **vrajapati**.

### **Varna System**

- Varna was the term used for colour, and it seems that the Aryans were fair and the indigenous inhabitants dark in complexion.
- The dasas and dasyus, who were conquered by the Aryans, were treated as **slaves** and **sudras**.

- Gradually, the tribal society was divided into three groups-**Warriors, Priests** and **The people**.
- The fourth division called the **Shudras** appeared towards the end of the Rig Veda period.

Metals Known to Rig Vedic People	
Gold	Hiranya
Iron	Shyama
Copper	Ayas

Rivers Mentioned in Rig Veda	
Rig Vedic Name	New Name
Gomati	Gomal
Krumi	Kurram
Kubha	Kabul
Suvastu	Swat
Sindhu	Indus
Drishadvri	Ghaghar/Chitang
Satudri	Satluj
Vipas	Beas
Parushni	Ravi
Asikni	Chenab
Vitasta	Jhelum

	Somapa, Purandra, Varitrahan and Maghayam
Agni	He was the second important divinity. He was intermediary between Gods and men. 200 hymns of the Rig Veda are devoted to him.
Varuna	Upholder of Rita or cosmic order or natural order and personified water.
Soma	He was considered to be the God of plants. An intoxicant drink was also called soma.
Yama	He was the guardian of the world of dead.
Surya	Similar to that of the Greek God Helios
Savitri	The famous Gayatri mantra is addressed to Savitri
Pusan	Lord of jungle path, guarding of roads, herdsman & cattle.
Vishnu	A relatively minor God
Vayu	Wind God
Dyaus	Father of Heaven
Aditi	Goddess of Eternity
Maruts	Storm Spirits
Gandharvas	Divine Musicians
Ashvins	Healers of diseases and experts in surgical art
Ribhus	Gnomes
Apsaras	Mistresses of Gods
Rudra	An archer of God, whose anger brought disease
Vishvadeva	Intermediate Deities
Aranyani	Goddess of Forest
Usha	Goddess of Dawn
Prithvi	Goddess of Earth

### Early Vedic Religion and Rig Vedic Gods

- The early Vedic religion believed in one Supreme God and did not believe in idol worship.
- The mode of prayer was recitation of mantras. Sacrifice (or **yajnas**) was offered for Praja (children), Pasu (cattle) and Dhana (wealth) and not for spiritual upliftment or misery.
- Vedic Gods have been classified into 3 categories - Terrestrial, Atmospheric and Celestial

Rig Vedic Gods	
Indra	He was the most important divinity. He played the role of a warlord, leading the Aryan soldiers to victory against the demons. 250 hymns are devoted to him in the Rig Veda. He was associated with thunder and storm and is addressed by various names: Ratheshtha, Jitendra

### Later Vedic Period

- The **vidatha** completely disappeared in this period. The sabha and samiti continued to hold the ground, but their character changed. It was dominated by **nobles** and **Brahmanas**.
- Tribal authority tended to become territorial. The term **rashtra**, which indicates territory, first appears in this period.
- Also in later Vedic times the king did not possess a standing army. Tribal units were mustered in times of war, and, according to one ritual for success in war, the king had to eat along with his people from the same plate.

Regions and Kings	
Eastern King	Samrat
Western King	Suvrat
Northern King	Virat
Southern King	Bhoja
King of middle country	Raja

Important Officials in Later Vedic Period	
Purohita or Rashtragopa	Chief Priest
Senani	Supreme Commander of army
Vrajapati	Officer-in-Charge of pasture land
Jivagribha	Police Officer
Spasas/Dutas	Spies who also sometimes worked as messengers
Gramani	Head of the village
Kulapati	Head of the family
Madhyamasi	Mediator on disputes
Bhagadugha	Revenue collector
Sangrahitri	Treasurer
Mahishi	Chief Queen
Suta	Charioteer and court minstrel
Govikartana	Keeper of games and forests
Palagala	Messenger
Kshatri	Chamberlain
Akshavapa	Accountant
Sthapati	Chief Justice
Takshan	Carpenter

Kingdoms in the Later Vedic Age	
Kingdom	Location
Gandhar	Rawalpindi and Peshawar districts of Western Punjab
Kekaya	On the bank of River Beas, east of Gandhar kingdom
Uttar Madra	Kashmir
Eastern Madra	Near Kangra
Southern Madra	Near Amritsar
Kushinagar	Nothern region of modern Uttar Pradesh
Panchal	Bareilly, Badayun and Farrukhabad districts of modern Uttar Pradesh
Kashi	Modern Varanasi
Koshal	Faizabad region of today's Uttar Pradesh

### Pottery

- The later Vedic Aryans used four types of pottery- Black and Red Ware, Black Slipped Ware, Painted Grey Ware, and Red Ware.
- The **black and red earthen pots** were used around 600 BC by the people of **Koshala**.

- The Aryans knew copper or bronze and Iron. They introduced the **Painted Grey Ware** in northern India. It consisted of bowls and dishes, which were used either for rituals or for eating or both. These were mostly found to the upper **Gangetic** basin.

### Currency

- A gold piece of definite weight called **Satamana** is mentioned in **Sathapatha-Brahmana**.
- Nishka** was the popular currency.
- Suvarna** and **Krishnala** were two other classes of coins of circulation.
- Money-lending was a lucrative trade and the interest on loan was moderately charged. The moneylender is mentioned as **Kusidin**.

Types of Marriages in the Later Vedic Age	
Brahma	Marriage of a duly dowered girl to a man of the same varna with Vedic rites and rituals
Daiva	Father gives the daughter to the sacrificial priests as part of fee or dakshina.
Arsa	A token bride-price of a cow and a bull is given.
Prajapati	Marriage without dowry and bride-price.
Gandharva	Marriage by the consent of two parties, often clandestine. A special form of it was swayamvara or self choice.
Asura	Marriage by purchase.
Paisacha	It is seduction of a girl while asleep, mentally deranged or drunk, hence it can hardly be called a marriage.
Rakshasa	Marriage by Capture

### Religion in Later Vedic Period

- Indra** and **Agni** (main rig vedic gods) lost their former importance. **Prajapati**, the creator, came to occupy the supreme position in later Vedic pantheon.
- Rudra**, the god of animals, became important in later Vedic times and **Vishnu**

came to be conceived as the preserver and protector of the people.

- In addition, some symbolic objects began to be worshipped, and we notice signs of idolatry. **Pushan**, who was supposed to look after cattle, came to be regarded as the god to the sudras.
- Important female deities during the Later Vedic Age were: **Usha** (goddess of Dawn), **Aditi** (Mother of Gods), **Prithvi** (Earth Goddess), **Aryani** (Forest Goddess) and **Saraswati** (River deity).
- The guest were known as the **goghna** or one who was fed on cattle. The priests who officiated at sacrifices were regarded generously and given **dakshinas** or gifts.

#### Chief Priests

- The Chief priests who were engaged in performing the sacrifices were
- **Hotri**: The invoker, he recited hymns from Rig Veda
- **Adhvaryu**: The executor, he recited hymns from Yajur Veda.
- **Udgatri**: The singer, he recited hymns from Sama Veda
- The Chief Priests received voluntary offering from the people called **Bali**.

#### VEDIC RITUALS

- **Rajasuya**: The King's influence was strengthened by rituals. He performed this sacrifice, which was supposed to confer supreme power on him.
- **Asvamedha**: A King performed the Asvamedha, which meant unquestioned control over the area in which the royal horse ran uninterrupted. The ceremony

continued for three days at the end of which horse sacrifice was performed.

- **Vajapeya**: A king performed the Vajpeya or the chariot race, in which the royal chariot was made to win the race against his kinsmen.
- **Garbhadhana**: A ceremony which is performed to promote conception in women
- **Pumsayam**: This ritual is performed to procure a male child
- **Semontonayam**: It is ritual performed to ensure the safety of the child in the womb.
- **Jatkarma**: It is a birth ceremony performed before the cutting of the umbilical cord.
- **Culakarma**: It is a ritual, also known as tonsure, performed for boys in their third year.
- **Upanayana**: It is an initiation ceremony to confer dvija (twice born) status of boys of the higher varnas in their eight year.

#### LITERATURE OF THE ARYANS

The vast literature of the Aryans is divided into two parts - **Sruti** and **Smriti**

##### Sruti Literature

Shruti describes the sacred texts comprising the central canon of Hinduism viz. Vedas, Brahmanas, Aranyakas, & Upanishads.

The word Veda has been divided from the Sanskrit word **Ved**, which means **spiritual knowledge**. The Vedas are four in number - Rig Veda, Samaveda, Yajurveda, and Atharvaveda.

**Brahmanas** are massive prose text which contain speculation of the meaning of the hymns, give precepts for their application,

relate stories of their origin in connection with sacrificial rites and explain the secret meaning of the later.

Vedas and their Brahmanas	
Rigveda	Aitereya and Kaushitaki
Samaveda	Tandya and Jaiminiya
Yajurveda	Tattiriya and Satpatha
Atharvaveda	Gopatha

### Vedic Literature : Four Vedas



#### 1. Samveda

- Rhythmic compilation of hymns for Rigveda
- "Book for Chants" contains 1,549 hymns, meant to be sung at the 'soma' sacrifice by a special class of Brahmanas called Udgatris. But the Samaveda has very little original value.
- Has only 75 fundamental hymns
  1. Karnataka - Jaiminga
  2. Gujarat - Kanthun
  3. Maharashtra - Ranayaniya
- Sung by Udgatri

#### 2. Rigveda

- Collection of hymns
- Oldest of all vedas
- Associated of 1017 hymns or Suktas after adding "Blhilya Sukta" number in 1028
- Compiled in 10 'mandalas' & 8 'Akhtaks'.
- Also contains the famous Gayatri Mantra
- II, III, IV, V, VI & VII are oldest mandalas

- I, VIII, IX, X are latest mandalas.
- The Tenth "Mandalas" or chapter which has the "Purushasukta" hymn, was probably added later.
- Mandala IX is completely devoted to 'Soma'.
- Mandala II to VII were created by Grita Samada, Vishwamitra, Vamadeva, Atri, Bharadwaj, Vashistha, VIII Kanwa and Angira, IX Soma

#### 3. Yajurveda

- Book of sacrificial prayers
- Rituals of yajnas
- Is sung of priest "Adhvaryu"
- Its mantras tell us how the sacrifices were to be performed and what part the "Adhvaryus"- the Brahmanas who performed the manual work in the arrangement of sacrifice were to play at the time of sacrifice.
- Has been compiled in "fourth path"
- Has been divided into, Krishna(black) Yajurveda & Shukla(white) Yajurveda
- Prose text

#### 4. Atharvaveda

- Mantras for magic spells
- Populate ritualistic system & superstitions
- Associated with "Saunkiya" and "Paiplad" community
- Collection of 711/731/760 hymns
- Not included in 'Trai'
- Has been divided in 20 "Kandas"
- 18th, 19th & 20th 'Kandas' are later works
- Provides freedom from evils spirits.
- Oldest text on Indian Medicine.

## Aranyaka

- The Aranyakas are the concluding parts of the Brahmanas. It does not lay much stress on rites, rituals and sacrifices, but merely contain the philosophy and mysticism. The lead with the problems of soul, origin and elements of universe and the creation of universe.
- Literarily, it means 'Jungle'
- Provides description of Moral Science and Philosophy
- Provides details of hermits and saints who lived in Jungles
- Give stress on meditation
- Protests the system of 'Yajnas'

## Upanishada

- It would be appropriate to describe Upanishadas as mystic writings. There are 108 Upanishads in all, the most prominent of them being Ish, Prasana, Aitareya, Taittiriya, Chhandogaya, Kathoupanishad, Ishopanishad, Brehadaranyaka, etc.
- Literary meaning is 'Satra' (to sit near masters feet) in which Guru offers band of knowledge to their disciples
- Is a combination of Tatva-mimansa and philosophy
- They are also called "Vedanta"
- Primitive upanishada are "Brahadaranyaka" and "Chandogya"
- Later Upnishada like "Katha" and "Swetaswatar" have been written in poetic forms.
- Brahma is the summary of philosophy, which is the only a 'truth' in the world.

- Knowledge awards salvation says Upanishadas
- Oldest possibility Narsinghpurvatapani
- Latest possibility Allopanishada in Akbar's reign

## Smriti Literature

Smriti is traditional knowledge and designates almost the entire body of post-Vedic classical Sanskrit literature. Smriti literature generally includes the following overlapping subjects:-

- **The Vedangas:** They refer to certain branches of post-Vedic studies regarded as auxiliary to the Vedas. The Vedangas are conventionally divided into six heading namely:- (i) Kalpa or the ritual canon, including the dharma shastras or legal codes, (ii) Jyotisha or astronomy, (iii) Siksha or phonetics, (iv) Chhanda or metre (v) Nirukta or etymology (vi) Vyakarana (Grammer)
- **The Shad-Darsana:** Six orthodox schools of Hindu philosophy, namely Nyaya, 'Vaisesikha', Sankhya, Yoga, Mimamsa and Vedanta.
- **Itihasa:** Legendary or semi-legendary works, specifically the Ramayana and Mahabharata and often extended to the Puranas.
- **Puranas:** Being a fairly late description of ancient legends, they are heavily coloured with the superstitions. The Puranas represent the most corrupt form of Hinduism. They are 18 in number



The Eighteen Puranas	
1.	Brahma Purana
2.	Vishnu Purana
3.	Shiva Purana
4.	Padma Purana
5.	Shrimad Bhagwat Purana
6.	Agni Purana
7.	Narad Purana
8.	Markandey Purana
9.	Bhavishya Purana
10.	Ling Purana
11.	Varah Purana
12.	Vaman Purana
13.	Brahm Vaivertya Purana
14.	Shanda Purana
15.	Surya Purana
16.	Matsya Purana
17.	Garuda Purana
18.	Brahmand Purana

- **Upaveda:** Also known as the auxiliary Vedas, they deal with medicine, architecture, erotics, archery and various arts and crafts. These were partly derived from original Vedic texts and were traditionally associated with one or other of the Vedas.

Upavedas	Deals With
Dhanur veda (of Yajur Veda)	Art of Warfare
Gandharva veda (of Sama Veda)	Art and Music
Shilpa veda (of Atharva Veda)	Architecture
Ayurveda (of Rig Veda)	Medicines

- **Tantras:** Tantras are the writings of Shakta or Shaivite sects and also of certain antinomian Buddhist scholars
- **Agamas:** They are scriptures of sectarian Hindus like Vaishnavites, Shaivites and Shaktas.
- **Upangas:** They are a generic name for any collection of treatises although traditionally confined to the philosophical systems of 'Nyaya' and 'Mimansa' - the 'Dharma Sutras' the 'Puranas' and the 'Tantras'

## Epics

Some historians regard the Later Vedic Period as the Period of Epics. The Mahabharata and the Ramayana are the two great epics of this period.

## Ramayana



- It is said to have been composed by the sage, Valmiki. The incident related in it precedes the Mahabharata by about a hundred and fifty years. The story of Ramayana is of indigenous origin and had existed in ballad form in Prakrit, in more than one version. It was rewritten in Sanskrit and augmented with many 'Shlokas'.
- The epic was given a Brahmanical character which was not visible in the original work. It is also known as Adi Kavya. Evidence places the oldest part of the Ramayana to before 350 BC.
- The reference in the epic to the mingled hords of Yavanas and Shakas suggests that it received accretions in the Graeco-Scythian period and may have acquired its final shape by about AD 250.

## Mahabharata



- The Mahabharata is the bulkiest epic consisting of 100,000 verses and is divided into 18 paravas (books).

- This book is usually assigned to Rishi Ved Vyas, but scholars have expressed doubts if such a great work could have been accomplished by one single person.
- The story itself occupies only about one-fourth of the poem. It is a tale about conflict between Aryans-Kaurava and Pandava.
- The rest is episodic comprising cosmology, theogony, state craft, the science of war, ethics, legendary history, mythology, fairy tales and several digressional and philosophical interludes, of which the best known is the Bhagavad Gita.

## Vedic Doctrine of Hinduism

*By the end of the Later Vedic Age, six prominent schools of Hindu Philosophy had been established. They are as follows:*

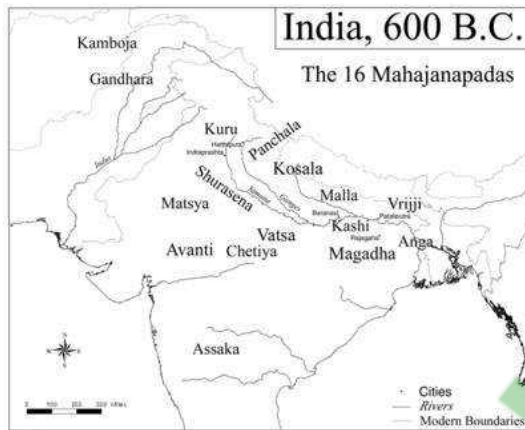
Darshans	Authors	Year of Beginning	Original Book	Theme
Nyaya	Gautama	6th BC	Nyaya Sutra	It is a logical quest for God. It tells that the material power Maya, with the help of God, becomes the universe.
Vaisheshik	Kanada	6th BC	Vaisheshik Sutra	It aims to receive happiness in this life and finally ultimate liberation through the attachment of true knowledge of the Divine.
Sankhya	Kapila	6th BC	Sankhya Sutra	It explains that the aim of Sankhya is to eliminate all kinds of physical and mental pains and to receive liberation.
Yoga	Maharishi Patanjali	2nd BC	Yog Sutra	It has four chapters and accepts three kinds of evidences for determining the aim of life.
Purva Mimansa	Jaimini	4th BC	Purva Mimansa Sutra	It is condensed explanation of Vedic theme and at the same time, the classification of its issues.
Vedanta (Uttara Mimansa)	Maharishi Vyasa	4th BC	Uttara Mimansa Sutra	It explains that Brahama Sutra is for that person who has a real deep desire to know God. True liberation could only be attained by lovingly surrendering to Him.

## FAST FACTS OF VEDIC CIVILISATION

- Origin of Indian Music - Samveda
- Mention of Word 'Shudra' - Rigveda 10th Mandala
- Gayatri Mantra - Rigveda
- Mention of word 'Yajna' - Brahmana
- Somaras (drink) - Rigveda (9th Mandala)
- Varna - Rigveda
- Four fold division of Society - Rigveda 10th Mandala
- Mention of four Ashrams - Jabala Upanishada
- War between Aryan & Dasas - Rigveda
- Transmigration of Soul - Brahadaranyka Upanishada

- Five divisions of India - Aiteraya Brahmana
- Wife and Husband are complementary - Satapathabrahmana
- Battle of Ten kings - Rigveda (7th Mandala)
- Superiority of Brahmins - Aiteraya Brahmana
- Rajanaya - Rigveda 10th Mandala
- Marut as Agriculturist - Satpatha Brahmana
- Satyameva Jayate - Mundaka upanishada
- Pashupath Shiva - Atharveda
- Vishnu - Satapatha Brahmana
- Conversion between Yam & Nachiketa - Katha Upanishada

## MAHAJANPADAS



- In the later Vedic period, the tribal organisations changed its identity and

gradually shifted to the territorial identity, and the area of settlement were now regarded as **janapadas** or states.

- The people in the lower Ganges Valley and Delta, which were outside the Aryan pale, were not incorporated. There was, therefore, a strong consciousness of the pure land of the Aryans called **Aryavarta**.
- Each janapada tried to dominate and subjugate other janapadas to become **Mahajanapadas**.

Mahajanapadas	Capital	Present Day Location
Kashi	Varanasi	Around Varanasi
Kosala	Shravasti	Eastern UP
Anga	Champanagri	Bhagal and Munger distts of Bihar
Magadh	Girivraj or Rajgriha	Patna and Gaya distt
Vaiji	Vaishali	Vaishali distt of Bihar
Malla	Kushinagar and Pavapuri	South of Vaishali distt
Chedi	Shuktimati	Eastern parts of modern Bundelkhand
Vatsa	Koushambi	Around modern Allahabad
Kuru	Hastinapur, Indraprastha and Isukara	Around the Delhi-Meerut region
Panchal	Ahichhatra and Kampilya	Rohilkhand
Matsya	Viratnagar	Jaipur-Bharatpur-Alwar distts
Surasen	Mathura	Mathura region
Assaka	Paudanya	Near Paithan in Maharashtra
Avanti	Ujjaini	Ujjain distt
Gandhara	Taxila	Between Kabul and Rawalpindi
Kamboj	Rajpur	Punchh area in Kashmir

## JAINISM



Jainism founded by Rishabhanath. There were 24 tirthankaras (Prophets or Gurus), all Kshatriyas.

24 Tirthankaras					
Name		Symbol	Name		Symbol
1	Rishabha	Bull	13	Vimalnath	Boar
2	Ajithnath	Elephant	14	Ananthnath	Falcon
3	Sambharanath	Horse	15	Dharmnath	Vakra
4	Abhiaandam Swamy	Monkey	16	Shantinath	Deer
5	Sumathinath	Curlew	17	Kuntunath	He-Goat
6	Padamprabhu	Red lotus	18	Arnath	Fish
7	Suparaswanath	Swastik	19	Mallinath	Water port
8	Chanraji Prabhu	Moon	20	Muniswasth	Tortoise
9	Suvidhinath	Crocodile	21	Naminath	Blue Lotus
10	Shitalnath	Srivatsa	22	Neminath	Conch Shell
11	Shregansnath	Rhinoceros	23	Parswanath	Serpent
12	Vasupujya	Buffalo	24	Mahavir	Lion

### Vardhman Mahavira



- He was born in **Kundagram** (Distt Muzaffarpur, Bihar) in **599 BC**.
- His father **Siddhartha** was the head of Jnatrika clan. His mother was **Trishla**, sister of Lichchavi Prince Chetak of Vaishali.
- Mahavira was related to **Bimbisara**.
- He married to **Yashoda**, had a daughter named **Priyadarsena**, whose husband **Jamali** became his first disciple.
- At 30, after the death of his parents, he became an ascetic.

- In the 13th year of his asceticism (on the 10th of Vaishakha), outside the town of Jrimbhikgrama, he attained supreme knowledge (**Kaivalya**).
- From now on he was called **Jaina** or **Jitendriya** and **Mahavira**, and his followers were named Jains. He also got the title of **Arihant**, i.e., worthy.
- At the age of 72, he attained death at **Pava**, near Patna, in **527 BC**.
- Mahavira preached almost the same message as Parshvanath and added one more, **Brahmcharya** (celibacy) to it.

### Three Gems or Ratnas of Jainism

Attainment of moksha or nirvana was the most important human desire. It says that moksha can be attained through the three following ratnas or gems:

1. Right knowledge : Understanding of religious principles
2. Right faith : Belief in Jains
3. Right action : Observance of 5 vows

Jaina Councils				
Council	Period	Place	Head	Consequence
1st	About 300 BC	Patali-putra	Sthulbahu	Compilation of 12 Angas to replace the last 14 Purvas
2nd	AD 512	Vallabhi	Devardhi Kshamasramana	Final compilation of 12 Angas and 12 Upangas

### Literature of Jainism

- 14 Purvas : Books of old Jain scriptures
- 12 Angas : Jaina doctrines
- 12 Upangas : Appendix to 12 Angas
- 10 Prikarnas : Deals with doctrinal matters
- 6 Chhedasutras : Deal with monastic life
- 4 Mulasutras : Basic principles of Jainism
- Kalpasutra : History of Jainism by Bhadrabahu
- Acharanga Sutras : Oldest Jain text containing monastic rules

### Angas

According to Svetanvaras, the original doctrine taught by Mahavira was contained in 14 old texts called Purvas, which were passed orally and were compiled later as twelve Angas.

12 Angas of Jainism	
1	Achranga
2	Sthananga
3	Vakyaprainapti
4	Upaska-Adyananga
5	Amuttarapada Kanga
6	Vipakasutringa
7	Sutrakruthanga
8	Somavayanga
9	Dharma-Kathanga
10	Anthakrudasanga
11	Prashnavyakaranaka
12	Drustipravadanga

### Jain's Architecture

- Statue of Gomateshwara/Bahubali; at Shravanabelagola in Mysore (Karnataka).
- Dilwara Temples Mount Abu, Vimala Vasahi and Tejapala temples.
- Girnar and Palitana temples (Gujarat),
- Pavapuri and Rajagriha temple (Bihar).
- **Caves** : Hathigumpha; Baghagumpha; Udaygiri and Khandagiri (Odisha)

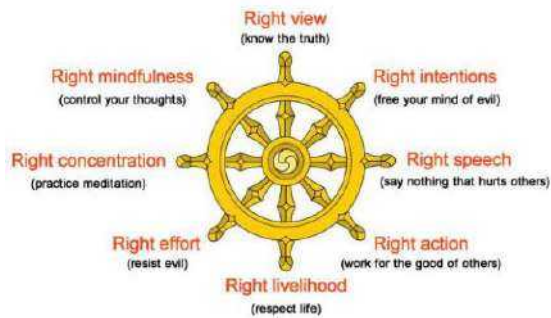
### Sects of Jainism

- After the death of Mahavira, during the reign of Chandragupta Maurya, a severe famine led to a great exodus of Jain monk from Ganga valley to the Ocean. This migration led to great schism in Jainism.
- In later times, Jainism was divided into two sects : **Svetambaras** or those who put on white dress, and **Digambaras** for those who keep themselves naked.

### Decline of Jainism

Jainism did not spread all over India. It preaches ahimsa, which was highly impossible for a common man to follow. The lack of royal support for this religion. The influence of Hinduism i.e. Vaishnava and Shaiva also an important reason for the decline of Jainism.

## BUDDHISM



Buddhism stands for 3 pillars :

1. Buddha : Its Founder.
2. Dhamma : His Teachings.
3. Sangha : Order of Buddhist monks and nuns.

### Gautama Buddha



- The founder of Buddhism was **Gautam Siddharth**, who was a **Saka prince**.
- He is also known as **Sakyamuni** or **Tathagata**.
- He was born in 563 BC on the **Vaishakha Poornima Day** at **Lumbini** (near Kapilavastu) in Nepal.
- His father **Suddhodana** was the Saka ruler.
- His mother **Mahamaya**, of Kosala dynasty died after 7 days of his birth. Brought up by stepmother **Gautami**.
- He married at 16 to **Yoshodhara**. His married life extends for 13 years and had a son named **Rahula**.
- After seeing an old man, a sick man, a corpse and an ascetic, he decided to become a wanderer.
- He left his palace at 29 (with Channa, the charioteer and his favourite horse, Kanthaka) in search of truth (also called Mahabhinishkramana or The Great Renunciation) and wandered for 6 years.
- He first meditated with **Alara Kalama**. But he was not convinced that man could obtain liberation from sorrow by mental discipline and knowledge. His next teacher was **Udraka Ramputra**. He then joined forces with five ascetics- **Kondana, Vappa, Bhadiya, Mahanama** and **Assagi**, who were practicing the most rigorous self-mortification in the hope of wearing away their karma and obtaining final bliss.
- After six years, he felt that his fasts and penance had been useless. So he abandoned these things. The five disciples also left him.
- He attained 'Nirvana' or 'Enlightenment' at 35 at **Gaya** in **Magadha** (Bihar) under the **Pipal tree**.
- He delivered the first sermon at **Sarnath** where his five disciples had settled. His first sermon is called 'Dharmachakrapravartan' or 'Turning of the Wheel of Law'.
- Attained **Mahaparinirvana** (death) at **Kushinagar** (identical with village Kasia in Deoria district of Uttar Pradesh) in **483 BC** at the age of 80 in the Malla republic.

Five Great Events in Buddha's Life and their symbols	
Birth	Lotus and bull
Great renunciation	Horse
Nirvana	Bodhi tree
First sermon	Wheel Dharma Chakra
Parinirvana/Death	Stupa

**The Dharma** (in Sanskrit) or **Dhamma** (in Pali)

### 1. The Four Great Truths :

- The world is full of sorrow and misery.
- The cause of all pain and misery is desire.
- Pain and misery can be ended by killing or controlling desire.
- Desire can be controlled by following the Eight Fold Path.

**2. The Eight Fold Path :** It consists of Right Faith, Right Thought, Right Action, Right Livelihood, Right Efforts, Right Speech, Right Remembrance and Right Concentration.

### 3. Belief in Nirvana :

- When desire ceases, rebirth ceases and nirvana is attained i.e. freedom from the cycle of birth, death and rebirth is gained by following the 8-fold path.
- According to Buddha, soul is a myth.

**4. Belief in Ahimsa :** One should not cause injury to any living being, animal or man.

**5. Law of Karma :** Man reaps the fruits of his past deeds.

Buddhist Councils					
Council	Year	Venue	Chairman	Royal Patron	Development
1st	483 BC	Saptaparni Cave, Rajgriha	Mahakassapa	Ajatshatru <i>Haryanka dynasty</i>	Compilation of Sutta Pitaka and Vinaya Pitaka by Ananda and Upali respectively
2nd	383 BC	Vaishali	Sabakami	Kalasoka <i>Shishunaga dynasty</i>	Monks were split into Sthavirvadins and Mahasanghikas
3rd	250 BC	Pataliputra	Mogaliputta Tisa	Ashoka <i>Mauryan Empire</i>	Compilation Abhidhammapitaka
4th	AD 72	Kundalvan, Kashmir	Vasumitra (chairman) Asvaghosha (vice chairman)	Kanishka <i>Kushan dynasty</i>	Division of Buddhists into Hinayana and Mahayana

### Buddhist Architecture

- In Buddhism, the first human statues to be worshipped.
- Stone-pillars depicting the life of Buddha at **Gaya, Sanchi** and **Bharhut**.
- **Gandhara** art is the style of Buddhist visual art.
- Cave architecture in the **Barabar** hills at Gaya and in Western India around Nasik.
- Art pieces of **Amaravati** and **Nagarjunakonda**.

### Buddhist Literature

Buddhist scriptures in **Pali** language are commonly referred to as Tripitakas, i.e. 'Threefold Basket'.

1. **Vinaya Pitaka :** Rules of discipline in Buddhist monasteries.
2. **Sutta Pitaka :** Largest, contains collection of Buddha's sermons.
3. **Abhidhamma Pitaka :** Explanation of the philosophical principles of the Buddhist religion.

**Khandhakas** contain regulations on the course for life in the monastic order and have two sections-the Mahavagga and the Cullavagga. The third part, the Parivara, is an insignificant composition by a Ceylonese monk.

**Jataks** are the fables about the different births of Buddha.

**Buddhist Writers** are Asvaghosha, Buddhaghosa, Dinnaga, Dharmakirti, Nagarjuna, Asanga and Vasubandhu.

### The Sangha

- It consists of **monks** (Bhikshus or Shramanas) and **nuns**.
- **Bhikshus** acted as a torch bearer of the **dhamma**.
- Apart from Sangha, the worshippers were called **Upasakas**.

### Famous Monks at the Time of Buddha

Monk	Related Fact
Ananda	The constant companion of Buddha and the most devoted disciple.
Anuraddha	The master of right mindfulness.
Mahakassapa	The President of the Buddhist Council held at Rajagriha.
Moggallana	He had the greatest super natural power.
Sariputta	Possessed the profound insight into the Dharma
Upali	Master of Vinaya

### Buddhist Universities

Buddhist University	Founded	Location
Nalanda	Badagaon, Bihar	Kumaragupta I (Gupta ruler)
Vikramshila	Bhagalpur, Bihar	Dharmapala (Pala ruler)
Somapuri	North Bengal	Dharmapala (Pala ruler)
Jagadal	Bengal	Ramapala (Pala ruler)
Odantpuri	Bihar Sharif, Bihar	Gopal (Pala ruler)
Vallabhi	Gujarat	Bhattarka (Maitrak ruler)

### Cause of Decline of Buddhism

- It capitulated to the Brahmanic rituals and ceremonies, such as idol worship, etc., which Buddhism had earlier denounced.
- Revival of reformed Hinduism with the preaching of Shankaracharya from ninth century onwards.
- Use of Sanskrit, the language of intellectuals, in place of Pali, the language of the common people.
- Deterioration in the moral standards among the monks living in Buddhist monasteries.
- Entry of women into Buddhist monasteries.
- Attacks of Huna king Mihirkula in the sixth century and the Turkish invaders in the twelfth century AD.



## THE MAGADHA EMPIRE (6th Century – 4th Century BC)

- *Magadha empire was founded by Vrihadratha.*
- *Giribraj or Rajgrih was the capital of Magadha.*
- *Magadha was one of the 16 Mahajanapadas or states in ancient India.*
- *Major dynasties of Magadha were Haryanka dynasty, Shishunaga dynasty, Nanda dynasty and Maurya dynasty.*
- *The first king of Magadha dynasty was Bimbisara and he founded the Haryanka dynasty.*
- *Magadha Empire included the former districts of Patna, Gaya & parts of Shahabad & grew to be the leading state of the time.*

### Haryanka Dynasty

It founded in 566 BC by the grandfather of Bimbisara, but actual foundation by **Bimbisara**.

#### Bimbisara (544 - 492 BC)

- Bimbisara became the king of Haryanka dynasty in 544 B.C.
- He established the Haryanka dynasty and was responsible for expanding the kingdom.
- He was contemporary of **Lord Mahavira** and patron of Buddha.
- As per Buddhist scriptures, King Bimbisara met the Buddha for the first time prior to the Buddha's enlightenment.
- As per Jain literature, he was referred to as **King Shrenika of Rajgriha**.
- He strengthen his kingdom through matrimonial alliances and conquest.
- Capital of Haryanka dynasty was **Rajgriha**.
- He sent physician **Jivaka** to **Ujjain** for medical treatment of King Pradyata, the king of Avanti.
- He had three wives, **Kosala devi, Chellana** and **Khema**.
- He was imprisoned and killed by his son **Ajatashatru**.

#### Ajatashatru (492-460 BC)

- Ajatashatru was the son of **Bimbisara** and **Chellana**. He ascended the throne in 492 B.C.
- He ruled from 492 BC to 461 BC.
- He was also known as **Kunika**.
- He struggled in the war against the **Vajjis/Lichhavis** but managed to defeat them.
- He followed the policy of conquest and expansion.
- Magadha became the most powerful kingdom in Northern India during his reign.
- **First Buddhist Council** was held at Rajgriha during the reign of Ajatashatru.
- He constructed a large fort around **Rajgriha** for protection against Lichhavis attack.
- He was killed by his son **Udayin** in 461 B.C.
- **Udayin** founded new capital at **Patliputra**.
- **Udayin** ruled from 461 B.C. to 444 B.C.
- The last ruler of Haryanka dynasty was **Nagdashak**.

#### Shishunaga Dynasty

It was founded by a minister Shishunaga. He was succeeded by Kalasoka (II Buddhist council). Dynasty lasted for two generations only. Greatest achievement was the destruction of power of Avanti.

### Nanda Dynasty

- It is considered first of the **Non-Kshatriya dynasties**.
- It founded by **Mahapadma Nanda**. He added Kalinga to his empire. He claimed to be the **Ekarat** and **Sarvakshatrantaka**, the sole sovereign who destroyed all the other ruling princes.
- **Dhana Nanda** was the last ruler of the Nanda dynasty. He was one of nine sons of Mahapadma Nanda.
- Alexander attacked India in their reign.
- Nandas were fabulously rich & enormously powerful. Maintained 200,000 infantry, 60,000 cavalry & 6,000 war elephants. This is supposed to have checked Alexander's army from advancing towards Magadha.

## FOREIGN INVASIONS

### Persian Invasion

- The first conqueror who invaded into India was the king of Persia **Cyrus** (558-530 BC). Then, he destroyed the city of **Capisa** (North of Kabul).
- **Herodotus**, the Greek historian and known as **Father of History**, states that in 516 BC **Darius** (552-486 BC), grandson of Cyrus, sent a naval expedition to explore the valley of the Sindhu river and invaded the part of Punjab and Sind.
- The army of India formed part of the **Archaemenian army** that conquered Greece in the time of Persian ruler **Xerxes** (465-456 BC) successor of Darius I. **Darius III** also recruited Indian army and sent them to fight Alexander.
- **Ambhi**, the prince of **Taxila** surrendered to Alexander without fight.
- Kingdom of Porus lay between the Jhelum and the Chenab rivers. King Porus provided a strong resistance to Alexander.
- **Battle of the Hydaspes** took place between King Porus and Alexander in 326 B.C. King Porus used elephants against the Greek army.
- But Greek soldiers were more skilled and stronger than their Indian counterpart. Thus, Alexander managed to defeat Porus in the Battle of the Hydaspes.
- Alexander was impressed with the courage of King Porus and treat him as a great warrior and gave him back his kingdom.
- **Porus** was also known as Purushottama.
- Greek soldiers were tired and did not want to move forward. Thus, due to the mutiny of his soldiers Alexander was forced to move back.
- In 325 B.C. Alexander began his journey back to home. He died in Babylon in 324 B.C.
- His invasion paved the way for expansion of **Mauryan Empire** in India.

### ALEXANDER INVASION IN INDIA or Greek Invasion

- Alexander was the son of Philip of Macedonia (Greece) and born in 356 BC.
- Alexander was the king of Macedonia in Greece.
- After conquering Syria, Egypt and Persia, Alexander moved towards Kabul, from there he marched towards India through the Khyber Pass in 326 B.C.

## THE MAURYAN DYNASTY

- *The Maurya Empire ruled from 322 to 185 BC.*
- *The capital of Mauryan Empire was Patliputra.*
- *The Mauryan Empire was founded by Chandragupta Maurya with the help of Chanakya by overthrowing the Nanda dynasty in 322 B.C. By 320 B.C.*
- *It had fully occupied North-western India. It was one of the largest empire in the world and the largest ever in the Indian subcontinent. At its greatest extent, the empire stretched to the north along the natural boundaries of the Himalayas, and to the east upto Assam. To the west, it conquered beyond modern Pakistan, annexing Balochistan, Iran, Afghanistan and Kandahar provinces.*
- *The Empire was expanded into India's central and southern regions by Chandragupta Maurya and Bindusara.*
- *Decline of Mauryan Empire began 60 years after Ashoka's rule ended, and it dissolved in 185 BC with the foundation of the Sunga Dynasty in Magadha.*
- *The Arthashastra and the Edicts of Ashoka are primary sources of information on the Mauryan empire.*

### Mauryan Literary Sources

- There are mainly two literary sources of the Mauryan period.
- One is the **Arthashastra** written by **Kautilya** or **Chanakya**, the Prime Minister of Chandragupta Maurya, which explains how a good government should be organised.
- The other source is **Indica** written in Greek by **Magasthenes**, the ambassador of Seleucus Nicator head the court of Chandragupta.
- Magasthenes wrote not only about the capital city of **Pataliputra** but also about the Maurya Empire as a whole and about the society.
- The history of Ashoka reign can be constructed mainly on the basis of his edicts.

### Arthashastra

- Written by Chankaya / Vishnugupta / Kautilya
- Divided in 15 Adhikarnas and 180 Prakarnas
- Is related to money and politics
- Is divided into 15 parts
- 6000 shlokas
- Comment-Pratipada Panchika commented by-Bhataswamy
- Manuscript discovered by Arya Sharma Shastri in 1904.

### Megasthenes' Indica

- The other source is a very interesting account written by Megesthenes in Greek.
- Megasthenes was the Greek ambassador of Seleucus Nicator who spent time in the court of Chandragupta Maurya.
- His account was mentioned in his book Indica which was survived only in

fragments. Yet, his book gives details about the Mauryan administration.

- The capital city of Pataliputra and its administration and military organization was particularly mentioned. He has given notable picture of contemporary social life.

#### Visakadatta's Mudrarakshasa

- It is a drama in Sanskrit.
- Although written during the Gupta period but it describes about the victory of Chandragupta over Nandas with the assistance of Kautilya.
- It also gives a detail account of the socio-economic condition under the rule of Mauryas.

#### Other Literature

The Puranas and the Buddhist literature such as Jatakas, apart from other sources provided information on the Mauryas. The Ceylonese Chronicles Dipavamsa and Mahavamsa throw light on the role of Asoka in spreading Buddhism in Sri Lanka.

#### Mauryan Administration

The Mauryan rule was vast and highly centralised bureaucratic rule with the king as the Fountainhead of all the powers. The king claimed not divine rule; rather it was paternal depotism, Kautilya called the king dharmapravartaka or promulgator of social order.

Mauryan Administration posts (Mantriparsihad)	
Mantrin	Chief Minister
Pirohita	High Priest
Senapati	Commander-in-charge
Yuvraj	Crowned Prince
Samaharta	Collector of revenue
Prashasti	Head of prisons
Sannidata	Head of treasury
Nayaka	Had of city security
Paur	City police

Vyabharika	Chief Judge
Karmantika	Head of industries and factories
Dandapala	Had of police
Durgapala	Head of Royal Fort
Annapala	Head of food grains Department
Rajjukas	Officers responsible for land measurement and fixing its boundary
Pradesika	Head of district Administration

#### Mauryan Art

Well-known art historian A.K. Coomaraswamy divides Mauryan art into two categories :

#### Indigenous and Official/Court

Mauryan Art	
Indigenous	Office Art/Court Art
Yaksha image from parkam	Pillars (well built and polished)
Yakshi sculpture from Besnagar	Finest example Samath - Lions which originally supported Dharma Chakra
Female Cauribearer from Patna	Animals figure or Maurya period of elephant at Dhauli
-	Stupas

#### Chandragupta Maurya (322 – 297 BC)

- He overthrew the Nandas & established the rule of the Maurya dynasty, with the help of **Chanakya** or Vishnugupta,
- Chandragupta is called Sandrocottus by the Greek scholars.
- Seleucus Nicator was one of the generals of Alexander and after his death, had succeeded in gaining control of most of the Asiatic provinces.
- Chandragupta defeated him in 305 BC and was compelled to yield parts of Afghanistan to Chandragupta. There was also a marriage alliance between the two families.
- Built a vast empire, which included not only good portions of Bihar and Bengal, but

also western and north western India and the Deccan.

- This account is given by Megasthenes (A Greek ambassador sent by Seleucus to the court of Chandragupta Maurya) in his book Indica. We also get the details from the Arthashastra of Kautilya.
- Chandragupta adopted Jainism and went to Sravanabelagola (near Mysore) with Bhadrabahu, where he died by slow starvation.
- Vishakhadatta wrote a drama Mudrarakshasa (describing Chandragupta's enemy) & Debi Chandraguptam in sixth century AD.

Various Names of Chandragupta Maurya	
Name	Source
Palibrothus	Strabo
Androcotus	Arien, Plutarch
Piyadamas	Mudraraksha
Vrishal	Mudraraksha
Chandrasiri	Mudraraksha
Kulihin	Mudraraksha

### Chanakya

- Chandragupta's advisers, Chanakya (also known as Kautilya) was author of Arthasashtra and is regarded as the architect of Chandragupta's early rise to power. Chandragupta, according to Jain literature, in his last days converted into Jainism by Bhadrabahu and abdicating his throne in favour of his son Bindusara became a monk.
- Born: 371 BC, India
- Died: 283 BC, Pataliputra

### Bindusara (297 – 273 BC)

- Called Amitraghat by Greek writers.
- Chandragupta was succeeded by his son Bindusara in 297 BC. He is said to have conquered 'the land between the 2 seas', i.e., the Arabian Sea & Bay of Bengal. At

the time of his death, almost the entire subcontinent came under the Mauryan rule. Greek Ambassador, Deimachos visited his court.

Various Names of Bindusara	
Name	Source
Amitraghat	Sanskrit Literature
Amitchetas	Strabo which was Greek version of Sanskrit 'Amitraghata'
Seemseri	Rajvalli Katha
Bindupala	Fa-Feenchulin or slayer of foes

### Ashoka (269 – 232 BC)

- Ashoka was appointed the Viceroy of Taxila and Ujjain by his father, Bindusara. He was at Ujjain when Bindusara, died. His formal coronation was delayed for four years, suggesting a disputed succession. A Buddhist literature says that he came to throne after killing his 99 brothers.
- Regarded as one of the greatest kings of all times. He was the first ruler to maintain direct contact with people through his inscription.
- In his inscriptions following languages have been used:
- Brahmi, Kharoshthi, Armaic and Greek. (James Prinsep first deciphered the inscriptions).
- Ashoka became the Buddhist under Upagupta.

Asoka's Hellenistic Contemporaries	
Antiochus II Theos	Syria
Ptolemy II Philadelpus	Egypt
Magas	Cyme
Antigonus Gonatas	Macedonia
Alexander	Epirus
Various Names Epithets of Asoka	
Name	Source
Devanamkriya	Monarchical Epithet
Ashokavardnan	Purana
Piyadassiraja	Barabar cave inscription
Ashoka Maurya	Junagarh Inscription
Piyadasi	Kandhar inscription

<b>Asoka's Epic and Inscriptions</b>	
First major rock edict	Prohibition on animal slaughter
Second major rock edict	Mention of places of Cholas, Pardayans, Satayaputras and Keralputras
Third major rock edict	Directions to Predeshikas, Yuktas and Rajukas for propagation of Dhamma
Forth major rock edict	Impact of Dhamma on society.
Fifth major rock edict	Appointments of Dhammamahamatras.
Sixth major rock edict	Welfare majors.
Seventh major rock edict	Propagation of peace, balance of mind and faith
Eighth major rock edict	Details of visit to Bodhi tree.
Ninth major rock edict	Stress on ceremony of Dhamma
Tenth major rock edict	Asoka's desire to gain popularity for Dhamma
Eleventh major rock edict	Appraisal of Dhamma
Twelfth major rock edict	Promotion to religion of different faiths
Thirteenth major rock edict	Largest of all, victory over Kalinga's destruction of war, mention of Greek rulers
Fourteenth major rock edict	Nature of all other rock edicts Inclusion of Asoka into Sangha It is bilingual. It tells that fishermen and hunters gave up hunting Faith of ruler and kingdom in Dhamma.

**Extent of Empire :** His empire covered the whole territory from Hindukush to Bengal & extended over Afghanistan, Baluchistan & whole of India with the exception of a small area in the farthest south. Kashmir and Valleys of Nepal were also included, first empire to do so.

**The Kalinga War History :** (261 BC, mentioned in XIII rock edict). It changed his attitude towards life. Ashoka became a Buddhist after that.

#### **Causes of decline of Mauryan Empire**

- Ashoka's patronage of Buddhism and his anti-sacrificial attitude is said to have affected the income of the Brahmins. So they developed antipathy against Ashoka.
- Revenue from agrarian areas was not sufficient to maintain such a vast empire as booty from war was negligible.
- Successors of Ashoka were too weak to keep together such a large centralized empire.
- The last Mauryan king **Brihadratha** was killed by **Pushyamitra Shunga** (Commander in Chief) in 185 BC, who started the **Shunga dynasty** in Magadha.

## KINGDOMS AFTER THE MAURYANS

### Sunga Dynasty

- Pushyamitra Sunga laid the foundation of Sunga dynasty in 187 B.C.
- His dominions extended to South as far as the Narmada River.
- Capital of Sunga dynasty was Patliputra. Vidhisha was the capital of later Sunga rulers.
- He performed two Ashwamedha sacrifices. He also defeated the Bactrian king, Demetrius.
- Pushyamitra Sunga ruled for 36 years and was succeeded by his son Agnimitra.
- Agnimitra was the hero of Kalidasa's Malavikagnimitram.
- Patanjali's Mahabhasya was composed during the rule of Sunga dynasty.
- It is said that there was ten kings in the Sunga dynasty who ruled Magadha for about 110 years.
- The last king of Sunga dynasty was Devabhuti.
- Devabhuti was killed by his minister Vasudeva Kanva in around 73 B.C. Thus, Vasudeva Kanva laid the foundation of Kanva dynasty.

### Kanva Dynasty

The founder of this short-lived dynasty was Vasudeva Kanva, who killed the last Sunga king, Devabhuti. This dynasty was swept away by Satavahanas of the Deccan.

### Satavahana Dynasty

- After the decline of Kanva Dynasty, Satavahana Dynasty ruled most part of India for about 450 years.
- The Satavahanas were the first to issue coins with their rulers embossed on it.
- Simuka is regarded as the founder of this dynasty.
- Srikakulam was the capital of Satavahana empire.
- The most important king was **Gautamiputra Satakarni** (AD 106 – 130) who raised the power and prestige of Satavahanas to greater heights. He set up his capital at **Paithan** on the Godavari in Aurangabad district.
- Achievements of Gautamiputra Satakarni was mentioned in Nasik inscription composed by his mother, Gautami.
- The two common religious constructions were the Buddhist temple that was called 'Chaitya' & the monasteries, which was called 'Vihara'. The most famous Chaitya is that of Karle in W. Deccan.
- The official language was Prakrit & the script was Brahmi, as in Ashokan times. One Prakrit text called Gathasattasai is attributed to a Satavahana king called Hala.
- Nasik and Nanaghat are the important inscription which give detail information of Satavahana Empire.

## Sangam Age

The three empires that ruled the South of India during Sangam age in first century AD were that of Cholas, Cheras and Pandyas. In spite of being in conflict, they were promoters of literature and other classical works.

### Chola Kingdom

- **Kaveripattanam** was the Capital of Chola Kingdom.
- The Chola kingdom was known as **Cholamandalam**, situated between the Pennar and the Velar rivers. Their chief centre of political power was at **Uraiyur**, a place famous for cotton trade.
- In the middle of the 2nd BC **Elara** a Chola king conquered Sri Lanka and ruled over it for nearly 50 years.
- The real foundation of the kingdom was laid down by **Karikala** in AD 2nd century. He founded the city of **Puhar** and constructed 160 km of ridge along the Kaveri river.
- The successors of **Karikala** were frail. Chola Kingdom was attack by the neighbouring territory of the Cheras and Pandyas. Thus, the Chola kingdom declined.

### Chera Kingdom

- **Vanji** or **Karur** was the capital of Chera Kingdom. The kingdom covered the portions of modern Kerala and Tamil Nadu.
- **Udiyangeral** is one of the earliest known Chera rulers. He served both the armies of **Kurushetra** War.
- The greatest king of the dynasty was **Senguttuvan**. He crossed the Ganga and invaded the kingdom of Northern India. He is remembered for building a temple of '**Kannagi**' the Goddess of chastity and founded the famous **Pattini** cult.

### Pandyan Kingdom

- **Madurai** was the Capital of Pandyan kingdom. References of Pandyas are found in the Sangam literature and the text of **Megasthenes** who speaks of it being ruled by a woman.
- **Mudukudumi** was the earliest known Pandyan ruler.
- It had flourishing trade contacts with the Roman Empire and sent embassies to the Roman Emperor Augustus.
- **Nedunjelian** was the most important king of Pandya. He accused **Kovalon** of theft. As a result, the city of Madurai was laid under a curse by **Kannagi** (Kovalan's wife).

Three Sangams			
Sangam	Venue	Chairman	Books
First	Thenmadurai	Agastya	No books survived
Second	Kapatapuram	Earlier- Agastya Later- Tolkappiyar	Tolkappiyam (author - Tolkappiyar)
Third	Madurai	Nakkirar	covers entire corpus of Sangam Literature



Sangam Literature				
Earliest Grammar Works	Ettutogai	Pattupattu	Padinenkilkanakku	Epics
Tolkappium oldest surviving Tamil Text by Tolkappiyar,	8 Anthologies Aingurunuru (Gudaliar Killar) largest collection of poems (500)	(10 Idylls) 10 long poems: most important is Murugarruppadal by a person known as Nakkirar.	(18 Minor Works) Padinenkilkanakku (not minor in significance preceptine in nature, stock of adages and aphorisms)	Silappadigaram by Illango Avadigal
Aggatiyam by Saint Gatiyan	Padirrupattu (8 poems) (Smallest collection of poems praising Chera kings.	Maduraikkanjai by Mangudi (Nedujeliam III Marudam written deals with Madurai city.	Most important work Tirukkural Thiruvalluvar referred to as the Bible of Tamil land	Manimegalai by Sattanar
-	-	Pattinappalai by Kannan deals with the city of Gcuhar or Modern Kaveripattnam.	-	Sivaga Sindamani by Tiruttakkadevar

## GUPTA EMPIRE *Golden Age of India* (AD 320 – 550)

- **Sri Gupta** was the first king and **Ghatotkacha** (Sri Gupta's son) was the next to follow him with the title **Maharaja**. The **Poona** copper plate inscription of **Prabhavati** Gupta describes Sri Gupta as the **Adhiraja** of the Gupta dynasty.
- In the **Riddhapura** copper plate inscription, it is stated that Sri Gupta belonged to the **Dharan Gotra**.
- Famous rulers of Gupta dynasty were Chandragupta-I, Samudragupta, Chandragupta- II and Kumaragupta-I.
- The Gupta period produced great scholars such as Kalidasa, Aryabhata, Varahamihira, Vishnu Sharma and Vatsyayana who made great advancements in many academic fields.

### Chandragupta I (AD 319 – 335)

- Chandragupta I was the son of Ghatotkacha.
- By marrying a Lichchhavi Princess **Kumaradevi** he sought to gain in prestige, though Vaishali does not appear to have been a part of his kingdom.
- His rule remained confined to Magadha and parts of eastern Uttar Pradesh (Saketa and Prayaga).
- He took the title of Maharajadhiraja, and his accession in about A.D. 319-20 marked the beginning of Gupta era.
- Patliputra was the capital of Gupta dynasty.

### **Samudragupta (AD 335 – 375)**

- The Gupta kingdom was enlarged enormously by Chandragupta's son & successor Samudragupta.
- His court poet **Harisena** wrote a glowing account of the military exploits of his patron. In a long inscription at the **Prayag Prashasti pillar** (at Allahabad), the poet enumerated the people & countries that were conquered by Samudragupta.
- Samudragupta believed in the policy of war and conquest and because of his bravery and generalship he is called the **Napoleon of India** (by the historian V.A. Smith).
- Samudragupta is said to have composed numerous poems of high merit. Some of his coins represent him playing vina. He also performed Asvamedha sacrifice.
- He assumed the titles of **Kaviraj** and **Vikramanka**.
- **Vasubandhu**, a celebrated Buddhist scholar was his minister.
- Though a follower of the brahmanical religion, he was tolerant of other faiths; received a missionary from Meghavarman, the ruler of Sri Lanka, seeking his permission to build a Buddhist temple at Gaya, which he granted.

### **Chandragupta – II (AD 380 – 413)**

- Samudragupta was succeeded by **Ramgupta** but **Chandragupta II** (son of Samudragupta) killed him and married his queen **Dhruvadevi**.
- He entered into matrimonial alliance with the **Nagas** (of upper and the Central Provinces) by marrying princess Kuberhavi whose daughter Prabhavati was married to Rudrasena-II of the Vakataka family.

- Took the title of **Vikramaditya** by defeating Rudrasimha III, a Kshatrap king of Ujjain. He also took the title of **Simhavikrama**.
- He was the first ruler to issue silver coins. Also issued copper coins.
- The iron pillar inscription, fixed near **Qutabminar** in Delhi mentions a king Chandra (considered by many as Chandragupta II only).
- His court was adorned by celebrated nine gems (navratnas) including Kalidasa, Amarsimha, Varahmihir, and Dhanvantri.
- It was in Chandragupta's reign that the **Chinese pilgrim Fa-Hien** (399-414) visited India and abroad and elaborate account of the life of its people.
- Chandragupta II adopted the title of Vikramaditya which had been first used by an Ujjain ruler in 57 BC as a mark of his victory over the Saka Kshatrapas of western India. The Court of Chandragupta II at Ujjain was adorned by a numerous scholars such as Kalidasa and Amarashimha.

### **Kumaragupta – I (AD 413 – 455)**

- Kumaragupta-I was the son of Chandragupta-II.
- He adopted the title of **Mahendraditya**.
- He founded **Nalanda University** (a renowned university of ancient India).
- He was the worshipper of **Lord Kartikeya** (son of Lord Shiva).
- In the last years of his reign, the peace and prosperity of the empire was disturbed due to the invasion of Turko- Mongol tribe, Hunas. During the war with the Hunas, Kumaragupta died.

### Skandagupta Vikramaditya (AD 455 – 467)

- Kumargupta-I was followed by Skandagupta.
- To consolidate his position he had to fight the Pushyamitras, and the country faced Huna invasion from across the frontiers in the north-west. However, Skandagupta was successful in throwing the Huns back. This heroic feat entitled him, like Chandragupta II, to assume the title of **Vikramaditya**.
- The **Junagarh inscription** of his reign tells us about the public works undertaken during his times.
- The **Sudarsana Lake** burst due to excessive rains and in the early part of his rule his governor Parnadatta and his son Chakrapalita got it repaired. The last known date of Skandagupta is 467 A.D. from his silver coins.

### Fall of Gupta Empire

- The weak successors of Skandagupta could not match the growing Huna power.
- Feudatories rose in Bihar, Bengal, Madhya Pradesh, Vallabhi, etc.
- Mihirkula was the most famous Huna king. Huen Tsang mentions him as a fierce persecutor of Buddhism. He was defeated by Yashodharman (one of the feudatories of Guptas in Malwa).

### Gupta Administration

- Kings were called **Parameshwara /Maharajadhiraja /Paramabhattaraka**.
- The most important officers were **Kumaramatyas**.
- Their military organization was feudal in character (though the emperor had the standing army).
- They issued the largest number of gold coins in Ancient India, which were called **Dinars**. Silver coins were called **rupyakas**.

Important Gupta Officials At The Central Level	
Mahabaladhikrita	Commander in chief
Mahadandanayak	Chief Justice
Mahasandhivigrahak or Sandhivigrahak	And facial for post-war conciliation.
Dandapashika	Head of the police department
Bhandagaradhikreta	Head of the Royal Treasury
Mahapaksha-Patalik	Head of the account Department
Vinaysthitisansathapak	Head of the education Department
Sarvadyaksha	Inspector for all the central departments
Mahashwapati	Controller of cavalry.
Vinaypura	Official to present different guests at Kings Court
Yuktapurusha	Office to keep account of war booty.
Khadyatpakika	Inspector of Royal kitchen
Ranabhandagarika	Officer in charge of Army stores
Mahanarpati	Head of foot soldiers(infantry)

### Gupta Religion

- **Bhagavad-Gita** was written during this time only.
- Buddhism declined.
- **Bhagavatism** centered on worshipping **Vishnu** or **Bhagvat**.
- History was presented as a cycle of 10 incarnations of Vishnu.
- Idol worship became a common feature.

- Vishnu temple at **Deogarh** (near Jhansi), a small temple near **Sanchi** and a brick temple at **Bhitragaon** (near Kanpur) belong to the Gupta architecture.

### Gupta Art & Sculpture

In art, architecture, sculpture, and painting the period witnessed unprecedented activities and development all over India. That is why the period is also referred to as the Golden Age of ancient India.

It may be mentioned that the Gupta plastic conception had its birth at Mathura and spread to Sarnath, Shravasti, Prayag and other places. At Sarnath, the plastic conception of Mathura School with all its elegance reached perfection in figure of seated Buddha in Dharma-Chakra-Pravarthana attitudes.

Famous Temples of The Got the Age	
Vishnu Temple	Tigawa (Jabalpur)
Shiva Temple	Bhumara (Nagaud)
Parvati Temple	Nachria Kuthara
Dasavtar Temple	Deogarh (Jhansi)
Shiva Temple	Koh (Nagaland)
Bhitragaon Temple	Bhitragaon
Lakshman Temple	Kanpur (Brick made)
Lakshman Temple	Sirpur (Raipur)
Mukund Darra Temple	Kota
Dhammekh Temple	Samath
Jarasangh's Sitting	Rajgrih (Bihar)

### Ajanta Paintings

- The greatest specimen of Buddhist art in Gupta Times is provided by Ajanta paintings. They depict the various events in the life of Gautama Buddha and previous Buddhas, of jataka stories.
- The most important examples of the Gupta paintings are to be found on the wall frescos of the **Ajanta** caves, the **Bagh** caves. The

Gupta painters also painted incidents from the life of Buddha during the Gupta period.

- Cave No. XVI at Ajanta has the scene known as “Dying Princess”. Cave no. XVII has been called a picture gallery. At Ajanta other prominent cave paintings are cave no. XIX, I and II.

### Gupta Architecture

- Gupta age marks the beginning of the main styles of temple architecture in India namely the **Nagara** style and **Dravida** style.
- The finest example of temple architecture is the **Dasavatara** Temple at Deogarh. It is also an example of early stone temple with a Shikara.
- It has a square **grabhagriha** with exquisitely carved doorway.
- The **Bhitragaon** temple of Kanpur is made entirely of bricks.
- Other examples of temple architecture are Parvati Temple at Nachna Kuthira, Shiva temple at Khoh, Cave temple at Udayariti etc.

### Gupta Literature

During the Gupta period, Sanskrit literature greatly encouraged. Prose and poetry both were written during the Gupta period. The Allahabad pillar inscription indicates that **Harisena** was a great poet.

A list of important literary works during the Gupta period is given in the table below.

Important Literary Works During the Gupta Period	
Works	Creators
<b>Epics</b>	
Ramayan	Valmiki
Mahabharata	Ved Vyasa
Raghuvansa, Ritusamhara, Meghaduta	Kalidas
Ravanabadha	Batsabhathi
Kavyadarshana and Dasakumarcharita	Dandin
Kiratarjunyam	Bharavi
Nitishataka	Bhartrihari
<b>Dramas</b>	
Vikramovarshiya, Malvikagnimitra and Abhijnansakuntalam Mrichchakatika	Kalidasa
Pratignayaugandharayana	Bhasa
Mudrarakshasa and Devichandraguptam	Vishakhadatta
<b>Eulogy</b>	
Pragya-PPrasasti	Harisena
<b>Philosophy</b>	
Sankhyakarika	Ishwar Krishna
Nyaya Bhasya	Vatsyayana
Vyasa Bhasya	Acharya Vyasa
<b>Grammer</b>	
Amarakosha	Amarsimha
Chandravyakarana	Chandragomin
Kavyadarsha	Dandin
<b>Narrative Story</b>	
Panchatantra and Hitopadesha	Vishnu Sharma
<b>Mathematics and Astronomy</b>	
Aryabhattiya	Aryabhata
Brihatsamhita and Panchasidhantika	Varamihira
Suryasidhanta	Brahmagupta
<b>Miscellaneous Works</b>	
Nitisastra	Kamandaka
Kamsutra	Vatsyayana
Kavyalankara	Bhamah

### Science and Technology of Gupta Period

- **Aryabhata**, the great mathematician wrote **Aryabhatiya** and **Suryasiddhanta**. In Aryabhatiya, he described the place value of the first nine nos. & the use of **zero**. He also calculated the value of **pie** and invented **Algebra**.
- In **Suryasiddhanta**, he proved that the earth revolves round the sun and rotates on its axis. In this way he discovered the cause of the solar and lunar eclipses and the methods for calculating the timings of their occurrence. He also said that the heavenly bodies, like the moon, were spherical and they shone by reflecting the light.
- **Varahamihira** wrote **Panchasi-dhantika** and **Brihatsamhita**. He said that the moon moves round the earth and the earth, together with the moon, move round the sun.
- **Brahmagupta** was a great mathematician. He wrote **Brahma-sphutic Siddhanta** in which he hinted at the Law of Gravitation.
- In the field of astronomy, **Romakasidhanta** was compiled.
- **Vagbhatta** was the most distinguished physician of the **Ayurvedic** system of medicine.
- **Palakapya** wrote **Hastyagarveda**, a treatise on the disease of elephants.
- **Dhanvantri** – famous for Ayurveda knowledge.

## Fa-Hien's Visit to India

- Fa-Hien was a renowned Chinese traveler and pilgrim, known for his extensive travel throughout India. He visited India during the year 399 and returned to his homeland, China, in the year 414.
- He visited India during the Gupta period in the reign of Chandragupta Maurya II.
- The main objective of Fahien's mission to India was to secure copies of Buddhist manuscripts.
- He visited Peshawar, Mathura, Kanauj, Sravasti, Kapilavastu, Kushinagara, Vaishali, Pataliputra, Kasi, Gaya, and Bodhgaya among other places.
- He spent three years at **Pataliputra** and two at **Tamralipti**.
- He gives interesting information about the life of the people and the general condition of the country.

## OTHER DYNASTIES AND RULERS

### Harsha Vardhana (606-647 A.D.)

- He belonged to **Pushyabhuti** family & son of **Prabhakar Vardhan**.
- He originally belonged to Thaneshwar, but shifted to Kannauj (after Harsha's death Kannauj was won from Harsha's successors by the Pratiharas).
- Brought '5 Indies' under his control (Punjab, Kannauj, Bengal, Bihar and Odisha).
- Defeated by Pulakesin – II, the great Chalukya king, on the banks of Narmada in 620. Pulakesin – II bestowed the title of '**Sakalottara – patha – natha**' – '**the lord of the entire north**' – on him.
- Chinese pilgrim, **Hieun Tsang** (Prince of Travelers) visited during his reign. He spent about eight years (635 – 643) in the dominions of **Harsha** and earned his friendship. Hieun Tsang has left a detailed account of a grand assembly held at **Kannauj** in 643 attended by representatives of Hinduism and Jainism.

- Harsha used to celebrate a solemn festival at Prayag (Allahabad), at the end of every five years.
- Harsha was a great patron of learning. He established a large monastery at Nalanda. Banabhatta, who adorned his court, wrote Harshacharita and Kadambari.
- Harsha himself wrote 3 plays – Priyadarshika, Ratnavali and Nagananda.
- After the death of Harsha in 647, the empire once again broke up into petty States.

### Vakatakas

- The founder of this Brahmin dynasty was **Vindhvasakti**.
- Vakatakas came to control parts of the Deccan and Central India till the rise of the Chalukyas.
- Most important king was **Pravarsen – I** who performed four **Ashwamedha yagyas**.
- Chandragupta – II married his daughter **Prabhawati** to the Vakataka king, Rudrasena – II.

## Chalukyas

- The founder of Chalukyas was **Pulakesin – I**.
- Established their kingdom at Vatapi (modern Badami, Karnataka).
- **Pulakesin – II** was their most famous king, who was a contemporary of Harsha. He sent an embassy to the Persian king, Khusr – II. His court poet, Ravikirti, wrote Aihole inscription. Hiuen Tsang visited his kingdom.
- They were the maritime powers of their time.
- Much of the paintings and sculptures of the Ajanta and Ellora caves were completed during the Chalukyan reign. They built several magnificent temples in Aihole and other places. Aihole is called the cradle of Indian temple architecture.
- There were two more Chalukya dynasties which were separate entities. They were Eastern Chalukyas of Vengi and Western Chalukyas of Kaivani.
- Vengi dynasty was founded by Pulakesin II's brother, Kubja – Vishnu-Vardhana. The power of Eastern Chalukyas was weakened in the tenth century and they became the allies of Cholas.
- The greatest ruler of Kalyani Chalukyas was Vikramaditya II Tribhuvanamalla. He

was the hero of Bilhana's Vikramankadeva Gharita. He introduced the Chalukya – Vikrama era (1076 A.D).

## Rashtrakutas Dynasty

- The founder of Rashtrakutas Dynasty was **Dantidurga**.
- Originally district officers under Chalukyas of Badami.
- Their king, Krishna – I is remembered for constructing the famous rock – cut Kailasha temple at Ellora. It was constructed in the Dravidian style and elaborately carved with fine sculptures.
- Their king, Amoghvarsha, is compared to Vikramaditya in giving patronage to men of letters. He wrote the first Kannada poetry named Kaviraj marg and Prashnottar Mallika. He built the city of Manyakheta as his capital.
- Their king, Krishna – III set up a pillar of victory and a temple at Rameshwaram.
- Rashtrakutas are credited with the building of cave shrine of Elephanta. It was dedicated to Shiva, whose image as Mahesh (popularly known as Trimurti), counts among the most magnificent art creations of India. The three faces represent Shiva as creator, Preserver and Destroyer.

Temples Constructed by Rashtrakutas		
Temples	Place	Constructed By
Vijalaycholeshwar	Naratmatai	Vijayalaya
Balsubramaniyam	Kannanur	Aditaya I
Nageshwar	Kuminakanam	Aditaya I
Kornagnain	Srinivasnallur	Vartak I
Moverkaite	Padukottai	Bhutivikram Kesiri
Tiruvaleswaram	Brahmadesha	Raj Raj I
Uttarkailash	Tiruvadi	Raj Raj I
Rajrajeshwar	Tanjore	Rajendra I
Gangaikondchola	Gangai Kondacholapuram	Rajendra I
Airavateshwar	Darsunam	Raj Raj II
Kamhaveswar	Tirumaranam	Kallotunga III

### Gangas Dynasty

- Gangas Dynasty's king was also called as **Chodagangas** of Odisha.
- King **Narsimhadeva** constructed the **Sun Temple** at Konark.
- King **Anantvarman** Ganga built the famous **Jagannath temple** at Puri.
- Even the Telegu batch of dancing girls was brought to the temple of Jagannath by **Chodagangadeva**. The son of Chodagangadeva, Rajaraja Deva II had appointed twenty dancing girls for service in the temple of Jagannath as testified by the **Madala Panji**.

- **Kesaris**, who used to rule Odisha before Gangas built the **Lingaraja temple** at Bhubhaneshwar.

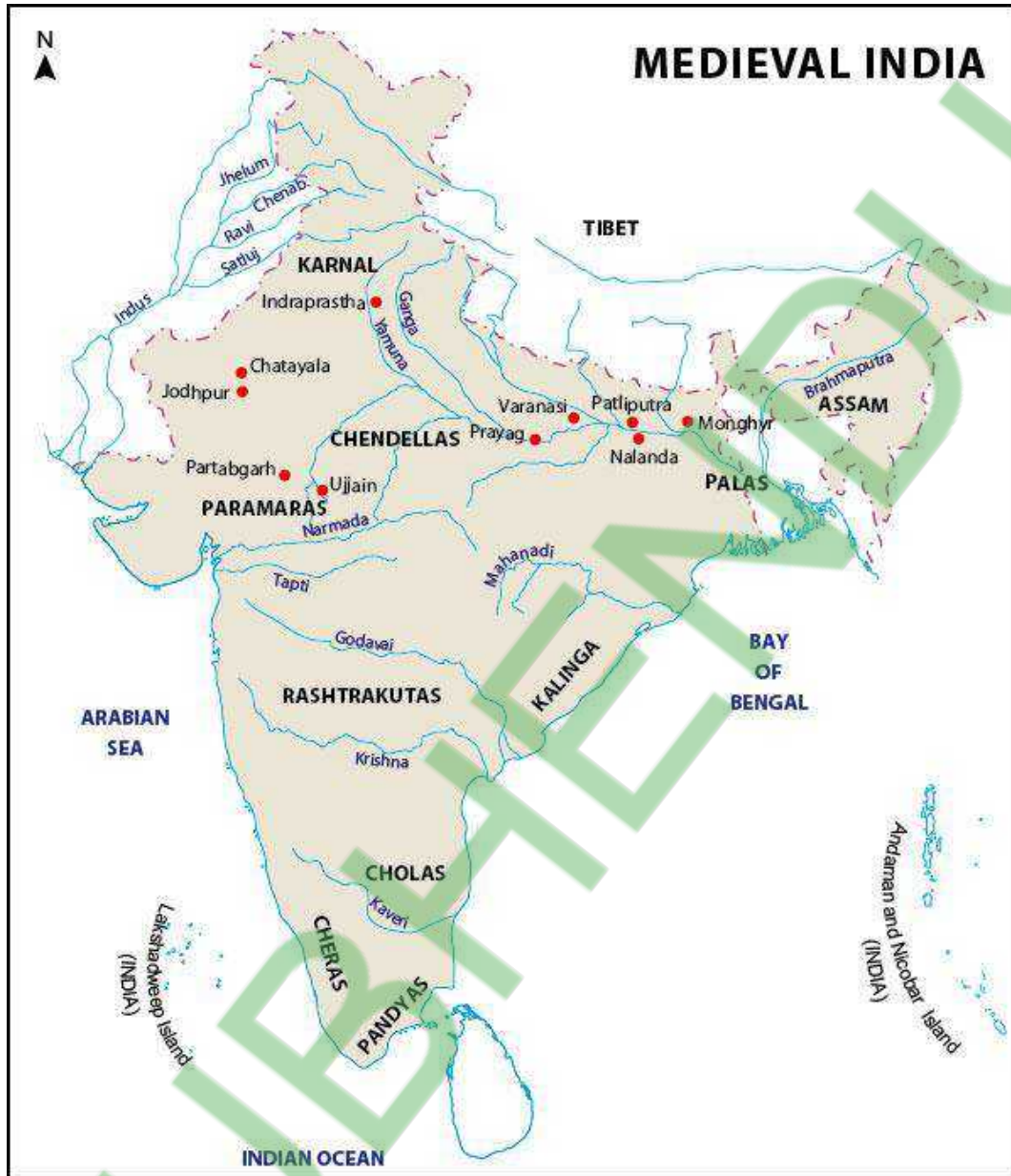
### Pallavas

- The founder of Pallavas was **Simhavishnu**. They set up their capital at Kanchi (south of Chennai).
- Narsimhavarman was their greatest king. He founded the town of Mamalapuram (Mahabalipuram) which he adorned with beautiful rock – cut Rathas or Seven Pagoras. Hieun Tsang visited Kanchi during his reign.

Dynasties, Their Rulers And Capitals		
Dynasties	By Rulers	Capitals
Shunga	Pushyamitra Sunga	Patliputra
Kanva	Vasudeva	Patliputra
Satvahanas	Simuk	Pratishthan
Ilkshavaakus	Shrishanta Mulak	Nagarjun Konda
Kushanas	Kujulkhadphises	Purusushpur/Peshawar
Gupta	Sri Gupta	Patliputra
Hunas	Tormaan	Shakal or Syalkot
Pushybhuti	Narvardhan	Thaneshwar/Kannauj
Pallavas	Simhavarman IV	Kanchi
Chalukya	Jaisingh Siddharaja	Vatapi/Badami
Rashtrakuta	Danti Durga	Manya Khait
Gurjara-Pratihara	Harish Chandra	Gujarat
Gadhwaal	Chandradev	Kannauj
Chauhaan	Vasudev	Ajmer/Shakambhari
Chandell	Nannuk or Dhanga	Khajurah or Kalinga



## MEDIEVAL INDIAN HISTORY



### MAHMUD GHAZNI (971 - 1030) :

#### Ghaznavid Empire

- In 998 AD, the Turkish conqueror, **Mahmud Ghazni**, succeeded his father, and established a huge empire in Central Asia, with capital at Ghazni, the present-day South Kabul.
- He was 27 years old then and the first ruler to get the title as "Sultan", which means

authority, thereby implying his power and strength.

- Mahmud Ghazni patronized 3 persons. They were **Firdausi** (Persian poet, known as Homer of the east) who wrote Shahnama; **Alberuni** (a brilliant scholar from Central Asia) who wrote Tahqiq-I-Hind; **Utbi** (court historian), who wrote Kitab-ud-Yamni.
- He died on 1030, Ghazni, Afghanistan.

- For 17 times, he attacked India during the period between 1000 and 1027 AD, a significant event in the history of India.

**First invasion of Mahmud Ghazni in 1000**

**AD :** Mahmud of Ghazni first invaded modern Afghanistan and Pakistan in 1000 AD. He defeated Hindu shahi kingdom ruler Jaya Pala, who killed himself later, and his son Ananda Pala became his successor.

**1005 :** Ghazni invaded Bhatia.

**1006 :** Ghazni invaded Multan. During this time, Ananda Pala attacked him.

**1007 :** Mahmud of Ghazni attacked and crushed Sukha Pala, ruler of Bhatinda.

**1011 :** Ghazni raided Nagarkot in the Punjab hills.

**1013 :** This was Mahmud's 8th expedition into Pakistan and Eastern Afghanistan, the shahi kingdom under Anand Pala, who was defeated by Ghazni in the Battle of Waihind, the Hind shahi capital near Peshawar.

**1014 :** Thanesar was conquered by Mahmud.

**1015 :** Kashmir was attacked by Mahmud.

**1018 :** He attacked Mathura, where a number of coalition of rulers were defeated, including a ruler called Chandra Pala.

**1021 :** Mahmud conquered Kanauj by defeating Kanauj King Chandella Ganda. In the same year he defeated and killed two more rulers, Shahi Trilochana Pala and his son Bhima Pala, thereby conquering Rahib and Lahore (modern Pakistan).

**1023 :** Gwalior was invaded and conquered by Ghazni.

**Last invasion of Mahmud Ghazni, 1027 :** In 1027, he attacked the Somnath temple. The

brave Hindu Rajputs tried to defend the temple when the enemy tried to get inside it. The Hindus fought very bravely and initially the enemies could not damage the temple. However, after 3 days of fights, Mahmud Ghazni's troops were successful in plundering the Somnath temple, in which the sacred idol, Linga was destroyed. Ghazni looted all the treasures of the temple, which was at that time worth 20-million Dinars, more than eighty times of what he had collected in his first invasion. Around 5000 Hindus died during this last invasion.

**MUHAMMAD GHORI (1149 - 1206) :  
Muslim Empire**

- The real founder of the Muslim Empire in India was Shihab – ud – Din Muhammad Ghori or Muhammad of Ghur. It is true that Muhammad bin Qasim was the first Muslim invader of India but he failed to carve out a Muslim empire in India on account of his premature death.
- Mahmud also failed to set a Muslim empire in India and the only permanent effect of his invasions was the annexation of Punjab. It was left to Muhammad Ghori to build up a Muslim Empire in India on a secure footing.
- He was also a ruler of a small kingdom in Afghanistan. But he was interested in conquering northern India and adding it to his kingdom, and not merely in getting gold and jewellery like Mahmud.
- His first invasion was directed against Multan in 1175 AD, which was successful.

By 1182, Sindh was also captured. Punjab was captured by 1186 AD.

- Prithviraj Chauhan, who was the king of Delhi at that time, received contingents from other Rajput kings and defeated him in the First Battle of Tarain (1191).
- But he defeated Prithviraj in the Second Battle of Tarain in 1192. Captured Delhi and Ajmer and thus laid the foundation of Muslim Rule in India. Also defeated Jaichandra (Gahadval Rajput, ruler of Kannauj) at the Battle of Chandwari in 1194 AD.
- Ikhtiyar – ud – din Muhammad bin Bakhtiyar Khalji, one of Ghori's commanders, annexed Bihar and Bengal and destroyed Nalanda and Vikramshila University.
- Died in 1206 AD, leaving Qutab – ud – Din Aibak the charge.

#### **PRITHVIRAJ CHAUHAN (1168 - 1192) : Rajput Empire**

- Prithviraj Chauhan was the hindu king of Chauhan dynasty in 12th century.
- He was born in 1168 at Ajmer. His father was Someshwar Chauhan, the king of Ajmer and mother was Kamala Devi.

- He defeated the king of Gujarat, Bhimdev only at an age of thirteen. For his bravery, his maternal grandfather Angam declared him the king of Delhi.
- He built a strong Rajput empire and his empire was expanded mainly in the northwest of India. His empire included Punjab, Haryana, Rajasthan and Uttar Pradesh.
- Chand Bardai, a poet of Prithviraj Chauhan's court wrote a poem "Prithviraj Raso" describing Prithviraj's life. Chand Bardai was also a friend of Prithviraj.
- He married to Somyukta. She was the daughter of Jaichandra Gahadwal, an enemy of Prithviraj.
- In 1191, He defeated Shahabuddin Muhammad Ghori in the **first battle of Tarrain**. He left Muhammad Ghori unharmed and forgave him. In 1192, Ghori again attacked Prithviraj and won the **battle of Second Tarrain**. Ghori not only arrested Prithviraj but also made him blind with red hot iron rods.
- Later Prithviraj killed Ghori in an archery competition with the help of his friend Chand Bardai and he got killed by Ghori's bodyguard.

## DELHI SULTANATE

*It covers five short-lived dynasties. It ruled from 1206 AD to 1526 AD, when the last was replaced by the Mughal dynasty. The five dynasties which are together termed as the Delhi Sultanate are : **Slave Dynasty** (1206 AD to 1290 AD), **Khilji Dynasty** (1290 AD to 1320 AD), **Tughlaq Dynasty** (1320 AD to 1414 AD), **Sayyid Dynasty** (1414 to 1451 AD) and **Lodhi Dynasty** (1451 AD to 1526 AD).*

### SLAVE DYNASTY

#### **Qutubuddin Aibak (1206 - 1210)**

- The defeat of Prithviraj Chauhan in the second battle of Tarain in 1192 by Muhammad Ghori laid the foundation of Muslim rule in India. After the death of Muhammed Ghori, his slave Qutubuddin Aibak took the charge and became the first sultan of Delhi.
- For his generosity, he earned the sobriquet **Lakh-Bakhsh** (giver of Lakhs.).
- He built two mosques-Quwat-ul-Islam at **Delhi** and Adhai din ka Jhonpra at **Ajmer**.
- He started the construction of **Qutub Minar** which was dedicated to famous Sufi Saint **Khwaja Qutubuddin Bakhityar Kaki**.
- He died while playing Polo in the year **1210**.

#### **Iltutmish (1210 - 1236)**

- He was the son – in – law of Qutubuddin Aibak.
- He divided his empire into **Iqtas**, known as **Iqtadari system** under which land were assigned to nobles and officers in lieu of salary.
- He introduced the **silver tanka** and the **copper jital** - the two basic coins of the Sultanate period.
- He built the **Hauz-i-Shamsi reservoir** in Mehrauli in 1230.
- He completed the **Qutub Minar**.

- He formed Turkan-i-Chahalgani or **Chalisa** (a group of 40 powerful Turkish nobles).
- He saved Delhi Sultanate from the wrath of Chengiz Khan, the Mongol leader.

#### **Razia Sultan (1236 - 1240)**

- She succeeded her father Iltutmish in 1236.
- She was the first lady to sit on the throne of Delhi.
- She was the the first and the last Muslim lady who ever ruled India'.
- Her promotion of Jalaluddin Yakut, an Abyssinian, to the important offices provoked the Turkish officers.
- She was killed along with her husband Altunia by Bahram Shah, a son of Iltutmish.

*After Razia, the battle of succession continued in which the following rulers ruled insignificantly : **Muizuddin Bahram Shah** (1240 – 1242), **Alauddin Masud Shah** (1242 – 1246) and **Nasiruddin Mehmud** (1246 – 1265).*

#### **Balban (1266 - 1286)**

- Balban ascended the throne in 1266.
- His real name was **Baharuddin**.
- He crushed the power of **Turkan-i-Chahalgani** or **Chalisa** which stabilized the Sultanate rule.
- He declared the Sultan as the representative of **God on earth**. He impressed upon the People that king was the **deputy of God** (niyabat – i – khudai) and the **shadow of God** (zil – i – ilahi).
- He established the military department **Diwani-i-Arz**.

- For defeating the Mongols he got the sobriquet Ulugh Khan.
- After Balban's death, **Kaiqubad** (1287 – 1290) sat on throne but he was an inefficient and fun – loving person.

## **KHILJI DYNASTY**

### **Jalaluddin Khilji (1290 - 1296)**

- He was the founder of Khilji Dynasty
- The most important event of his reign was the invasion of Devagiri in 1294 by his nephew and son-in-law, **Ali Gurshap** or Ala-ud-din Khalji. Devagiri was the capital of the Yadava kingdom in the Deccan and Ala-ud-din plundered the vast treasury.
- Married his daughter to **Ulugh Khan**, a descendent of **Chengiz Khan**, to win their goodwill.
- He assassinated his uncle and proclaimed himself Sultan winning over the nobles and soldiers to his side by a lavish use of gold (accumulated from Devagiri).

### **Alauddin Khilji (1296 - 1316)**

- Alauddin Khilji killed Jalaluddin Khilji and succeeded the throne in 1296.
- He was the most powerful ruler of Khilji dynasty.
- He built **Hauz Khas** and **Jamait Khana** Mosque.
- He seized the famous **Kohinoor** diamond from the ruler of **Malwa**.
- He created new department viz Diwan-i-Mustakhrāj to enquire into the revenue areas and to collect them.
- He introduced the first permanent standing army of India.
- He introduced a free market policy with effective price control system.

## **TUGHLAQ DYNASTY**

### **Ghiyasuddin Tughlaq (1320-1325)**

- Ghiyasuddin Tughlaq or Ghazi Malik was the founder of the Tughlaq Dynasty.
- This dynasty is also known as the dynasty of the Qaraunah Turks as the father of Ghiyasuddin Tughlaq was a Qaraunah Turk.
- He was the first Sultan of Delhi who took up the title of Ghazi or slayer of the infidels.
- He liberalized Alauddin's administrative policies and took keen interest in the construction of canals and formulated a famine policy. The Chehra and Dagh system introduced by the Alauddin was continued.
- Built the fortified city of Tughlaqabad and made it his capital.
- Dispatched his son, Jauna Khan to re-establish the authority in Warangal (Kakatiyas) and Madurai (Pandyas).
- He had troublesome relationship with the sufi saint, Shaikh Nizamuddin Aulia.
- Died in 1325, after a fall from a high-raised pavilion. Ibn Batuta, the Moroccan traveller, who was in Delhi at that time, opined that his death was due to sabotage arranged by his son, Jauna Khan.

### **Mohammad-bin Tughlaq (1325-1351)**

- **Jauna Khan** was the real name of Mohammad-bin Tughlaq
- He knew Arabic and Persian languages. He was also an expert in philosophy, astronomy, logic and mathematics. He was also a good calligrapher.
- He built the fortress of Adilabad and the city of Jahanpanah.
- He introduced token currency using brass and copper coins but failed due to absence of central mint and forgery of coins.

- The famous traveller, Ibn Batuta came to Delhi during 1334. He acted as the Quazi of the capital for 8 years. He has recorded the contemporary Indian scene in his 'Safarnamah' (called Rehla).

### **Firoz Shah Tughlaq (1351-1388)**

- He was the son of a Hindu princess of Dipalpur and Muhammad's cousin.
- He established many cities such as Firuzabad, Fatehabad, Jaunpur and Hissar.
- He rebuilt two storeys of Qutub Minar which were damaged by lightning in 1368 AD.
- He established Diwan-i-Khairat (department for poor and needy people) and Diwan-I-Bundagan (department of slaves).
- He wrote a book 'Fatuhat Firozshahi'.
- He made iqtdary system hereditary. The principle of heredity was recognised not only in civil offices, but also in army. Soldiers were given land assignments instead of cash payment.
- He Imposed some new taxes :  
**Kharaj** : a land tax equal to 1/10 of the produce of the land (by Hindus only).  
**Jaziya** : a tax by non – muslims (even by brahmins).  
**Zakat** : Tax on property (by Muslims only).  
**Khams** : 1 / 5th of booty captured in war.
- Barani, the historian was in his court. He wrote two well known works of history: Tarikh – i – Firozshahi and Fatwa – i – Jahandari.
- Khwaja Abdul Malik Isami wrote Futuh – us – Sulatin.

### **SAYYID DYNASTY**

- **Khizr Khan** (1414 – 1421) founded the dynasty and claimed to have descended from the prophet of Islam.
- He helped Timur in his invasion, so he was given the governorship of Lahore, Multan & Dipalpur.
- When Khizr Khan got possession of Delhi, his position was very weak and he didn't take up the title of king and contended himself with that of Rayat – i – Ala.
- The coins were struck and Khutba was read in the name of Timur and after his death in the name of his successor, Shah Rukh.
- Khizr Khan's 3 successors – Mubarak Shah (1421 – 33), Muhammad Shah (1434 – 43) and Alauddin Alam Shah (1443 – 51) were incapable leaders.
- Sayyid dynasty's 37 Years remained troubled with external invasions, internal chaos, etc.
- Provided opportunity to Bahlul Lodhi.
- Yahya – bin – Ahmed – bin – Abdullah – Sirhindi wrote Tarikh – i – Mubarakshahi (history from Mahmud to Muhammad Shah of Sayyid Dynasty).

### **LODHI DYNASTY**

They were Afghans by race (considered the first Afghan dynasty of India). They were ruling over Sirhind when Sayyids were in India.

#### **Bahlul Lodhi (1451 – 1489)**

- He founded the Lodhi dynasty by usurping the throne from the last of the Sayyid rulers.
- He conquered Jaunpur by ousting Sharqui dynasty.
- He revived Sultanate to quite an extent.

#### **Sikandar Lodhi (1489 – 1517)**

- His real name was Nizam Khan. Noblest of the three Lodhi rulers.

- Introduced the Gaz-i-Sikandari (Sikandar's yard) of 32 digits for measuring cultivated fields.
- In 1504, he founded the city of Agra and made it his capital.
- He set up an efficient espionage system and introduced the system of auditing of accounts.
- He introduced the Gaz-i-Sikandari (Sikandar's yard) of 32 digits for measuring cultivated fields.
- He took care of department of Justice and department of agriculture.
- He was a poet himself and wrote verses in Persian under the pen-name of Gulrukhi.

#### **Ibrahim Lodhi (1517 – 1526)**

- He was the last king of Lodhi dynasty and the last Sultan of Delhi.
- He was the son of Sikandar Lodhi.
- He was defeated and killed by Babur in the first battle of panipat in 1526 AD.

## **PROVINCIAL KINGDOMS**

<b>Provincial Kingdoms during and after the sultanate</b>		
<b>Kingdom</b>	<b>Capital</b>	<b>Founder/Most Important Ruler</b>
Shah Mir dynasty in Kashmir	Kashmir	Shah Mirza or Sams-ud-din; Zainul Abidin
Sisodia dynasty in Mewar	Chittor	Rana Hamir; Rana Kumbha
Rathore dynasty in Marwar	Jodhpur	Rao Chunda; Rao Jodha and Maldeva
Kachhawaha dynasty of Amber or Amer	Ajmer	Dullah Rao; Hammir Deva
Muzaffarshahi dynasty in Gujart	Anhilvada (later Ahmedabad)	Zafar Khan or Muzaffarshah; Ahmad Shah I, Mahmud
Sultanate of Bengal	Gaud	Ilyas Shah; Ala-ud-din Shah
Suryavansi or Gajapati dynasty in Odisha	Jajnapur	Kapilendra; Kapilendra
Khalji dynasty in Malwa	Mandu	Dilawar Khan Ghorji; Mahmud Khalji
Sharqi dynasty in Jaunpur	Jaunpur	Malik Sarwar; Ibrahim Shah Sharqi
Ahom dynasty in Kamrup and Assam	Charaideo (later Charqua)	Sukapha; Suhungmung
Farukki dynasty in Khandesh	Burhanpur	Malik Raja Farukki; Malik Raja Farukki
Bahmani in Karnataka	Gulbarga (later Bidar)	Hasan Gangu Bahman Shah; Firuz Shah, Ahmad Shah I
Vijaynagar : Sangam dynasty, Suluva dynasty, Tuluva dynasty, Aravidu dynasty	Hastinavati or Hampi Penugonda	Thirumala; Thirumala

## RELIGIOUS MOVEMENTS

### Sufi Movement : Sufism

- The advent of Sufism in India is said to be in the eleventh and twelfth centuries.
- One of the early Sufis of eminence, who settled in India, was Al-Hujwari who died in 1089, popularly known as Data Ganj Baksh (Distributor of Unlimited Treasure).
- In the beginning, the main centres of the Sufis were Multan and Punjab.
- By the thirteenth and fourteenth centuries, the Sufis had spread to Kashmir, Bihar, Bengal and the Deccan.
- Its fundamental and moral principles, teachings and orders, system of fasting, prayers and practice of living in **khanqahs** had already been fixed.
- Abul Fazl while writing in the Ain-i-Akbari speaks of fourteen silsilahs of the Sufis. These silsilahs were divided into two types: **Ba-shara** and **Be-shara**.
- **Ba-shara** were those orders that followed the Islamic Law (Sharia) and its directives such as namaz and roza.
- **Be-shara** silsilahs were not bound by the Sharia.

Major Sufi Orders		
Order	Founder	Famous Saints
Chistis	Khwaja Moinuddin chisti (came with Ghori) Burhanuddin Garib.	Qutubuddin Bakhtiyar Kaki, Farid-ul-din Ganji-i-Shakar (his verses were included in Adi, Granth of Sikhs), Nizamuddin Auliya and Nasiruddin Chirag-i-Delhi
Suharwardi	Shikh Shihabuddin Suharwardi	Hamiduddin Nagori, Ruknuddin Abdul Fath, Baha-ud-din Zakaria
Qadri	Sheika Nizamat Ullah	Nasiruddin Mohammed Jilani Dara Shikoh (Shah Jahan's son)
Naqshabandi	Baha-ud-Din Naqshband Bukhari	Sheikh Ahmed, Sirhindi (Mujaddid), Ubaidullah Ahrar, Babur
Qalandariya	Abu Wali Qalander	Sidi Maulah
Shattari	Abdullah Shattari	Vaji al din, Shah Pir

### Bhakti movement

- It originated in the seventh-century Tamil south India (now parts of Tamil Nadu and Kerala), and spread northwards.
- It swept over east and north India from the 15th century onwards, reaching its zenith between the 15th and 17th century CE.
- The Bhakti movement regionally developed around different gods and goddesses, such as Vaishnavism (Vishnu), Shaivism (Shiva), Shaktism (Shakti goddesses), and Smartism.
- The Sanskrit word bhakti is derived from the root bhaj, which means "divide, share, partake, participate, to belong to".

### Bhakti Saints

#### Sankracharya (AD 788 - 822)

- Shri Adi Shankaracharya or the first Shankara with his remarkable



reinterpretations of Hindu scriptures, especially on Upanishads or Vedanta.

- He is also known as Bhagavatpada Acharya (the guru at the feet of Lord).
- He advocated the greatness of the Vedas and was the most famous Advaita philosopher who restored the Vedic Dharma and Advaita Vedanta to its pristine purity and glory.
- He wrote commentaries on Upanishads, Bhagawad Gita and Brahmasutras of Badrayana.
- The Four Adi Shankaracharya Peethas are **Vedanta Jnana Peetha** in Sringeri (Karnataka), **Govardhana Peetha** in Jagannath Puri (Odisha), **Kalika Peetha** in Dwaraka (Gujarat), **Jyotir Peetha** in Badarikashrama (Uttarakhand).

#### **Ramanuja Acharya (1017 - 1137)**

- He was a Tamil Vaishnavite saint.
- He established Vaishnavism. He founded Visistadvaita Siddhanta or qualified monism and according to him, the way to salvation lies through Karma, Gyan and Bhakti.
- He wrote **Sribasya** and **Gitabhasya**.

#### **Nimbarka (13th-14th Century)**

Nimbarka, a younger contemporary of Ramanuja. He was worshipper of Krishna and Radha. He founded Dvaitadvaita or dualistic monism. He wrote Vedanta Parijata-saurabha, a commentary on Brahmasutras. He settled in Mathura.

#### **Madhavacharya (13th Century)**

He ranks with Sankaracharya and Ramanuja as one of the three principal philosophers of the Vedanta system. He propounded Dvaita or dualism. Divided universe into two parts Swatantra and a Swatantra.

#### **Vallabhacharya (1479-1531)**

Born in Varanasi, he propounded Suddhadvaita Vedanta (Pure non-dualism) and philosophy called Pustimarga (the path of grace). He founded a school called Rudra Sampradaya. He was the author of a number of scholarly works in Sanskrit and Brajbhasa, the important being Subodhini and Siddhant Rahasya.

#### **Ramananda (1400 – 1476)**

- Born at Prayag, he was the first great Bhakti saint of North India. He opened the door of Bhakti to all without any distinction of birth, caste, creed or sex.
- Ramananda has been described as “the bridge between the Bhakti movement of the South and the North.”
- He was a worshipper of Rama and believed in two great principles, namely as perfect love for god and human brotherhood.
- His disciples included Kabir, Raidasa, Sena, Dhanna, Sadhana, Narahari and Pipa.

#### **Namadeva (1270 - 1350)**

- Namadeva was a tailor who had taken to banditry before he became a saint.
- His poetry which was written in Marathi breathes a spirit of intense love and devotion to God.

#### **Chaitanya (1486-1533)**

- He was the greatest saint of the Bhakti movement.
- Born at Navadwip in Bengal, his original name was Vishwambhar Mishra.
- He was responsible for the popularity of Vaishnavism in Bengal through his Kirtans.
- He began the **Achintya Bheda Abheda** School of theology. He preached the religion of intense faith in one Supreme Being whom he called Krishna or Hari.
- He adored Krishna and Radha and attempted to spiritualise their lives in

Vrindavan. He settled permanently at Puri where he died. After his death, his followers systematised his teachings and organised themselves into a sect called Gaudiya Vaishnavism. Krishnadasa Kaviraja wrote his biography, Chaitanyacharitamrita.

#### **Mirabai (1498-1557)**

- A great saint of the Bhakti movement, she was the only child of Ratna Singh Rathor of Merta.
- She was married to Rana Sanga's eldest son and heir-apparent Bhojaraj in 1516.
- She was highly religious from her childhood and a follower of the Krishna cult of Vaishnavism.
- After the death of her husband, she devoted herself completely to religious pursuits. Mirabai is said to have composed numerous devotional songs.

#### **Tulsidas (1532-1623)**

- He was a great poet and a devotee of Rama.
- He composed the famous Ramcharitamanas in Hindi, expounding the various aspects of Hindu dharma.
- His other creations are Vinaya-Patrika and Kavitavali.

#### **Surdas (1479-1584)**

- As a saint and a poet, he preached the religion of love and devotion to a personal God.
- He was a devotee of Lord Krishna and Radha.
- He made use of Brajbhasa in his works which include Sursagar, Sahitya Ratna and Sur Sarawali.

#### **Shankar Dev (1449 - 1568)**

He is known as Saguna bhakti saints. He was the founder of Ekasarana Dharma. Sankardev popularised Vaishnava bhakti in Assam.

#### **Kabir (1440 – 1518)**

- He was born near Benaras, he led the life of a normal householder. His verses are found in Sikhism's scripture **Adi Granth**.
- He emphasised the unity of god whom he calls by several names, such as Rama, Hari, Allah, etc. He strongly denounced Hindu and Muslim rituals.
- His dohas and sakhi (poems) are found in the Bijak. After Kabir's death, his Muslim disciples organised themselves in Maghar, and the Hindu disciples were organised into an order by Surat Gopala, with their centre at Banaras.

#### **Sikhism**

- It is a monotheistic religion that originated in the Punjab region of South Asia (subcontinental India) during the 15th century.
- The Sikh scripture is the **Guru Granth Sahib**, a book that Sikhs consider a living Guru.
- It was founded by **Guru Nanak** and is based on his teachings, and those of the 10 Sikh gurus who followed him.

#### **THE TEN SIKH GURUS**

##### **Guru Nanak (1469-1539)**

He was born at Talwandi (now called Nankana Sahib) in Punjab. He was the founder of the Sikh religion. He was the first of the ten Sikh Gurus. His birth is celebrated world-wide on Kartik Purnamashi, the full-moon day.

##### **Guru Angad (1539-1552)**

He was the second of the ten Sikh Gurus. He invented the Gurumukhi script.

##### **Guru Amar Das (1552-1574)**

He was the third Sikh Guru. He strengthened the tradition of the free kitchen, **Guru Ka**

**Langar** which was started by Guru Nanak. He completely abolished the custom of Sati amongst the Sikhs.

**Guru Ram Das (1574-1581)**

He was the fourth Sikh Guru. Emperor Akbar donated a plot of land to Guru Ram Das on which Golden Temple was later constructed. He founded the city of Amritsar.

**Guru Arjun Dev (1581-1606)**

He was the fifth Sikh Guru. He composed Adigranth (Guru Granth Sahib). He was tortured to death by Mughal Emperor Jahangir in 1606.

**Guru Hargovind (1606-1645)**

He was the sixth Sikh Guru. He built the Akal Takht. He built a fortress at Amritsar called Lohgarh "Fortress of steel".

**Guru Har Rai (1645-1661)**

He was the seventh Sikh Guru. Dara Shikoh (the eldest son of emperor Shah Jahan) came to

Guru Har Rai asking for help in the war of succession launched by his half-brother Aurangzeb.

**Guru Har Kishan (1661-1664)**

He was the eighth Sikh Guru. He was only five years old when he succeeded his father, Guru Har Rai, as Guru. Thus, he was the youngest guru in Sikh history.

**Guru Teg Bahadur (1664-1675)**

He was the ninth Sikh Guru. Mughal Emperor Aurangzeb wanted to convert India into an Islamic country. In this process, he was tortured to force him to convert into Islam. Aurangzeb executed him when he refused to convert into Islam.

**Guru Govind Singh (1675-1708)**

He was the last Sikh Guru. He was born in Patna, Bihar. He founded the **Khalsa Pantha**. He organised a community of warriors who were trained in **Guerilla warfare**.

## MUGHAL DYNASTY (1526-1858)

**Babur (1483 – 1530)**

- He was the founder of Mughal dynasty in India.
- His real name was Zahir-ud-Din Muhammad.
- He laid the foundation of Mughal dynasty by defeating Ibrahim Lodhi in the first battle of Panipat in 1526.
- He defeated Rana Sanga of Mewar in the Battle of Khanwa in 1527.
- He was a direct descendant of Taimur, from the Barlas clan, through his father, and a descendant of Genghis Khan through his mother.

- He wrote his memoirs Baburnama (Tuzuk-i-Baburi) in Turkish language.
- He introduced gun powder in India.

**Humayun (1508 – 1556)**

- He was the eldest son of the Emperor Babur.
- He became the second ruler of the Mughal empire after succeeding his father in 1530.
- He ruled the country for 10 years but later in 1540 he was defeated by **Sher Shah Suri** in the battle of **Kannauj** and was forced to leave India.

- After 12 years, in 1555 Humayun regain the throne by defeating **Sikander Suri**, the successor of Sher Shah Suri.
- **Gulbadan Begum** wrote the biography of Humayun: **Humayun-nama**.
- Humayun was killed in an accidental fall from his library staircase in 1556. His tomb was built in Delhi by his first wife Bega Begum in 1569. It was declared a UNESCO World Heritage Site in 1993.

### **Akbar (1542 – 1605)**

- His real name was Abu'l-Fath Jalal ud-din Muhammad Akbar.
- He was the third and greatest ruler of the Mughal Dynasty in India.
- **Bairam Khan** represented Akbar in the second battle of Panipat in 1556 and defeated Hemu Vikramiditya.
- He built **Buland Darwaza** at Fatehpur Sikri to to commemorate his victory of Gujarat.
- His forces headed by Raja Man Singh and Asaf Khan defeated **Rana Pratap** in the battle of **Haldighati** in 1576.
- He built **Ibadat Khana** (House of Worship) at Fatehpur Sikri.
- In 1581, he promulgated the **Din-i-Ilahi** or **Tauhid-i-Ilahi** to establish national religion which would be acceptable to the Hindus and Muslims alike.
- **Raja Todarmal** was the minister for revenue in the court of Akbar. Land revenue system prevalent during this period was known as **Todar Mal Bandobast** or **Zabti System**.
- He introduced the Mansabdari System for organizing the army and the nobles.
- He ruled the country for nearly 50 years and died in 1605 and was buried outside of Agra at Sikandra.
- **Abul Fazal** wrote **Akbar Nama**, a biographical account of Akbar.

### **Jahangir (1569 – 1627)**

- His real name was Nur-ud-din Mohammad Salim.
- He was the eldest surviving son of Mughal Emperor Akbar.
- The art of Mughal painting reached great heights under Jahangir's reign.
- In 1611, Jahangir married **Mehr-un-Nisaa**, the young widow of a Mughal officer, **Sher Afgan**. She became Jahangir's favorite queen and assumed the title of **Nur Jahan**, 'Light of the World'.
- His greatest failure was the loss of **Kandahar** to Persia in 1622.
- He executed the fifth of the ten Sikh gurus, **Guru Arjun Dev**, for giving aid and comfort to Khusrau, Jahangir's rebellious son.

### **Shahjahan (1592 – 1666)**

- He was the son of Emperor Jahangir and his Hindu Rajput wife, **Taj Bibi Bilqis Makani**.
- His rule is considered the Golden Age of the Mughal Empire.
- He built **Tajmahal** and **Moti Masjid** at Agra, and **Jama Masjid** and Red Fort at Delhi.

- Other important buildings of Shah Jahan's rule were the **Diwan-i-Aam** and **Diwan-i-Khas** in the Red Fort Complex in Delhi.
- As he apparently lay dying in 1658 there was a brutal war of succession among his four sons (Dara, Aurangzeb, Shuja and Murad) but Aurangzeb came out victorious.
- Aurangzeb put him under house arrest in Agra Fort for 8 years where he died at the age of 74.
- His full name was Abul Muzaffar Muhi-ud-Din Mohammad Aurangzeb.
- He was the third son and sixth child of **Shah Jahan** and **Mumtaz Mahal**.
- He spread the extent of Mughal Empire to the entire Indian sub continent barring the southernmost tip of India.
- In 1675, he ordered the execution of ninth **Sikh Guru Tegh Bahadur** because of his objection to Aurangzeb's forced conversions.
- He died in Ahmednagar in 1707 at the age of 88.

#### **Aurangzeb (1618 – 1707)**

- He was also known as Alamgir (Conquerer of the World).

## **MARATHA EMPIRE (1674 - 1818)**

*The Maratha Empire or the Maratha Confederacy is located in the south west of present-day India. The founder and consolidator of the Maratha Empire was **Shivaji Bhosale**. After the death of Mughal Emperor Aurangzeb the empire expanded greatly under the rule of the Peshwas, the Prime Minister of the empire.*

#### **Chatrapati Shivaji (1630 - 1680)**

- His parents were Shahaji Raje Bhonsle and Jijabai.
  - His first attack was on the Torna fort. He captured the fort only at an age of 16. After capturing Torna fort, he captured Kondana and Rajgad forts. At the rise of Shivaji's power Bijapur sultan arrested his father. Shivaji captured the forts of Purander and Javeli after rescuing his father from the Bijapur sultan's prison.
  - He was invited to Agra by Aurangzeb. Shivaji was arrested and imprisoned in Agra. But he escaped from Agra and returned to his kingdom. Returning from imprisonment, he recaptured the forts which he lost in the treaty of Purander. During this time he took the title 'Chhatrapati'.
  - He built a strong army. He introduced the guerrilla warfare tactics. He also built a strong Navy. He is called the "Father of Indian Navy".
  - The great Shivaji Maharaja died in 1680.
  - Chatrapati Shivaji had two sons namely **Sambhaji** and **Rajaram**.
- Ashta Pradhan** was a council of eight ministers that administered the Maratha empire.

The council was formed in 1674 by their king, Shivaji. The eight ministerial roles were as follows:

1. **Pantpradhan** or **Peshwa** - Prime Minister, general administration of the Empire.
2. **Amatya** or **Mazumdar** - Finance Minister, managing accounts of the Empire.
3. **Sacheev** - Secretary, preparing royal edicts.
4. **Mantri** - Interior Minister, managing internal affairs especially intelligence and espionage.
5. **Senapati** - Commander-in-Chief, managing the forces and defense of the Empire.
6. **Sumant** - Foreign Minister, to manage relationships with other sovereigns.
7. **Nyayadhish** - Chief Justice, dispensing justice on civil and criminal matters.
8. **Panditrao** - High Priest, managing internal religious matters.

#### **Sambhaji (1657 - 1689)**

- Sambhaji, the elder son, was very popular among the courtiers as he was a poet, great politician and a great warrior.
- In 1681, Sambhaji had himself crowned and resumed his father's expansionist policies and had earlier defeated the Portuguese and Chikka Deva Raya of Mysore. With his entire imperial court, administration, and an army of about 400,000 troops he proceeded to conquer the sultanates of Bijapur and Golconda.

- During the eight years that followed, Sambhaji led the Marathas, never losing a battle or a fort to Aurangzeb.

#### **Rajaram (1670 - 1700)**

Rajaram, Chattrapati Sambhaji's brother, ascended the throne. Mughals laid siege to Raigad.

He fled to Vishalgad and then to Jinji for safety. He died in 1700 at Sinhgad.

His widow, Tarabai, assumed control in the name of her son Ramaraja (Shivaji II). Then Tarabai heroically led the Marathas against the Mughals; by 1705, they had crossed the Narmada River and entered Malwa, then in Mughal possession.

#### **Chhatrapati Shahu (1682 - 1749)**

- Shivaji's grandson and Sambhaji's son Sahuji was released from Mughals captivity in 1707.
- He challenged Tarabai and Sambhaji II for the Maratha leadership and with the help of his Peshwa Balaji Vishwanath, Sahuji became the Maratha Emperor.
- Though as a Maratha Emperor Shahuji had a huge territory in his possession but he was mostly a titular head of the Maratha empire. Maratha Empire was almost governed by the Peshwas of Pune. After Shahuji's death in 1749 his adopted son, Rajaram II succeeded him.

## PESHWA EMPIRE (1713 - 1818)

### Balaji Vishwanath (1662 to 1720)

- In 1713, Peshwa, Balaji Vishwanath was appointed a Peshwa (Prime Minister) by Sahuji.
- He assisted a young Shahu to consolidate his grip on an empire.
- In 1717 a Mughal emissary signed a treaty with the Marathas confirming their claims to rule in the Deccan.
- 1718 marked the beginning of the Maratha influence in Delhi.

### Bajirao Peshwa I (1700 - 1740)

- After death of Balaji Vishwanath, his elder son Bajirao, became the Peshwa.
- Pune had regained its status as capital of Maratha Kingdom from Rajgad.
- In 1734, Bajirao captured the Malwa territory in the north, and in 1739, he drove out the Portuguese from nearly all their possessions in the Western Ghats. He died in 1740.

### Balaji Bajirao (1721 - 1761)

- Baji Rao's son, Balaji Bajirao (Nanasaheb) succeeded as the Peshwa. He defeated Ahmad Shah Abdalli in 1756 near Delhi.
- In Third Battle of Panipat (1761), between Marathas and Ahmad Shah Abdalli, Marathas lost the war.
- This war destroyed both Abdalli and Peshwas. He died soon after the war shattered by the death of his older son and brother.

### Madhav Rao (1745 - 1772)

- He (eldest son of Balaji Bajirao) assumed the title of Peshwa in 1761.

- He achieved many remarkable victories and restored the glory of Maratha kingdom to a large extent.
- His outstanding achievements included defeat of Nizam of Hyderabad, Hyder Ali of Mysore and Bhosle of Nagpur. In 1769, Marathas led by Mahadaji Shinde, headed the North India campaign.
- They defeated the Jats and took hold of Agra and Mathura. Madhav Rao died in 1772 at an early age of 27 years.

### Narayanrao Peshwa (1755 - 1773)

He (youngest son of Balaji Bajirao) just ruled for one year and was murdered in a palace conspiracy.

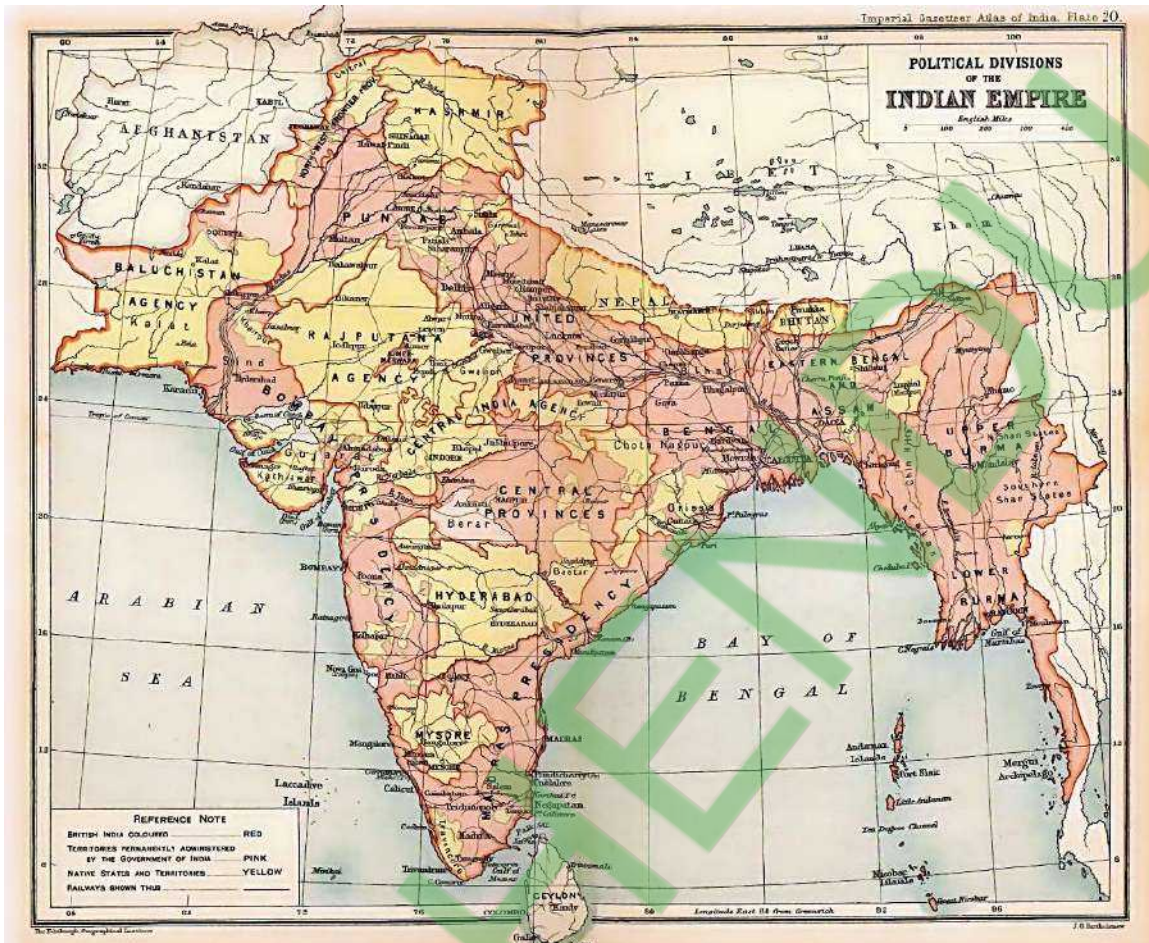
### Raghunathrao (1734 - 1783)

He was proclaimed the next Peshwa, although he was not heir to the title. He was displaced from power by a clever plot by twelve Maratha chiefs and infant son of Madhav Rao called **Sawai Madhavrao** was then declared the next Peshwa.

He handled the Peshwai well and with great unity among Maratha chiefs. They defeated the rising British power in 1784, near Pune and halted their advancements, temporarily till the premature death of Sawai Madhavrao in 1795.

In 1796 **Baji Rao II (1775 - 1851)**, son of Raghunath Rao became the Peshwa. Nana Phadanis looked after the Maratha kingdom well until his death in 1800 A.D. After that Baji Rao II signed a treaty with the British in 1802, which weakened the Peshwa power. His son, Nanasaheb Peshwa opposed the British with whatever support he could muster. By 1818 the Peshwa power came to an end. Nanasaheb Peshwa's fight still continued. But the failure of 1857 war put an end to any lingering hopes.

## MODERN INDIAN HISTORY



### ADVENT OF EUROPEANS (15TH & 16TH CENTURY)

*In modern times India was invaded by the Europeans. The Portuguese, the Dutch, the English and the French. The Portuguese are the 1<sup>st</sup> to come to India. Finally, it was the British who remained in India.*

*There were several factors which made the Europeans come to India. The capturing of Constantinople by the Ottoman Turks in 1453, the demand for spices of the east in Europe and the monopoly of the Arabs over trade & commerce in the East.*

#### Portuguese in India

- The Portuguese voyager Vasco da Gama reached Calicut on May 17, 1498. At that time Calicut was ruled by a king named Zamorin.
- His voyage was successful in establishing a sea route from Europe to India that would permit trade with the Far East, without the use of the costly and unsafe Silk Road

caravan routes, of the Middle East and Central Asia.

- In 1502, he established a factory at Cochin.
- The first Governor of Portuguese in India was Francisco Almeida.
- He was followed by Alfonso de Albuquerque in 1503. He gave them new



heights. He captured Goa in 1510 from the Bijapur ruler. He also abolished Sati.

- Nino – da – Cunha transferred the Portuguese capital in India from Cochin to Goa in 1530 and acquired Diu (in 1535) and Daman (in 1559).
- Portuguese lost Hugly in 1631 during the reign of Shahjahan.
- In 1661, the Portuguese king gave Bombay to Charles II of England as dowry, for marrying his sister.
- Gradually, their Indian territories were taken away from them by various sources. The Dutch played an important role to oust them.

#### **Dutch East India Company**

- It was formed in 1602.
- They set – up their first factory at Masulipatnam in 1605.
- Their other factories were at Pulicat, Chinsura, Patna, Balasore, Nagapattanam, Cochin, Surat, Karikal, Kasimbazar.

#### **English East India Company**

- It was formed in 1599, and was given the royal Charter by Queen Elizabeth I in 1600 to trade in the east.
- Captain William Hawkins stayed in Jahangir's court from 1609 – 1611. But he failed to get the king's permission to erect a factory at Surat. Captain Middleton succeeded in this effort in 1611.
- An imperial Farman allowed the Company to set up a permanent factory at Surat in 1613. Sir Thomas Roe played an important role in this.
- In 1616, the Company established its first factory in the south in Masulipatnam. In

1633, it established its first factory in east India in Hariharpur, Balasore (Odisha).

- The Company got the lease of Madras in 1639 and built Fort St. George in Madras, which acted as its headquarter on the Coromandal coast.
- Bombay was made the Company's main settlement on the west coast in 1668.
- Aurangzeb gave the Company the Farman in 1667 to trade in Bengal. In 1690, a factory was set up at Sutanuti village. In Sutanuti and nearby villages of Kalikata and Gobindpur, grew the city of Calcutta (now Kolkata). In 1696, the Company fortified the Calcutta factory into Fort William.
- In 1717, John Surman obtained a Farman from Farrukhsiyar which gave large concessions to the Company. This Farman is called the 'Magna Carta' of the Company.

#### **French in India**

- It was set in 1664, at the instance of a minister, Colbert, in the reign of Louis XIV.
- The French Company was created, financed and controlled by the State and it differed from the English Company which was a private commercial venture.
- They established their first factory at Surat in 1668 and at Masulipatnam in 1669.
- The foundation of Pondicherry was laid in 1673 which, afterwards, became its capital. They also developed a factory in Chandernagar.

## CARNATIC WAR

*The Carnatic Wars (also spelled Karnatic Wars) were a series of military conflicts in the middle of the 18th century in India. The conflicts involved between the French East India Company and the British East India Company. There were three Carnatic wars fought between them.*

### **The First Carnatic War (1746–48)**

It was an offshoot of the Anglo-French rivalry in the Austrian War of Succession that took place in Europe. In 1745, the British navy captured French ships and threatened Pondicherry.

The French, under Dupleix, retaliated by attacking Fort St George. The War ended with the signing of the Treaty of Aix-la-Chappelle (1748), whereby the English retrieved Madras.

### **The Second Carnatic War (1748–54)**

It began when the British and the French, in trying to win favor with Indian rulers, backed opposing parties in Hyderabad and the Carnatic. The French were defeated and the War concluded with the Treaty of Pondicherry (1754). A year later, as per the Treaty of Trichinopoly, the French were forced to return

the territories they had captured, thereby facilitating British expansion in the south.

### **The Third Carnatic War**

It was started because of renewed conflict between Britain and France in the Seven Years' War (1756–63; between France, Austria, Saxony, Sweden, and Russia on one side; and Prussia, Hanover, and Great Britain on the other).

In 1757, the British captured Chandernagar, and three years later, crushed the French army in the Battle of Wandiwash in the Carnatic. Henceforth, in India, the French were confined to trading activities only.

*The Carnatic Wars exhibited the military superiority of the British infantry over their adversaries. This advantage would play a crucial role in the Company's rise to power.*

## BRITISH CONQUEST OF BENGAL

- *Bengal was the richest of India's provinces.*
- *From 1740 – 1756, Bengal was ruled by Alivadri Khan.*
- *After his death, his grandson, Siraj-ud-Daulah became the Nawab.*
- *Because of young and inexperience of Siraj-ud-Daulah, British interfere in the politics of Bengal.*
- *British decided to depose Siraj-ud-Daulah and this led to war.*

### **Battle of Plassey (1757)**

- On June 23rd of that year, at the Battle of Plassey, a small village and mango grove between Calcutta and Murshidabad, the forces of the East India Company under

Robert Clive defeated the army of Siraj-ud-daulah, the Nawab of Bengal.

- The Battle of Plassey became famous because it was the first major victory the Company won in India.

- On 2 July 1757, Siraj-Ud-Daulah was executed under orders from Mir Miran, son of Mir Jafar.
- Mir Jafar was placed as a titular Nawab of Bengal in 1757. The British extracted enormous sums from Mir Jafar as the price of his elevation.

#### **Battle of Buxar (1764)**

- It was fought on 22 October 1764 between the forces under the command of the British East India Company led by **Hector**

**Munro** and the combined army of **Mir Qasim**, the Nawab of Bengal; **Shuja-ud-Daula**, the Nawab of Awadh; and the Mughal King **Shah Alam II**.

- The battle fought at Buxar, then within the territory of Bengal, a "small fortified town" located on the bank of the Ganges river about 130 km west of Patna, was a decisive victory for the British East India Company.
- British East India Company wins the battle of Buxar.

## **ANGLO-MYSORE WAR**

#### **First Anglo-Mysore war (1766-1769)**

In 1767 Mysore was a powerful state under Hyder Ali. In 1769, the first Anglo-Mysore war was fought in which Haider Ali defeated the British and Treaty of Madras was signed between them. Haider Ali occupied almost the whole of Carnatic.

#### **Second Anglo-Mysore War (1780-1784)**

Warren Hastings attacked French port Mahe, which was in Haider Ali's territory. Haider Ali led a joint front with Nizam and Marathas and captured Arcot (Capital of Carnatic State). In July 1781, Haider Ali was defeated at Porto Novo by Eyre Coote and saved Madras. In December 1782, after the death of Haider Ali the war was carried on by his son Tipu Sultan. Treaty of Mangalore was signed by Tipu Sultan in March 1784 which ended the second Anglo-Mysore war.

#### **Third Anglo-Mysore War (1790-1792)**

Third war was fought between Tipu Sultan and British East Indian Company began in 1789 and ended in Tipu's defeated in 1792. In this war, Marathas and Nizam aided the British and Cornwallis captured Bangalore.

The war ended by signing of Treaty of Seringapatna, between Tipu Sultan and Lord Cornwallis. In this treaty, Tipu ceded half of his territories and two of his son's as hostage of war.

#### **Fourth Anglo-Mysore war (1799):**

The British army led by Lord Wellesley attacked and defeated Tipu Sultan in a brief but fierce war. He was killed on 4th May 1799 while defending his capital Seringapatnam.

## ANGLO-MARATHA WAR

### **The First Anglo-Maratha War (1775–1782)**

It began with British support for Raghunath Rao's bid for the office of peshwa (chief minister) of the confederacy. The British were defeated at Wadgaon (see Wadgaon, Convention of) in January 1779, but they continued to fight the Marathas until the conclusion of the Treaty of Salbai (May 1782); the sole British gain was the island of Salsette adjacent to Bombay (now Mumbai).

### **The Second Anglo-Maratha War (1803–1805)**

It was caused by the peshwa Bajji Rao II's defeat by the Holkars (one of the leading Maratha clans) and his acceptance of British protection by the Treaty of Bassein in December 1802. The Sindhia and the Bhonsle families contested the agreement, but they were defeated,

respectively, at Laswari and Delhi by Lord Lake and at Assaye and Argaon by Sir Arthur Wellesley (later the Duke of Wellington). The Holkar clan then joined in, and the Marathas were left with a free hand in the regions of central India and Rajasthan.

### **The Third Anglo-Maratha War (1817 - 1818)**

It was the result of an invasion of Maratha territory in the course of operations against Pindari robber bands by the British governor-general, Lord Hastings. The peshwa's forces, followed by those of the Bhonsle and Holkar, rose against the British (November 1817), but the Sindhia remained neutral. Defeat was swift, followed by the pensioning of the peshwa and the annexation of his territories, thus completing the supremacy of the British in India.

## BRITISH RULE IN INDIA

*The British rule in India can be divided into two phases such as **The Company Rule (1773-1858)** and **The Crown Rule (1858 – 1947)**.*

***The Company Rule (1773-1858)**, **The Crown Rule (1858 – 1947)** and their **Constitutional Developments** are briefly described in the Chapter of INDIAN POLITY (in this book). So, Please refer INDIAN POLITY for more details.*

### **GOVERNOR GENERALS OF THE BENGAL** (*events during his administration*)

#### **Warren Hastings (1773-1785)**

- He Became **Governor** in 1772 and **Governor-General** in 1773 through **Regulating Act** of 1773.
- His four councillors were **Clavering, Francis, Monson and Barwell**.

- He abolished **Dual system** (1767-1772) of administration (1772).
- He auctioned the right to collect land revenue to the highest bidder in 1772.
- He divided Bengal into districts and appointed Collectors in 1772.

- Rohilla war (1774) and annexation of Rohilkhand by the Nawab of Awadh with the help of Britishers.
- Trial of Nand Kumar and his judicial murder in 1775.
- **Treaty of Surat** (1775) between Raghunath Rao and Warren Hastings, but Council of Calcutta rejected it.
- **Treaty of Purandar** (1776) between English and Peshwa.
- Refined Hindu and Muslim laws. A translation of the code in Sanskrit appeared in 1776 under the title of "**Code of Gentoo Laws**"
- **James Augustus Hickey** started a weekly paper called **Bengal Gazette** or **Calcutta General Advertiser** (1780).
- **First Anglo-Maratha War** (1776-82) and **Treaty of Salbai** (1782).
- Founded Asiatic Society of Bengal with William Jones in 1784. He wrote introduction to the first English translation of the Gita by Charles Wilkins.
- Second Anglo-Mysore War (1780-84) and Treaty of Mangalore (1785) with Tipu Sultan.
- Pitts India Act of 1784 was passed.
- He started Diwani and Faujdari adalat at the district level and Sadar diwani and Nizam adalats (appellate courts) at Calcutta.

#### **Lord Cornwallis (1786-1793)**

- He is known as the father of the **Civil Services in India**.
- He set up courts at different levels and separation of revenue administration from judicial administration in order to reform the judiciary.
- New Police System was introduced in 1791.
- Third Anglo-Mysore War - defeat of Tipu Sultan (1790-92)

- Treaty of Seringapatam (1792)
- Created post of district judge (1793)
- He introduced Cornwallis Code based on the principle of separation of powers in 1793.
- Introduced Permanent Settlement in Bengal in 1793.

#### **Sir John Shore (1793-1798)**

- First Charter Act was introduced in 1793 by him.
- He planned Permanent Settlement with Cornwallis and later succeeded him in 1793.
- He is famous for his Policy of Non-Interference.
- Battle of Kurdla / Kharda / Khadra between Nizam and the Marathas (1795)

#### **Lord Wallesey (1798-1805)**

- Introduced the Subsidiary Alliance system to achieve British paramountcy in 1798 - The states that signed the alliance were - Hyderabad (first to sign) in 1798 and then Mysore, Tanjore, Awadh, Jodhpur, Jaipur, Mecheri, Bundi, Bharatpur and Berar.
- First treaty with Nizam in 1798.
- Fourth Anglo-Mysore war (1799) - defeat and death of Tipu Sultan
- Second Anglo-Maratha War (1803-1805) - defeat of the Sindhiya, the Bhonsale and the Holkar
- Formation of Madras presidency in 1801, during his tenure after the annexation of the kingdoms of Tanjore and Carnatic
- Treaty of Bassein in 1802 with Peshwa
- Lord Lake captured Delhi and Agra and the Mughal emperor was put under Company's protection

#### **Sir George Barlow (1805-1807)**

- End of Second Anglo-Maratha in 1805
- Sepoy Mutiny of Vellore in 1806

- Tried towards restoration of peace with Scindhia and Holkar

#### **Lord Minto I (1807 - 1813)**

- Sent the mission of Malcolm to Persia and that of Eliphinston to Kabul (1808)
- Treaty of Amritsar (1809) - with Ranjit Singh
- Charter Act of 1813

#### **Lord Hastings (1813-1823)**

- Anglo-Nepalese (Gurkha / Gorkha) war (1813-1823)
- Treaty of Sugauli / Segowlee / Sequelae (1816) - between the East India Company and King of Nepal
- Treaty of Poona in 1817 with Peshwa
- Third Anglo-Maratha War (1817-1818)
- Pindari war (1817-1818)

- Creation of Bombay Presidency in 1818
- Ryotwari settlement in Madras by Thomas Munro, the Governor (1820)
- Mahalwari system of land revenue was made in North-West province by James Thomson.
- Adopted the Policy of Intervention and War

#### **Lord Amherst (1823-28)**

- First Burmese war (1824-1826)
- Treaty of Yandaboo in 1826 - with lower Burma (Pegu) by which British merchants were allowed to settle in southern coast of Burma and Rangoon
- Acquisition of territories in Malay Peninsula in 1824
- Capture of Bharatpur in 1826

### **GOVERNOR GENERALS OF INDIA** (*events during his administration*)

#### **Lord William Cavendish - Bentinck (1828-35)**

- Known as most enlightened and liberal Governor-General of India
- Known as **Father of Modern Western Education** in India
- Abolition / Prohibition of **Sati** (1829)
- Banned **female infanticide** (1829)
- Suppression of **thuggee / thugs** (1829-35) - Military operations led / curbed by William Sleeman - 1830
- Annexed Mysore (1831), Coorg (1834), Central Chachar (1834) on the plea of misgovernment
- **Charter Act / Regulation of** (1833) - Mertins Bird (Father of land revenue settlement in North)
- Created the province of Agra in 1834
- Macaulay's minutes on Education in 1835
- **English** was made the official language of India in 1835

- Abolition of provincial court of appeal and circuit set up by Cornwallis
- Appointment of commissioners of circuit and revenue
- Concluded a treaty of perpetual friendship with Ranjit Singh

#### **Sir Charles (Lord) Metcalfe (1834-1836)**

- He is known as the **Liberator of Press**.
- He passed the famous Press Law, which freed Indian press from restrictions

#### **Lord Auckland (1836-1842)**

- Tripatriate Treaty was signed between the company Ranjit Singh and Shah Shuja by which Ranjit Singh accepted company's mediation in disputes Amirs (Sind).
- Shah Shuja conceded his sovereign right to the company over Sind on condition of receiving the arrears of the tribute, the amount of which was to be determined by the company.
- Mandavi state was annexed in 1839.
- First Afghan War (1836-42)

### **Lord Ellenborough (1842-1844)**

- Termination of First Afghan Wars (1842)
- Annexation of Sindh to British Empire in 1843.
- Charles Napier was replaced by Major Outram as the Resident in Sind.
- War with Gwalior in 1843
- Abolition of slavery in India in year in 1844

### **Lord Hardinge (1844-48)**

- First Sikh war (1845-1846)
- Treaty of Lahore (1846) - end of Sikh sovereignty in India
- Prohibition of female infanticide and human sacrifice among Gonds of central India.

### **Lord Dalhousie (1848-56)**

- Introduced the policy of Doctrine of Lapse of Law of Escheat which postulated that Indian States having no natural heir would be annexed to the British Empire.
- The Indian States annexed by the application of his doctrine were Satara (1848), Jaipur and Sambalpur (1849), Baghat (1850), Baghat (1850), Udaipur (1852), Jhansi (1853) and Nagpur (1854).
- He abolished Title and Pension.
- Second Sikh War in 1845-1846
- Annexation of Punjab in 1849
- Second Burmese war in 1852

- Annexation of Berar in 1853
- Charter Act of 1853
- Recruitment of the Civil Service by competitive examination in 1853
- Santhal uprising (1855-56)
- Annexation of Oudh in 1856
- Hindu widow remarriage Act was passed in 1856.
- It recommended, establishment of Anglovernacular Schools in districts, government colleges in important towns and universities in presidency towns and introduction of vernacular languages as the medium of instruction.
- Boosted up the development of railways-laid the first railway line in 1853 from Bombay to Thane and second from Calcutta to Raniganj.
- Gave a great impetus to post and telegraph. Telegraph lines were laid. (First line from Calcutta to Agra).
- Shimla was made summer capital and army headquarter.
- Annexed Awadh in 1856 on excuse of misgovernment when Nawab Wajid Ali Shah refused to abdicate.
- Raised Gorkha Regiment
- Founded the Public Work Department (P.W.D.)

## **VICEROYS OF INDIA** (*events during his administration*)

### **Lord Canning (1856 - 1862)**

- The outbreak of the Sepoy Mutiny, 1857.
- Lord Canning suppressed it and the Parliamentary Act of 1858 followed this great event.
- He restored law and order in an effective way and introduced a new system of administration.

- The recommendations of Charles Wood on education made in 1854 were given effect and the three universities of Calcutta, Bombay and Madras were founded in 1857.
- The British started tea and coffee plantations.
- The Indian Penal Code framed by Lord Metcalfe, was introduced in 1860 and the

Criminal Procedure Code appeared in 1861.

- Archaeological Survey of India was established in 1861.
- After the Sepoy Mutiny the rule of the British East India Company was transferred to the Crown in the person of Queen Victoria.
- The Governor-General remained head of the Government of India and now was more commonly called the Viceroy on account of his secondary role as the Crown's representative to the nominally sovereign princely states.

#### **Lord Elgin (1862 - 1863)**

- He became the Viceroy of India in 1862 but next year died of a heart attack while crossing a swinging rope and wood bridge over the river Chandra, on the lap between Kullu and Lahul.
- He suppressed Wahabis movement.

#### **Lord John Lawrence (1864 -69)**

- Establishment of High Courts at Calcutta, Bombay and Madras in 1865
- In his time Anglo-Bhutan Duar War took place. Imperial Forestry Service (now Indian Forest Service) was created in 1867.

#### **Lord Mayo (1869 - 1872)**

- Establishment of Statistical Survey of India
- He promoted irrigation, railways, forests and other useful public works.
- The European-oriented Mayo College at Ajmer was founded by him for the education of young Indian chiefs.
- Department of Agriculture (now Ministry of Agriculture) was created in his time.
- He was assassinated in Andamans in 1872.

#### **Lord Northbrook (1872 - 1876)**

- The main events of this period were: deposition of Gaekwad in 1874; the Kuka

movement; visit of Prince of Wales; abolition of income tax; famine in Bihar and Bengal in 1873-1874.

- In Jan 1876 he resigned.

#### **Lord Lytton (1876-1880)**

- In November 1878, Lytton ordered an invasion which sparked the Second Anglo-Afghan War.
- Queen Victoria (in absentia) proclaimed Empress of India at Delhi Durbar of 1877.
- Royal Titles Act of 1876
- Vernacular Press Act
- Arms Act of 1878
- Second Afghan War (1878-80)
- Appointment of first famine commission in 1878

#### **Lord Ripon (1880 - 1884)**

- He held high post of Viceroy of India in 1880 and set his reform programme in motion immediately after he assumed power.
- He entered into a peace treaty with the new Afghan, Amir Abdur Rahman.
- He made remarkable contribution to the development of Local Government.
- In 1882, he abandoned the existing system of local government by the officially nominated people.
- He initiated the famous Bengal Tenancy Act of 1885, though enacted after Ripon's departure.
- First Factory Act and First census
- Division finances of the centre in 1882
- Hunter commission on Education
- Ilbert Bill Controversy

#### **Lord Dufferin (1884 - 1888)**

- Foundation of Indian National Congress
- He called Indian National Congress as **Microscopic Minority**.



- In 1884, he was appointed as Viceroy of India. In 1885, Bengal Tenancy Act and Bengal Local Self-Government Act were passed.
- Third Anglo-Burmese War started in 1885.
- In his time Allahabad University was established.

#### **Lord Landsdowne (1888 - 1894)**

- Factory Act of 1891
- Division of Civil services into Imperial, Provincial and Subordinate
- Indian councils Act of 1892
- Appointment of Durand Commission and its definition of Durand line between India (Now Pakistan) and Afghanistan

#### **Lord Elgin II (1894 - 1899)**

- Assassination of British by Chapekar in 1897.
- Santhal and Mundas uprising of 1899.
- Famine in part of Rajasthan - Lyli Commission appointed to look into the cause of famines.

#### **Lord Curzon (1899-1905)**

- Lord Curzon, conceived and carried out the project of setting up a memorial to the Queen at Kolkata on the death of Queen Victoria in January 1901.
- Curzon's glorious administrative record was largely marred by two controversial policies. One was the education policy illustrated by the Universities Act, 1904 and other one Partition of Bengal, 1905.
- Thomas Raleigh commission
- Ancient Monuments Preservation Act of 1904
- Establishment of Agriculture research Institute at Pusa in Bihar

#### **Lord Minto II (1905 - 1910)**

- Minto passed the Indian Press Act of 1910 laying down heavy fines and penalty of Press for rebellious publications
- Anti Partition and swadeshi movements
- Surat session and Split in the congress
- Minto Morley reforms
- Foundation of Muslim League by Aga Khan
- Nawab of Dacca etc. in 1906

#### **Lord Hardinge II (1910 - 1916)**

- Delhi was made the capital in place of Calcutta in 1911.
- Annulment of partition of Bengal
- Death of Gopal Krishna Gokhale in 1915
- Foundation of Hindu Mahasabha in 1915

#### **Lord Chelmsford (1916 - 1921)**

- The Government of India Act of 1919, popularly known as Montague-Chelmsford reform was passed.
- It was passed to expand participation of Indians in the government of India. In 1919 the **Rowlatt Act** also called the **Black Bill** was passed.
- Home Rule leagues
- Luknow Session and reunion of congress in 1916
- Lucknow pact in 1916 by the efforts of B.G.Tilak
- August Declaration of Montague
- Formation of Indian Liberal Federation by S.N.Banerjee
- This incident is known as the most infamous **Jallianwala Bagh massacre** (13 April 1919), also known as the **Amritsar massacre** in Indian History.
- In the year 1920, Mahatma Gandhi led the Non -Cooperation movement which was a significant phase of the Indian struggle for freedom from British rule.

- Appointment of Sir S.P. Sinha as Lieutenant Governor of Bihar (First Indian)
- Death of Bal Gangadhar Tilak in 1920.

#### **Lord Reading (1921 - 1926)**

- ChauriChaura incident (5th Feb 1922)
- Formation of Swaraj party by C.R. Das
- Foundation of Rastriya Swyam SevakSangh (RSS) by K.B.Hedgewar (1925)
- Repeal of Rowlatt Act
- Holding of simultaneous examinations in India and England
- Beginning of Indianisation of officer's cadre of the Indian Army.

#### **Lord Irwin (1926 - 1931)**

- Popularly known as Christan Viceroy.
- Appointment of the Indian States Commission under.
- Harcourt Butler (1927) to recommend measures for the establishment of better relations between the Indian states and the Central government.
- Deepavali Declaration (1929) that India would be granted Dominion status in due course.
- Royal commssion on Indian Labour was appointed (1929), Report (1931).
- Sard Act was passed in 1929 Marriages of girl below 14 and boys below 18 years of age was prohibited.
- Poornaswaraj declaration
- Launching of Civil Disobedience Movement and Dandi march
- First Round Table Congress
- Gandhi Irwin Pact

#### **Lord Willingdon (1931 - 1936)**

- Second and Third Round Table conferences
- Communal award (1932) by Ramsay Mac Donald

- White Paper on political reforms in India was published (1933).
- Burma and Aden was separated from the British Empire (1935).
- Odisha, Bihar and Sind were made new States (1935)
- Poona pact between Gandhi and Ambedkar(1932)
- Govt. of India Act 1935
- Foundation of Socialist Party by Acharya Narendra Dev and Jai Prakash Narayan (1934)
- The Reserve Bank of India was established on 1 April 1935 in accordance with the provisions of the Reserve Bank of India Act, 1934.

#### **Lord Linlithgow (1936 - 1943)**

- Formation of congress ministries
- Resignation of Subash Chandra Bose from the President ship of congress
- Formation of Forward Block
- August offer by Linlithgow and its rejection by congress in 1940.
- Deliverance day by Muslim League (1939)
- Cripps Mission in 1942
- On 8 August 1942 at the All-India Congress Committee session in Bombay, Mohandas Karamchand Gandhi launched the 'Quit India' movement.
- Under him elections were held for the first time in 11 Indian states in 1939

#### **Lord Wavell (1943 - 1947)**

- Wavell Plan and Shimla conference. Congress represented by Maulana Azad.
- Royal Indian Navy mutiny in 1946
- Under him the Cabinet Mission (Lawrence, Cripps and Alexander) came to India from London.
- The first meeting of the Constituent Assembly was held on 9th December 1946

- **Interim Government** was formed (September 2, 1946).
- Prime Minister of Britain Clement Attlee announced **Independence of India**.

#### **Lord Mountbatten (1947 - 1948)**

- He was the last British Governor General and Viceroy of India.
- Under him an act for Indian independence was passed by British Parliament.
- Declaration of third June, 1947.
- India attained independence on 15 August 1947.
- Mountbatten remained in New Delhi for another ten months, serving as India's first governor general until June 1948.
- Indian Independence Act, Partition of the country between two independent states of India and Pakistan with Lord Mountbatten

and M.A. Jinnah as their respective Governor generals.

#### **Chakravarti Rajagopalachari (1948 - 1950)**

- He was the last Governor-General of India and the only Indian national ever to hold the office.
- He also served as leader of the Indian National Congress, Premier of the Madras Presidency, Governor of West Bengal, Minister for Home Affairs of the Indian Union and Chief Minister of Madras state.
- He founded the Swatantra Party and was one of the first recipients of India's highest civilian award, the Bharat Ratna. On 26 January 1950, India became a republic and a new constitution came into effect under which India was established as a secular and a democracy.

### **SOCIO-RELIGIOUS MOVEMENTS**

<b>Organization</b>	<b>Founder</b>	<b>Year of Foundation</b>
* <i>Fairazi Movement</i>	Haji Shariatullah, Dudhi Miyan	1804
Atmiya Sabha	Raja Rammohan Roy	1815
Brahmo Samaj	Raja Rammohan Roy	1827
Tatvabodhini Sabha	Devendra Nath Tagore	1839
Prarthana Samaj	Dr. Atma Ram Pandurang	1867
Veda Samaj	Chembeti Sridhara Naidu	1864
Satya shodak Samaj	Jotiba Phule	1873
Rahnumai, Mazdyasnan Sabha	Dadabhai Naoroji Naoroji Furdonj	1851
Mohammedan Literary Society	Vawab Abdul Latif	1863
* <i>Deoband Movement</i>	Mohammad Qasim Nanutavi, Rashid Ahmed Ganghoi	1867
Arya Samaj	Swami Dayanand Saraswati	1875
* <i>Aligarh Movement</i>	Sir Syed Ahmed Khan	1875
Theosophical Society	Vladam Blavatsky, Henry Olcott	1882
Ramkrishna Mission	Swami Vivekananda	1887
Dev Samaj	Shivnarayan Agnihotri	1887
* <i>Ahmadiya Movement</i>	Vliirza Ghulam Ahmad	1889
Sri Narayan Dharam Paripalana Yogam	Sri Narayan Guru	1903
Bahujan Samaj	Mukundrao Patil	1910
Justice Movement	C.N. Mudaliar, T.M. Nair, P. Tyagaraja	1915
All India depressed class Federation	B.R. Ambedkar	1920
Self-respect movement	E.V. Ramaswami Naicker	1925
Harijan Sevak Sangha	Mahatma Gandhi	1932
Dravid Monnetra Kazhagam	C N Annadurai	1949

\* Every (\*) mark denotes Muslim Socio-Religious Movements

## TRIBAL MOVEMENTS/ REVOLTS/ UPRISINGS

Movements/ Revolts/ Uprisings	Area	Year(s)
Bhil Uprising	Western Ghat	1818 - 1831
Ho Rising	Singhbhum and Chhotanagpur	1820, 1822 and 1832
Koli Uprising	Gujarat	1824 - 1828, 1839 and 1899
Singpo Rising	Assam	1830 - 1839
Kol Rising under Buddha Bhagat	Chhotanagpur	1831 - 1832
Khond Rising under Chakrabisai	Khandmal area in Odisha	1846 - 1848, 1855 and 1941
Khasi Rising	Odisha	1846 - 1848, 1855 and 1914
Naikad Revolt under Roop Singh and Joria Bhagat	Gujarat	1858 - 1859 and 1868
Rampa Rebellion	Coastal Andhra	1879
Kachhag Revolt under Sambhudaan	Chhachar area of Assam	1882
Munda Revolt under Birsa Munda	Chhotanagpur	1899 - 1900
Bhil Rising under Govind Guru	Baswana and Durgapur area of South Rajasthan	1913
Oraon Revolt under Jatra Bhagat	Chhotanagpur area	1914 - 1915
Tharo Kuti Rising under Jadonand and Rani Gaidilieu	Manipur	1917 - 1919
Kuki Rising under Rani Gaidilieu	Manipur	1917 - 1919
Rampa Rebellion under Allari Sita Ram Raju	Andhra Pradesh	1923 - 1924
Chaur Uprising	Bengal and Bihar	1966 - 1970

## INDIAN INDEPENDENCE MOVEMENT

*The Indian Independence Movement encompassed activities and ideas aiming to end the East India Company rule (1757–1858) and the British Raj (1858–1947) in the Indian subcontinent.*

*The very first organised militant movements were in Bengal, but they later took movement in the then newly formed Indian National Congress with prominent moderate leaders.*

### FIRST REBELLION OF INDIA AGAINST BRITISH

#### Pazhassi Raja (18th century)

- Kerala Varma Pazhassi Raja (also known as Cotiote Rajah or Pychy Rajah) (3 January 1753 – 30 November 1805) was one of the earliest freedom fighters in India.
- He was the prince regent of the princely state of Kottayam or Cotiote in Malabar, India between 1774 and 1805.
- His struggles with English East India Company is known as **The Cotiote War**.
- He is popularly known as **Kerala Simham (Lion of Kerala)** on account of his martial exploits.

#### Veerapandiya Kattabomman (18th century)

- Veerapandiya Kattabomma Karuthayya Nayakkar (also known as Kattabomman) was a courageous 18th-century Palayakarrar ('Polygar') chieftain from Panchalankurichi of Tamil Nadu, India.
- He waged a war with the British six decades before the Indian War of Independence occurred in the Northern parts of India. He was captured and hanged in 1799 CE. His fort was destroyed and his wealth was looted by the British army.

## PAIK REBELLION of 1817

- In September 1804 the King of Khurda, **Kalinga**, was deprived of the traditional rights of Jagannath Temple which was a serious shock to the King and the people of Odisha.
- Consequently in October 1804 a group of armed **Paiks** attacked the British at **Pipili**. This event alarmed the British force. **Jayee Rajguru** the chief of Army of Kalinga, requested all the Kings of the State to join hands for a common cause against the British.
- The Kings of **Kujanga, Kanika, Harishpur, Marichipur** and others made an alliance with the King of Khurda and prepared themselves for the battle. Jayee Rajguru was later hailed as the first martyr of India against Britain.
- **Jayee Rajguru** (real name was Jayakrushna Rajguru Mohapatra) was killed on 6 December 1806 in a procedure in which executioners tied his legs to the opposite bounded branches of a tree and released the branch.
- It cause **Bakshi Jagabandhu** commanded an armed rebellion against the British East India Company's rule in Odisha which is known as **Paik Rebellion** in 1817.
- It gave the nation the first direction towards the war for Independence. The landed militants of Odisha to whom the English conquest had brought little but ruin and oppression.

## INDIAN REBELLION OF 1857 : SEPOY MUTINY

- The main persons behind this rebellion were the soldiers (sepoy). That is why it is also called sepoy Mutiny. But the revolt did not remain limited to the soldiers, later it spread and took a massive form. Some people also called this-‘India’s first war of Independence’.
- The revolt was started on 10th May of 1857 in the town of Meerut. Though in some places, fractional clashes began before that. It ended on 20 June 1858.
- The first martyr of 1957 revolt was Mangal Pandey. He killed a higher officer in his regiment on 29 March 1857 at Barrackpore for the introduction of the offensive rule. He was captured and was sentenced to death when the British took back control over the regiment.
- Some of the leaders of the rebellion were- Rani Lakshmibai (Jhansi), Kunwar Singh (Bihar), Bahadur Shah (Delhi), Nana Saheb (Kanpur), Tatia Tope (Kanpur), Begum Hazrat Mahal (Lucknow).
- Lord Canning was the governor general at that time.
- The revolt was failed to spread across the India. Some epicenters of the revolt were- Kanpur, Lucknow, Aligarh, Agra, Arrah, Delhi, and Jhansi.
- Revolts broke out in other parts of Oudh and the North-Western Provinces as well, where civil rebellion followed the mutinies, leading to popular uprisings.
- The British fought the main army of the rebels near Delhi, and after prolonged fighting and a siege, defeated them and retook the city on 20 September 1857
- The last significant battle was fought in Gwalior on 17 June 1858, during which

Rani Lakshmbai was killed. Sporadic fighting and guerrilla warfare, led by Taty Tope, continued until spring 1859, but most of the rebels were eventually subdued.

- Under the Government of India Act 1858, the Company was deprived of its involvement in ruling India, with its territory being transferred to the direct authority of the British government.
- In 1876, in a controversial move Prime Minister Disraeli acceded to the Queen's request and passed legislation to give Queen Victoria the additional title of Empress of India. Liberals in Britain objected that the title was foreign to British traditions.

#### **Causes of the revolt**

- Induction of enfield rifles in the army, cartridge of which had fat of cow and pig. Hindu and Muslim soldiers protested against this.
- There was discrimination among the British and Indian soldiers. British soldier's behavior was rude against the Indian soldiers.
- The policies used by the British for territorial annexation [Doctrine of lapse, Subsidiary Alliance] angered the Indian rulers.
- There was fear that British were converting Hindus and Muslims in Christianity.
- The social reforms introduced by the British made some of the people angry.

#### **Reasons of Failure**

- There was communication gap between the leaders of different parts of India.
- There was no central leadership and the rebellion got limited to some parts of India only.

- Rebels did not have enough weapons and finance where British people had advanced weapons and enough finance.
- Lack of planning and discipline among the rebels.

#### **Effects of the Revolt**

- East India Company's rule ended in India and the ruler ship was handed over to the Queen Victoria.
- Reforms were introduced in the army and all the steps were taken so that no such incident occurs in the future.
- Indian's were assured of better governance.
- It was declared that there will be no discrimination and people will have more power and respect.
- Doctrine of Lapse was withdrawn.

## **RISE OF INDIAN NATIONALISM (1885–1905)**

- **Sir Syed Ahmed Khan** launched a movement for **Muslim regeneration** that culminated in the founding in 1875 of the **Muhammadan Anglo-Oriental College** at Aligarh, Uttar Pradesh (renamed Aligarh Muslim University in 1920). Its objective was to educate wealthy students by emphasising the compatibility of Islam with modern western knowledge. The diversity among India's Muslims, however, made it impossible to bring about uniform cultural and intellectual regeneration.
- **Dadabhai Naoroji**, who went as far as contesting, successfully, an election to the British House of Commons, becoming its first Indian member.
- **Bal Gangadhar Tilak** was the first Indian nationalist to embrace Swaraj as the destiny of the nation.
- Tilak deeply opposed the then British education system that ignored and defamed

India's culture, history and values. He resented the denial of freedom of expression for nationalists, and the lack of any voice or role for ordinary Indians in the affairs of their nation. For these reasons, he considered Swaraj as the natural and only solution. His popular sentence "**Swaraj is my birthright, and I shall have it**" became the source of inspiration for Indians.

- In 1907, the Congress was split into two factions: The radicals, led by Tilak, advocated civil agitation and direct revolution to overthrow the British Empire and the abandonment of all things British.
- The moderates, led by leaders like **Dadabhai Naoroji** and **Gopal Krishna Gokhale**, on the other hand wanted reform within the framework of British rule.
- Tilak was backed by rising public leaders like **Bipin Chandra Pal** and **Lala Lajpat Rai**, who held the same point of view. Under them, India's three great states – **Maharashtra, Bengal** and **Punjab** shaped the demand of the people and India's nationalism.
- Gokhale criticised Tilak for encouraging acts of violence and disorder. But the Congress of 1906 did not have public membership, and thus Tilak and his supporters were forced to leave the party.
- But with Tilak's arrest, all hopes for an Indian offensive were stalled. The Congress lost credit with the people. A Muslim deputation met with the Viceroy, Minto (1905–10), seeking concessions from the impending constitutional reforms, including special considerations in government service and electorates.
- The British recognised some of the Muslim League's petitions by increasing the number of elective offices reserved for Muslims in the **Indian Councils Act 1909**.

The Muslim League insisted on its separateness from the Hindu-dominated Congress, as the voice of a "**nation within a nation**".

### **EMERGENCE OF INDIAN NATIONAL CONGRESS (1885)**

- The Indian National Congress was founded by Allan Octavian Hume in 1885. Hume was a retired Civil Service Officer. He saw a growing political consciousness among the Indians and wanted to give it a safe, constitutional outlet so that their resentment would not develop into popular agitation against the British rule in India. He was supported in this scheme by the Viceroy, **Lord Dufferin**, and by a group of eminent Indians.
- **Womesh Chandra Banerjee** of Calcutta was elected as the first President. The Indian National Congress represented an urge of the politically conscious Indians to set up a national organization to work for their betterment. Its leaders had complete faith in the British Government and in its sense of justice.
- Among the liberal leaders, the most prominent were Firoz Shah Mehta, Gopal Krishna Gokhale, Dada Bhai Naoroji, Ras Behari Bose, Badruddin Tayabji, etc. From 1885 to 1905, the Indian National Congress had a very narrow social base. Its influence was confined to the urban educated Indians.

### **PARTITION OF BENGAL, 1905**

- Division of Bengal carried out by the British viceroy in India, **Lord Curzon**, despite strong Indian nationalist opposition. It began a transformation of the Indian National Congress from a middle-class pressure group into a nationwide mass movement.

- Bengal, Bihar, and Odisha had formed a single province of British India since 1765. By 1900 the province had grown too large to handle under a single administration. East Bengal, because of isolation and poor communications, had been neglected in favour of west Bengal and Bihar. Curzon chose one of several schemes for partition: to unite Assam, which had been a part of the province until 1874, with 15 districts of east Bengal and thus form a new province with a population of 31 million. The capital was Dacca (now Dhaka, Bangl.), and the people were mainly Muslim.
- In 1911, the year that the capital was shifted from Calcutta (now Kolkata) to Delhi, east and west Bengal were reunited; Assam again became a chief commissionership, while Bihar and Odisha were separated to form a new province.
- The final division of Bengal at the partitioning of the subcontinent in 1947, which split Bengal into India in the west and East Pakistan (later Bangladesh) in the east, was accompanied by intense violence.

#### **FORMATION OF THE MUSLIM LEAGUE in 1906**

- Partion of Bengal motivated Muslims to form a permanent political association of their own.
- In December, 1906, during the Muhammadan Educational conference in Dacca, Nawab Salim Ullah Khan raised the idea of establishing a Central Muhammadan Association to take care of Muslim interests.
- Accordingly, on 30th December, 1906, the All India Muslim League was founded. Another prominent person, Aga Khan was chosen as its president.

- The main objective of the league was to protect and advance the rights of Muslims in India and represent their needs to the government.
- By encouraging the issue of separate electorates, the government sowed the seed of communalism and separatism among Indians.
- The formation of the Muslim League is considered to be the first fruit of the British master strategy of 'Divide and Rule'.
- Mohammad Ali Jinnah later joined the League.

#### **MORLEY-MINTO REFORMS in 1909**

For details about **MORLEY-MINTO REFORMS**, please refer **Indian Councils Act of 1909** in the Chapter **INDIAN POLITY** (in this book).

#### **EMERGENCE OF GANDHI**

The final phase of the Nationalist Movement (1917-1947) is known as the **Gandhian era**. During this period Mahatma Gandhi became the undisputed leader of the National Movement. His principles of **nonviolence** and **Satyagraha** were employed against the British Government.

Mohandas Karamchand Gandhi was born at Porbandar in Gujarat on 2 October 1869. He studied law in England. He returned to India in 1891. In April 1893 he went to South Africa and involved himself in the struggle against apartheid (Racial discrimination against the Blacks) for twenty years.

Finally, he came to India in 1915. Thereafter, he fully involved himself in the Indian National Movement. Mahatma Gandhi began his experiments with Satyagraha against the oppressive European indigo planters at Champaran in Bihar in 1917.



### **The Rowlett Act**

- In 1917, a committee was set up under the presidentship of Sir Sydney Rowlatt to look into the militant Nationalist activities. On the basis of its report the Rowlatt Act was passed in March 1919 by the Central Legislative Council.
- As per this Act, any person could be arrested on the basis of suspicion. No appeal or petition could be filed against such arrests. This Act was called the **Black Act** and it was widely opposed. An **All-India hartal** was organized on 6 April 1919. Meetings were held all over the country.
- Mahatma Gandhi was arrested near Delhi. Two prominent leaders of Punjab, Dr Satya Pal and Dr. Saifuddin Kitchlew, were arrested in Amritsar.

### **Jallianwala Bagh Massacre**

- The Jallianwala Bagh Massacre took place on 13 April 1919 and it remained a turning point in the history of India's freedom movement. In Punjab, there was an unprecedented support to the Rowlatt Satyagraha.
- Facing a violent situation, the Government of Punjab handed over the administration to the military authorities under General Dyer. He banned all public meetings and detained the political leaders. On 13th April, the Baisakhi day (harvest festival), a public meeting was organized at the Jallianwala Bagh (garden).
- Dyer marched in and without any warning opened fire on the crowd. The firing continued for about 10 to 15 minutes and it stopped only after the ammunition exhausted. According to official report 379 people were killed and 1137 wounded in the incident.

- There was a nationwide protest against this massacre and Rabindranath Tagore renounced his knighthood as a protest. The Jallianwala Bagh massacre gave a tremendous impetus to the freedom struggle.

### **Khilafat Movement**

- The chief cause of the Khilafat Movement was the defeat of Turkey in the First World War. The harsh terms of the Treaty of Sevres (1920) was felt by the Muslims as a great insult to them.
- The whole movement was based on the Muslim belief that the Caliph (the Sultan of Turkey) was the religious head of the Muslims all over the world. The Muslims in India were upset over the British attitude against Turkey and launched the Khilafat Movement.
- Maulana Abul Kalam Azad, M.A. Ansari, Saifuddin Kitchlew and the Ali brothers were the prominent leaders of this movement. A Khilafat Committee had been formed and on 19th October 1919, the whole country had observed the Khilafat day.
- On 23 November, a joint conference of the Hindus and the Muslims had also been held under the chairmanship of Mahatma Gandhi. Mahatma Gandhi was particularly interested in bringing the Hindus and the Muslims together to achieve the country's independence.

### **Non-Cooperation Movement (1920-1922)**

- It organized by Mohandas Gandhi, to induce the British government of India to grant self-government, or swaraj, to India.
- It arose from the outcry over the massacre at Amritsar in April 1919, when the British killed several hundred Indians, and from later indignation at the government's

alleged failure to take adequate action against those responsible.

- Gandhi strengthened the movement by supporting (on nonviolent terms) the contemporaneous Muslim campaign against the dismemberment of Turkey after World War I.
- The movement was to be nonviolent and to consist of the resignations of titles; the boycott of government educational institutions, the courts, government service, foreign goods, and elections; and the eventual refusal to pay taxes. Noncooperation was agreed to by the Indian National Congress at Calcutta (now Kolkata) in September 1920 and launched that December.
- In 1921 the government, confronted with a united Indian front for the first time, was visibly shaken, but a revolt by the Muslim Moplahs of Kerala (southwestern India) in August 1921 and a number of violent outbreaks alarmed moderate opinion.
- After an angry mob murdered police officers at Chauri Chaura (February 1922), Gandhi himself called off the movement; the next month he was arrested without incident. The movement marks the transition of Indian nationalism from a middle-class to a mass basis.

### **Dandi March**

- On 12th March 1930, Gandhi began his famous March to Dandi with his chosen 79 followers to break the salt laws.
- He reached the coast of Dandi on 5 April 1930 after marching a distance of 200 miles and on 6 April formally launched the **Civil Disobedience Movement** by breaking the salt laws.
- On 9 April, Mahatma Gandhi laid out the programme of the movement which included making of salt in every village in

violation of the existing salt laws; picketing by women before the shops selling liquor, opium and foreign clothes; organising the bonfires of foreign clothes; spinning clothes by using charkha fighting untouchability; boycotting of schools and colleges by students and resigning from government jobs by the people. Over and above all these, the programme also called upon the people not to pay taxes to the government.

### **Round Table Conference**

- The British government adopted the strategy of talking to different political parties by convening the Round Table Conferences.
- The **first Round Table Conference** was held in November 1930 at London and it was boycotted by the Congress. In January 1931 in order to create a conducive atmosphere for talks, the government lifted the ban on the Congress Party and released its leaders from prison.
- On 8 March 1931 the **Gandhi-Irwin Pact** was signed. As per this pact, Mahatma Gandhi agreed to suspend the Civil-Disobedience Movement and participate in the Second- Round Table Conference.
- In September 1931, the **Second Round Table Conference** was held at London. Mahatma Gandhi participated in the Conference but returned to India disappointed as no agreement could be reached on the demand of complete independence and on the communal question.
- In January 1932, the Civil-Disobedience Movement was resumed. The government responded to it by arresting Mahatma Gandhi and Sardar Patel and by reimposing the ban on the Congress party.

### **Quit India Movement (1942-1944)**

- The failure of the Cripps Mission and the fear of an impending Japanese invasion of India led Mahatma Gandhi to begin his campaign for the British to quit India.
- The All India Congress Committee met at Bombay on 8 August 1942 and passed the famous **Quit India Resolution**. On the same day, Gandhi gave his call of '**do or die**'.
- On 8th and 9th August 1942, the government arrested all the prominent leaders of the Congress. Mahatma Gandhi was kept in prison at Poona. Pandit Jawaharlal Nehru, Abul Kalam Azad, and other leaders were imprisoned in the Ahmednagar Fort.
- At this time, leadership was provided by Ram Manohar Lohia, Achyuta and S.M. Joshi. The role of Jayaprakash Narain in this movement was important. Large number of students also left their schools and colleges to join the movement. The youth of the nation also participated in this movement with patriotism.
- Strikes, demonstrations and public meetings were organised in various towns and cities. Slowly the movement reached the rural areas. In 1943, as the movement gained further momentum, there were armed attacks on government buildings in Madras and Bengal.
- In 1944 **Mahatma Gandhi** was released from jail. **Quit India Movement** was the final attempt for country's freedom. The British Government ordered for 538 rounds of firing. Nearly 60,229 persons were jailed. At least 7,000 people were killed. This movement paved the way for India's freedom.
- It aroused among Indians the feelings of bravery, enthusiasm and total sacrifice.

### **The Indian National Army**

- During the course of the Second World War, armed revolutionary activities continued to take place. The role of Subhas Chandra Bose towards such activities is incomparable.
- On 2 July 1943, Subhas Chandra Bose reached Singapore and gave the rousing war cry of 'Dilli Chalo'. He was made the President of Indian Independence League and soon became the supreme commander of the Indian National Army. He gave the country the slogan of Jai Hind.
- The names of the INA's three Brigades were the Subhas Brigade, Gandhi Brigade and Nehru Brigade. The women's wing of the army was named after Rani Laxmibai. The Indian National Army marched towards Imphal after registering its victory over Kohima. After Japan's surrender in 1945, the INA failed in its efforts. Under such circumstances, Bose went to Taiwan.
- Then on his way to Tokyo he died on 18 August 1945 in a plane crash. The trial of the soldiers of INA was held at Red Fort in Delhi. Pandit Jawaharlal Nehru, Bhulabhai Desai and Tej Bahadur Sapru fought the case on behalf of the soldiers.
- "Give me blood and I shall give you freedom" - was one of the most popular statements made by S.C. Bose, where he urges the people of India to join him in his freedom movement.

The following **HEADINGS** are briefly described in Chapter **INDIAN POLITY (in this book)**. So, please refer **INDIAN POLITY** for more details about the followings.

- Simon Commission
- Poona Pact of 1932
- Cripps Mission, 1942
- Cabinet Mission Plan, 1946
- Mountbatten Plan
- Indian Independence Act of 1947
- Interim Government, 1946

## INDEPENDENCE AND PARTITION OF INDIA

- On 3 June 1947, Louis Mountbatten, the last British Governor-General of India, announced the partitioning of British India into India and Pakistan.
- With the speedy passage through the British Parliament of the **Indian Independence Act 1947**, at **11:57** on **14 August 1947** **Pakistan** was declared a separate nation, and at **12:02**, just after midnight, on **15 August 1947**, **India** also became an independent nation.
- Violent clashes between Hindus, Sikhs and Muslims followed. Prime Minister **Nehru** and Deputy Prime Minister **Sardar Vallabhbhai Patel** invited Mountbatten to continue as Governor General of India. He was replaced in June 1948 by **Chakravarti Rajagopalachari**.
- **Patel** took on the responsibility of bringing into the Indian Union 565 princely states, steering efforts by his "iron fist in a velvet glove" policies, exemplified by the use of military force to integrate Junagadh and Hyderabad State into India (Operation Polo). On the other hand, Pandit Jawahar Lal Nehru kept the issue of Kashmir in his hands.
- The Constituent Assembly completed the work of drafting the constitution on 26 November 1949; on **26 January 1950**, the **Republic of India** was officially proclaimed.
- The Constituent Assembly elected **Dr. Rajendra Prasad** as the **first President** of India, taking over from Governor General Rajgopalachari.
- Subsequently India invaded and annexed Goa and Portugal's other Indian enclaves in 1961, the French ceded Chandernagore in 1951, and Pondichery and its remaining Indian colonies in 1956, and Sikkim voted to join the Indian Union in 1975.

### SESSIONS OF INDIAN NATIONAL CONGRESS

Name of President	Year of Presidency	Place of Conference
Womesh Chunder Bonnerjee	1885	Bombay
Dadabhai Naoroji	1886	Calcutta
Badruddin Tyabji	1887	Madras
George Yule	1888	Allahabad
William Wedderburn	1889	Bombay
Pherozeshah Mehta	1890	Calcutta
Anandacharlu	1891	Nagpur
Womesh Chunder Bonnerjee	1892	Allahabad
Dadabhai Naoroji	1893	Lahore
Alfred Webb	1894	Madras
Surendranath Banerjee	1895	Poona
Rahimtulla M. Sayani	1896	Calcutta
C. Sankaran Nair	1897	Amraoti
Anandamohan Bose	1898	Madras
Romesh Chunder Dutt	1899	Lucknow

N. G. Chandavarkar	1900	Lahore
Dinshaw Edulji Wacha	1901	Calcutta
Surendranath Banerjee	1902	Ahmedabad
Lalmohan Ghosh	1903	Madras
Henry Cotton	1904	Bombay
Gopal Krishna Gokhale	1905	Benares
Dadabhai Naoroji	1906	Calcutta
Rashbihari Ghosh	1907	Surat
Rashbihari Ghosh	1908	Madras
Madan Mohan Malaviya	1909	Lahore
William Wedderburn	1910	Allahabad
Bishan Narayan Dar	1911	Calcutta
Raghunath Narasinha Mudholkar	1912	Bankipur
Nawab Syed Muhammad Bahadur	1913	Karachi
Bhupendra Nath Bose	1914	Madras
Lord Satyendra Prasanna Sinha	1915	Bombay
Ambica Charan Mazumdar	1916	Lucknow
Annie Besant	1917	Calcutta
Madan Mohan Malaviya	1918	Delhi
Syed Hasan Imam	1918	Bombay (Special Session)
Motilal Nehru	1919	Amritsar
Lala Lajpat Rai	1920	Calcutta (Special Session)
C. Vijayaraghavachariar	1920	Nagpur
Hakim Ajmal Khan	1921	Ahmedabad
Deshbandhu Chittaranjan Das	1922	Gaya
Mohammad Ali Jouhar	1923	Kakinada
Abul Kalam Azad	1923	Delhi (Special Session)
Mohandas Gandhi	1924	Belgaum
Sarojini Naidu	1925	Kanpur
S. Srinivasa Iyengar	1926	Gauhati
Mukhtar Ahmed Ansari	1927	Madras
Motilal Nehru	1928	Calcutta
Jawaharlal Nehru	1929 & 30	Lahore
Vallabhbhai Patel	1931	Karachi
Madan Mohan Malaviya	1932	Delhi
Madan Mohan Malaviya	1933	Calcutta
Nellie Sengupta	1933	Calcutta
Rajendra Prasad	1934 & 35	Bombay
Jawaharlal Nehru	1936	Lucknow
Jawaharlal Nehru	1936 & 37	Faizpur
Subhas Chandra Bose	1938	Haripura
Subhas Chandra Bose	1939	Tripuri
Abul Kalam Azad	1940-46	Ramgarh
J. B. Kripalani	1947	Meerut
Pattabhi Sitaraimayya	1948 & 49	Jaipur
Purushottam Das Tandon	1950	Nasik
Jawaharlal Nehru	1951 & 52	Delhi
Jawaharlal Nehru	1953	Hyderabad
Jawaharlal Nehru	1954	Calcutta
U. N. Dhebar	1955	Avadi
U. N. Dhebar	1956	Amritsar
U. N. Dhebar	1957	Indore
U. N. Dhebar	1958	Gauhati
U. N. Dhebar	1959	Nagpur
Indira Gandhi	1959	Delhi
Neelam Sanjiva Reddy	1960	Bangalore
Neelam Sanjiva Reddy	1961	Bhavnagar

Neelam Sanjiva Reddy	1962 & 63	Patna
K. Kamaraj	1964	Bhubaneswar
K. Kamaraj	1965	Durgapur
K. Kamaraj	1966 & 67	Jaipur
S. Nijalingappa	1968	Hyderabad
S. Nijalingappa	1969	Faridabad
Jagjivan Ram	1970 & 71	Bombay
Shankar Dayal Sharma	1972 – 74	Calcutta
Dev Kant Baruah	1975 – 77	Chandigarh
Indira Gandhi	1978 – 83	Delhi
Indira Gandhi	1983 – 84	Calcutta
Rajiv Gandhi	1985 – 91	Bombay
P. V. Narasimha Rao	1992 – 96	Tirupati
Sitaram Kesri	1997 – 98	Calcutta
Sonia Gandhi	1998–present	Calcutta

### BOOKS, NEWSPAPERS AND JOURNALS DURING PRE INDEPENDENCE

Aurobinda Ghosh	Karmayogi New Lamp for old Bhawani Mandir
BC Chatterjee	Anand Math Durgesh Nandini
BR Ambedkar	Mook Nayak Bahiskrit Bharat
Dadabhai Naroji	Voice of India Poverty and Unbritish Rule
Dayanand Saraswati	Veda Bhasya Satyartha Prakash
Gopal Krishna Gokhale	Nation Sudharak
Jawaharlal Nehru	Discovery of India National Herald Wither India
Mahatma Gandhi	Navjeevan Young India and Harijan Indian Opinion
Madan Mahon Malviya	Hindustan Leader
Rabindranath Tagore	Gora
Raja Ram Mohan Roy	Sambad Kaumudi
Swami Vivekananda	Prabhuda Bharat Udbodhana Prachya aur Pashchatya
Annie Besant	New India Common Wealth
Bal Gangadhar Tilak	Kesari and Maratha
Manabendra Nath Roy	India in Transition
Madam Bikaji Cama	Bande Mataram
Maulana Abdul Kalam Azad	Al-Hilal
Maulana Mahummad Ali	Comrade
Mukandrao Patil	Din Mitra
Muzaffer Ahmed	Navyug
Prafulla Chandra Ray	History of Hindu Chemistry
Phirozshah Mehta	Bombay Chronicle
Romesh Chunder Dutt	Economic history of British India
BK Nanda	Biography of Gokhale

Brahmabandhav Upadhyay	Sandhya
Bal Shastri Jambekar	Darpan
Bhartendu Harish Chandra	Kavicharan Sudha
Bipin Chandrapal	Paridarshak
Curzon	Philosophy of the East
Dayal Singh Majeetia	Tribune
Deenbandhu Mitra	Neel Darpan
Derozio	East Indian
Devendranath Tagore	Indian Mirror
EV Ramaswamy Naiker	Kudi Anasu
GS Aiyar	Swadesh Mitram
GS Aiyar, Viraraghavachari and Subra Rao Pandit	The Hindu
Ghulam Hussain	Inquilub
Harish Chandra Mukherjee	Hindu Patriot
Henry Vivan Derozio	India Gazette
Hunters	Indian Musalmanas
Iswar Chandra Vidyasagar	Som Prakash
James Augustus Hicky (1780)	Bengal Gazette (1780)
Jyotiba Rao Phule	Gulam Giri
KK Mitra	Sanjivini
KM Panikkar	The Hindustan Times
MA Azad	India wins freedom
MG Ranade	Essays in India Economics
Robert Knight	India Statesman
Robert Knight and Thomas Bennet	Bombay Times
SA Dange	The Socialist
Subhash Chandra Bose	Indian Struggle
SN Banerjee	Bengalee
Sachindranath Sanyal	Bandi Jivan
Shyamji Krishna Verma (London)	Indian Sociologist
Sir Sayed Ahmed Khan	Tahzib-ul-Akhlaq
Sisir kumar Ghosh and Motilal Ghosh	Amrit Bazar Patrika
Tarakanth Das	Free Hindustan

## IMPORTANT NATIONAL LEADERS and FREEDOM FIGHTERS : *In Alphabetically Order*


**Annie Besant** 1847 – 1933



- Born: October 1, 1847, Clapham, London, United Kingdom
  - Died: September 20, 1933, Adyar, Karnataka, India
  - In 1893, she left for India having been influenced by the Indian culture and civilization. She was famous as a social worker, educationalist and journalist.
  - She became a staunch supporter of Indian Independence Movement and her contribution to India's freedom struggle was remarkable.
  - She founded the Home-Rule League. She revived the Theosophical Society.
  - In 1915, she chaired the Calcutta session of the Indian National Congress.
  - She also edited 'New India'. She established Indian Boy Scouts Association.
  - She received a prestigious award for her work for scouts.
  - She also studied Hinduism. India is indebted to Annie Besant for her immeasurable work for freedom struggle, educational advancements and social reforms.
- He was a jurist, a statesman, a social reformer and a leader of the depressed classes.
  - He was born in Mahar caste in Mahu (M.P) in 1891. He went for higher studies to England and America. He was the first graduate of Mahar caste.
  - He participated in all the three Round Table Conferences. He signed Poona Pact with Gandhiji in 1932.
  - From 1942 to 1946, he was in the Executive Council of the Governor General. He organized the Indian Labour Party, Scheduled Caste Federation and People's Education Society.
  - He was the chairman of the Drafting Committee of our Constitution.
  - He also piloted the Hindu Code through the Indian Legislature.
  - From 1947 to 1951, he was a law minister in Nehru's cabinet.
  - Towards the end of his life he embraced Buddhism.

**Baji Rout** 1925 – 1938



- B. R. Ambedkar** 1891 – 1956
- 
- Born: April 14, 1891, Mhow, Madhya Pradesh
  - Died: December 6, 1956, Delhi
  - Full name: Bhimrao Ramji Ambedkar
- Born: October 5, 1926, Dhenkanal district
  - Died : October 11, 1938, Bhuban
  - He is the youngest martyr of India. This 12 yr old boat boy was shot dead by British police when he courageously denied to ferry them across the Brahmani River on the night of 11th October 1938.

### Bal Gangadhar Tilak 1856 – 1920



- Born: July 23, 1856, Chikhli, Maharashtra
- Died: August 1, 1920, Mumbai
- Full name: Keshav Gangadhar Tilak
- Bal Gangadhar Tilak, 1856–1920, Indian nationalist leader. He was a journalist in Pune, and in his newspapers, the Marathi-language Kesari [lion] and the English-language Mahratta, he set forth his nationalist ideals.
- He sought a Hindu revival based on Maratha traditions and independence [swaraj] from Britain.
- After the Indian National Congress was founded (1885), Tilak became the acknowledged leader of the extreme wing.
- He fought the moderate measures of Gopal Krishna Gokhale and advocated resistance to British rule; he was arrested (1897) by the British and imprisoned for 18 months.
- In 1907 a split took place in the Congress, and Tilak led his extremist wing out of the party.
- The next year he was again imprisoned, this time for six years. Unlike Mohandas Gandhi, he welcomed the Montagu-Chelmsford Report (1918), which conceded a substantial measure of self-rule.

### Bankim Chandra Chattopadhyay

1838 – 1894



- Born: June 27, 1838, Naihati, West Bengal, India
- Died: April 8, 1894, Kolkata
- He was one of the active nationalist, greatest novelists and poets of India. He is

famous as author of Vande Mataram, the national song of India.

- His first Bengali romance **Durgeshnandini** was published in 1865.
- His famous novels are **Kapalkundala** (1866), **Mrinalini** (1869), **Vishbriksha** (1873), **Chandrasekhar** (1877), **Rajani** (1877), **Rajsimha** (1881), and **Devi Chaudhurani** (1884).
- His famous novel was **Anand Math** (1882). Anand Math contained the song **Bande Mataram** (Hail to thee, Mother), which was later adopted as National Song.

### Bhagat Singh 1907 – 1931



- Born: September 28, 1907, Khatkar Kalan, Banga, Punjab, India.
- Died: March 23, 1931, Lahore, Pakistan
- He was also known as Shaheed-e-Azam Bhagat Singh.
- He was a revolutionary and martyr, the second son of Kishan Singh and Vidya Vati. He is the symbol of the heroism of the youth of India.
- He gave a new direction to revolutionary movement in India, formed 'Naujawan Bharat Sabha' to spread the message of revolution in Punjab, formed 'Hindustan Samajvadi Prajatantra Sangha' along with Chandrasekhar Azad to establish a republic in India, assassinated police official Saunders to avenge the death of Lala Lajpat Rai
- On April 8 1929 Bhagat Singh and Batukeshwar Dutt threw a bomb onto the corridors of the assembly and shouted 'Inquilab Zindabad!' The bomb was not meant to kill or injure anyone and therefore it was thrown away from the crowded



place. Following the blasts both Bhagat Singh and Batukeshwar Dutt courted arrest.

- The British authority, while interrogating them, came to know about their involvement in the murder of J. P. Saunders. Bhagat Singh, Rajguru, and Sukhdev were charged with the murder. Singh admitted to the murder and made statements against the British rule during the trial.
- As a protest, he along with some fellow prisoners declared to "go on hunger strike". The strike continued for over a month and finally the British had to accept before their conditions.
- Bhagat Singh along with other revolutionaries found responsible for the Assembly bombing and murder of Saunders. On March 23, 1931, Bhagat Singh was hanged in Lahore with his fellow comrades Rajguru and Sukhdev. Singh was cremated at Hussainiwala on banks of Sutlej River.

#### **Bipin Chandra Pal 1858 – 1932**



- Born : November 7, 1858, Habiganj, Sylhet region, British India (now Bangladesh)
- Died : 20 May 1932 (aged 73), Kolkata
- He is known as the 'Father of Revolutionary Thoughts' in India. He was also an eminent radical of his time.
- He was one of the three famous leaders called "Lal Bal Pal" who comprised the extremist wing of the Indian National Congress.
- By his contributions to various newspapers and through speaking tours, he popularized the concepts of swadeshi (exclusive use of

Indian-made goods) and swaraj (independence).

- In later years Pal allied himself with fellow Bengali nationalists who resented the cult of personality surrounding Mahatma Gandhi, the most popular nationalist leader. Pal's overriding concern in his writings from 1912 to 1920 was to achieve confederation of the different regions and different communities within India.

#### **Chakravarti Rajagopalachari 1878 – 1972**



- Born : 10 December 1878 Thorapalli, Madras Presidency, British India (now in Tamil Nadu, India)
- Died : 25 December 1972 (aged 94), Madras, Tamil Nadu, India (now Chennai)
- C. Rajagopalachari was an Indian lawyer, independence activist, politician and writer.
- He was the **first** and **last** Indian Governor General of India after Lord Mountbatten left India in 1948.
- He is popularly known as 'Rajaji' or 'CR'.
- He actively participated in Home League Rule under Bal Gangadhar Tilak. Later in 1919 and being influenced by Gandhi he joined in the freedom struggle. Later, in 1937 he was selected as the Chief Minister of Madras.
- In 1957, he found the **Swatantra Party**.
- He also published a highly regarded, abridged edition of the Hindu epic Mahabharata, that was translated from Sanskrit to Tamil and then to Hindi.

### Chandra Shekhar Azad 1906 – 1931



- Born : Chandra Shekhar Tiwari, 23 July 1906, Bhavra, Alirajpur, Central India Agency
- Died : 27 February 1931 (aged 24), Allahabad, Uttar Pradesh, India
- He was a daring freedom fighter and a fearless revolutionary, involved in incidents such as **Kakori Train Robbery**, **Assembly Bomb incident** and the **shooting of Saunders at Lahore**, to avenge the killing of Lala Lajpat Rai, he was the face of revolutionary India.
- He got involved in revolutionary activities at a very young age.
- He joined the non-cooperation movement launched by Mahatma Gandhi.
- He remained a terror for the British Government as long as he was alive.
- On 27 February 1931, betrayed by one of the associates, he was besieged by the British police in Alfred Park, Allahabad. He fought valiantly but seeing no other way he shot himself and fulfilled his resolve to die a 'free man' or 'Azad'.

### Dadabhai Naoroji 1825 – 1917



- Born : 4 September 1825, Bombay, British India
- Died : 30 June 1917 (aged 91)
- He is known as the Grand Old Man of India, was a Parsi intellectual, educator, cotton trader, and an early Indian political and social leader.

- He was a member of parliament (MP) in the United Kingdom House of Commons between 1892 and 1895, and the first Asian to be a British MP.
- Naoroji is also credited with the founding of the Indian National Congress, along with A.O. Hume and Dinshaw Edulji Wacha.
- His book Poverty and Un-British Rule in India brought attention to the draining of India's wealth into Britain. He was also member of the Second International along with Kautsky and Plekhanov.
- First to demand 'Swaraj' from the INC Platform (Calcutta session, 1906).
- Selected to 'House of Commons' on Liberal Party ticket (First Indian to do so).

### Gopal Krishna Gokhale 1886 – 1915



- Born : 9 May 1866, Kothluk, Ratnagiri Dist., Bombay Presidency, British India
- Died : 19 February 1915 (aged 48), Bombay, Bombay Presidency, British India
- Gopal Krishna Gokhale (1866-1915) was an Indian nationalist leader. President of the Indian National Congress, he also served in the Imperial Legislative Council and founded the famed Servants of India Society.
- On May 9, 1866, Gopal Krishna Gokhale was born in the Ratnagiri District of the Bombay Presidency into a poor but eminently respectable Chitapavan Brahmin family. At age 18 he secured a bachelor's degree from Elphinstone College and joined the illustrious Deccan Education Society. At 22 Gokhale became secretary of the famous Sarvajanic Sabha, the leading political organization of Bombay. He also became a professor at Fergusson College and, in 1891, secretary of the Deccan Education Society.

- In 1895 Gokhale was chosen secretary to the Indian National Congress. In the same year he was elected to the senate of Bombay University. He was 29 years old. From 1898 to 1906 Gokhale was a member of the Poona Municipality and served as its president in 1902 and 1905. Under his leadership the municipal government was effectively reformed and democratized. In 1899 he was elected to the Bombay Legislative Council, in which he played a prominent role until his election to the Imperial Legislative Council in 1902.
- In 1912 Gokhale visited South Africa, where he met Mohandas Gandhi in connection with Gandhi's campaign for rights for Indians. Gokhale also met with Gen. Jan Smuts to assist in securing a satisfactory agreement regarding the position of Indians. His involvement in so wide a range of public and legislative bodies and his strenuous commitment to the advancement of education had, however, worn him out, and he died in Poona on Feb. 15, 1915.

#### **Jawaharlal Nehru 1889 – 1964**



- Born: November 14, 1889, Allahabad
- Died: May 27, 1964, New Delhi
- He was the first Prime Minister of Independent India and is known as the architect of Modern India.
- He was born in Allahabad on Nov 14, 1889.
- In 1928, he became the General Secretary of the INC and in 1929 its President. At the Lahore session, under his President ship was passed the Independence resolution.
- He was the Prime Minister of India from 1947 to 1964.

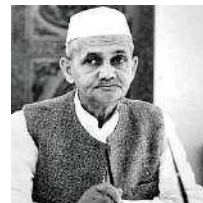
- He was the author of the Doctrine of Panchsheel, and believed in the policy of non – alignment.
- He was an author of international fame.
- His works include The Discovery of India, Glimpses of World Histoty, A Bunch of Old Letters, The Unity of India, Independence and After, India and the World, etc. His autobiography, entitled Autobiography, is one of his most famous works.

#### **Khan Abdul Ghaffar Khan 1890 – 1988**



- Born: February 6, 1890, Utmanzai, Charsadda, Pakistan
- Died: January 20, 1988, Peshawar, Pakistan
- Popularly known as Frontier Gandhi, Badshah Khan or Sarhadi Gandhi.
- Founded an organization Khudai Khidmatgars. It was an organization of non – violent revolutionaries which was also known as ‘Red Shirts’.
- He also published a newspaper, Pakhtoon.
- Ghaffar Khan vehemently opposed partition.
- He was awarded Bharat Ratna in 1987 by the Government of India.

#### **Lal Bahadur Shastri 1904 – 1966**



- Born : Lal Bahadur Shrivastava, 2 October 1904, Mughalsarai Varanasi, United Provinces, British Raj (now in Uttar Pradesh, India)

- Died : 11 January 1966 (aged 61), Tashkent, Uzbek SSR, Soviet Union (now in Uzbekistan)
- Shastri joined the Indian independence movement in the 1920s. Deeply impressed and influenced by Mahatma Gandhi, he became a loyal follower, first of Gandhi, and then of Jawaharlal Nehru.
- Following independence in 1947, he joined the latter's government and became one of Prime Minister Nehru's principal lieutenants, first as Railways Minister (1951–56), and then in a variety of other functions, including Home Minister.
- Lal Bahadur Shastri was the second Prime Minister of independent India in 1964.
- He coined a slogan 'Jai Jawan, Jai Kisaan' to bring unity within the country. He died on 10 January 1966 at Tashkent after he had signed the Joint Declaration with President Agha Khan of Pakistan.

#### **Lala Lajpat Rai 1865 – 1928**



- Born : 28 January 1865, Dhudike, Punjab, British India
- Died : 17 November 1928 (aged 63), Lahore, Punjab, British India
- He founded the Indian Home League Society of America; became Congress President in 1920.
- He was one of the foremost leaders who fought against British rule in India.
- He was popularly known as Punjab Kesari (Lion of the Punjab).
- Lalaji was arrested on May 3, 1907 for creating "turmoil" in Rawalpindi. He was put in Mandalay jail for six months and was released on November 11, 1907.

#### **Madan Mohan Malviya 1861 – 1946**



- Born : 25 December 1861, Allahabad, India
- Died : 12 November 1946 (aged 84), Varanasi
- He became the Indian National Congress President four times. He is remembered in the world as the founder of Asia's largest residential university at Varanasi, the Banaras Hindu University in 1916.
- The University has around 12,000 students all across the field such as the arts, sciences, engineering and technology. He was the Vice Chancellor of BHU from 1919 to 1938.
- He was also the founders of Scouting in India as well as a highly influential English newspaper, "The Leader" which was published from Allahabad in 1909.
- Malaviya was a delegate at the First Round Table Conference in 1930. He was also the Chairman of Hindustan Times from 1924 to 1946. He died in 1946.
- A freedom fighter and educationist, Pandit Madan Mohan Malviya, has been nominated to get awarded with the highest civilian award of the India, the Bharat Ratna. It has been announced by the Indian President, Pranab Mukherjee, on 24th of December 2014 to award Bharat Ratna to the Pandit Madan Mohan Malviya.

### Mahtma Gandhi 1869 – 1948



- Born : Mohandas Karamchand Gandhi, 2 October 1869, Porbandar, Kathiawar Agency, British India
- Died : 30 January 1948 (aged 78), New Delhi, Delhi, India
- The honorific Mahatma (Sanskrit: "high-souled", "venerable") - applied to him first in 1914 in South Africa, is now used worldwide. He is also called Bapu (Gujarati: endearment for father) in India.
- Born and raised in a Hindu merchant caste family in coastal Gujarat, western India, and trained in law at the Inner Temple, London, Gandhi first employed nonviolent civil disobedience as an expatriate lawyer in South Africa, in the resident Indian community's struggle for civil rights.
- After his return to India in 1915, he set about organising peasants, farmers, and urban labourers to protest against excessive land-tax and discrimination.
- Assuming leadership of the Indian National Congress in 1921, Gandhi led nationwide campaigns for easing poverty, expanding women's rights, building religious and ethnic amity, ending untouchability, but above all for achieving Swaraj or self-rule.
- Gandhi famously led Indians in challenging the British-imposed salt tax with the 400 km (250 mi) Dandi Salt March in 1930, and later in calling for the British to Quit India in 1942.
- Gandhi's vision of a free India based on religious pluralism, however, was challenged in the early 1940s by a new Muslim nationalism which was demanding a separate Muslim homeland carved out of India.
- Eventually, in August 1947, Britain granted independence, but the British Indian Empire was partitioned into two

dominions, a Hindu-majority India and Muslim Pakistan.

- On 12 January 1948 at age 78, also had the indirect goal of pressuring India to pay out some cash assets owed to Pakistan.
- Nathuram Godse, a Hindu nationalist, assassinated Gandhi on 30 January 1948 by firing three bullets into his chest at point-blank range.
- Indians widely describe Gandhi as the father of the nation. His birthday, 2 October, is commemorated as Gandhi Jayanti, a national holiday, and world-wide as the International Day of Nonviolence.

### Mangal Pandey 1827 – 1857



- Born : 19 July 1827, Nagwa, Ballia district, Uttar Pradesh, India
- Died : 8 April 1857 (aged 29), Barrackpore, Calcutta, West Bengal, India
- He sparked off the First War of Indian Independence or as the British termed it, the Sepoy Mutiny of 1857.
- He was the first freedom fighter and martyr of 1857. He revolted against the British atrocities against Indians in the British Army.
- At Barrackpore near Kolkata on 29 March 1857, Pandey attacked and injured his British sergeant, besides wounding an adjutant. A native soldier prevented him from killing the adjutant and the sergeant-major. He was arrested and sentenced to death. He was hanged on 8 April 1857.

### Maulana Abul Kalam Azad 1888 – 1958



- Born: November 11, 1888, Mecca, Saudi Arabia
- Died: February 22, 1958, Delhi
- He was born in Mecca in 1889. For higher education he went to the Al Azhar University at Cairo.
- He joined the INC during the Swadeshi movement.
- He began two weeklies, Al Hilal and Al – Balagh.
- He was made the President of the Khilafat Committee in 1920. He became the President of the Congress session of 1923 at Delhi.
- He led the Congress delegation during the Shimla Conference in 1945. He also led the delegation during the Cabinet Mission Plan.
- He was elected the member of the Constituent Assembly in 1946. He was the Education Minister in the Interim Government and also Independent India's first Education Minister.
- He was also instrumental in the foundation of U.G.C. and IIT – Kharagpur.
- His book India Wins Freedom evoked much controversy.

### Rabindranath Tagore 1861 – 1941



- Born : 7 May 1861, Calcutta, Bengal Presidency, British India
- Died : 7 August 1941 (aged 80), Calcutta

- He was a leader of the Brahmo Samaj, which was a new religious sect in nineteenth-century Bengal and which attempted a revival of the ultimate monistic basis of Hinduism as laid down in the Upanishads.
- Tagore was knighted by the ruling British Government in 1915, but within a few years he resigned the honour as a protest against British policies in India.
- At age of 16, he released his first substantial poems under the pseudonym Bhānusimha ("Sun Lion"), which were seized upon by literary authorities as long-lost classics.
- He composed the music and lyrics for India's national anthem "Jana-Gana-Mana" (Thou Art the Ruler of All Minds) and when Bangladesh became independent in 1971 they chose Tagore's song "Amar Sonar Bangla" (My Golden Bengal) as its national anthem.
- The original song of Sri Lanka's National Anthem was also written and tuned by Tagore.
- He was Asia's first Nobel Prize winner. He was awarded the Nobel Prize for literature in 1913 for his book Gitanjali.

### Rajendra Prasad 1884 – 1963



- Born : 3 December 1884, Ziradei, Bengal Presidency, British India (now in Bihar)
- Died : 28 February 1963 (aged 78), Patna, Bihar, India
- He was the **first President of free India** in 1950.
- He was actively involved in the Non Cooperation movement, Salt Satyagraha and Champaran Agrarian Agitation.
- He was elected as the **President of Indian National Congress** in 1934.

- He was honoured with the **Bharat Ratna Award** in 1954.

#### **Sardar Vallabhbhai Patel** 1875 – 1950



- Born : Vallabhai Jhaverbhai Patel, 31 October 1875, Nadiad, Gujarat, Bombay Presidency, British India
- Died : 15 December 1950 (aged 75), Bombay, Bombay State, India
- He is popularly known as a **‘Man of Steel’**.
- Inspired by the work and philosophy of Mahatma Gandhi, he joined India's struggle for independence.
- He was also involved in Salt Satyagraha in Nagpur and Quit India Movement in 1942.
- He was elected as the **President of Indian National Congress** in 1931.
- After India's independence, he became the **first Home Minister** and **Deputy Prime Minister** of India.

#### **Sarojini Naidu** 1879 – 1949



- Born : Sarojini Chattopadhyay, 13 February 1879, Hyderabad, Hyderabad State, British India, (now in Telangana, India)
- Died : 2 March 1949 (aged 70), Lucknow, United Provinces, India (now in Uttar Pradesh, India)
- She was known as Nightingale of India.

- The play "Maher Muneer", written by Naidu at an early age, fetched a scholarship to study abroad.
- In 1905, a collection of poems, she had composed, was published under the title of "Golden Threshold".
- Sarojini Naidu joined the Indian national movement in the wake of partition of Bengal in 1905. She came into contact with Gopal Krishna Gokhale, Rabindranath Tagore, Muhammad Ali Jinnah, Annie Besant, C.P. Rama Swami Iyer, Gandhiji and Jawaharlal Nehru. She awakened the women of India.
- In 1925, she presided over the annual session of Indian National Congress and later participated in the Civil Disobedience Movement.
- In 1942, Sarojini Naidu was arrested during the "Quit India" movement and was jailed for 21 months with Gandhiji.
- She was the first Indian woman to become the President of Indian National Congress was also the first Indian woman to become the Governor of the state, Uttar Pradesh.

#### **Subhash Chandra Bose** 1897 – 1945



- Born: January 23, 1897, Cuttack
- Died: August 18, 1945, Taihoku Prefecture
- Popularly known as Netaji, was born on Jan 23, 1897 at Cuttack.
- He passed the Indian Civil Services Examination in 1920, but left it on the Gandhiji's call of Non – Cooperation Movement.
- He founded the Independence for India League with Jawahar Lai Nehru.

- In 1938, he was elected the President of the INC at its Ilaripura session and in 1939, he was elected President of its Tripuri session. But he had to resign from Tripuri due to differences with Gandhiji.
- He founded the Forward Block in 1939.
- In 1941, he escaped to Berlin and met Hitler. In 1943, he took charge of Indian National Army in Singapore and set up the Indian Provisional Government there. He gave the war cry of 'Dilli Chalo'.
- He addressed Mahatma Gandhi as the Father of the Nation; He gave the slogan of 'Jai Hind'. He wrote his autobiography 'The Indian Struggle'.
- He supposedly died in a plane crash on Aug 18, 1945.

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SUBHENDU





## ART & CULTURE OF INDIA

### RELIGION IN INDIA



- India is a land of diversities. This diversity is also visible in the spheres of religion.
- The spiritual land of India has given birth to many religions such as Hinduism, Sikhism, Jainism and Buddhism. These religions together form a subgroup and are known as Eastern religions.
- The major religions of India are **Hinduism** (majority religion), **Islam**, **Sikhism**, **Christianity**, **Buddhism**, **Jainism**, **Zoroastrianism** and **Judaism**.

#### Distribution of Population by Religion in India

Religion	Population 2011 in %
Hinduism	79.80
Islam	14.23
Christianity	2.30
Sikhism	1.72
Buddhism	0.70
Jainism	0.37
Others	0.66
Religion not specified	0.22

#### HINDUISM



- Followers are called as **Hindus**.
- Their place of worship is known as **Temple (Devasthanam or Mandir in Hindi)**
- It is the **world's third largest** religion by population, and the majority religion in **India**.
- It has been called the **oldest religion** in the world, and some practitioners refer to it as **Sanatana Dharma**, "**the eternal law**" or the "**eternal way**" beyond human origins.
- This "**Hindu synthesis**" started to develop between 500 BCE and 300 CE, after the Vedic times.
- Hindu texts are classified into **Sruti** ("revealed") and **Smriti** ("remembered").
- **Major scriptures** : Vedas, Upanishads (both Sruti), Mahabharata, Ramayana, Bhagavad Gita, Puranas, Manusmṛti, and Agamas (all Smriti).
- **Major Hindu festivals** : Diwali, Holi, Bihu, Ganesh Chaturthi, Durga Puja, etc.

## ISLAM



- Followers are called as **Muslims**.
- Their place of worship is known as **Mosque (Masjid)**
- Islam first came to the western coast of India with **Arab traders** as early as the **7th century AD** to coastal **Malabar** and the **Konkan-Gujarat**.
- It is the **second-largest** religion in India and also the second largest religion of World.
- Founder of Islam : **Prophet Muhammad**
- Holy book of Islam : **Quran**
- There are many denominations amongst Indian Muslims, the majority belong to the **Sunni** branch of Islam, while a substantial minority belong to the **Shia** branch.
- There are also small minorities of **Ahmadiyya** and **Quranists**.
- Many Indian Muslim communities, both **Sunni** and **Shia**, are also considered to be **Sufis**.
- Major Islamic festivals celebrated in India are **Eid-ul-Fitr**, **Eid-ul-Zuha**, **Muharram**, etc.

## CHRISTIANITY



- Followers are called as **Christians**.
- Their place of worship is known as **Church**.
- It is the world's **largest religion**.
- Founder of Christianity : **Jesus**
- Holy book of Christianity : **Bible**
- Most Christians are of two denominations: **Catholic** and **Protestant**.

- The **Old Testament** and **New Testament** is the major Holy text of Christianity.
- **Major festival of Christians** : Good Friday, All Souls Day, Easter, etc.

## SIKHISM



- Followers are called as **Sikhs**.
- Their place of worship is known as **Gurdwara**.
- It is the **fifth-largest** religion in the world.
- Founder of Sikhism : **Guru Nanak**
- Holy book of Sikhism : **Guru Granth Sahib**
- Major festivals : **Gurupurabs**, **Baisakhi**, **Nagar Kirtan**, **Hola Mohalla**, etc.

## BUDDHISM



- Followers are called as **Buddhists**.
- Founder of Buddhism : **Siddhartha Gautama Buddha**
- They believe in the concepts of Samsara, Karma and Rebirth, and practice the teachings of Buddha.
- Branches of Buddhism : **Theravada** ("The School of the Elders") and **Mahayana** ("The Great Vehicle")
- Holy book of Buddhism : **Tripitak**
- Major Festivals : Birthday of Buddha (also known as Vesak), Asalha Puja Day, Magha Puja Day and Loy Krathong, etc.

## JAINISM



- Followers are called as **Jains**.
- Founder of Buddhism : **Mahavira**
- Holy book of Jainism : **Kalp Sutras**
- Major sects : **Svetambara** and **Digambara**.
- It follows the principles of ahimsa (nonviolence), aparigraha (non-possessiveness) and anekantavad (non-absolutism).
- Major Festivals : Mahavira Jayanti, Paryushana Parva, Maun-agiyara, etc.

## Other Religions

- **Judaism and Zoroastrianism** are also practiced by minority population in the country. According to Judaism, there exists a covenant relationship between God and Jewish people. One of the minority groups in the country, Zoroastrianism considers that humans are the helpers of God. The people who follow Zoroastrianism are known as Parsis and those who follow Judaism are called Jews.
- Although, different religions are practiced in India, the secular and sovereign nature of the country remains intact. In fact, all religions collectively play an important role in maintaining the harmony, culture, history and peace in the country.

## INDIAN LITERATURE AND LANGUAGE

### SANSKRIT

- It is considered as the mother of all languages. It belongs to the Indic group of language family of Indo-European and its descendents which are Indo-Iranian & Indo Aryan.
- This is the only language that is used in holy functions and ceremonies of Hindus, as it has always been regarded as the sacred language of the religion.
- Sanskrit mantras, when recited in combination with the sound vibration, have a specific effect on the mind and the psyche of the individual.
- The oldest known texts in Sanskrit are the Rigveda, Sama-veda, Yajur-veda and the Atharva-veda. Upanishads, Puranas and Dharmasutras are all written in Sanskrit.
- **Famous books in Sanskrit** : Dharmasutras, the Manusmriti, Arthashastra and Gita Govinda.

- **Famous writers in Sanskrit** : Panini, Kautilya, Kalhan, Chanakya, Jayadeva, Manu.
- It was the period after which **Panini** composed his **grammar of Sanskrit**.
- The two great epics **Ramayana** and **Mahabharata** were written in ancient Sanskrit.

### PALI

- It is a Prakrit language native to the Indian subcontinent.
- The word Pali refers to "**line**" or "**canonical text**".
- It is widely studied because it is the language of many of the earliest extant literature of Buddhism as collected in the Pāli Canon or Tipiṭaka and is the sacred language of Buddhism.
- Its literature is mainly concerned with Theravada Buddhism.

## TELUGU

- It is a South-Central Dravidian language.
- It was heavily influenced by Sanskrit and Prakrit.
- It is the primary language in the states of Andhra Pradesh and Telangana.
- It is one of six languages designated a classical language of India by the Government of India.
- The Telugu Grammar is called **Vyakaranam**.
- The first treatise on Telugu grammar, the Andhra Sabda Chintamani, was written in Sanskrit by Nannayya, considered the first Telugu poet and translator, in the 11th century AD.
- **Tikkana** (13th century) and **Yerrapragada** (14th century) continued the translation of the Mahabharata started by Nannaya.
- **Ashtadiggajas** is the collective title given to the eight Telugu poets in the court of the emperor **Sri Krishna Deva Raya** who ruled the **Vijayanagara Empire** from 1509 until his death in 1529.
- **Tenali Ramakrishna**, who was known as **Vikatakavi** (jester poet), was a Telugu poet who hailed from the present-day Andhra Pradesh region, generally known for his wit and humour. He was one of the **Ashtadiggajas** or the eight poets at the court of Krishnadevaraya, the Vijayanagara emperor. He was the author of **Panduranga Mahatyam**, as one among the **Pancha Kavyas**, the five great books of Telugu Literature.

## KANNADA

- It is also known as **Canarese** or **Kanarese**.
- It is a South-Indian Dravidian language.
- It is also a classical language of India.
- It is one of the scheduled languages of India and the official and administrative language of the state of Karnataka.

- Kannada's history can be divided into three periods; Old Kannada (halegannada) from 450–1200 A.D., Middle Kannada (Nadugannada) from 1200–1700 A.D., and Modern Kannada from 1700 to the present.
- The oldest existing record of Kannada poetry in **Tripadi metre** is the **Kappe Arabhatta** record of AD 700.
- Three gems of Kannada literature : **Adikavi Pampa** (Father of Kannada), **Sri Ponna** and **Ranna**.
- **Pampa** wrote **Adipurana**.

## MALAYALAM

- It sometimes referred as Kairali.
- It is a language spoken in India, predominantly in the state of Kerala. It is also a classical language of India.
- The word Malayalam originated from the Tamil resp. Malayalam words **malai** or **mala**, meaning **hill**, and **elam**, meaning **region**. Malayalam thus translates as "hill region" and used to refer to the land itself (Chera Kingdom), and only later became the name of the language.
- The language Malayalam is alternatively called Alealum, Malayalani, Malayali, Malean, Maliyad, and Mallealle.
- The earliest known extant literary work in Malayalam is **Ramacharitam**, an epic poem written in the late 13th or early 13th century.
- In the subsequent centuries, besides a popular **pattu** ("song") literature, the manipravalam poetry also flourished.
- **Manipravalam** (translates "ruby coral") style mainly consisted of poetry in an admixture of Malayalam and Sanskrit.
- **Cherusseri** introduced poems on devotional themes.
- **Thunchath Ezhuthachan**, a strong proponent of Bhakti movement, is known as the father of Malayalam. His poems are classified under the genre of **kilippattu**.

- The earliest written record of Malayalam is the vazhappalli inscription (830 AD).
- The earliest extant prose work in the language is a commentary in simple Malayalam, *Bhashakautaliyam* (12th century) on **Chanakya's Arthasastra**.

## TAMIL

- It belongs to the southern branch of the Dravidian languages. It is also a classical language of India.
- It is the official and administrative language of the State of Tamilnadu and the Union territory of Puduchery.
- The earliest known Tamil inscriptions date back to at least 500 BC and the oldest literary text in Tamil, *Tolkappiyam*, was composed around 200 BC.
- The earliest Tamil literature goes back to the Sangam period perhaps from 600 BC-200 AD.
- **Tolkappiyam** is a work on the grammar of the Tamil language and the earliest extant work of Tamil literature. It is written in the form of **noorpa** (short formulaic compositions).
- A collection of lyrics, known as **Ettuthokai** or **Eight Anthologies**, and another one of longer poems, known as **Pattu Pattu** or **Ten Idylls** are the main literatures of the third Sangam.
- The Tamil Lexicon of University of Madras defines the word 'Tamil' as 'sweetness'. S.V Subramanian suggests the meaning 'sweet sound' from 'tam'- sweet and 'il'- 'sound'.
- **Subramanya Bharati** (1882-1921 AD), one of the greatest of Tamil litterateurs of the modern times. *Panchali Sabadam*, an epic poem based on the Mahabharata, *Kalippattu*, *Kannanpattu* and *Kuyilpattu* are his great works.

## URDU

- Urdu is historically associated with the Muslims of the region of Hindustan.

- It evolved from the medieval (6th to 13th century) **Apabhramsa**.
- Urdu has a few recognised dialects, including Dakhni, Rekhta, and Modern Vernacular Urdu (based on the Khariboli dialect of the Delhi region). Dakhni (also known as Dakani, Deccani, Desia, Mirgan) is spoken in Deccan region of southern India.
- Urdu is written right-to left in an extension of the Persian alphabet, which is itself an extension of the Arabic alphabet.
- Urdu holds the largest collection of works on **Islamic literature** and **Sharia**. These include translations and interpretation of the **Qur'an**.
- The **afsāna** or short story is probably the best-known genre of Urdu fiction. The best-known **afsāna** writers, or **afsāna nigār**, in Urdu are Munshi Premchand, Saadat Hasan Manto, Rajinder Singh Bedi, Krishan Chander, Qurratulain Hyder (Qurat-ul-Ain Haider), Ismat Chughtai, Ghulam Abbas, and Ahmad Nadeem Qasimi.
- **Amir Khosrow** (1253–1325) was the major poet of Urdu, who composed **dohas** (couplets), folksongs, and riddles in the newly formed speech, then called **Hindvi**.
- **Faiz Ahmad Faiz** is the poet of modern era.

## HINDI

- It is an Indo-Aryan language and has been strongly influenced by Sanskrit.
- It is the fourth-most natively spoken language in the world, after Mandarin, Spanish and English.
- It was originally written with the Brahmi script, but since the 11th century AD, it has been written with the Devanagari alphabet, which is common to several other Indian languages as well.
- The first printed book in Hindi was John Gilchrist's *Grammar of the Hindoostanee Language*.

- **Prominent Figures of Hindi literature :** Chand Bardai, Sheikh Farid, Amir Khusro, Vidyapati, Kabir, Surdas, Nanak, Malik Muhammad Jayasi, Mirabai, Goswami Tulasidas, Keshavdas, Bihari, Guru Gobind Singh, Bharatendu Harishchandra, Ganga Das, Munshi Premchand, Yashpal, Jainendra Kumar, Ramdhari Singh Dinkar, etc.

Hindi literature is divided into four stages. These are

1. Adi kal or Vir-Gathas (poems extolling brave warriors) – 11th–14th century
2. Bhakti kal or Bhakti era poems (devotional poems) – 14th–18th century
3. Riti-kavya kal or Srngar poems (poems of romance) – 18th–20th century
4. Adhunik kal or Adhunik literature (modern literature) – 20th century onwards

Modern Hindi literature has been divided into four phases

1. The age of Bharatendu or the Renaissance (1868-1893)
2. Dwivedi Yug (1893-1918)
3. Chhayavada Yug (1918-1937)
4. Contemporary Period (1937 onwards)

*Bharatendu Harishchandra (1849-1882) is the 'Father of Modern Hindi Literature'.*

## ODIA

- It is an Indo-Aryan language that is mostly spoken in eastern India. It is also a classical language of India.
- The oldest evidence for Odia dates back to the 3rd century BCE.
- Odia, Bengali and Assamese are considered to be sister languages.
- Mughalbandi Odia is considered proper or Standard Odia due to literary traditions.
- In the 14th century, the poet Sarala Dasa wrote the Sarala Mahabharata, Chandi Purana, and Vilanka Ramayana, in praise

of the goddess Durga. Sarala Dasa is known as **Vyasa of Odisha**.

- The Pancha Sakha - five poets, Balarama, Jagannatha, Anant, Yosowant and Achyutanand - of the fifteenth century rendered the Sanskrit classics into simple Odia.
- Rama-bibaha, written by Arjuna Dasa, was the first long poem written in the Odia language.
- The earliest literature in Oriya language can be traced to the Charyapadas composed in the 7th to 9th centuries.
- Eminent Odia poets include Kabi Samrat Upendra Bhanja and Kabisurya Baladev Ratha.
- Three great poets and prose writers are Kabibar Radhanath Ray (father of modern Odia poetry) (1849–1908), Fakir Mohan Senapati (1843–1918) and Madhusudan Rao (1853–1912).
- **Haldhar Nag** is known as Lok kabi Ratna, was awarded Padma Shri in 2016.

## BENGALI

- Bengali Language or Bangla is an Indo-Aryan language spoken mostly in the East Indian subcontinent.
- It has evolved from the Magadhi Prakrit and Sanskrit languages and is the second most spoken language in India.
- The first works in Bengali known as the **Charyapada**, appeared between 10th and 12th centuries. Haraprasad Shastri (Bengali linguist) discovered the palm leaf Charyapada manuscript in the Nepal Royal Court Library in 1907.
- The evolution of Bengali Literature started in the later half of the 19th century. The first truly romantic Bengali novel is Bankim Chandra's Durgeshnandini (1865), while the first Bengali novel of social realism is Peary Chand Mitra's Alaler Gharer Dulal (1858).
- **Bankim Chandra Chatterjee** wrote "Vande Mataram", the national song of

India, which appears in his novel *Anandamath* (1882).

- **Rabindra Nath Tagore** won Nobel Prize for **Geetanjali** in 1913.
- The post Tagore age had very few writers of his calibre, some of whom were Sarat Chandra Chatterjee (1876-1938), Prabhakumar Mukherjee (1873-1932) and Abanindranath Tagore (1871-1951).

### ASSAMESE

- It is an Eastern Indo-Aryan language used mainly in the state of Assam.
- The earliest text found in **Prahlada Charitra** of the late 13th-century poet **Hema Saraswati**.
- Madhava Kandali who belonged to the 14th century and he wrote the famous epic *Ramayana* in the native language and wrote **Devajit**, a narrative on Krishna.
- The following generations saw a number of excellent novelists, writers and poets like Rajanikanta Bardaloi (1867- 1939), Chandra Kumar Agarwala (1867-1938), Padmanath Gohain Baruwa (1871-1946), Hiteshwar Bezbarua (1871- 1931), Benudhar Raj Khowa (1872-1935) and many more.
- The most famous Assamese poet of bhakti movement period was **Shankaradeva** (1449–1568),
- The first plays in the Assamese language : Hemchandra Barua's **Kaniyar Kirtan** (1861; "The Revels of an Opium Eater")

### PUNJABI

- It is an Indo-Aryan language. It is the native language of Punjab and is the 10th most spoken language in the world.
- It is a successor of the chief language of medieval northern India called Sauraseni Prakrit.
- It is written in two different scripts, called **Gurmukhi** and **Shahmukhi**. Punjabi speaking Muslims use Shahmukhi (Perso-Arabic script written from right to left).

Punjabi speaking Sikhs write Punjabi in the Gurmukhi script, which was developed by Guru Andgad dev.

- *Adi Grantha* or *Guru Granth Sahib* composed by Guru Arjun Dev is one of the earliest texts in Punjabi written in the Gurmukhi script.
- The **Janamsakhis**, stories on the life and legend of **Guru Nanak** (1469–1539), are early examples of Punjabi prose literature.
- Baba Bulleh Shah was the most famous Punjabi Sufi poet who put Saraiki language culture into the Punjabi Language.
- The *Qissa of Heer Ranjha* by Waris Shah (1706–1798) is the most popular of Punjabi qissa.
- Modern Punjabi literature commences with the works of Bhai Vir Singh and Padmabhushana (1872–1957).

### MARATHI

- It is an Indo-Aryan language spoken predominantly by Marathi people of Maharashtra.
- Written Marathi first appeared during the 11th century in the form of inscriptions on stones and copper plates. The Marathi version of the Devanagari alphabet, called **Balbodh**, is similar to the Hindi Devanagari alphabet.
- The first modern book exclusively concerning Marathi Grammar was printed in 1805 by William Carey.
- The early Marathi literature written during the Yadava (850-1312 CE).
- The earliest known Marathi inscription found at the foot of the statue at Shrvanabelgola in Karnataka is dated c.a. 983.
- Marathi literature started with the religious writings by the saint-poets belonging to Mahanubhava and Warkari sects during the Yadadva reign.



- Bhaskarbhatta Borikar of the Mahanubhava sect is the first known poet to have composed hymns in Marathi.
- The oldest book in prose form in Marathi, Vivekasindhu, was written by Mukundaraj.
- Sant Dnyaneshwar (1275–1296) wrote Bhavarthadeepika, popularly known as Dnyaneshwari (1290), and Amritanubhava.
- In the 18th century, some well-known works such as Yatharthadeepika by Vaman Pandit, Naladamayanti Swayamvara by Raghunath Pandit, Pandava Pratap, Harivijay, Ramvijay by Shridhar Pandit and Mahabharata by Moropanta were produced.
- Krishnadayarnava and Sridhar were poets during the Peshwa period.
- Baburao Bagul (1930–2008) was a pioneer of Dalit writings in Marathi.

## GUJARATI

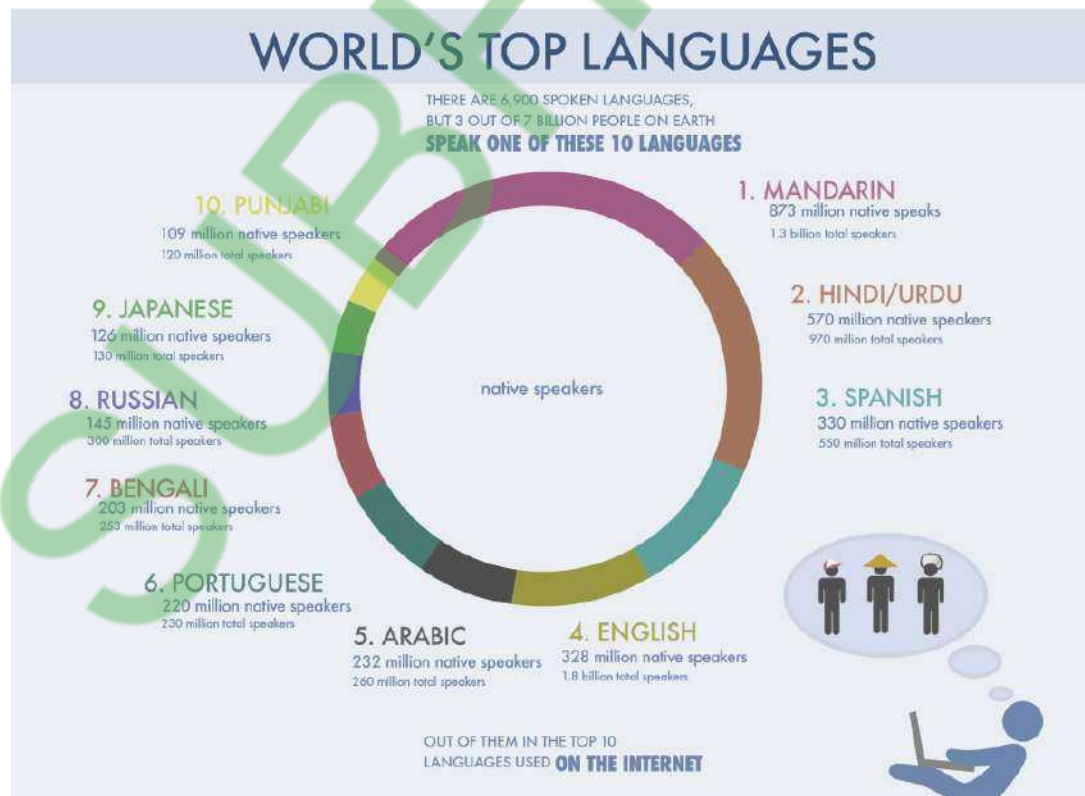
- It is an Indo-Aryan language native to the Indian state of Gujarat.
- The oldest examples of Gujarati literature date from the writings of the 12th-century Jain scholar and saint Hemachandra.
- Two Gujarati bhakti (devotional) poets, both belonging to the 15th century, are Narasimha Mahata (or Mehta) and Bhalana (or Purushottama Maharaja). The latter cast the 10th book of the Bhagavata-purana into short lyrics.
- The most famous of the bhakti poets is a woman, the saint Mira Bai, who lived during the first half of the 16th century.
- One of the best known of the non-bhakti Gujarati poets is Premananda Bhatta (16th century), who wrote Akhyan.
- He also was Mannbhaat, a poet who sang to the accompaniment of music created by Copper pot struck with ringed fingers.
- In 19th Century, it was Narmad, the Poet (1833-86) who pioneered prose and poetry through his work on social revolution.

## INDIAN LITERATURE IN ENGLISH LANGUAGE

- First English Newspaper published in India : **Hickey's Bengal Gazette** (in 1779)
- First book written by an Indian in English : **Travels of Dean Mahomet; Mahomet's travel narrative** by **Sake Dean Mahomet** (in 1793 in England)
- First Indian novel written in English : **Rajmohan's Wife** by **Bankim Chandra Chattopadhyay** in 1864
- First Indian author to win a literary award in the United States : **Dhan Gopal Mukerji**
- **Rabindranath Tagore** (1861–1941) wrote in Bengali and English and was responsible for the translations of his own work into English.
- **R. K. Narayan** (1906 –2001), was an Indian writer, best known for his works set in the fictional South Indian town of **Malgudi**.
- Early notable poets in English : Derozio, Michael Madhusudan Dutt, Toru Dutt, Romesh Chunder Dutt, Sri Aurobindo, Sarojini Naidu, & Harindranath Chattopadhyay.
- **Notable 20th Century authors of English poetry in India** : *Dilip Chitre, Kamala Das, Eunice De Souza, Nissim Ezekiel, Kersy Katrak, Arun Kolatkar, P. Lal, Jayanta Mahapatra, Dom Moraes, Gieve Patel, and A. K. Ramanujan.*  
*The younger generation of poets writing in English include Smita Agarwal, Makarand Paranjape, Arundhati Subramaniam, Eunice de Souza, Anuradha Bhattacharyya, Ranjit Hoskote, Sudeep Sen, Jeet Thayil, Abhay K, Mani Rao, Arnab Jan Deka, Jerry Pinto, Meena Kandasamy, Gopi Kottoor, Dr Tapan Kumar Pradhan, Rukmini Bhaya Nair, Robin Ngangom, Anju Makhija, Bhaskaranand Jha Bhaskar Vivekanand Jha, Bibhu Padhi, Vihang A. Naik, Jaydeep Sarangi K Srilata, Ananya S Guha, Nabina Das, Uddipana Goswami, Nitoo Das among others.*
- **Notable Indian writers in english language:** *Khushwant Singh, Kiran Desai, Jhumpa Lahiri, Agha Shahid Ali, Rohinton Mistry, Salman Rushdie, Vikram Seth etc.*

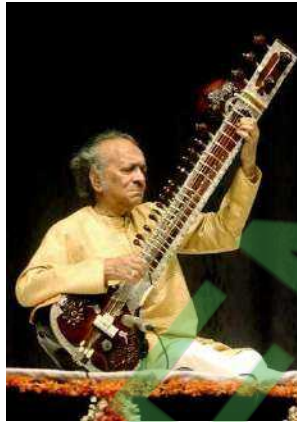
## PRINCIPAL LANGUAGES OF INDIA

Language	Family	State(s)
Assamese	Indo-Aryan, Eastern	Assam, Arunachal Pradesh
Bengali	Indo-Aryan, Eastern	West Bengal, Tripura, Assam, Andaman & Nicobar Islands
Bodo	Tibeto-Burman	Assam
Dogri	Indo-Aryan, Northwestern	Jammu and Kashmir
Gujarati	Indo-Aryan, Western	Dadra and Nagar Haveli, Daman and Diu, Gujarat
Hindi	Indo-Aryan, Central	Andaman and Nicobar Islands, Bihar, Chandigarh, Chhattisgarh, the National capital territory of Delhi, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh and Uttarakhand
Kannada	Dravidian	Karnataka
Kashmiri	Indo-Aryan, Dardic	Jammu and Kashmir
Konkani	Indo-Aryan, Southern	Goa, Karnataka, Maharashtra, Kerala
Maithili	Indo-Aryan, Eastern	Bihar
Malayalam	Dravidian	Kerala, Lakshadweep, Puducherry
Manipuri	Tibeto-Burman	Manipur
Marathi	Indo-Aryan, Southern	Maharashtra, Goa, Dadra & Nagar Haveli, Daman and Diu
Nepali	Indo-Aryan, Northern	Sikkim, West Bengal
Odia	Indo-Aryan, Eastern	Odisha
Punjabi	Indo-Aryan, Northwestern	Chandigarh, Delhi, Haryana, Punjab
Sanskrit	Indo-Aryan	non-regional
Santhali	Munda	Santhal tribals of the Chota Nagpur Plateau (comprising the states of Bihar, Chattisgarh, Jharkhand, Odisha)
Sindhi	Indo-Aryan, Northwestern	non-regional
Tamil	Dravidian	Tamil Nadu, Andaman & Nicobar Islands, Puducherry
Telugu	Dravidian	Andhra Pradesh, Puducherry, Andaman & Nicobar Islands
Urdu	Indo-Aryan, Central	Jammu and Kashmir, Andhra Pradesh, Delhi, Bihar and Uttar Pradesh



## INDIAN MUSIC

- The origin of Indian music goes back to the **Vedas**.
- **Amir Khusro** has made immense contribution in literature and music and was associated with the royal empires of more than seven rulers of Delhi. He is regarded as the "**father of Qawwali**" (a devotional music form of the Sufis in the Indian subcontinent), and introduced the **ghazal** style of song into India.
- **Tansen** was one of the jewels of Akbar's court.
- Indian music is divided into three main categories. These are **Indian Classical music**, **Folk music** and **Modern music**.



*Indian Music legend Ravi Shankar*

### INDIAN CLASSICAL MUSIC

- The basic concepts of classical music includes shruti (microtones), swara (notes), alankar (ornamentations), raga (melodies improvised from basic grammars), and tala (rhythmic patterns used in percussion).
- Its tonal system divides the octave into 22 segments called shrutis, not all equal but each roughly equal to a quarter of a whole tone of Western music.
- It is broadly divided into two main stream, one is the **Carnatic music** which belonging to the **South Indian** traditions and another is the **North Indian** tradition known as **Hindustani music**.

### Carnatic music

- It is a system of music commonly associated with the southern part of the Indian subcontinent, with its area roughly confined to five modern states of India: Andhra Pradesh, Telangana, Karnataka, Kerala, and Tamil Nadu.
- The main emphasis in Carnatic music is on vocal music; most compositions are written to be sung, and even when played on instruments, they are meant to be performed in gayaki (singing) style.
- It is usually performed by a small ensemble of musicians, consisting of a principal performer (usually a vocalist), a melodic accompaniment (usually a violin), a rhythm accompaniment (usually a mridangam), and a tambura, which acts as a drone throughout the performance.
- The 8 basic notes are, in ascending tonal order are **Sa Ri Ga Ma Pa Dha Ni Sa**.

## Hindustani music

- It is the North Indian style of Indian classical music.
- It is a tradition that originated in Vedic ritual chants and has been evolving since the 12th century CE.
- It's main instruments are Tabla and sometimes use Sitar and modern guitars.
- The rhythmic organization is based on rhythmic patterns called tala.
- The melodic foundations are called **ragas**. One possible classification of ragas is into "melodic modes" or "parent scales", known as **thaats**, under which most ragas can be classified based on the notes they use.
- **Thaats** may consist of up to seven scale degrees, or **swara**.
- Hindustani musicians name these pitches using a system called **Sargam**.
- The 8 basic notes are, in ascending tonal order are Sa (Shadja), Re (Rishabh), Ga (Gandhar), Ma (Madhyam), Pa (Pancham), Dha (Dhaivat), Ni (Nishad), Sa (Shadja)
- The major vocal forms or styles associated with Hindustani classical music are dhrupad, khyal, and tarana. Other forms include dhamar, trivat, chaiti, kajari, tappa, tap-khyal, ashtapadis, thumri, dadra, ghazal and bhajan; these are folk or semi-classical or light classical styles, as they often do not adhere to the rigorous rules of classical music.

## Dhrupad

It is an old style of singing, traditionally performed by male singers. It is performed with a **tambura** and a **pakhawaj** as instrumental accompaniments.

## Khayal

It is a Hindustani form of vocal music based on Dhrupad. Literally meaning "thought" or "imagination".

## Tarana

It is a Hindustani classical vocal music in which certain words and syllables (e.g. "odani", "todani", "tadeem" and "yalali") based on Persian and Arabic phonemes are rendered at a medium (madhya) or fast (drut) pace (laya).

## Tappa

It originated from the folk songs of the camel riders of Punjab and was developed as a form of classical music. Tappas were sung mostly by songstresses, known as **Baigees**, in royal courts.

## Thumri

It is a common genre of semi-classical Indian music. It began in Uttar Pradesh with the court of Nawab Wajid Ali Shah (of nawab of Oudh). There are three types of thumri: poorab ang, Lucknavi and Punjabi thumri. The text is romantic or devotional in nature, and usually revolves around a girl's love for Krishna.

## Dadra

It is a light classical vocal form in Hindustani classical music, mostly performed in Agra and in Bundelkhand region. It consists of six beats in two equal divisions of three.

## Qawwali

It is a form of Sufi devotional music. Its root can be traced back to 8th century Persia (Iran and Afghanistan). Major languages used in qawwali are Urdu and Punjabi.

## Ghazal

It is a poetic form consisting of rhyming couplets and a refrain, with each line sharing the same meter. The ghazal spread into South Asia in the 12th century due to the influence of Sufi mystics and the courts of the new Islamic Sultanate.

### Hori

It is a genre of semi-classical singing, popular in Uttar Pradesh and Bihar. It is a form of seasonal songs.

### Bhajan

It is any type of Hindu devotional song. It has no fixed form: it may be as simple as a mantra or kirtan or as sophisticated as the dhrupad or kriti with music based on classical ragas and talas. Bhajans by Kabir, Mirabai, Surdas, Tulsidas and a few others are considered to be classic.

### Kirtana

It is call-and-response chanting performed in India's bhakti devotional traditions. It is sometimes accompanied by story-telling and

acting. Texts typically cover religious, mythological or social subjects. Kirtana as a form of worship was popularized by the 15th–16th-century Bengal mystic Chaitanya, who continually strove for more direct emotional experience of God.

### Gharanas

The word Gharana means "family". In relation to music, Gharana refers to a family of musicians, a school of music or a musical lineage connected with the name of a particular person or place. The characteristic feature of a Gharana is its special style of presentation. The concept of a Guru - Shishya leads to the development of Gharanas.

Gharana	Founder	Exponents
Agra	Ghaghe Khudabaksh	Faiyyaz Khan, Latafat Hussein Khan and Dinkar Kakini.
Benaras	Pt Gopal Mishra	Rajan Mishra, Sajan Mishra, Girija Devi
Bhendi Bazaar	Chhajju Khan, Nazeer Khan, Khadim Hussain Khan	Ustad Aman Ali Khan, Shashikala Koratkar and Anjanibai Malpekar.
Delhi	Qawwalis	Chand Khan, Nasir Ahmed Khan, Usman Khan, Iqbal Ahmed Khan and Krishna Bisht.
Gwalior	Nathan Pir Baksh, Nathu Khan	Bal Krishna Balchal Karanjikar, Vishnu Digambar Paluskar, Pandit Omkarnath Thakur, Veena Sahasrabuddhe and Malini Rajurkar
Indore	Amir Khan	Pandit Amarnath, Gokulotsavji Maharaj, Kankana Banerjee and others.
Jaipur-Atrauli	Alladiya Khan	Alladiya Khan, Mallikarjun Mansur, Kesarbhai Kerkar, Kishori Amonkar, Shruti Sadolikar, Padma Talwalkar and Ashwini Bhide Deshpande.
Kirana	Nayak Gopal	Hirabhai Barodekar, Begum Akhtar, Bhimsen Joshi, Gangubai Hangal and Prabha Atre.
Mewati	Ghagge Nazir Khan	Pandit Jasraj, Moti Ram, Mani Ram, Sanjeev Abhyankar
Patiala	Bade Fateh Ali Khan, Ali Baksh Khan	Bade Ghulam Ali Khan, Ajoy Chakravarti, Raza Ali Khan, Beghum Akhtar, Nirmala Deni, Naina Devi, Parveen Sultana and others.
Rampur-Sahaswan	Inayat Hussain Khan	Ghulam Mustafa Khan, Ustad Nissar Hussain Khan, Ustad Rashid Khan, Sulochana and Brihaspati.
Sham Chaurasia	Miyam Chand Khan, Miyam Suraj Khan	Salamat Ali, Nazakat Ali Khan and others.

## MAJOR MUSICAL INSTRUMENTS



TABLA



VEENA



SAROD



SHEHNAI



HARMONIUM



SANTOOR



SITAR



TANPURA

Percussion Instruments	
Dholak	It is a very popular folk drum of northern India, Pakistan and Bangladesh as well. It is barrel shaped, at times a cylindrical drum, with skins on both sides.
Dumroo	It is probably the oldest and traditional form of percussion instrument in India. It is the only remaining form of hour-glass drums which are seen in ancient Indian statues.
Ghatam	It replicates or conveys the meaning of the pot in Sanskrit. It is an ancient percussion instrument and ancient like other musical instruments mridangam, veena, etc.
Ghungroos	These are very famous Musical Instrument in India. These are usually the small brass bells. It is a musical accessory used by performers of all classical dances.
Kanjeera	It is a very old and traditional instrument which is very popular in South Indian classical performances. It is secondary percussion which is played as an accompaniment with the mridangam.
Kartal	It literally means rhythm of the hand which is made of wooden blocks with holes for the fingers and circular copper plates, pairs of Kartals are played with both hands.
Khol	It is usually used traditionally for accompanying Bhajans and Kirtans. Its high skin is relatively small with a diameter of about 9 - 10 cm, which gives it a particularly high, piercing sound.
Manjeera	It is basically a set of small cymbals and is a ubiquitous component of dance, music and bhajans. It is a very ancient instrument seen on ancient temple walls. It is the most inexpensive and easy to play Instrument.
Mridangam	It is one of the most popular classical instruments of South India. It accompanies vocal, instrumental and dance performances.
Pakhawaj	It is also called Mardal, Pakhawaj, Pakuj, Pakhvaj, Pakavaj or Mardala, as it is a barrel-shaped, two-headed drum.
Tabla	It is the most popular pair of drums in the Indian Sub- continent. It is a pair of drums which consists of a small right hand drum called Dayan and a larger metal one called bayan.
Wind Instruments	
Bansuri	It is basically a folk instrument, invariably linked to the lives and playfulnesses of Krishna. However, it was during the Bhakti movement that Bansuri raised to prominence.
Harmonium	It usually belongs to the family of free-reed aerophones. The instrument is a small, tabletop size organ which has bellows at the back that is pumped by one hand while the other hand plays the keyboard.
Shehnai	The wind instrument is believed to have been introduced in India by the Muslims. It is the predominant double-reed wind instrument used in North Indian music.
String Instruments	
Sarangi	It has a hollow body and made of teak wood adorned with ivory inlays. It consists of forty strings of which thirty seven are sympathetic.
Sarod	It is a popular Indian classical musical instrument which is similar to the Western lute in structure.
Sitar	It is one of the most popular Indian classical instruments and it comes under the category of a chordophone in the lute family. It has neck crafted from toon or teakwood and a resonator carved from a large seasoned gourd.
Tanpura	It in India is a drone instrument that accompanies Dhrupad singing and is the most fundamental of all instruments of Indian Classical Music.
Veena	It is the traditional instrument of India is also known as Saraswati Veena which is a musical instrument of South India. It is a classical instrument basically plucked stringed instrument that is used to accompany Carnatic music.

## FAMOUS MUSICAL INSTRUMENTS AND THEIR EXPONENTS of INDIA

Instruments	Exponents
Flute	Pandit Hari Prasad Chaurasia, Raghunath Seth, Pannalal Ghosh, B. Kunjamani, N. Neela, Rajendra Prasanna, Rajendra Kulkarni, Prakash Saxenam, Mohini Mohan Patnaik etc.
Ghatam	T.H. Vinayakaram
Guitar	Vishwamohan Bhatt, Jatin Mazumdar, Brij Bhushan Kabra, Sri Krishna Nalin, Keshav Jalegaonkar etc.
Harmonium	Jnan Prakash Ghosh, Shri Purushottam Walawalkar, Appa Jalgaonkar etc.
Israj	Alauddin Khan
Jal Tarang	Himanshu Biswas, Jagdish Mohan, Ghasiram Nirmal, Ram Swaroop Prabhakar etc.
Mandolin	U. Srinivas, Khagen Dey, Nagen Dey etc.
Mohan Veena	Pt. Vishwa Mohan Bhatt
Mridang	Thakur Bhikam Singh, Palghat Raju, Dr. Jagdish Singh, T.K. Moorthy, U.K. Sivaram, K.R. Mani etc.
Nadaswaram	Sheikh Chinna Maulana, Rajaratna Pillai, Niru Swami Pillai, N. Krishna etc.
Pakhawaj	Ustad Rehman Khan, Gopal Das, Chhatrapati Singh, Ramakant Pathak, Arun Saiwal etc.
Piano	V. Balsara
Rudra Veena	Ustad Sadiq Ali Khan, Zia Moinuddin Dagar Asad Ali Khan etc.
Santoor	Pt. Shiv Kumar Sharma, Tarun Bhattacharya, Bhajan Sopori etc.
Sarangi	Ustad Bendu Khan, Pt. RAMnarayanji, Aruna Kale, Santosh Mishra, Indralal, Ashiq Ali Khan etc.
Sarod	Ustad Amjad Ali Khan, Ustad Ali Akbar Khan, Ustad Aluddin Khan, Hafiz Khan, Zarin Daruwala, Mukesh Sharma, Chandan Rai, Biswajit Roy Chaudhury, Sharan Rani etc.
Shehnai	Ustad Bishmillah Khan, Daya Shankar, Jagannath, Hari Singh, Shailesh Bhagwat, Ali Ahmed, Hussain Khan etc.
Simphoni	Zubin Mehta
Sitar	Pt. Ravi Shankar, Nikhil Banerjee, Ustad Vilayat Khan, Shujaat Khan, Jaya Biswas, Debu Choudhary, Nishaat Khan, Bande Hasan, Shahid Parvej, Uma Shankar Mishra, Buddhaditya Mukherjee, Anushka Shankar etc.
Surbahar	Imrat Khan, Anapurna Devi etc.
Tabla	Ustad Shafat Ahmed Khan, Sapan Choudhry, Zakir Hussain, Latif Khan, Allah Rakha Khan, Gudai Maharaj, Kishan Maharaj, Payaz Khan, Sukhbinder Singh etc.
Veena	S. Balachandran, Badruddin Dagar, Kalyan Krishna Bhagavatar, B. Doraiswami Iyengar Gopal Krishna, Ashad Ali etc.
Vichitra Veena	Ahmed Raja khan, Abdul Aziz Khan etc.
Violin	Dr. N. Rajan, Vishnu Gobind (VG) Jog, Dr. L. Subramaniam, Sangitha Rajan, Kunakkadi Baidyanathan, Shishir Choudhry, Lagudi Jayaraman, R.P. Shastri, Suryadev Pawar, Govind Swami Pillai, T.N. Krishnan etc.

## INDIAN DANCE

India has thousands of year old tradition of fine arts and classical and folk music and dances. The Natya Shastra is the oldest surviving text on stagecraft in the world.



*Odissi Dance*

### INDIAN CLASSICAL DANCES

Indian classical dance is a blend of

NRITTA - the rhythmic elements

NRITYA - the combination of rhythm with expression and

NATYA - the dramatic element

### NATARAJA

Sanskrit: “Lord of Dance”, the Hindu god Siva (Shiva) in his form as the cosmic dancer, represented in metal or stone in most Saiva temples of South India. One of the most enduring symbols of India is the figure of NATARAJA - Shiva (The King of Dancers).

### CLASSICAL DANCE FORMS AND DANCERS OF INDIA

Dance form	State	Dancers
Bharatanatyam	Tamil Nadu	Bala Saraswati, CV Chnadrasekhar, Leela Samson, Rukmini Devi, Padma Subramanyam, Alarmel Valli, Yamini Krishnamurthy, Sanyukta Panigrahi, Sonal Mansingh, Anita Ratnam, Mallika Sarabhai, Mrinalini Sarabhai, Meenakshi Sundaram Pillai, etc.
Kathak	Uttar Pradesh	Pandit Birju Maharaj, Sitara Devi, Shovana Narayan, Malabika Mitra, Kumudini Lakhiya, Manisha Gulyani, Bharti Gupta, Damayanti Joshi, Durga Das, Gopi Krishna, Sambhu Maharaj, etc.
Kathakali	Kerala	Kalamandalam Gopi, Kottakkal Sivaraman, Mrinalini Sarabhai, Guru Shankaran, Shankar Kurup, Kalamandalam Kesavan Namboodiri, Kalamandalam Ramankutty Nair, Kalamandalam Vasu Pisharody, Kavungal Chathunni Panicker, Kalamandalam Krishna Prasad, etc.
Kuchipudi	Andhra Pradesh	Raja & Radha Reddy, Josyula Seetharamaiah, Vempathi Chinna Sathyam, Kaushalya Reddy, Yamini Reddy, Bhavana Reddy, etc.
Manipuri	Manipur	Guru Bipin Sinha, Jhaveri Sisters, Nayana Jhaveri, Nirmala Mehta, Savita Mehta, etc.
Mohiniyattam	Kerala	Protima Devi, Sanyukta Panigrahi, Sunanda Nair, Jayaprabha Menon, Pallavi Krishnan, Gopika Varma, Vijayalakshmi, Radha Dutta, Smitha Rajan's, Sonal Mansingh, Pankaj Charan Das, Kelucharan Mahapatra, Madhvi Mudgal, etc.
Odissi	Odisha	Kelucharan Mahapatra, Debaprasad Das, Dharendra Nath Pattnaik, Indrani Rahman, Priyambada Mohanty, Sonal Mansingh, Aadya Kaktikar, Aditi Bandyopadhyay, Anita Babu, Aruna Mohanty, etc.
Sattriya	Assam	Maniram Datta Moktar, Bapuram Bayan Attai, Indira P. P. Bora, Pradip Chaliha, Parmanand Borbayan, Ghanakanta Bora, Jatin Goswami, Ganakanta Dutta Borbayan, Manik Borbayan, etc.



## FOLK DANCES OF THE INDIAN STATES

States	The Folk Dances
Andhra Pradesh	Kuchhipudi (Classical), Ghantamardala, Kolattam/Kolanna Thedal, Mohiniattam, Kummi, Siddhi Madhuri, Chhadi
Arunachal Pradesh	Bardo Chham, Mask Dance (Mukhauta Nritya), War Dance
Asom	Bihu, Bichhua, Natpuja, Maharas, Kaligopal, Bagurumba, Ali Ai Ligang, Naga Dance, Khel Gopal, Tabal Bhongli, Canoe, Jhumura Habjanai
Bihar	Jata-Jatin, Bakho-Bakhain, Panwariya, Sama-Chakwa, Bidesia, Jatra
Chhatisgarh	Goudi, karma, Jhumar, Dagla, Pali, Tapali, Navrani, Diwari, Mundari
Goa	Mando, Jhagor, Khol, Dekhni, Talgadi, Goff, Dasarawadan etc.
Gujarat	Garba, Dandiya Ras, Tippani Dance, Juriun, Bhavai
Haryana	Jhumar, Phag Dance, Daph, Dhamal, Loor, Gugga, Khor, Gagor
Himachal Pradesh	Jhora, Jhali, Chharhi, Dhaman, Chhapeli, Mahasu, Nati, Dangi, Chamba, Thali, Jhainta, Daf, Stick Dance
Jammu & Kashmir	Dumhal, Rauf, Hikar, Mandjas, Kud Dandi Naach, Damali, Panthi
Jharkhand	Chhau, Sarahul, Jat-Jatin, Karma, Danga, Bidesia, Sohri
Karnataka	Yakshgana, Bayalata, Huttari, Suggi, Dollu Kunitha, Karga, Lambi
Kerala	Kathakali (Classical), Ottam Thulal, Mohini-attam, Kaikottikali, Tappatikali, Kali Auttam
Madhya Pradesh	Tertali, Charkula, Jawara, Matki Dance, Phulpati Dance, Grida Dance, Maanch, Gaur Maria Dance
Maharashtra	Lavani, Nakata, Koli, Lezim, Gafa, Dahikala Dasvtar or Bohada, Tamasha, Mauni, Powara, Gouricha, Koli
Manipur	Manipuri (Classical), Thang Ta, Rakhl, Nat Rash, Maharash, Raukhat, Dhol Cholom
Meghalaya	Laho, Baagla, Doregata, Shad Sukmysiem, Shad Nongkrem
Mizoram	Khanatam, Pakhupila, Cherokan
Nagaland	Chong Lo / Sua Lua, Khaiva, Lim, Nuralim
Odisha	Oddisi (Classical), Savari, Ghumara, Painka, Munari, Chhau, Chadya Dandanata, Goti Pua
Punjab	Bhangra, Giddha, Malwai Giddha, Jhumar, Karthi, Daff, Dhaman, Kikli,
Rajasthan	Ghoomar, Bhavai, Chakri, Ganagor, Jhulan Leela, Jhuma, Suisini, Ghapal, Panihari, Ginad
Sikkim	Chu Faat Dance, Singhi Chham, Yak Chaam, Khukuri Naach, Maruni Dance, Chutkey Naach
Tamil Nadu	Bharatnatyam, Kummi, Kolattam, Kavadi, Mayil Attam, Paampuattam, Oyilattam, Theru Koothu etc.
Tripura	Bizu, Cheraw, Garia, Hozagiri, Hai-Hak, Labang, Wangala, Way(Lamp) Festival Dance
Uttarakhand	Gadhwali, Kumayuni, Kajari, Jhora, Rasila, Chappeli
Uttar Pradesh	Nautanki, Raslila, Kajri, Jhora, Chappeli, Jinta
West Bengal	Kalikapatadi, Kathi, Gambhira, Dhali, Jatra, Baul, Marasia, Mahal, Keertan
Lakshadweep	Lava

## INDIAN ARCHITECTURE AND PAINTING

### INDIAN ARCHITECTURE

- The Indian Architecture is rooted in its history, culture and religion.
- Traditional **Vastu Shastra** remains influential in India's architecture during the contemporary era.
- *Char Dham (the four abodes) are the names of four pilgrimage sites in India that are widely revered by Hindus. It comprises **Badrinath, Dwarka, Puri** and **Rameswaram**.*



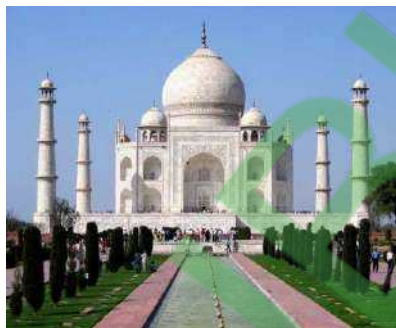
*Konark Sun Temple in Odisha*



*Akshardham temple in South Delhi*



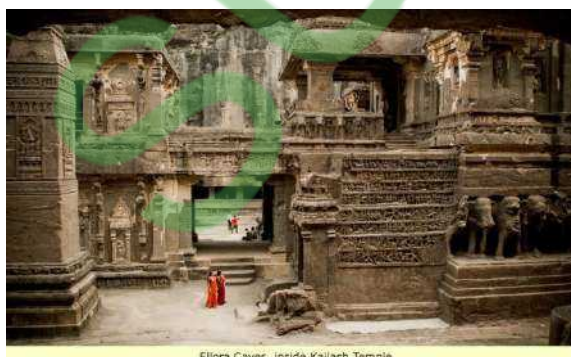
*Puri Jagannath temple in Odisha*



*Taj Mahal in Agra*



*Khajuraho Temple in Madhya Pradesh*



Ellora Caves, inside Kailash Temple



*Shringeri Temple in Karnataka*



*Madurai temple in Tamil Nadu*



*The Pratap Museum A Fantastic Ancient Red Stone Architecture*

### **Rajput Architecture**

- The Rathas of Mahabalipuram or Mamallapuram, the Kailash temple at Ellora and the sculpture of Elephanta belonging to the early Rajput period (600 AD to 900 AD).

- The temple architecture of Odisha, Khajuraho, Rajasthan, Madhya Pradesh and the Pallava, Chola and Hoysala temples in the South belong to the later Rajput period. (900 A.D. to 1200 A.D.).
- The foundation of Jaipur, the fabled "pink city", represents the final phase of Rajput architecture.
- The oldest Rajput palaces date from the mid-fifteenth century and are found at Chittor and Gwalior.
- The palaces of Jaisalmer, Bikaner, Jodhpur, Udaipur and Kota represent the maturity of the Rajput style.

### **Deccan Architecture**

- Indo Islamic architecture in Deccan flourished after the invasion of the Delhi sultanates in the medieval period and constitutes of the tombs of the Qutb Shahi Rulers of Golconda and the Charminar at Hyderabad among others.
- Some of the important styles evolved are those of Bengal, Gujarat, Malwa and the Deccan.
- The greatest monument of Dravidian architecture in the ancient period in Deccan is the Kailashanath temple at Ellora.
- The Gujarat style of architecture is considered the most beautiful of provincial styles. Some of the most beautiful of structures are the Rauza and Mosque of Rani Sipri; Sidi Sayyid's mosque and the Shaking towers, all in Ahmedabad.
- The Mosque and Rauda of Rani Sipri was built in 1514 A.D. by Rani Sa-brai during the reign of Sultan Muzaffar II.
- The mosque of Sidi Sayyid was built in 1572 A.D. by Shaik Said, a noble at the court of Sultan Muzaffar III.
- The Jami Masjid is a majestic building and is said to have been designed on the pattern of the great Mosque at Damascus. Started by Hoshang Shah, it was completed by Mahmud Khilji in 1454 A.D.

- Bahamani architecture is seen at its best in the monuments of Bijapur.
- The Kailashanath temple at Ellora is one of the most remarkable architecture of the Deccan in the ancient period.
- The monuments of Malwa also represent the architecture of the Deccan. In the medieval period these monuments were constructed under the Tughlaq, Lodhi dynasty and Khilji dynasty. The major architectures of this period are forts, Masjid and mausoleums.
- The Gol Gumbad, the mausoleum of Muhammad Adil Shah is an imposing structure. Enclosing one big hall, it has one of the largest domes in the world. It is 37 metres in diameter.
- The famous Charminar in Hyderabad is an impressive structure of four lofty minars in the heart of the city. It was built by Mohammad Quli Qutab Shah to celebrate his victory over an outbreak of plague in 1591. It is a square structure resembling a gateway. It is open on all four sides with lofty arches.
- Sher Shah's tomb at Sasaram in Bihar built in 1549 is in the centre of a large square tank and rises at 46 metres high.
- Humayun's tomb was built by his widow Haji Begum in 1565 A.D.
- A greater part of the fort at Agra was constructed by Akbar starting in 1565 AD and completed it in 1574 A.D. Situated on the bank of the river Jamuna, it is a massive and grand structure.
- Akbar's greatest architectural achievement was the construction of Fatehpur Sikri, his Capital City near Agra. The construction of the walled city was started in 1569 A.D. and completed in 1574 A.D.
- Shah Jahan started construction of the red sandstone **Red Fort** or **Lal Quila** in 1638 A.D. on the banks of the river Jumna.
- The **Taj Mahal** in Agra, a dream in white marble was built by Shah Jehan as a memorial to his beloved wife Mumtaz Begum. Built on the banks of the river Jumna, it was started in 1632 A.D. and took 22 years to complete. A Mosque on the west and a corresponding structure on the east in red sand-stone complete the effect of symmetry. Situated in a large enclosed rectangular garden with fountains, ornamental pools and water-courses, entrance to the Taj is by a majestic gateway.
- In 1579, Guru Ramdas, the fourth Guru of the Sikhs founded the city of Amritsar in the Punjab. He first constructed a pool and named it **Amrit Sar** or '**Pool of Nectar**' on a stretch of land gifted to him by Akbar.

### **Mughal Architecture**

- The Mughals constructed excellent mausoleums, mosques, forts, gardens and cities. The Mughal buildings show a uniform pattern both in structure and character.
- Sher Shah built the Purana Quila in Delhi. Started by him, it was completed by Humayun. Built of red and buff sandstone, it is ornamented with black and white marble and coloured tiles.

## INDIAN PAINTINGS

The tradition of painting has been carried on in the Indian subcontinent since the ancient times.



Standing as a testimony to this fact are the exquisite murals of Ajanta and Ellora, Buddhist palm leaf manuscripts, Mughal and Kangra schools of miniature Indian paintings, etc.

**Cave Paintings** of India date back to the prehistoric times. *e.g.* Paintings at Ajanta, Ellora, Bagh, Sittanavasal, etc.

**Patachitra** can be dated back to the 5th century BC. It is an art form developed lovingly by the locals of Raghurajpur, Puri, Sonapur, etc. 'Pata' indicates 'vastra' or clothing, and 'chitra' means painting. This special painting on cloth is a special art form of Odisha. Pattachitras were usually done by the **Chitrakars**.

**Bengal Pat** art form that developed in Bengal. Paintings are made with dyes made from spices, earth, soot, etc. and reflect the life and times of the society and folklore. The traditional colors used in Bengal Pat are red, indigo, green, black and ochre.

**Gond Art** is a form of tribal art developed by the Gonds of central India. This art has been inspired by the hills, streams and forests in which the Gonds live. Nature and social customs are depicted by the Gond artists with a series of dots and dashes intricately arranged into forms.

**Madhubani Paintings** originated in a small village, known as **Maithili**, of the Bihar state of India.

**Miniature Paintings** are handmade paintings, which are quite colorful but small in size. The highlight of these paintings is the intricate and delicate brushwork, which lends them a unique identity. The colors are handmade, from minerals, vegetables, precious stones, indigo, conch shells, pure gold and silver.

**Mughal painting** reflects a special amalgamation of Indian, Persian and Islamic art styles. As the name suggests, these paintings originated and developed at the time of Mughal dynasty in India, between 16th and 19th centuries. The Mughal paintings in India circled around themes like battles, receptions, court scenes, hunting scenes, legendary stories, portraits, wildlife, etc.

**Mysore Painting** is a form of classical South Indian painting, which evolved in the Mysore city of Karnataka. During that time, Mysore was under the reign of the Wodeyars and it was under their patronage that this school of painting reached its zenith.

**Pahari Painting** is the name given to Rajput paintings, made in the in the Himachal Pradesh and Jammu & Kashmir states of India. These painting developed as well as flourished during the period of 17th to 19th century.

**Rajasthani Paintings** also known as Rajput paintings originated in 18th century from Rajasthan, India. Etymologically, this form of art was derived from Persian miniature style. These paintings depict Hindu devotional themes and stories from Ramayana and Mahabharata, Life of lord Krishna, and different legends of Rajasthani war heroes. These paintings were found in miniature form indeed but a major portion of Indian Rajasthani artwork was found on the walls of

fortress, palaces, inner chamber of royal court, and in Shekhawati havelis.

**Tanjore paintings** originated from Thanjavur, Tamil Nadu in and around 16th century. Although, it's one of the most traditional streams of painting style, it is also famous for its contemporary look, surface richness, compact opus, and flamboyant color range within the picture.

**Kalamkari** painting was developed in Kalahasti near Chennai and Masulipatnam near Hyderabad. This style of painting has got its name from the method of craftsmanship – 'kalam' meaning pen and 'kari' meaning work. The artists use fine pens made of bamboo dipped in vegetable dyes to draw.

#### **PUPPETRY IN INDIA**

Puppets or "Kathputli" is an ancient and popular form of folk entertainment. Puppetry in India must have originated earlier than 5th century B.C.



Stories adapted from puranic literature, local myths and legends usually form the content of traditional puppet theatre in India which, in turn, imbibes elements of all creative expressions like painting, sculpture, music, dance, drama, etc. The presentation of puppet programmes involves the creative efforts of many people working together.

- **String Puppets :** *Kathputli* in Rajasthan, *Kundhei* in Odisha, *Gombeyatta* in Karnataka, *Bommalattam* in Tamil Nadu
- **Shadow Puppets :** *Togalu Gombeyatta* in Karnataka, *Tholu Bommalata* in Andhra Pradesh, *Ravanachhaya* in Odisha
- **Rod Puppets :** *Putul Nautch* in West Bengal, *Yampuri* in Bihar
- **Glove Puppets :** *Pavakoothu* in Kerala

## INDIAN THEATER AND DRAMA



- Indian theatre has a history going back about 5000 years or more. Infact, the very first book on drama, called the **Natya Shahtra**, was penned in India only, by **Bharat Muni**.
- The **Mahabhasya** by **Patanjali** contains the earliest reference to what may have been the seeds of **Sanskrit drama**.
- **Kalidas** wrote a number of plays in 4<sup>th</sup> Centure AD, the most famous being **Abigyan Shakuntala**.
- **Horasim Lebedev** (a Russian Theater enthusiast) and **Golaknath Das**, a Bengali Theater lover, established the Bengali theater in 1765.
- **Rabindranath Tagore** was a pioneering modern playwright who wrote plays noted for their exploration and questioning of nationalism, identity, spiritualism and material greed.
- The **National School of Drama** was founded in 1959 by the Sangeet Natak Akademi (1953).

The founders of dramatic revival	
Name	Language
Bharatendu Harischandra	Hindi
Kirloskar, Deval and Khadilkar	Marathi
Lakshminath Bezraru	Assamese
C.V. Raman Pilai and Verma Thampuran	Malayalam
P Sambhadi Madaliar	Tamil
Ranchhodhai and Nanalal Kavi	Gujurati
Guruzada Appa Rao and B. Raghavchar	Telgu
Baishnaba Pani and Kalicharan Patnaik	Odia

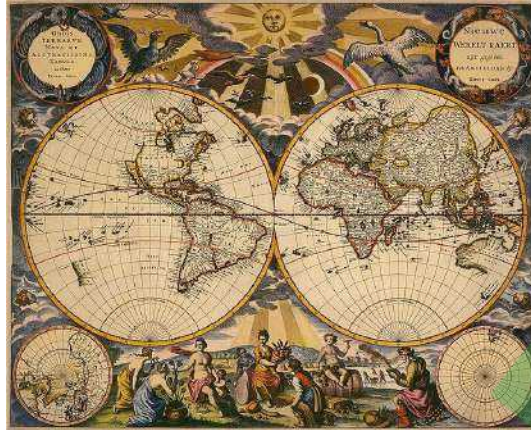
LIST OF TRADITIONAL INDIAN THEATRE			
Theatre	State/Region	Theatre	State/Region
Akhyana	Gujarat	Nautanki	Uttar Pradesh
Bayalata	Karnataka	Odissi	Odisha
Bhand pather	J & K	Ojhapali	Assam
Bhavai	Gujarat	Padayani	Kerala
Burrakatha	Andhra Pradesh	Pala	Odisha
Chhau	Bihar & Odisha	Pandavani	Madhya Pradesh
Dashavatar	Maharashtra	Powada	Maharashtra
Harikatha	Southern India	Ramlila	Northern India
Jatra	West Bengal	Raslila	Uttar Pradesh
Kalaripayattu	Kerala	Swang	Rajasthan
Kathakali	Kerala	Swang	Uttar Pradesh
Keertana	Maharashtra	Tamasha	Maharashtra
Kathakatha	West Bengal	Tang-ta	Manipur
Kudiyattam	Kerala	Terukkuttu	Tamil Nadu
Maach	Madhya Pradesh	Theyyam	Kerala
Naqal	Punjab	Wari-leeba	Manipur
Nata-sankeertana	Manipur	Yakshagana	Karnataka

# WORLD HISTORY





## WORLD HISTORY



### MESOPOTAMIAN CIVILIZATION

- It is the first of the civilization to have ever emerged on the face of planet earth ever since the evolution of humans.
- The origin of Mesopotamia dates back so far behind in the history, there is no known evidence of any other civilized society before them. The timeline of ancient Mesopotamia is usually kept around 3300 BC – 750 BC.
- Mesopotamia is generally credited with being the first place where civilized societies truly began to take shape.
- Mesopotamia's major cities included Baghdad, Babylon and Nippur.
- Baghdad is located in the middle of Iraq by the Tigris River; Babylon was located along the Euphrates River; Nippur was located approximately 100 miles south of Babylon.
- Babylon was the capital of Mesopotamia.
- Mesopotamians developed glass, the Pythagorean Theorem, and ancient sanitation techniques.
- Mesopotamians invented the wheel in approximately 3500 BC, changing transportation forever.

- Major gods in Mesopotamia included Anu (father of gods and the sky), Enlil (god of the air), Utu (god of sun and truth and justice), Nanna (moon god), Inanna (goddess of love and war), Ninhursag (goddess of earth), and Enki (god of fresh water, wisdom and magic).
- The first form of ancient writing was invented by the Sumerians. They wrote on tablets and drew pictures which represented ideas or objects.

### EGYPTIAN CIVILIZATION

- The ancient Egyptians are known for their prodigious culture, the ever standing pyramids and the sphinx, the Pharaohs and the once a majestic civilization that resided by the banks of the river Nile.
- The civilization coalesced around 3150 BC (according to conventional Egyptian chronology) with the political unification of Upper and Lower Egypt under the first Pharaoh. But this could not have been possible had there not been early settlers around the Nile valley in the early 3500 BC.
- The Egyptians kings were known as 'pharaohs' and built burial chambers called

pyramids. The best known pyramid is the famous Great Pyramid at Giza.

- The old Egyptian society was divided into 3 classes. The 1st were the pharaohs (kings & family), the 2nd nobility (consisting of priests and high ranking government officials) and in the 3rd rank were farmers & craftsmen.
- In ancient Egypt, they had devised a unit of measurement known as 'Cubit', a man's fore arm, about 45 cm long.
- The ancient Egyptians were the 1st to have a year consisting of 365 days, which was divided into 12 months. They also invented clocks. They first devised 360 days calendar first after observing annual recurrence of floods in Nile river. Later on they added another 5 days to adjust certain myths about moon & religious festivals.
- Cats were considered to be a sacred animal by the Ancient Egyptians.

### **INDUS VALLEY CIVILIZATION**

It is briefly described in the Chapter : **INDIAN HISTORY**. Please go to **Indian History** (in this book) for more details.

### **MAYAN CIVILIZATION**

- The ancient Mayan civilization flourished in Central America from about 2600 BC and had been much talked about in recent times because of the timeline in the calendar they had created.
- Once the civilization was established, it went on to prosper and become one of the most sophisticated civilization with a booming population of about 19 million at its peak.

- By 700 BC, the Mayans had already devised their own way of writing which they used to create their own solar calendars carved in the stones.
- According to them, the world was created on August 11, 3114 BC, which is the date their calendar counts from. And the supposed end was on December 21, 2012.
- The Maya had fairly advanced writing skills, their written language was in hieroglyphs.
- The Mayan system of hieroglyphics, one of the most complex systems on Earth, only began to be successfully decoded in the 1950's.
- The island city of Tayasal is considered as the last independent Mayan Kingdom and it existed until 1696.

### **CHINESE CIVILIZATION**

- Ancient China – also known as Han China, comes in at number 5 and has doubtlessly one of the most diverse history.
- The Yellow river civilization is said to be the cradle of entire Chinese civilization as this is where the earliest dynasties were based. It was around the 2700 BC that the legendary Yellow Emperor began his rule, a point in time that later led to the birth of many dynasties that went on to rule the mainland China.
- In 2070 BC, the Xia dynasty became the first to rule the entire China as described in ancient historical chronicles. Then on, there came a number of dynasties that held control over China in different periods of time until the end of Qing dynasty in 1912 AD with the Xinhai revolution.

- The last Emperor of China became the ruler when he was only three years old. His name was Puyi.
- The people of ancient China kept the methods of producing silk from silkworms a closely guarded secret for centuries. They first began making this soft cloth around 3,000 B.C.
- The Great Wall of China was built during the Chang Dynasty. The Emperor at the time was Tsu. The first sections of the wall were built between 220 and 206 B.C.
- It was Chinese astronomers who first spotted Halley's Comet, in 240 BC.
- The first known Chinese calendar was called the Oracle Bone Calendar, dating back to 1200 BC.

### **GREEK CIVILIZATION**

- The first Ancient Greek civilisations were formed nearly 4,000 years ago (approximately 1600 BC) by the mighty Mycenaeans of Crete (a Greek Island).
- The Ancient Greek Empire spread from Greece through Europe and, in 800 BC, the Greeks started to split their land into city-states, each with its own laws, customs and rulers.
- Ancient Greece was split into many different states, each one was ruled in its own way. Each state had its own laws, government and money but they shared the same language and religion. The two most important city states were Athens and Sparta.
- The first Olympic Games were held in 776 BC at the Greek city of Olympia.
- The Ancient Greeks played an important part in the development of the alphabet.

The first two letters of the Greek alphabet - alpha and beta - have given us the word 'alphabet'.

- Famous Greek philosophers include Democritus, Protagoras, Heraclitus, Pythagoras and Thales, Socrates and Plato.
- Athens is the capital of Greece, and the first inhabitants to this city were present around the 11th-7th millennium BC. That makes it one of the world's oldest cities.
- The Parthenon was originally built as a temple dedicated to the goddess Athena in 438 BC. It is considered one of the world's greatest monuments.
- Mount Olympus is the highest point in Greece, and it was believed to be the home of the Olympian Gods and Goddesses. Mount Olympus rises to 9,750 feet.

### **PERSIAN CIVILIZATION**

- Over 200 years, the Persians conquered lands that covered over 2 million square miles. From the southern portions of Egypt to parts of Greece and then east to parts of India, the Persian Empire was known for its military strength and wise rulers.
- They created such a vast empire just within a period of 200 years, before 550 BC, Persian (or Persis as it was called back then) used to be divided in factions among a number of leaders.
- King Cyrus II, who later on came to be known as Cyrus the great, came into power and unified the entire Persian Kingdom. Then he went on to conquer the ancient Babylon. In fact, his conquest is so rapid that by the end of 533 BC, he had already invaded India, far in the east.

- Cyrus' son Cambyses continued his father's method of benevolent conquest and expanded the Persian Empire into Egypt. Darius, Cambyses' successor, conquered Western India and created the Persian satrapy, or governorship, of the valley of the Indus River. Darius was succeeded by his son Xerxes, who unsuccessfully invaded Greece in 480 B.C.E.
- Alexander the Great, who conquered the Persian Empire in 331 B.C.E.
- The Persians who are thought to draft the world's first human rights charter. This charter is better known as the Cyrus Cylinder, as it is basically a baked-clay cylindrical object from 539 BC with engraved Akkadian language. The artifact was created under King Cyrus.
- Persians built the earliest known vertical axis windmills
- The Persian prowess in cooling and refrigeration tech is even older with the first crafting techniques of ancient refrigerators coming from circa 400 BC. Known as Yakhchals (or ice pits), these designs generally comprised of large yet insulated underground storage spaces that sometimes crossed volumes of 1,800,000 cubic ft.
- powerful city during the next few hundred years.
- By AD 117 the Roman Empire included the whole of Italy, all the lands around the Mediterranean and much of Europe, including England, Wales and parts of Scotland.
- Life expectancy in Ancient Rome was from 20 to 30 years.
- The wars between Romans and Persians lasted about 721 years, the longest conflict in human history.
- Ancient Romans celebrated "Saturnalia", a festival in which slaves and their masters would switch places.
- The Capuchin Crypt in Rome consists of five chapels and a corridor 60 meters long—and it is decorated with the bones of 4,000 deceased monks.
- The first-ever shopping mall was built by the Emperor Trajan in Rome. It consisted of several levels and more than 150 outlets that sold everything ranging from food and spices to clothes.
- The snake was a common image in Roman art and jewellery and was believed to have powers over a family's well-being.
- In response to a 73 B.C. revolt against Rome by Spartacus the gladiator, 6,000 slaves were crucified.

## ROMAN CIVILIZATION

- The Roman Civilization came into picture around the 6th century BC.
- Roman Empire Mediterranean Empire formed by Augustus after the assassination of Julius Caesar. Its power centre was ancient Rome.
- Rome was founded in 753BC by its first king, Romulus. It grew into a rich and
- The Romans were the first civilization to use concrete and the arch with any notable skill.
- The Colosseum had a large sun roof that could be stretched over the crowd to keep the spectators in the shade. The Colosseum took 12 years to build, and the exit time for all 70,000 spectators was only three minutes.

### AZTEC CIVILIZATION

- The Aztecs came in the scenario pretty much around the time when the Incas were appearing as the powerful contenders in South America.
- Around the 1200s and early 1300s, the people in present day Mexico used to live in three big rival cities – Tenochtitlan, Texcoco and Tlacopan.
- Around 1325, these rivals created an alliance and thus the new state was brought under the rule of the Valley of Mexico.
- Back then, the people preferred the name Mexica than to the Aztecs. The rise of the Aztecs was within a century of the fall of another influential civilization in Mexico and Central America – the Mayans.
- Aztecs had a variety of currency including cacao beans, and quachtli - a type of cotton cloth.
- The Aztecs had two calendars. One calendar's purpose was to mark religious festivals while the other calendar was used as a measurement of time.
- The Aztecs introduced chocolate to the Europeans. It was originally called "chocolatl".
- The Aztecs did not write - only the priests and scribes were permitted to write. They used a system of pictures for the alphabet called Nahuatl.

### INCA CIVILIZATION

- The Inca Empire, also known as the Inka Empire or Incan Empire, was the largest empire in pre-Columbian America. The administrative, political, and military center of the empire was located in Cusco in modern-day Peru.
- The man who established the Inca Empire was Manco Capac in 1438. Manco Capac declared himself Sapa Inca, divine son of the Sun.
- The official language of the Inca was Quecha.
- The Inca pyramids were built with mud bricks of clay that were mixed with dry straw from the corn plant.
- The Incas were the first to cultivate the potato in Peru.
- The Incas created a highway and road system in Peru with over 30,000 kilometers of roads.
- The Ancient Inca's developed important medical practices. They performed surgery on human skulls and used anesthetics during surgery. Inca medicine included treating physical and emotional problems.
- In 1532 the Spanish arrived in Peru and by 1535 the Inca Empire was gone.

## MAJOR WARS OF INDEPENDENCE

Years	Name	Result
1521–1523	Swedish War of Liberation	Independence of Sweden from the Kalmar Union
1568–1648	Eighty Years' War	Independence of the Netherlands from Spain
1640–1668	Portuguese Restoration War	Restoration of Portuguese independence from Spain
1775–1783	American Revolutionary War (American Revolution)	Independence of United States from Great Britain
1804–1813	First Serbian Uprising (Serbian Revolution)	Defeat of insurgents; Ottoman Empire retains control of Serbia
1808–1814	Peninsular War	Independence of Spain from France
1810s–1820s	Latin American wars of independence	Independence of many Spanish-American colonies from Spain
1810–1818	Chilean War of Independence	Independence of Chile from Spain
1815–1817	Second Serbian Uprising (Serbian Revolution)	Semi-independence of Serbia within the Ottoman Empire
1821–1827	Greek War of Independence	Independence of Greece from the Ottoman Empire
1835–1836	Texas Revolution	Independence of Texas from Mexico
1843–1849	Dominican War of Independence	Independence of Dominican Republic from Haiti
1848	First Italian War of Independence	Kingdom of Sardinia defeated by the Austrian Empire; Italian unification not achieved
1857–1858	Indian Rebellion of 1857	Defeat of Indian insurgents; Great Britain retains control of India
1859	Second Italian War of Independence	France and the Kingdom of Piedmont-Sardinia defeat the Austrian Empire; most of the Kingdom of Lombardy-Venetia transferred to France and then to Piedmont-Sardinia; Duchy of Parma, Duchy of Modena, Grand Duchy of Tuscany and the Papal Legations annexed by Piedmont-Sardinia
1861–1864	American Civil War	Ended the Confederate States of America attempt to secede from the United States.
1863–1865	January Uprising	Defeat of Polish insurgents; Russia retains control of Poland
1866	Third Italian War of Independence	Austrian Empire loses Veneto to Kingdom of Italy
1868–1878	Ten Years' War	Defeat of insurgents; Spain retains control of Cuba
1869	Red River Rebellion	Establishment of Provisional government of the Red River Colony
1876	April Uprising	Defeat of Bulgarian nationalists by the Ottoman Empire; subsequent reprisals by the Ottomans led to the Russo-Turkish War, 1877–78 and the 1878 independence of Bulgaria from the Ottoman Empire.
1877	Romanian War of Independence	Independence of Romania from the Ottoman Empire
1896–1898	Philippine Revolution	Inconclusive; Philippines independence from Spain then achieved by Spanish–American War
1899–1913	Philippine–American War	Defeat of Philippine insurgents; United States retains control of the Philippines
1916–1918	Arab Revolt	Defeat of Arab aspirations for independence by post-World War I partition of Arab Ottoman Empire lands into protectorates controlled by United Kingdom and France
1920–1926	Rif War	Defeat of insurgents and Rif Republic; Spain retains control of Spanish Morocco
1945–1949	Indonesian National Revolution	Independence of Indonesia from the Netherlands
1946–1954	First Indochina War	Independence of Vietnam, Laos, Cambodia from France; partition of Vietnam
1947–1949	1948 Arab–Israeli War	Defeat of Arabs; Israel retains independence

1952–1960	Kenyan Mau Mau Uprising	Defeat of insurgents; United Kingdom retains control of Kenya
1954–1962	Algerian War	Independence of Algeria from France
1961–1974	Angolan War of Independence	Independence of Angola from Portugal
1964–1974	Mozambican War of Independence	Independence of Mozambique from Portugal
1966–1988	Namibian War of Independence	Independence of Namibia from South Africa
1967–1970	Nigerian Civil War	Defeat and dissolution of the Republic of Biafra
1971	Bangladesh Liberation War	Independence of Bangladesh from Pakistan
1992–1995	Bosnian War	Independence of Bosnia from Yugoslavia
2012	Tuareg rebellion (2012) (Northern Mali conflict (2012–present))	Unrecognized independence of Azawad from Mali. Azawad claimed territory controlled by Ansar Dine.

### IMPORTANT BATTLES OF WORLD

Battle	Year	Countries Involved
Battle of Megiddo	608 BC	Necho of Egypt and Josiah of Judah; Egyptians victorious
Battle of Marathon	490 BC	Atheins and Persians ; King Darius of Persia defeated
Battle of Themopylae	480 BC	Spartans led by Leonidas and Persians by Xerxes; Spartans were defeated
Battle of Salamis	480 BC	Athenian and Persian fleet in the Bay of Salamis; Persian fleet defeated
Battle of Platae	479 BC	Greek and Persian forces; Persian forces defeated
Battle of Mycale	479 BC	Greek and Persian forces; Persian fleet defeated
Spartan War I	459 BC	Sparta and Athens, also called 'Pelponesian War'; it lasted for 30 years
Spartan War II	431-21 BC	Sparta and Athens; Spartans victorious
Battle of Arabia	331 BC	Greek and Persian forces; Greeks victorious
Battle of Magnesia	190 BC	Syrian and Roman forces; Syrian forces defeated (north-west Lydia)
Hundred Year War	1337-1453	France and England
War of Roses	1455-85	Civil War in England between the two rival royal houses of Lancaster and York; White and red rose were their respective symbols
Anglo-Spanish War	1588	Spanish and English fleets fought in the English Channel; Defeat of the Spanish fleet
Thirty Year War	1618-48	Started as religious-cum-political war between (Conto) the Lutherans and Catholics in Germany and developed into an international war
Civil War of England	1642-49	Between Cavaliers (King Charles supporters) and forces of the Parliament led by Oliver Cromwell; King Charles I executed
Battle of Gibraltar Bay	1607	The Dutch defeated the Spaniards and the Portuguese
Seven Year War	1756-63	Britain and France against Austria and Prussia; British alliance won
Battle of Nile	1798	British and French fleets; Britain victorious
Battle of Trafalgar	1805	British fleet defeated fleets of France and Spain; British fleets commanded by Admiral Nelson, who was killed in the battle
Battle of Austerlitz	1805	Britain, Austria, Russia and Prussia on one side and France on the other; French forces victorious
Battle of Borodino	1812	France and Russia; the French forces were commanded by Napoleon who was defeated
Battle of Leipzig	1811	Germany and combined forces of Austria, Prussia and Russia defeated Napoleon (French forces)
Battle of Waterloo	1815	British forces led by Duke of Wellington defeated French forces led by Napoleon Bonaparte; it was Napalm's last battle; Napoleon was abdicated and was exiled to the island of St Helena in South Atlantic where he died in 1821
First China War	1840	China and Britain; Chinese forces yielded. It was a trade war and also known as the 'Opium War'
American Civil War	1861-65	Northern Vs Southern states of America for the abolition of slavery; Abraham Lincoln defeated the Southern states
Russo—Japanese War	1904-05	Russia and Japan in the Sea of Japan; Russia defeated; also called the 'Battle of Port Arthur' or 'Battle of Yalu'

Balkan War I	1912	Turkey and Balkan countries (Montenegro, Serbia, Bulgaria and Greece); Turkey defeated
Balkan War II	1913	Invasion of Serbia and Greece by Bulgaria; Bulgaria defeated by combined forces of Serbia, Greece, Romania, Montenegro, which stripped Turkey of most of its European territories
World War I	1914-18	Germany (with Austria, Hungary and Turkey) against Britain (with France, US, Russia, Japan, Canada, Austria and Belgium); Germany and its allies were defeated
Battle of Jutland	1916	During World War I—naval battle between Germany and England in which Germany was defeated
World War II	1939-45	Axis powers (Germany, Italy and Japan) against the Allies (Britain, USSR, US, France and several other countries); Axis powers were defeated
Desert War	1942	Italian Army from Libya invaded Egypt in order to attack British forces
Korean War	1954	South Korea invaded by North Korea; North Korea was forced back by UN forces
Israel—Arab War	1967	Six-day war, shortest war in history; Arab forces led by Egypt, Syria and Jordan were defeated
Battle of Wandiwash	1970	Confrontation between French and British
Pakistan—Bangladesh war	1971	Mukti Bahini forces aided by India against the Pakistani forces stationed in Bangladesh (former East Pakistan); Pakistani forces surrendered and Bangladesh came into being
Gulf War	1991	US led multinational forces attacked Iraq to oust Iraqi troops from Kuwait
Kargil War	1999	India defeated Pakistani forces at Kargil
US—Afghanistan War	2001	US led coalition forces attack Afghanistan to bring down the Taliban regime in Afghanistan in retaliation to the 11 September terrorist attack in the USA
Gulf War II	2003	US led coalition forces dethroned the Iraqi President Saddam Hussein
Israel-Lebnon	2006	Hezbollah kidnaps two Israeli soldiers and kills other three. Israel responds with massive airstrikes and artillery fire on targets in Lebanon.
Fatah-Hamas Conflict	2006	Palestinian Civil War between two main Palestinian Political factions
South Yemen Insurgency	2009	Between Government and the Southern Yemen movement.
Syrian Civil War	2011	Nationwide protest started in 2011 against President Bashar-al-Azad's government and various groups such as Free Syrian Army and Islamic Front Hezbollah began operating in 2013 and Islamic State of Iraq and Levant (ISIL) in 2014. By mid-2014, ISIL controlled almost 40% of Syrian Territory establishing itself as a major opposition party. Islamic countries have decided to impose sanctions against Syria because it has failed to check violence on its land.
Islamist Uncast in Egypt	2013	An Egyptian Armed Forces removed President Mohammed Morsi in mid-2013, the conflict between Egyptian Government and the Muslim Brotherhood has intensified.
Conflicts in Africa	No less than 30 sub-saharan	African nations have been involved in numerous Civil Wars since 1989, and some of these are still ongoing. Some work mentioning conflicts involves: Angola, Algeria, Burundi, Congo, the Democratic Republic of Congo (DRC), Cote d'Ivoire (Ivory Coast), Eritrea/Ethiopia, Liberia, Nigeria, Rwanda, Sierra Leone, Sudan and South Sudan/Darfur, Uganda and Zimbabwe. Some of these nations are involved in war in the DRC and the DRC is involved in some of these Civil Wars.



## Timeline of World History

*Before Christ (B.C.) or Before the Common Era (B.C.E.)*

### **4.5 billion B.C.**

Planet Earth formed.

### **3 billion B.C.**

First signs of primeval life (bacteria and blue-green algae) appear in oceans.

### **600 million B.C.**

Earliest date to which fossils can be traced.

### **4.4 million B.C.**

Earliest known hominid fossils (*Ardipithecus ramidus*) found in Aramis, Ethiopia, 1994.

### **4.2 million B.C.**

*Australopithecus anamensis* found in Lake Turkana, Kenya, 1995.

### **3.2 million B.C.**

*Australopithecus afarensis* (nicknamed “Lucy”) found in Ethiopia, 1974.

### **2.5 million B.C.**

*Homo habilis* (“Skillful Man”). First brain expansion; is believed to have used stone tools.

### **1.8 million B.C.**

*Homo erectus* (“Upright Man”). Brain size twice that of *Australopithecine* species.

### **1.7 million B.C.**

*Homo erectus* leaves Africa.

### **100,000 B.C.**

First modern *Homo sapiens* in South Africa.

### **70,000 B.C.**

Neanderthal man (use of fire and advanced tools).

### **35,000 B.C.**

Neanderthal man replaced by later groups of *Homo sapiens* (i.e., Cro-Magnon man, etc.).

### **18,000 B.C.**

Cro-Magnons replaced by later cultures.

### **15,000 B.C.**

Migrations across Bering Straits into the Americas.

### **10,000 B.C.**

Semi-permanent agricultural settlements in Old World.

### **10,000–4,000 B.C.**

Development of settlements into cities and development of skills such as the wheel, pottery, and improved methods of cultivation in Mesopotamia and elsewhere.

### **5500–3000 B.C.**

Predynastic Egyptian cultures develop (5500–3100 B.C.); begin using agriculture (c. 5000 B.C.). Earliest known civilization arises in Sumer (4500–4000 B.C.). Earliest recorded date in Egyptian calendar (4241 B.C.). First year of Jewish calendar (3760 B.C.). First phonetic writing appears (c. 3500 B.C.). Sumerians develop a city-state civilization (c. 3000 B.C.). Copper used by Egyptians and Sumerians. Western Europe is neolithic, without metals or written records.

### **3000–2000 B.C.**

Pharaonic rule begins in Egypt. King Khufu (Cheops), 4th dynasty (2700–2675 B.C.), completes construction of the Great Pyramid at Giza (c. 2680 B.C.). The Great Sphinx of Giza (c. 2540 B.C.) is built by King Khafre. Earliest Egyptian mummies. Papyrus. Phoenician settlements on coast of what is now Syria and Lebanon. Semitic tribes settle in Assyria. Sargon, first Akkadian king, builds Mesopotamian empire. The Gilgamesh epic (c. 3000 B.C.). Systematic astronomy in Egypt, Babylon, India, China.

**776** First Olympiad in Greece.

**753** Foundation of Rome.

**490** Greeks defeated the Persians at the Battle of Marathon.

**360** The period of Aristotle and Plato.

**332** Egypt conquered by Alexander.

**323** Alexander dies at Babylon.

**214** Work on the Great Wall of China begins.

**55** Julius Ceasar attacks Great Britain.

**4** Birth of Jesus Christ.

## **Timeline of World History**

*Anno Domini (AD or A.D.), A.D. stands for Anno Domini, which is Latin for "year of our Lord," and it means the number of years since the birth of Jesus Christ.*

### **A.D.**

**29** Crucifixion of Jesus Christ.

**375** Huns' invasion of Europe.

**570** Prophet Mohammed born at Mecca.

**622** Flight of Mohammed from Mecca to Madina.

**632** Death of Mohammed; Beginning of Hijiri Era.

- 711 Arabs invade Spain.
- 1066 Norman invasion of England; Victory of William the Conquerer over the English King Harold II at Hastings.
- 1280 Roger Bacon invents gunpowder.
- 1338 The Hundred years War broke out.
- 1348 English faces Black Death Plague.
- 1453 Turks captured Constantinople; Renaissance in Europe.
- 1492 Discovery of America by Columbus.
- 1498 Sea-route to India discovered by Vasco-de-Gama.
- 1588 Spanish Armada defeated.
- 1600 British East India Company established in India.
- 1649 Execution of Charles I.
- 1665 The Great Plague of England.
- 1668 Glorious Revolution in England.
- 1704 Battle of Blenheim.
- 1707 Union of England and Scotland.
- 1776 Declaration of American Independence.
- 1789 French Revolution; George Washington elected the first President of America.
- 1805 Battle of Trafalgar and Nelson's death.
- 1815 Battle of Waterloo; Napoleon exiled to St. Helena.
- 1821 Death of Napoleon.
- 1832 Reforms Bill passed in England.
- 1837 Queen Victoria's accession to the throne of England.
- 1861 Beginning of the American Civil War.
- 1863 Slavery abolished in USA
- 1865 Assassination of Abraham Lincoln.
- 1869 Opening of the Suez Canal for traffic.
- 1895 Roentgen discovered X-Rays.
- 1896 Marconi invented wireless.
- 1904 Russia-Japan war.
- 1905 Japan defeated Russia; Discovery of the theory of Relativity by Einstein.
- 1911 Chinese Revolution.

- 1912** Republic of China established.
- 1914** Beginning of World War I.
- 1917** Russian Revolution.
- 1918** End of World War I.
- 1919** Treaty of Versailles signed.
- 1920** Formation of the League of Nations.
- 1923** Turkey declared Republic.
- 1933** Hitler became the Chancellor of Germany.
- 1936** Beginning of the Spanish Civil War.
- 1939** World War II begins.
- 1941** Russia invaded by Hitler; Pearl Harbour invaded by Japan.
- 1945** Establishment of UNO; End of World War II; Hiroshima and Nagasaki experience the first dropping of the Atom Bomb; Death of President Roosevelt.
- 1946** Civil War in China.
- 1948** Burma and Ceylon get independence.
- 1949** Indonesia gets independence; The Communists capture power in China.
- 1953** Death of Stalin; Mt. Everest conquered for the first time.
- 1955** Austria gets independence; Bandung Conference.
- 1956** Suez Canal nationalised by President Nasser; Egypt attacked by the forces of Britain; France and Israel.
- 1957** First artificial satellite launched by Russia.
- 1958** Egypt and Syria united and renamed United Arab Republic (UAR)
- 1959** Chinese capture Tibet; Dalai Lama flees to India; Sputnik launched by Russia.
- 1960** Explosion of an atom bomb device by France; Election of John F. Kennedy as President of USA
- 1961** Yuri Gagarin of USSR becomes the first spaceman.
- 1963** Partial Nuclear Test-Ban Treaty signed; Malaysia established; John F. Kennedy assassinated.
- 1965** Death of Sir Winston Churchill; Singapore becomes the sovereign independent nation; outbreak of Indo-Pak war.
- 1966** Tashkent Pact; a Russian aircraft lands on moon.
- 1967** Chinese explode hydrogen bomb; Arab-Israel War; Suez Canal closed.
- 1971** Outbreak of Indo-Pak war; Birth of Bangladesh; Surrender of 93,000 Pakistani troops; Khrushchev died; Z.A. Bhutto new President of Pakistan.

- 1972** Sheikh Mujibur Rahman freed from Pakistani Jail and assumed the office of P.M. Bangladesh; Nixon of USA visited China; King Mahendra of Nepal died; USA and the USSR sign Strategic Arms Limitations Treaty.
- 1973** Outbreak of fourth Arab-Israeli war; Fourth non-aligned summit in Algiers.
- 1975** Sheikh Mujibur Rahman, President of Bangladesh assassinated; King Faisal of Saudi Arabia, assassinated; Suez Canal reopened; Red Cross force Cambodia Government to Surrender.
- 1976** Chou-En Lai, P.M. of China, died; Seychelles gets independence; Viking I lands on Mars; Mao Tse-tung died; Jimmy Carter elected President of USA
- 1978** Agreement between Israel and Egypt; Vietnam attacked Cambodia; Z.A. Bhutto, former P.M. of Pakistan, sentenced to death; Bloody coup in Afghanistan; Mohammed Daoud assassinated; World's first test-tube baby born.
- 1979** Chinese aggression in Vietnam; Cambodian rebels grab power in Pnom Penh; Mr. Z.A. Bhutto hanged; Mrs. Margaret Thatcher is the first woman P.M. of Britain.
- 1980** War starts between Iran and Iraq; Ronald Reagan elected USA President.
- 1982** Falklands, captured by Argentina; Israel attacks South Lebanon; Argentina forces surrender to British; P.L.O. Chief Yasser Arafat leaves Beirut; Bashir Gemyel, the President elect of Lebanon, assassinated; Soviet President breathes his last.
- 1983** US attacks Grenada; USA withdraws from UNESCO.
- 1985** India gets Presidentship of UN Security Council; Soviet President, Mr. Konstantin Chernenko, dies; Vietnam withdraws troops from Kampuchia.
- 1987** Nuclear tests by USSR; Fresh proposal by Gorbachev; Group 77 meet at Havana; Unsuccessful military coup in Philippines, Prime Minister of Lebanon killed.
- 1988** WHO observes 7th of April as no smoking day, French President re-elected, Gen. Zia-ul-Haq killed in plane crash, Quake kills about 1,000 people in Bihar (India), George Bush elected President of USA, Arafat declares on independent state of Palestine, Nearly 1,00,000 people killed in earthquake in Armenia.
- 1989** The UN Peace keeping force starts implementation of UN Resolution 435 for the independence of Namibia.
- 1990** The Panamanian President surrenders to the United States. South Africa lifts lean on African National Congress. Lithuania declares independence from the Soviet Union. Namibia becomes a free nation. Iraq overruns Kuwait. East and West Germanys unite.
- 1991** War breaks out in the Gulf, with the defeat of Iraq and freedom of Kuwait, Gulf war ends.
- 1994** South Africa emerged from apartheid regime with Nelson Mandela as its president. GATT treaty signed to create World Trade Organisation (WTO).
- 1995** WTO comes into existence; Nuclear test by France; Balkan peace accord signed.
- 1996** Kofi Annan new UN Secretary General; Clinton re-elected US President; India refuses to sign CTBT; Taliban capture Kabul and execute former communist President Najibullah.
- 1997** Tony Blair back in power in UK; Mohd. Khatami elected president of Iran; Hong Kong goes back to China after 99 year British rule.

- 1998** Indonesian President Suharto resigns. Pakistan test fires 'Gauri' missile. US President Clinton faces impeachment.
- 1999** G-15 Summit ends; Yugoslavia accepts a peace plan for Kosovo.
- 2000** The Constitution of Finland is rewritten; the Patent Law Treaty (PLT) is signed; India-China sign agreement on Information Technology, Bill Clinton becomes the first U.S. President to visit Vietnam since the end of the Vietnam War.
- 2001** George W. Bush, was sworn in as the 43rd President of the United States; Heritage destroy of Bamiyan Buddha in Afghanistan by Taliban; Massacred of Nepal Royal family; Terrorist attacks on America by Taliban Supremo Osama bin Laden.
- 2002** 'Euro' becomes the official currency of 12 European countries. A new nation East Timor came into existence. Switzerland and East Timor becomes the 190th & 191th member of the UN.
- 2003** Germany, Spain, Pakistan, Chile and Angola take rotating two-year seats on the UN Security Council; India-born American astronaut Kalpana Chawla and six other crew of the STS-107 space shuttle mission were killed as the US space shuttle Columbia disintegrates over Texas; name of Yugoslavia has been changed, it became Serbia and Montenegro; Australia win ICC World Cup by defeating India, war between US and Iraq; International criminal court was launched. WTO ministerial conference held in Cancun. India and ASEAN signed three accords. Over 20,000 people are killed as a major earthquake destroys the Iranian Fort city Bam.
- 2004** India-Pakistan air links resume, the 12th SAARC Summit concludes in Islamabad after the signing of historic Agreement on Free Trade, Additional Protocol on Terrorism and Social Charter. NASA announced that it would name the spot where the robot probe Spirit landed successfully, in the memory of seven astronauts of the space shuttle Columbia. The US declares Mr. Saddam Hussein a prisoner of war. Pakistan has been readjusted to the common wealth. The 28th Olympics start in Athens. Russian Parliament ratifies the Kyoto Protocol, Yasser Arafat dies in Paris. Taslima Nasreen awarded UNESCO tolerance and non-violence Prize.
- 2005** India and Pakistan agree to allow travel by bus across the Line of Control between Srinagar and Muzaffarabad, Canada introduces the Civil Marriage Act, making Canada the fourth country to sanction same-sex marriage, Latvia ratifies E.U. Constitution, The sixth book by J. K. Rowling, Harry Potter and the Half Blood Prince, hits the stands worldwide, The Dhaka Declaration decides to set up a SAARC poverty Alleviation Fund and to declare 2006-2015 the SAARC Decade of Poverty Alleviation, The Kyoto protocol on limiting pollution becomes fully operational, The Galileo navigational telescope is launched from Kazakhstan.
- 2006** SAFTA comes into effect. Chile elected socialist Michelle Bachelet to be its first woman president. 18th CWG held in Melbourne (Australia). UNO passed a resolution for new Human Rights Council. UN General Assembly has approved Ban-Ki-Moon as the new Secretary General. North Korea conducted an underground Nuclear test. 15th Asian Games were held in Doha (Qatar) in December 2006.
- 2007** Bangladesh declares a state of emergency. Nepal's Parliament unanimously approves the interim Constitution. 14th SAARC Summit held in New Delhi (India). Australia won the World Cup Cricket tournament, 2007. G-8 Summit held in Heiligendamm, Berlin (Germany). Viktor Zubkov has been appointed as a new Prime Minister of Russia. Yasuo Fukuda was sworn in as the Prime Minister of Japan. India won the Twenty-20 World Cup Cricket Championship over Pakistan in South Africa. Nobel Prize 2007 has been announced.

- 2008** End of Monarchy in Nepal; Barack Obama is elected President of the United States. Cyclone Nargis kills 133,000 in Myanmar. Gaza War begins. 2008 South Ossetia war. Kosovo declares independence, to mixed reaction. Battle of Basra - Iraqi forces crack down on Muqtada al Sadr's Mahdi forces in Basra and Sadr City.
- 2009** Gaza War ends; Gaza blockade continues. Sri Lankan Civil War ends. Election protests begin in Iran. Second Chechen War ends. Boko Haram rebellion begins in Nigeria. Death of Michael Jackson; Burj Khalifa in Dubai, the world's tallest skyscraper, is completed. Great Recession officially ends. Formation of BRICS economic bloc. Treaty of Lisbon ratified.
- 2010** David Cameron becomes Prime Minister of the United Kingdom. Benigno Aquino III is elected as the 15th President of the Philippines. A 7.0 magnitude earthquake in Haiti kills 230,000. The threat of Greece defaulting on its debts triggers the European sovereign debt crisis and Ireland's financial crisis. The largest oil spill in US history occurs in the Gulf of Mexico. North Korea shells the island of Yeonpyeong. Aung San Suu Kyi is released from house arrest. 2010 Moscow Metro bombings. Arab Spring triggered by self-immolation of Mohamed Bouazizi on December 17, 2010 in Tunisia. 2010 Kyrgyzstani revolution. 2010 Nigerien coup d'état. 10 April the President of Poland, Lech Kaczyński, is among 96 killed when their airplane crashes in Smolensk.
- 2011** Independence of South Sudan. Arab Spring: revolutions in Tunisia, Egypt and Libya follow, as well as uprisings in Yemen and Bahrain, and protests in several other Arab countries. Syrian civil war begins. Occupy movement inspires worldwide protests. News International phone hacking scandal. A 9.0 earthquake in Japan triggers a tsunami and the meltdown of the Fukushima Nuclear Power Plant. Second Ivorian Civil War ends with the arrest of former president Laurent Gbagbo. Deaths of Osama bin Laden, Muammar Gaddafi, and Kim Jong-Il. Iraq War ends. Riots flare across England. Bombings occur in Russia and Somalia. World population reaches 7 billion. Floods in Pakistan, Thailand and the Philippines kill roughly 2500 people. Death of Steve Jobs.
- 2012** Northern Mali conflict, the MNLA declares Azawad an independent state. Yemeni President Ali Abdullah Saleh steps down. 2012 Benghazi attack leads to the death of US ambassador J. Christopher Stevens. The Higgs boson is discovered. Hurricane Sandy kills 209 people in North America, while Typhoon Bopha kills over 1,600 in the Philippines. Skydiver Felix Baumgartner becomes the first person to break the sound barrier without a vehicle. Conflict begins in the Central African Republic. UN Climate Change Conference agrees to extend the Kyoto Protocol until 2020. Israel launches Operation Pillar of Defense against the Palestinian-governed Gaza Strip. 2012 Guinea-Bissau coup d'état.
- 2013** The French military intervenes in the Northern Mali conflict. Chelyabinsk meteor. Pope Benedict XVI resigns and Pope Francis becomes Pope. Terrorist attacks occur in Boston and Nairobi. The Rana Plaza collapses in Bangladesh. Edward Snowden releases classified documents concerning mass surveillance by the NSA. President of Egypt Mohamed Morsi is deposed by the military in a coup d'état. Croatia becomes a member of the European Union. The Euromaidan protest begins in Ukraine. A chemical attack in Ghouta, Syria is blamed on President Bashar al-Assad. Typhoon Haiyan kills nearly 6150 people in the Philippines and Vietnam. Deaths of Hugo Chávez, Nelson Mandela and Margaret Thatcher. Conflict begins in South Sudan. Uruguay becomes the first country to fully legalise cannabis. End of 2012–2013 Cypriot financial crisis.

- 2014** The worst Ebola virus epidemic in recorded history begins in West Africa, to date infecting more than 20,000 people and killing more than 7,000. Euromaidan protest in Ukraine sparks a revolution and the overthrow of Viktor Yanukovich, leading to Russia's annexation of Crimea and the War in Donbass. Malaysia Airlines Flight 370 and Indonesia AirAsia Flight 8501 disappear mid-flight, while Malaysia Airlines Flight 17 is shot down over Ukraine and Air Algerie Flight 5017 crashes in Mali. A coup d'état in Thailand overthrows the caretaker government. King Juan Carlos I of Spain abdicates; his son becomes King Felipe VI. Tehrik-i-Taliban Pakistan kill over 130 students in Pakistan. Israel launches an assault on the Gaza Strip in response to tit-for-tat murder-kidnappings, leading to the deaths of 71 Israelis and 2100 Palestinians. ISIS begins its offensive in northern Iraq, leading to intervention in Iraq and Syria by a US-led coalition. Second Libyan Civil War begins. The Rosetta spacecraft's Philae probe becomes the first to successfully land on a comet. The Mars Orbiter Mission (MOM), also called Mangalyaan is a space probe orbiting Mars since 24 September 2014. It was launched on 5 November 2013 by the Indian Space Research Organisation (ISRO), making it the fourth space agency of the world and the first Asian nation to successfully send a probe to Mars.
- 2015** Five former Soviet countries form the Eurasian Economic Union. Charlie Hebdo shooting in Paris. Boko Haram perpetrates a massacre of over 2000 people in Baga, Nigeria, and allies itself with ISIS. Al-Shabaab perpetrates a mass shooting in Kenya, killing 148. Houthis overthrow the government in Yemen, triggering a military response by Saudi Arabia. A series of earthquakes in the Himalayas kills over 10,000 people. ISIS claims responsibility for the Kobani massacre in Syria, the Sousse attacks in Tunisia, a mosque bombing in Kuwait, the Suruç bombing in Turkey, multiple bombings in both Beirut and Paris, and inspires a shooting in San Bernardino, California. Turkey and Russia intervene in the Syrian Civil War. The heads of China and Taiwan meet for the first time, while the United States and Cuba resume diplomatic relations. 195 nations agree to lower carbon emissions. Liquid water is found on Mars. First close-up images of Ceres and Pluto.
- 2016** The fallout caused by the execution of Nimr al-Nimr, Iran ends its diplomatic relations with Saudi Arabia. Joaquín Guzmán, widely regarded as the world's most powerful drug trafficker, is recaptured following his escape from a maximum security prison in Mexico. The International Atomic Energy Agency announces that Iran has adequately dismantled its nuclear weapons program, allowing the United Nations to lift sanctions immediately. The World Health Organization announces an outbreak of the Zika virus. EgyptAir Flight 804 crashes with 66 people on board over the Mediterranean en route from Paris to Cairo. Former Chadian President Hissène Habré is sentenced to life in prison for crimes against humanity committed during his tenure from 1982 to 1990, the first time an African Union-backed court convicted a former ruler of a country within its jurisdiction. The Gotthard Base Tunnel, the world's longest and deepest railway tunnel, is opened following two decades of construction work. The United Kingdom votes in a referendum to leave the European Union. NASA's Juno spacecraft enters orbit around Jupiter and begins a 20-month survey of the planet. The 2016 Summer Olympics are held in Rio de Janeiro, Brazil. The US and China, together responsible for 40% of the world's carbon emissions, both formally joined the Paris global climate agreement. In a surprise victory, businessman and television personality Donald Trump is elected President of the United States as a Republican after running a populist campaign. A study finds the VSV-EBOV vaccine against the Ebola virus between 70-100% effective, and thus making it the first proven vaccine against the disease.



**2017** Millions of people worldwide join the Women's March in response to the inauguration of Donald Trump as President of the United States. 420 marches were reported in the U.S. and 168 in other countries, becoming the largest single-day protest in American history and the largest worldwide protest in recent history. North Korea prompts international condemnation by test firing a ballistic missile across the Sea of Japan. The UN warns that the world is facing the biggest humanitarian crisis since World War II, with up to 20 million people at risk of starvation and famine in Yemen, Somalia, South Sudan and Nigeria. In response to a suspected chemical weapons attack on a rebel-held town, the U.S. military launches 59 Tomahawk cruise missiles at an air base in Syria. Russia describes the strikes as an "aggression", adding they significantly damage U.S.–Russia ties. In the 2017 Nangarhar airstrike the U.S. drops the GBU-43/B MOAB, the world's largest non-nuclear weapon, at an ISIL base in Afghanistan. Computers around the world are hit by a large-scale ransomware cyberattack, which goes on to affect at least 150 countries. The Great Mosque of al-Nuri in Mosul, Iraq, is destroyed by the Islamic State of Iraq and the Levant. The World Health Organization estimates that Yemen has over 200,000 cases of cholera. Russia and China urge North Korea to halt its missile and nuclear programs after it successfully tested its first intercontinental ballistic missile. The Treaty on the Prohibition of Nuclear Weapons is voted for by 122 of the 193 UN member states. A security operation targeting Rohingya Muslims in Myanmar "seems a textbook example of ethnic cleansing", according to the United Nations High Commissioner for Human Rights. Russian President Vladimir Putin expels 755 diplomats in response to United States sanctions. North Korea conducts its sixth and most powerful nuclear test. The International Olympic Committee awards Paris and Los Angeles the right to host the 2024 and 2028 Summer Olympics, respectively. Cassini–Huygens ends its 13-year mission by plunging into Saturn, becoming the first spacecraft to enter the planet's atmosphere. An earthquake of magnitude 7.1 strikes Central Mexico, killing 369 people and leaving thousands more homeless. Fifty-eight people are killed and 489 injured when Stephen Paddock opens fire on a crowd in Las Vegas, surpassing the 2016 Orlando nightclub shooting as the deadliest mass shooting perpetrated by a lone gunman in U.S. history. The United States announces its decision to withdraw from UNESCO. A massive blast caused by a truck bombing in Mogadishu, Somalia kills at least 327 people and injures nearly 400.



# WORLD GEOGRAPHY



## WORLD GEOGRAPHY



- It is a field of science devoted to the study of the lands, the features, the inhabitants, and the phenomena of Earth.
- It is derived from two Greek words ‘**geo**’ mean earth ‘**graphein**’ means description.
- **Eratosthenes** was the first person to use the word "**geography**" and is known as the father of geography.
- One of the first estimates of the radius of the Earth was made by **Eratosthenes**.
- **Anaximander** created the first map of world.
- **AinviJe** made the first map of India.
- **Ptolemy** first presented India on the world map.

### Branches of Geography

Generally geography is divided into two main branches i.e. **human geography** and **physical geography**.

### Human Geography

It is a branch of the Geography that studies the world, its people, communities and cultures with an emphasis on relations of land across space and place.

*Various fields of human geography are*

1. **Economic Geography** : deals with the distribution of production, goods and wealth
2. **Population Geography** : deals with the distribution, migration, and growth of population in geographic areas
3. **Geography of Religions** : geographic distribution of religious groups and their cultures.
4. **Medical Geography** : geographic distribution of health, disease and death.
5. **Military Geography** : geographic distribution of military facilities and troops
6. **Political Geography** : geography of a particular region influences its political structure
7. **Agricultural and Rural Geography** : study of agriculture and rural settlement
8. **Urban Geography** : the location, structure, development, and growth of cities

### Physical Geography

It deals with the study of processes and patterns in the natural environment.

*Various fields of human geography are*

- **Geomorphology** : study the landforms of the planet, from their development to their disappearance.
- **Hydrology** : deals with the amounts and quality of water moving and accumulating on the land surface and in the soils and rocks.
- **Glaciology** : study of glaciers and ice sheets.
- **Biogeography** : study of relationships of organisms with their environment.
- **Climatology** : study of the climate, scientifically defined as weather conditions averaged over a long period of time.

- **Pedology** : study of soils in their natural environment.
- **Coastal geography** : study of the dynamic interface between the ocean and the land.
- **Oceanography** : deals with Earth's oceans and seas.

- **Geomatics** : deals with gathering, storing, processing, and delivering of geographic information.
- **Environmental geography** : is a branch of geography that analyzes the spatial aspects of interactions between humans and the natural world.

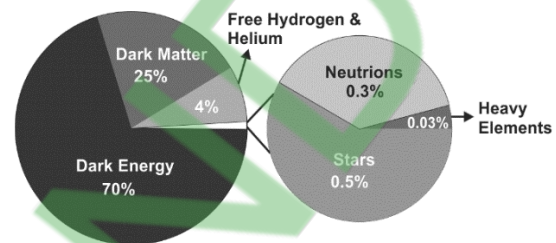
## UNIVERSE

- It is all of **time and space** and its contents. It includes planets, stars, galaxies, the contents of intergalactic space, the smallest subatomic particles, and all matter and energy.
- The study of universe is called as **Cosmology**.
- The age of universe is approximately **13.8 billion years ( $13.8 \times 10^9$  years)**.
- The observable universe is a spherical volume of space. The observable universe is about **91 billion** light years in diameter.



- *Earth was the center of the Universe and the Sun, the Moon, and the other planets are orbited the Earth.* - **Aristotle** and **Claudius Ptolemy**
- *Sun was the center of the Universe.* – **Aristarchus**, **Nicholas Copernicus** and **Galileo**
- **Johannes Kepler** stated that the sun is the center of solar system and not the universe.
- In 1924, the existence of galaxies was first demonstrated by **Edwin Hubble**.

### Composition of Universe



### Evolution of Universe

#### Big Bang Theory

This theory was proposed by **Georges LeMaitre**.

In 1920s, a theory that the universe was created by a huge explosion, and all matter in the universe is still flying away from that explosion at enormous speeds. This theory named as the **Big Bang Theory** around 1930.

#### Steady State Theory

It states that the counting of the galaxies in our Universe is constant and new galaxies which are forming continuously are filling the empty spaces which are created by those heavenly bodies which have crossed the boundary lines of observable Universe.

It was developed in 1948 by **Fred Hoyle**, **Thomas Gold** and **Hermann Bondi**.

### Pulsating Theory

It states that it is the possibility that after some passage of time the expansion in the universe may stop. Then there may be the possibility of contraction. When this contraction will approach to a particular size. Again the explosion will take place. As a result of this explosion the expansion of universe will start again. Hence it results in a pulsating universe in which there is alternate expansion and contraction of universe.

### Galaxy

- Galaxies are formed by group of stars, gases, and dust particles all are together by strong gravitational forces.
- Galaxies are classified into three main types: **spiral** galaxies, **elliptical** galaxies, and **irregular** galaxies.
- **Milky Way (Akash Ganga)** is the galaxy that contains our Solar System.
- The Milky Way is a barred **spiral** galaxy.
- The **Andromeda Galaxy** (also known as NGC 224 and M31) is the nearest spiral galaxy to our Milky Way galaxy.
- **MACS0647-JD** is the farthest known Galaxy in the Universe.

### Star

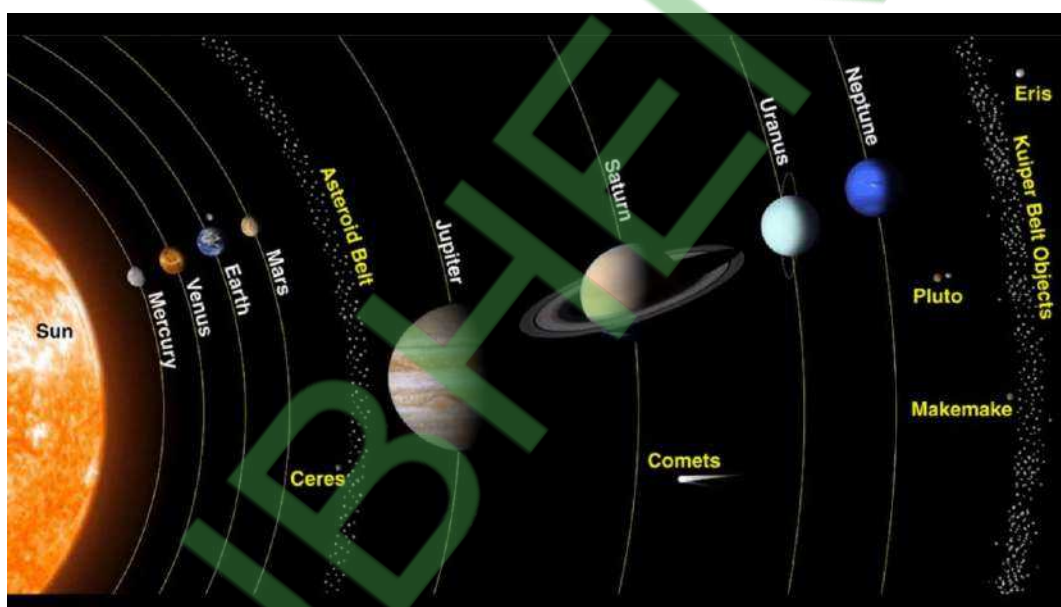
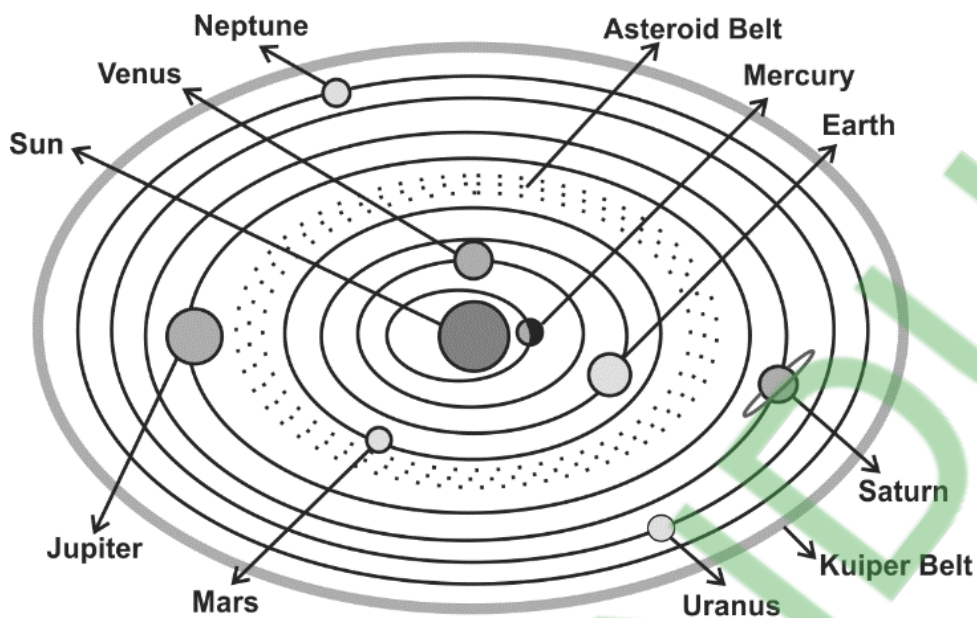
- Stars are glowing heavenly bodies. It emits light due to their high temperatures. It can be seen on a clear night.
- The nearest star to us the sun. It is the brightest star.
- The second brightest star is **Alpha Centauri**. The approximate distance of the star Alpha Centauri from earth is near about 4.3 light years.
- Oldest star : **HE 1523-0901** about **13.2** billion years old
- Biggest star : **VY Canis Majoris**, 1,540 times the size of the Sun.
- Smallest star : **Gliese 623b**. One tenth the mass of the sun.

### Black Hole

- Black holes are the cold remnants of former stars, so dense that no matter—not even light—is able to escape their powerful gravitational pull.
- While most stars end up as white dwarfs or neutron stars, black holes are the last evolutionary stage in the lifetimes of enormous stars that had been at least 10 or 15 times as massive as our own sun.
- When giant stars reach the final stages of their lives they often detonate in cataclysms known as supernovae. Such an explosion scatters most of a star into the void of space but leaves behind a large "cold" remnant on which fusion no longer takes place.

## SOLAR SYSTEM

- The solar system is made up of the sun and everything that orbits around it, including planets, moons, asteroids, comets and meteoroids.
- **Sun** is the center of the solar system.
- The sun is by far the largest object in our solar system, containing 99.8 percent of the solar system's mass.



Fast Fact of Solar System	
Age	4.568 billion years
Nearest star	Proxima Centauri (4.22 ly), Alpha Centauri system (4.37 ly)
Nearest known planetary system	Alpha Centauri system (4.37 ly)
Stars	1 (Sun)
Planets	8 (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune)
dwarf planets	5 (Ceres, Pluto*, Haumea, Makemake, Eris)
comets	3,406
*In August 2006 the International Astronomical Union (IAU) downgraded the status of Pluto to that of "dwarf planet."	

### Dwarf planet

- It is a planetary-mass object that is neither a planet nor a natural satellite. It orbits around the sun. There are 5 officially recognised dwarf planets in our solar system, they are **Ceres, Pluto, Haumea, Makemake and Eris**.
- **Pluto** is the most famous dwarf planet. Discovered in 1930, it was long classified as our solar system's ninth planet.
- Biggest dwarf planet : **Eris**
- Smallest dwarf planet: **Ceres**

### Natural and Artificial Satellites

- Natural satellites are objects which are formed by nature that orbits another body such as the **moon**. There are **173** known natural satellites orbiting planets in the Solar System.
- Artificial satellites are manufactured objects that continuously go round the Earth or some other body in space.
- The first artificial satellite was **Sputnik I**.
- Biggest natural satellite : **Ganymede**
- Smallest natural satellite : **Deimos**
- The only natural satellite with an atmosphere like earth is **Titan**.

### Asteroids and Planetoids

- Asteroids are rocky, airless worlds that orbit our sun, but are too small to be called planets and the largest asteroids are called **planetoids**. e.g. **Apothis, Ceres, Pallas, Vesta, Ida, Eros, Gaspra**, etc.
- The near-Earth asteroid is **99942 Apothis**. Its diameter is about **325 meters**.

### Meteors & Meteorites

- Meteor is a streak of light (a shooting star) that suddenly appears in the sky when a particle from a comet or asteroid enters the Earth's atmosphere.
- Meteorite is a fragment of a comet or asteroid that survives its passage through the Earth's atmosphere and lands on the Earth's surface.
- 1478 BCE: First recorded observation of meteors.
- 1908: (Tunguska), 1947 (Sikote Alin), 1969 (Allende and Murchison), 1976 (Jilin) - Important 20th-century meteorite falls.

### Comet

It is made up of ice, dust and small rocky particles that is a relatively small and it orbits the Sun. e.g. Hale-Bopp, Swift-Tuttle, Hyakutake, Halley, Shoemaker-Levy 9, etc.

### Halley's Comet

It is a "periodic" comet and returns to Earth's vicinity about every **76** years, making it possible for a human to see it twice in his or her lifetime. The last time it was here was in **1986**, and it is projected to return in **2061**.

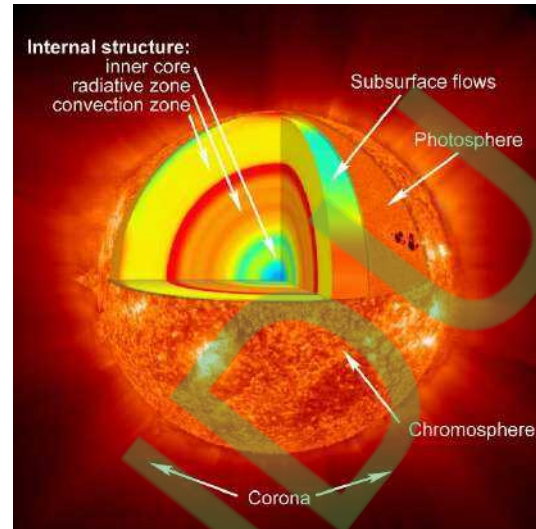
### Comet Shoemaker-Levy 9

It was a comet that broke apart and collided with Jupiter in July **1994**, providing the first direct observation of an extraterrestrial collision of Solar System objects. It was first spotted in March **1993** by three veteran comet discoverers: **Eugene** and **Carolyn Shoemaker**, and **David Levy**.

## THE SUN

- Sun formed around 4.57 billion years ago from the collapse of part of a giant molecular cloud that consisted mostly of hydrogen and helium, and probably gave birth to many other stars.
- The Sun is the center of the Solar System and the source of all life and energy here on Earth. It accounts for more than 99.86% of the mass of the Solar System and its gravity dominates all the planets and objects that orbit it.
- The brightest star of our solar system is sun and its shape is spherical.
- It is classified as a yellow dwarf star.
- The Sun rotates from west to east (opposite in direction from that the Earth's rotation).
- The interior of the Sun is differentiated between multiple layers, which includes a core, a radiative zone, a convective zone, a photosphere, and an atmosphere. The core is the most dense and hottest region of the Sun ( $150 \text{ g/cm}^3/15.7 \text{ million K}$ ) and accounts for about 20–25% of the Sun's overall radius.

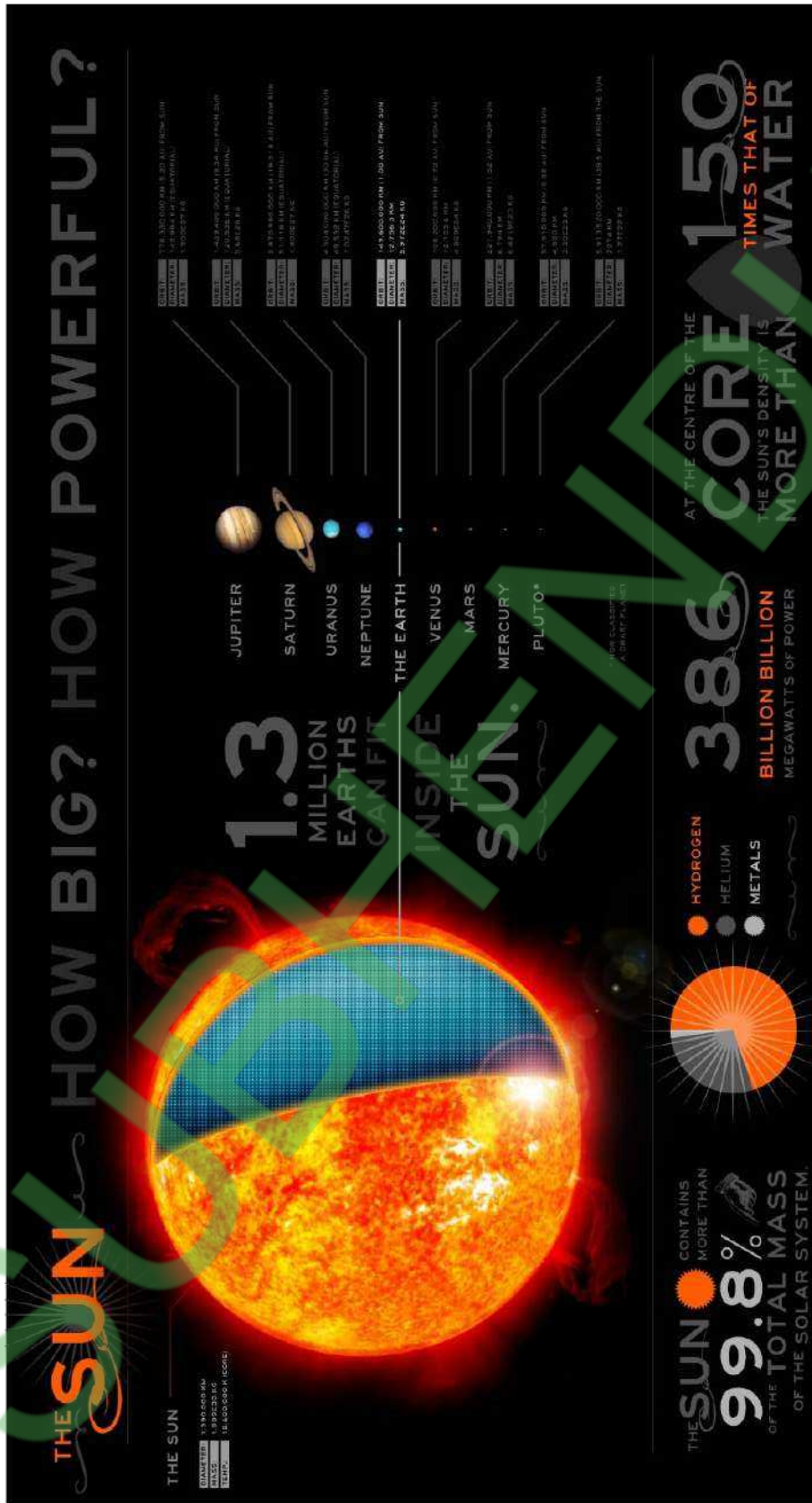
*Sunspots are slightly cooler areas on the surface of the sun that appear as dark areas. They only appear dark against the brightness of the rest of the surface of the sun.*



**Layers of the sun**

Fast Fact of Sun	
Spectral Type of Star	G2V
Mean diameter	$1.392684 \times 10^6 \text{ km}$
Equatorial radius	$6.96342 \times 10^5 \text{ km}$ $109 \times \text{Earth}$
Mass	$1.989 \times 10^{30} \text{ kg}$ $333,000 \times \text{Earth}$
Surface Temperature (Photosphere)	5,500 degree Celcius
Mean distance from Earth	$1.496 \times 10^8 \text{ km}$ 8 min 19 s at light speed
Rotation Period at Equator	26.8 days
Rotation Period at Poles	36 days
Composition	92.1% hydrogen, 7.8% helium, 0.1% other elements
Luminosity*	$3.83 \times 10^{33} \text{ ergs/sec}$
* The total energy radiated by the Sun (or any star) per second at all wavelengths	





## THE PLANETS

*Planets are among the many worlds and smaller objects that orbit the Sun. The formal definition of planet, as voted on by the International Astronomical Union in 2006, is as follows:*

*A planet is a celestial body that*

- a) is in orbit around the Sun,*
- b) has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape, and*
- c) has cleared the neighbourhood around its orbit.*

*There are eight planets in the Solar System, which are in increasing distance from the Sun : **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.***

*In increasing sizes the order is **Jupiter, Saturn, Uranus, Neptune, Earth, Venus, Mars and Mercury.***

### Classification of Planets

- The 8 planets are classified into 2 main groups. These are **inner planets** and **outer planets**.
- The **Inner Planets** (Terrestrial planets) are nearer to the Sun. These are Mercury, Venus, Earth and Mars. They spin slowly.
- The **Outer Planets** (Gas giants or Jovian) are further away, larger and made up mostly of gas. These are Jupiter, Saturn, Uranus, and Neptune. They spin quickly.

FAST FACTS OF PLANETS	
Earth's twin	Venus
Brightest	Venus
Biggest	Jupiter
Smallest	Mercury
Hottest	Venus
Coldest	Neptune
Fastest rotating	Jupiter
Slowest rotating	Venus
Heaviest	Jupiter
Lightest	Mercury
Closest planet to Sun	Mercury
Farthest planet from Sun	Neptune
High dense	Earth
Low dense	Mars
Red Planet, Green Planet & Blue Planet	Mars, Uranus & Earth

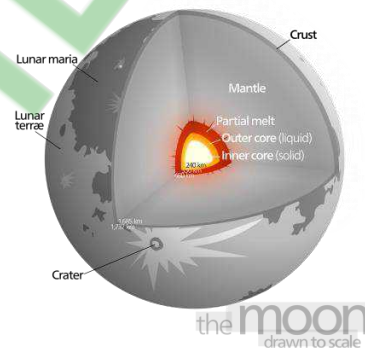
## PLANETS PROFILE

Planet with Symbol	Radius in km	Rotation time Length of day	Revolution time Length of year	No. of Satellite(s)
Mercury ♀	2,440	58d 15h 30m	88 days	0
Venus ♀	6,052	116d 18h 0m	225 days	0
Earth ⊕	6,371	24h 0m	365 days and 6 hours	Moon is the only Satellite
Mars ♂	3,390	1d 0h 40m	1.9 years	Phobos & Deimos
Jupiter ♃	69,911	9h 56m	11.9 years	63
Saturn ♄	58,232	10h 39m	29.5 years	62
Uranus ♅	25,362	17h 14m	84.0 years	27
Neptune ♆	24,622	16h 6m	164.8 years	13 Satellites

## THE MOON

- The Moon (or Luna) is the Earth's only natural satellite and it is the fifth largest moon in the Solar System.
- Moonlight is sunlight reflected off of the moon.
- The rise and fall of the tides on Earth is caused by the Moon.
- The Moon is moving approximately 3.8 cm away from our planet every year.
- The Moon has much weaker gravity than Earth, due to its smaller mass, so you would weigh about one sixth (16.5%) of your weight on Earth. This is why the lunar astronauts could leap and bound so high in the air.
- The Moon has no atmosphere.
- The first unmanned mission to the Moon was in 1959 by the Soviet Lunar Program with the first manned landing being Apollo 11 in 1969.

### Structure of Moon



Fast facts of Moon	
Distance from earth	3,82,200 km
Diameter	3,475 km
Mass	$7.3477 \times 10^{22}$ kg (0.012300 Earths)
Composition	Argon (Ar), Helium (He), Sodium (Na), Potassium (K), Hydrogen (H), Radon (Rn)
Circumference	10,921 km (equatorial)
Apogee (Farthest distance between earth and moon)	405,503 km
Perigee (Nearest distance between earth and moon)	363,295 km
Time taken by Moon light to reach earth	1.3 sec
Revolution period around earth	27 days, 7 hrs, 43 min, and 11.47 sec.
Rotation period	27 days, 7 hrs, 43 min and 11.47 sec.
Highest Mountain	35,000 ft (Leibnitz mts)

## THE EARTH (Blue Planet)

- Earth is the third planet from the Sun and is the largest of the terrestrial (inner) planets.
- It is the fifth largest of the eight planets in the Solar System.
- It is the only planet in our solar system not to be named after a Greek or Roman deity.
- It was formed approximately 4.54 billion years ago and is the only known planet to support life.
- Aphelion (Farthest Distance between earth and sun) : 152,098,232 km
- Aphelion (Nearest Distance between earth and sun) : 147,098,290 km
- Apogee (Farthest distance between earth and moon) : 405,503 km
- Perigee (Nearest distance between earth and moon): 363,295 km
- The highest point of earth measured from sea level : **Mount Everest** : 8,848 m (borders Nepal and China)
- The lowest point of earth measured below sea level : **Challenger Deep**, at the bottom of the **Mariana Trench** : 10,911 m



### Geographical History of the Earth

Period and Epoch	Beginning Years ago	Facts
<b>Genozoic Era</b>		
<b>Quaternary Period</b>		
Holocene Epoch	10000	Modern man
Pleistocene Epoch	2 million	Homo Sapiens
<b>Tertiary Period</b>		
Pliocene Epoch	5 million	Early human ancestor
Miocene Epoch	24 million	Flowering plants and trees
Oligocene Epoch	38 million	Early horses, cats, dogs, camel
Eocene Epoch	55 million	Rabbits, hare
Paleocene Epoch	63 million	Small mammals: Rats, mice
<b>Mesozoic Era</b>		
Cretaceous Period	138 million	Extinction of dinosaurs
Jurassic Period	205 million	Age of dinosaurs
Triassic Period	240 million	Frogs and turtles
<b>Palaeozoic Era</b>		
Permian Period	290 million	Reptile dominate, Replace amphibians
Carboniferous Period	330 million	First Reptiles and fish
Devonian Period	410 million	Amphibians
Silurian Period	435 million	Corals
Ordovician Period	500 million	Graptolites
Cambrian Period	570 million	First abundant record of marine life
Pre-cambrian Period	4.5 billion	Fossils extremely rare, consisting of primitive aquatic plants, Evidence of flaciation. Oldest dated algae, over 2600 million years; Oldest dated meteorite 4500 million years

FAST FACTS OF EARTH	
Age	4.54 billion years
Shape	Oblate ellipsoid <b>or</b> Geoid
Mass	$5.97 \times 10^{24}$ kg
Volume	$1.083 \times 10^{12}$ km <sup>3</sup>
Radius	6,371 km
Surface area	510,072,000 km <sup>2</sup>
Land area (29.2 %)	148,940,000 km <sup>2</sup>
Water area (70.8 %)	361,132,000 km <sup>2</sup>
Circumference	40,075.017 km (equatorial) ; 40,007.86 km (meridional)
Rotation period	1 day (23h 56m 4.100s)
Revolution period	1 year (365 days, 5 hours, 48 minutes and 45.51 sec)
Time Cordinate of Earth	Longitude
Temperature cordinates of Earth	Latitude
Average orbital speed	29.78 km/s
Composition	78.08% nitrogen (N <sub>2</sub> ) (dry air), 20.95% oxygen (O <sub>2</sub> ), 0.93% argon (Ar), 0.039% carbon dioxide (CO <sub>2</sub> ), About 1% water vapor (varies with climate)

## THE EARTH'S MOVEMENT

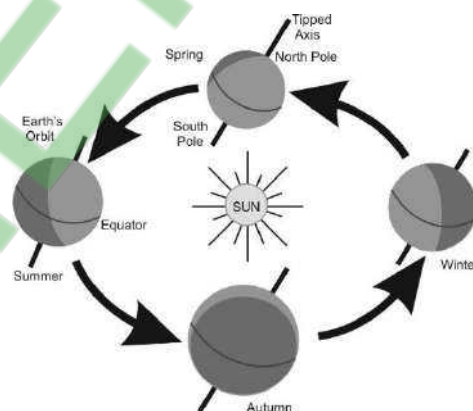
### Earth's Rotation

- The Earth rotates with a speed of 1670 km/h on its own axis from West to East.
- The axis is an imaginary line passing through the northern and the southern poles.
- Earth's rotation is completed in about 24 hours, this is called the daily motion of the earth.
- This motion is responsible for the occurrence of **Day & Night** and **Rise & fall** of tides everyday.

### Earth's Revolution

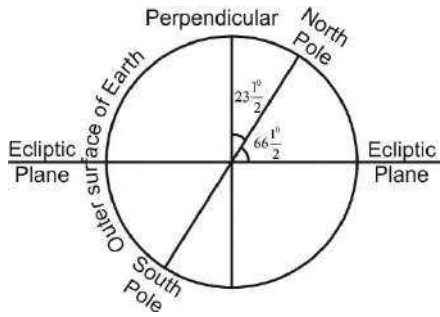
- It is the movement of the Earth around the sun in its orbit. Earth's Revolution speed is 29.8 km/s.
- This movement of the earth is also from west to east. The period of revolution is one year (365 1/4 days).
- This motion is responsible for Season and Year.
- The orbit of the Earth around the sun is elliptical and not circular. Due to this, the distance between the Earth and the sun keeps changing.
- When this distance is minimum, the Earth is said to be in perihelion (around January 3).

- When the distance is the maximum, it is said to be in aphelion (around July 4).



### Tilt of the Earth's Axis

- The tilt of the Earth's spin axis with respect to the plane of its orbit about the sun (the ecliptic plane) is important for a habitable Earth.
- The Earth's spin axis is tilted 23.5° with respect to the ecliptic, giving moderate seasons and preventing temperature extremes anywhere on the planet.
- When it's winter in the southern, it's summer in the northern hemisphere, and vice versa.



### Equinox

- Equinox is derived from the Latin *aequus* (equal) and *nox* (night), because around the equinox, night and day are about equal length.
- As the Earth moves around its orbit, it reaches two points during the year where the tilt of its axis causes it to be straight relative to the Sun. These days are known as equinoxes.
- During these equinoxes the rays of the Sun shine directly on the equator.
- This happens on approximately March 20th and September 22nd.

### Solstice

- Solstice is derived from the Latin *sol* (sun) and *sistere* (to stand still).
- At two points throughout the year, the tilt of the Earth's axis reaches its maximum angle compared to the Sun, and begins to move back the other direction.
- This usually happens around June 21st and December 21st. These days are known as solstices.

- On these solstices, the rays of the Sun shine directly on one of the two Tropics.
- During the June Solstice the rays of the Sun shine directly on the Tropic of Cancer.
- During the December Solstice the Sun's rays shine on the Tropic of Capricorn.

### Season

- It is a division of the year, marked by changes in weather.
- Seasons result from the yearly orbit of the Earth around the Sun and the tilt of the Earth's rotational axis relative to the plane of the orbit.
- Generally there are four type sof Seasons. These are **spring**, **summer**, **autumn** (fall), and **winter**.
- In the **Spring**, the weather is warmer, and often wetter. Seeds take root and vegetation begins to grow.
- In the **Summer**, temperatures may increase to their hottest of the year because Sun is directly overhead the equator. In this season days are long and nights are short.
- In the **Autumn**, or fall, temperatures cool again. In northern hemisphere it comes in September and in southern hemisphere it comes in March.
- In the **Winter**, temperatures may decrease to their coldest of the year. In this season days are short and nights are long.

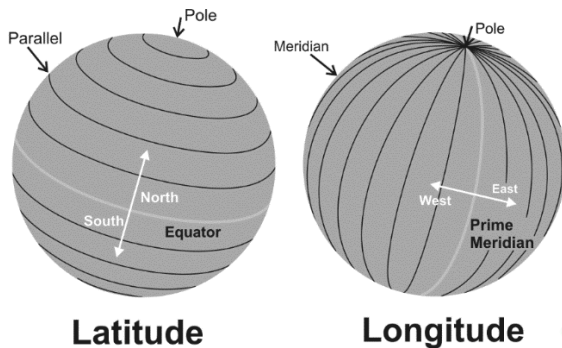
### Seasons in India

*In India, there are six seasons (or Ritu). These are described below*

Hindu Season	Gregorian month	Hindu Months	English Names
Vasanta	~ March to May	Chaitra, Vaishakha	Spring
Grishma	~ May to July	Jyeshtha, Ashadha	Summer
Varsha	~ July to September	Shraavana, Bhadrapada	Monsoon
Sharad	~ September to November	Ashwin, Kartika	Autumn
Hemanta	~ November to January	Maargashirsha, Pausha	Winter
Shishira	~ January to March	Magh, Phalgun	Prevernal

## Geographic Coordinate System

- It is a coordinate system that enables every location on the Earth to be specified by a set of numbers or letters, or symbols.
- A common choice of coordinates is latitude, longitude and elevation.
- The invention of a geographic coordinate system is generally credited to **Eratosthenes**.
- The webbing of latitude and longitude is known as **Graticule**.



### Latitude ( $\Phi$ )

- Latitude (shown as a horizontal line) is the angular distance, in degrees, minutes, and seconds of a point north or south of the

Equator. Lines of latitude are often referred to as parallels.

- Its angular range is 0 to 90° North and South.
- It denotes distance from north or south (Equator)
- It is used to classifying temperature zones.
- Number of horizontal lines (Latitude) is 180.
- One degree latitude = 111.2 km

### Longitude ( $\lambda$ )

- Longitude (shown as a vertical line) is the angular distance, in degrees, minutes, and seconds, of a point east or west of the Prime (Greenwich) Meridian. Lines of longitude are often referred to as meridians.
- Its angular range is 0° to 180° East and West.
- It denotes distance from east or west (Prime Meridian)
- It is used to classifying time zones.
- Number of vertical lines (Longitude) is 360.

## Time Zones and Universal Time

### Universal Time (UT)

- Time based on the rotation of Earth on its axis with respect to the stars is known as Universal Time.
- Greenwich Mean Time (GMT) is the mean solar time at the Royal Observatory in Greenwich, London.
- GMT was formerly used as the international civil time standard, now superseded in that function by Coordinated Universal Time (UTC).
- Coordinated Universal Time (UTC) is the primary time standard by which the world regulates clocks and time. is based on atomic time.

### Time Zone

- Time Zones are a geographical world globe division of 15 degree each, starting at Greenwich, in England.
- Earth is divided in to 24 longitudinal zones, each being 15 degree or 1 hour apart in time (360/24 = 15 degree in 1 hour) or 1 degree in 4 minutes are called Standard Time Zones.
- Indian Standard Time (IST) is the time observed throughout India and Sri Lanka, with a time offset of UTC+05:30.
- Country with largest number of time zones : **Russia, 11** time zones
- Largest country with only one time zone : **China**

## Major world cities and their time zones

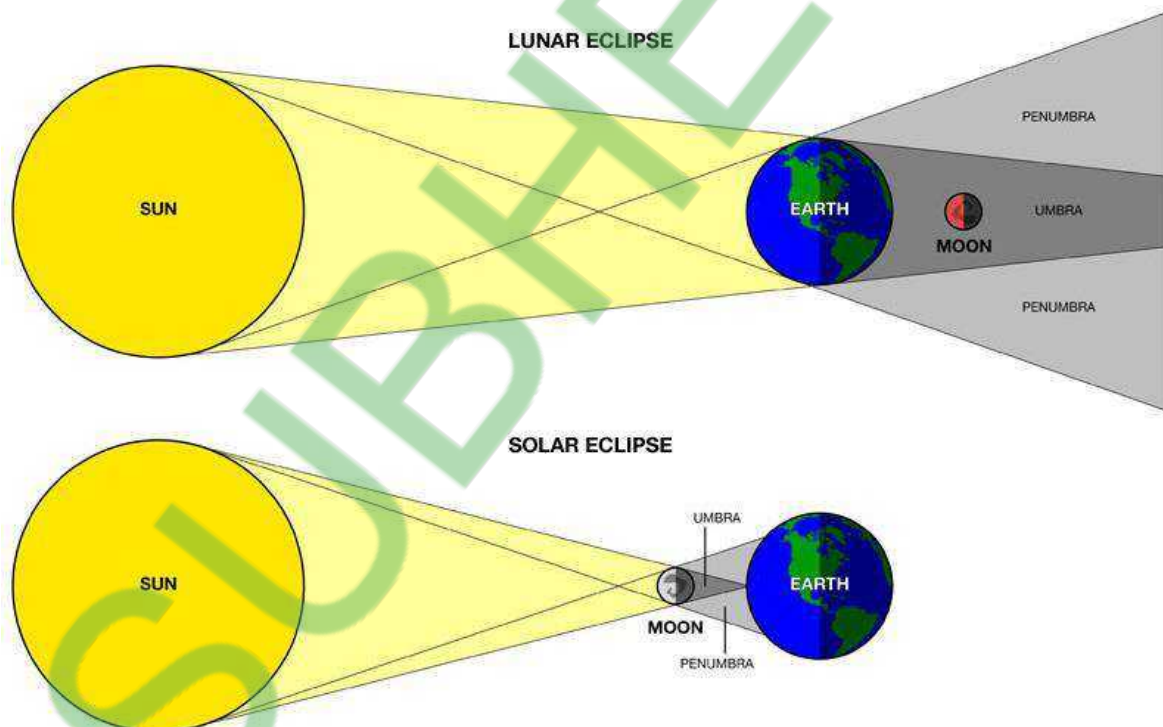
Beijing: UTC+8  
London (U.K.): UTC  
Los Angeles: UTC-8  
Melbourne: UTC-10  
Mexico City: UTC-6  
Moscow: UTC+3  
New Delhi: UTC+5.30  
New York: UTC-5  
Paris: UTC+1  
Rome: UTC+1  
Sydney: UTC+10  
Tokyo: UTC+9  
Washington DC: UTC-5

## International Date Line (IDL)

- The International Date Line, established in 1884, passes through the mid-Pacific Ocean and roughly follows a 180 degrees longitude north-south line on the Earth.
- It is located halfway round the world from the prime meridian - the zero degrees longitude established in Greenwich, England, in 1852.
- The International Date Line functions as a “line of demarcation” separating two consecutive calendar dates.

## Eclipses

*An eclipse takes place when one heavenly body such as a moon or planet moves into the shadow of another heavenly body. There are two types of eclipses are form. Those are : **Lunar eclipses** and **Solar eclipses**.*



## Lunar Eclipses

- The Moon does not have its own light. It shines because its surface reflects the Sun's rays. A lunar eclipse occurs when the Earth comes between the Sun and the Moon and blocks the Sun's rays from directly reaching the Moon. Lunar eclipses only happen at full Moon.
- There are 3 kinds of lunar eclipses: total, partial, and penumbral.
- A **total lunar eclipse** occurs when the Earth's umbra – the central, dark part of its



shadow – obscures all of the Moon's visible surface.

- A **partial lunar eclipse** can be observed when only part of the Moon's visible surface is obscured by the Earth's umbra.
- A **penumbral lunar eclipse** happens when the Moon travels through the faint penumbral portion of the Earth's shadow.

### Solar Eclipses

- Solar eclipses can only occur during a new Moon, when the Moon moves between the Earth and the Sun and the three celestial bodies form a straight line: **Earth - Moon - Sun.**
- There are 3 kinds of solar eclipses: total, partial, annular. There is also a rare hybrid that is a combination of two eclipses.
- A **total solar eclipse** occurs when the Moon completely covers the Sun, as seen from Earth. Totality during such an eclipse can only be seen from a very small area on Earth.
- A **partial solar eclipse** can be observed when the Earth, Moon and Sun do not

align in a perfectly straight line, and the Moon only partially covers the disc of the Sun.

- An **annular solar eclipse** occurs when the Moon appears smaller than the Sun as it passes centrally across the solar disk and a bright ring, or annulus, of sunlight remains visible during the eclipse.
- A **hybrid solar eclipse** is a rare form of solar eclipse, which changes from an annular to a total solar eclipse along its path.

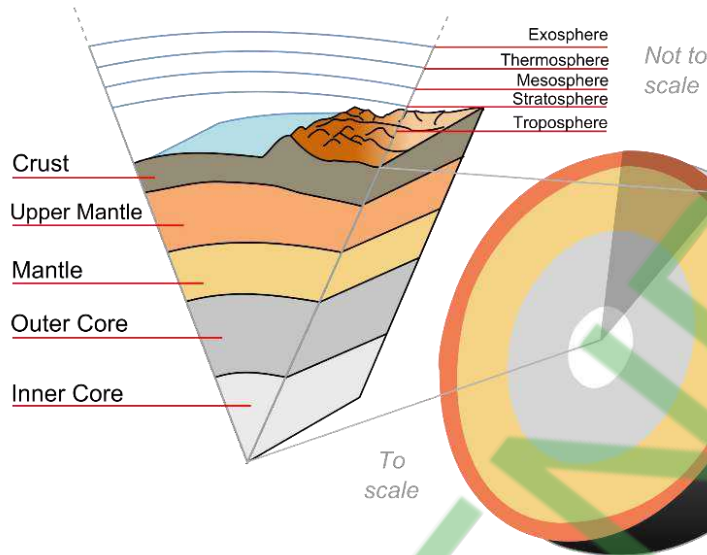
### Planet Transits

When a planet comes between the Earth and the Sun, it is called a transit. The only two planets that can be seen transiting the Sun from Earth are Venus and Mercury, because they are the only planets which orbit inside Earth's orbit.

From 2000–2099, there will be 14 transits of Mercury. Venus transits are even rarer with only two this century, in 2004 and 2012.

## STRUCTURE OF THE EARTH

The interior structure of the Earth is layered in spherical shells. It is divided into three parts: **crust**, **mantle** and **core**.



Interior structure	Thickness (km)	Temperature (Kelvin)	Types of rock found
Crust	30	300-500	Silicic rocks, Andesite, basalt at base
Upper mantle	720	500	Peridotite, eclogite, olivine, spinel, garnet, pyroxene, Perovskite, oxides
Lower mantle	2171	3000	Magnesium and silicon oxides
Outer core	2259	3000	Iron + oxygen, sulfur, nickel alloy
Inner core	1121	5700	Iron + oxygen, sulfur, nickel alloy

### Crust

- It is the outermost layer.
- There are two different types of crust: **thin oceanic crust** that underlies the ocean basins and **thicker continental crust** that underlies the continents.

### Mantle

- It is the **thickest** layer of Earth. It comprises about 80% of the Earth's volume.
- It has **different** temperatures at different depths.
- The steady increase of temperature with depth is known as the **geothermal gradient**.

- Rocks in the upper mantle are cool and brittle, while rocks in the lower mantle are hot and soft (but not molten).

### Core

- It is the innermost layer.
- The core is a layer rich in iron and nickel that is composed of two layers: the inner and outer cores.
- The inner core is theorized to be solid with a density of about 13 grams per cubic centimeter .
- The outer core is liquid and has a density of about 11 grams per cubic centimeter.
- The inner core was discovered in 1936 by Inge Lehmann and is generally believed to be composed primarily of iron and some nickel.

### Discontinuity Layers of Earth's Structure

1. **Connard Layer** : It lies between Upper crust and lower crust
2. **Mohorovic Layer** : It lies between Crust and mental
3. **Repetti Layer** : It lies between Upper mental and lower mental
4. **Gutenberg Layer** : It lies between Core and mental
5. **Lehman Layer** : It lies between Upper core and lower core

### Continental Drift Theory

- It is the movement of the Earth's continents relative to each other by appearing to drift across the ocean bed.
- The theory of continental drift has been replaced by the science of plate tectonics.
- This theory was proposed by **Abraham Ortelius** in **1596** and developed by **Alfred Wegener** in **1912**. Wegener was convinced that all of Earth's continents were once part of an enormous, single landmass called **Pangaea**.

### Seafloor Spreading Theory

- It is a process that occurs at mid-ocean ridges, where new oceanic crust is formed through volcanic activity and then gradually moves away from the ridge.
- It helps explain continental drift in the theory of plate tectonics.
- It was proposed by **Harry Hess** in the **1960s**. The the phenomenon is known to be caused by convection currents in the plastic, very weak upper mantle, or asthenosphere.

### Tectonic Plates

- The Earth's lithosphere (the crust and the upper part of the mantle) is cracked into a number of large pieces called tectonic plates.
- These plates (like big rock rafts) are less dense than the mantle and so float on it and constantly move at relative speeds of a few centimetres per year as a result of convection currents within the Earth's mantle. The convection currents are driven by heat released by natural radioactive processes in the mantle.
- Earthquakes, volcanic activity, mountain-building, and oceanic trench formation can occur along these plate boundaries.

*There are four types of plate boundaries:*

1. **Divergent boundaries** - where new crust is generated as the plates pull away from each other.
2. **Convergent boundaries** - where crust is destroyed as one plate dives under another.
3. **Transform boundaries** - where crust is neither produced nor destroyed as the plates slide horizontally past each other.
4. **Plate boundary zones** - broad belts in which boundaries are not well defined and the effects of plate interaction are unclear.

### Major Tectonic Plates

Plate name	Area x 10 <sup>6</sup> km <sup>2</sup>
Pacific Plate	103.3
African Plate	61.8
North American Plate	75.9
Eurasian Plate	67.8
Antarctic Plate	60.9
Indo-Australian Plate	58
Indian Plate	11
Australian Plate	47
South American Plate	43.6

## FORCES THAT AFFECT THE EARTH

The earth can be affected by two forces which may result into various physical features. These two features are **internal** and **external forces**.

### The internal forces

These are forces which operate within the earth's crust. Internal forces include vulcanicity and earth movements, that is, horizontal (lateral) and vertical movements. These forces may result into formation of several landform features.

### Vulcanicity (volcanic eruptions)

- This refers to all the various ways by which molten rock (magma) and gases are forced into the earth's crust and on to its surface.
- Vulcanicity therefore includes volcanic eruptions (the formation of volcanoes and lava plateaus and geysers, and the formation of volcanic features such as batholiths, sills and dykes, etc, in the earth's crust.
- **Active volcano** : erupt frequently
- **Dormant volcano** : erupted in the recent past but do not erupt frequently.
- **Extinct volcanoes** : have not erupted in the historical time and are not likely to erupt.

### Types of vulcanicity

There are two types of vulcanicity such as intrusive vulcanicity and extrusive vulcanicity.

### Intrusive (internal) vulcanicity

This occurs when the magma cools, solidifies and forms features within the earth's crust before it reaches the earth's surface. The features (landforms) formed this way are sometimes termed as intrusive (internal) features.

The landforms formed through intrusive vulcanicity are Dyke, Sill, Laccolith, Lapolith, Batholith and Phacolith.

### Extrusive vulcanicity

This is the type of vulcanicity that occurs when molten rocks reach the surface of the earth. When magma emerges at the surface it is called lava. This forms features called extrusive features of vulcanicity.

The landforms formed through extrusive vulcanicity are Acidic lava cone, Basic lava cone, Ash and cinder cone, Crater, Volcanic plug, Composite cone, Caldera, Geysers, hot springs and Lava plateau.

## SEVEN VOLCANIC SUMMITS

*The highest volcanoes of each continent*

Summit	Elevation	Continent	Range	Country
Kilimanjaro	5,895 m	Africa	Kilimanjaro	Tanzania
Mount Sidley	4,285 m	Antarctica	Executive Committee Range	n/a (unclaimed)
Mount Giluwe	4,368 m	Oceania	Southern Highlands	Papua New Guinea
Damavand	5,610 m	Asia	Alborz	Iran
Elbrus	5,642 m	Europe	Caucasus	Russian Federation
Pico de Orizaba	5,636 m	North America	Trans-Mexican Volcanic Belt	Mexico
Ojos del Salado	6,893 m	South America	Andes	Argentina-Chile

## Diastrophic Forces

It is the general term applied to slow bending, folding, warping and fracturing.

These forces originate inside the earth's crust and are responsible for the vertical or horizontal movement of the rock masses.

### Epirogenic or Vertical or Continental Building movement

- It act along the radius of the earth; therefore, they are also called radial movements.
- These movements are generally slow upward or downward movement.
- The results of such movements may be lead to emergence or submergence of continents.

### Orogenic or Horizontal or Mountain Building movement

- It acts tangentially to the earth surface, as in plate tectonics.
- Tensions produces fissures (since this type of force acts away from a point in two directions) and compression produces folds (because this type of force acts towards a point from two or more directions).
- In the landforms so produced, the structurally identifiable units are difficult to recognise.
- The results of such movements may be lead to block mountain, rift valley etc. *e.g.* folding, faulting and earthquake.

### Folding

- It is the force created when two of the Earth's plates collide. Then the rock gets pushed up, and mountains are formed.
- Usually, mountains form in ranges, or groups. Some of the best-known mountain ranges are the Himalayas, the Alps, and the Andes.

- The upfolded rocks are called **anticline** and the downfolded rocks are called **syncline**.

### Faulting

- It refers to the fracture or crack caused by folding (collision of Earth's plate). It results to an earthquake.
- The Plane along which the rock blocks are displaced is called **fault plane**. A fault Plane may be vertical, Or inclined, or horizontal, or curved or of any type and form.
- The movement responsible for the formation of a fault may operate in vertical or horizontal or in any direction.

### Earthquakes

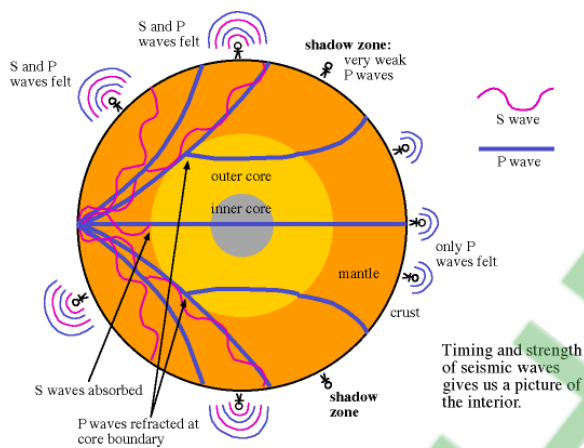
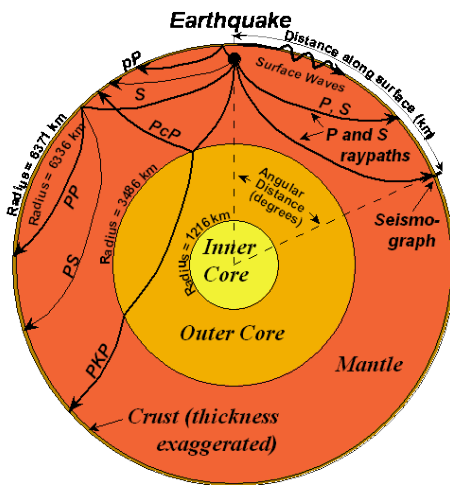
- Earthquakes refer to the sudden shaking or vibrations of the earth's crust due to sudden and rapid displacement of tectonic plates along the line of weakness (faults). It occurs mainly in volcanic eruption zones.
- The point from which the earthquake originates is known as focus and the intensity of earthquakes can be measured by using an instrument called seismograph.
- The point on the surface vertically above the focus is called epicentre.
- Magnitude refers to the total amount of amount of energy released and it is given on the Richter scale. This scale ranges from 0 to 9.

### Magnitude and Effect of Earthquakes

**1 to 3 :** Can be recorded, but rarely causes damage. Usually not felt by humans.

**3 to 6 :** Can be felt by humans. Damage is usually minor. Some buildings can be affected.

**6 to 9+ :** Can cause great damage. An earthquake with a magnitude over 6 can cause damage for 100 miles (160 km). Anything greater than 8 can cause severe damage over an area of hundreds of square miles.



Earthquake Waves

### FAST FACTS OF EARTHQUAKES

The **World's Largest Earthquake** occurred on May 22, 1960 near Valdivia, in southern Chile. It was assigned a magnitude of 9.5 by the United States Geological Survey. It is referred to as the "**Great Chilean Earthquake**" and the "**1960 Valdivia Earthquake**".

The **World's Deadliest Earthquakes** occurred on January 23, 1556, an 8.0 magnitude earthquake struck Shansi, China killing 830,000 people.

**India's Largest Earthquake** occurred on December 26, 2004, near west coast northern Sumatra India Sri Lanka Maldives. It was assigned a magnitude of 9.1. **Third deadliest earthquake** in the history of the world, the

tsunami generated killed 15,000 people in India.

### Seismology

- It is the study of earthquakes and seismic waves that move through and around the earth.
- **Seismic waves** are the waves of energy caused by the sudden breaking of rock within the earth or an explosion.
- They are the energy that travels through the earth and is recorded on **seismographs**.
- The two main types of waves are **body waves** (P-waves & S-waves) and **surface waves**.

### Body Waves

Traveling through the interior of the earth, body waves arrive before the surface waves emitted by an earthquake. These waves are of a higher frequency than surface waves.

### P-waves or Compressional Waves

- It is also known as primary waves or pressure waves, travel at the greatest velocity through the Earth.
- P-waves (Primary waves) are the first waves to arrive on a complete record of ground shaking because they travel the fastest.
- They typically travel at speeds between ~1 and ~14 km/sec.
- The vibration caused by P waves is a volume change, alternating from compression to expansion in the direction that the wave is traveling. P-waves travel through all types of media - solid, liquid, or gas.

### S-waves or Transverse Waves

- Secondary waves travel slower than P waves and are also called "shear" waves because they don't change the volume of the material through which they propagate, they shear it.

- S-waves are transverse waves because they vibrate the ground in a the direction "transverse", or perpendicular, to the direction that the wave is traveling.
- S-wave propagation speeds are on the order of 1 to 8 km/sec.

### Surface Waves

- It can be generated when the source of the earthquake is close to the Earth's surface.
- It also cause damage to structures, as they shake the ground underneath the foundations of buildings and other structures.
- There are two basic kinds of surface waves Rayleigh waves and Love waves.
- Rayleigh and Love waves always travel slower than P waves and usually travel slower than S waves.

**Rayleigh Waves** *named after British physicist Lord Rayleigh*

These are the slowest of all the seismic wave types and in some ways the most complicated. It moves both vertically and horizontally in a vertical plane pointed in the direction in which the waves are travelling.

**Love Waves** *named after British geophysicist A. E. H. Love*

These are transverse waves that vibrate the ground in the horizontal direction

perpendicular to the direction that the waves are traveling. Its velocities is between 2 and 6 km/second.

### External forces

These forces are affect the surface of the earth from the above. *e.g.* weathering and erosion.

### Weathering

- It is the breaking down of rocks through exposure to the atmosphere. There are two basic types of weathering: mechanical and chemical.
- **Mechanical weathering** takes place when rocks are broken apart. For example, water in rocks will freeze and thaw based on air temperatures. This causes the water to contract and expand, which weakens the rock. Over time, the rock breaks down.
- **Chemical weathering** causes rocks to weaken. When iron meets water it rusts. The same thing happens to the iron in a rock. When it rusts, or oxidizes, the rock gets weaker, and sooner or later it breaks down.

### Erosion

Once rocks begin to break down through weathering, erosion can take over. Erosion is the process by which rock particles are moved. Water, wind, ice, and gravity can all cause sediment to break away from rocks.

## ROCKS

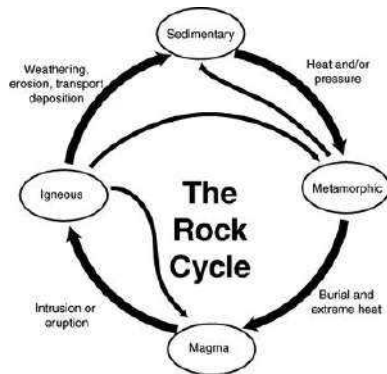
*Rocks are the most common material on Earth. They are naturally occurring aggregates of one or more minerals. It is the solid mineral material forming part of the surface of the earth.*

### Rock Cycle

The rocks of earth's crust are constantly being recycled and changed into new forms through geologic processes. This continual transformation of rocks from one type to another is called the rock cycle. Through

processes such as weathering, heating, melting, cooling, and compaction, any one rock type can be changed into a different rock type as its chemical composition and physical characteristics are transformed.

The three main rock types are **igneous**, **sedimentary**, and **metamorphic**.



**Rock Cycle**

### **Igneous Rocks**

- Igneous rocks form when molten rock, known as **magma** (if below the surface of the Earth) or **lava** (at the surface of the Earth), solidifies. *e.g.* granite, basalt and diorite.
- The minerals in the rock crystallize or grow together so that the individual crystals lock together.
- Igneous rocks and magma make up much of the oceanic and continental crust, as well as most of the rock deeper in the Earth.
- **Granite rocks** are igneous rocks which were formed by slowly cooling pockets of magma that were trapped beneath the earth's surface.
- **Obsidian rocks** are igneous rocks that form when lava cools quickly above ground. Obsidian is actually glass and not a mixture of minerals.

### **Sedimentary Rocks**

- Sedimentary rocks are those made of grains of preexisting rocks or organic

material that, in most cases, have been eroded, deposited, compacted, and cemented together. *e.g.* shale, sandstone, limestone, and conglomerate.

- They typically form at the surface of the Earth as sediment moves as a result of the action of wind, water, ice, gravity, or a combination of these.
- Sedimentary rocks into three subclasses:
  1. **Clastic:** basic sedimentary rock which is composed of clasts: little pieces of broken-up rock which are joined together as a result of compaction and cementation.
  2. **Chemical:** these are often formed as a result of repeated flooding and evaporation. When water evaporates it leaves a layer of dissolved minerals behind. Deposits of salt and gypsum are characteristic examples of these processes.
  3. **Organic:** rocks which form from organic material such as the calcium from the shells and bones of animals.

### **Metamorphic Rocks**

- The metamorphics get their name from "meta" (change) and "morph" (form). Metamorphic rocks are named for the process of metamorphism, or change, that affects rocks. *e.g.* slate, gneiss, marble, and quartzite.
- These rocks are commonly formed by the partial melting of minerals, and re-crystallization.
- Metamorphism frequently occurs deep within the crust or beneath mountain ranges, where high temperatures and pressures provide favorable conditions for metamorphism.



## LANDFORMS

A landform is a natural feature of the solid surface of the Earth. *e.g.* mountains, hills, valleys, plateaus, plains, islands, loess, deserts, and glaciers.

### Mountains

- A mountain is the highest landform on the surface of the earth.
- It is usually found to be conical in shape with steep sides and a pointed tip called a peak.
- As compared to their surroundings, mountains are high points on the surface of the earth.
- **Mountain range** is a series of mountains.
- Mountains could be steep and snow covered or they could be gently sloping having rounded tops.
- The highest mountain on Earth is **Mount Everest** in the Himalayas of Asia. Its peak is 8,848 metres above sea level.
- The highest mountain of our Solar System is **Olympus Mons** (21,171m) on Mars.

### Mountain Features and Structures

- **Arête** - A narrow ridge formed when two glaciers erode opposite sides of a mountain.
- **Cirque** - A bowl shaped depression formed by the head of a glacier usually at the foot of a mountain.
- **Crag** - A mass of rock that projects outward from a rock face or cliff.
- **Face** - The side of a mountain that is very steep.
- **Glacier** - A mountain glacier is formed by compacted snow into ice.
- **Leeward side** - The leeward side of a mountain is opposite the windward side. It is protected from the wind and rain by the mountain.
- **Horn** - A horn is a sharp peak formed from multiple glaciers.
- **Moraine** - A collection of rocks and dirt left behind by glaciers.

- **Pass** - A valley or path between mountains.
- **Peak** - The highest point of a mountain.
- **Ridge** - A long narrow top of a mountain or series of mountains.
- **Slope** - The side of a mountain.

### Types of Mountains

There are three types of mountains: Volcanic, Fold and Fault-block mountains

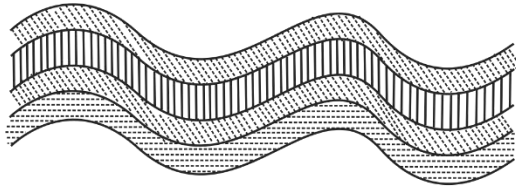
#### Volcanic Mountain

- It formed when molten rock (magma) deep within the earth, erupts, and piles upon the surface.
- There are two main types of volcanic mountains: **volcanoes** and **dome mountains**.
- **Volcanoes** are formed when magma erupts all the way to the surface of the Earth. The magma will harden on the Earth's surface, forming a mountain. *e.g.* Mount Fuji in Japan and Mount Mauna Loa in Hawaii.
- **Dome mountains** are formed when a large amount of magma builds up below the Earth's surface. This forces the rock above the magma to bulge out, forming a mountain. *e.g.* Sierra Nevada range

#### Fold Mountain

- It formed when two plates collide head on, and their edges crumbled, much the same way as a piece of paper folds when pushed together. *e.g.* Himalayan Mountains in Asia, the Alps in Europe, the Andes in South America, the Rockies in North America, the Urals in Russia, etc.
- The upward folds are known as **anticlines**, and the downward folds are **synclines**.

- There are **two types** of folded mountains:  
**Young folded mountains** (10-25 million years old), **Old folded mountains** (over 200 million years old)



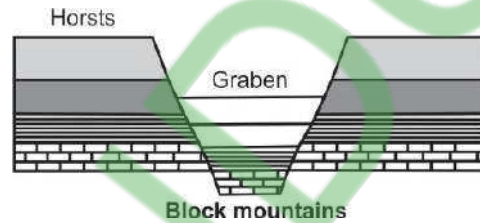
Fold mountains

### Fault-block mountains

- It forms when faults or cracks in the earth's crust force some materials or blocks of rock up and others down.
- Instead of the earth folding over, the earth's crust fractures (pulls apart). It

breaks up into blocks or chunks. Sometimes these blocks of rock move up and down, as they move apart and blocks of rock end up being stacked on one another.

- Often fault-block mountains have a steep front side and a sloping back side.
- *e.g.* the Sierra Nevada mountains in North America, the Harz Mountains in Germany



Block mountains

### SEVEN SUMMITS : *the highest peaks of the 7 continents*

Peak	Elevation	Prominence	Continent	Range	Country
Mount Everest	8,848 m	8,848 m	Asia	Himalaya	Nepal / China
Aconcagua	6,961 m	6,961 m	South America	Andes	Argentina
Mount McKinley	6,194 m	6,144 m	North America	Alaska Range	United States
Kilimanjaro	5,895 m	5,885 m	Africa	Eastern Rift mountains	Tanzania
Mount Elbrus	5,642 m	4,741 m	Europe	Caucasus Mountains	Russia
Mount Vinson	4,892 m	4,892 m	Antarctica	Sentinel Range	Antarctica
Mount Kosciuszko	2,228 m	2,228 m	Australia	Great Dividing Range	Australia

However, the highest mountain in the Australian continent which includes Australia and New Guinea is Puncak Jaya, 4,884 m (16,024 ft) above sea level, in the Indonesian province of Papua on the island of New Guinea which lies on the Australian continental shelf. Puncak Jaya is also known as Carstensz Pyramid.

## Hills

- Hills are lower than mountains but are higher than their surrounding areas.
- A number of hills together form a 'range of hills'.
- It may be formed by a buildup of rock debris or sand deposited by glaciers and wind or may be created by faults.
- The climate in the hills is more pleasant than the climate in high snow covered mountains. It is usually neither too hot nor too cold.
- Hill made by people is called a mound.

## Valleys

- Valleys are the low-lying areas between two mountains or hills.
- When rivers flow down the mountainsides and hillsides, it wears off the rocks and soil. Over a period of time, the water carves out v- shaped grooves. These grooves get deeper and wider, finally forming low land areas called valleys.
- Valleys formed by glaciers are **U- shaped valleys**.
- Valleys formed due to the effect of erosion are **V – shaped valleys**.
- The valleys formed (that is V shaped or U shaped), depend upon the rate at which deepening and widening takes place.
- Narrow valleys are called **canyons**.
- In young Mountain areas the valleys found are **steep sided**.
- The bottom of a valley is called its **floor**. The part of the floor along riverbanks is called **flood plain**.
- A valley's sides are called **valley walls** or **valley slopes**. A valley wall is the side slope of a **stream** or **glacial valley**.

## Plateaus

- A plateau is a flat topped highland with steep sides. Since it looks like a table, it is also called a tableland. They are basically areas of high flat land. Plateaus are usually

surrounded by steep rock faces called cliffs.

- **Intermontane plateau** is surrounded by mountains on all sides. *e.g.* the Tibetan plateau, the Bolivian plateau
- **Piedmont plateau** has a mountain on one side. *e.g.* the Malwa plateau in India, the Patagonian plateau in Argentina
- **Continental plateau** is surrounded by oceans or plains. *e.g.* plateaus of western Australia and Africa
- **Volcanic plateaus** are produced by volcanic activity. *e.g.* Columbia Plateau ecoregion in United States and Canada.
- **Dissected plateaus** are highly eroded plateaus cut by rivers and broken by deep narrow valleys. *e.g.* plateaus of south-western USA.
- *The Deccan Plateau in India is good for growing cotton because of the black soil present.*

## Famous Plateaus of the World

Plateau	Situation
Arabian Plateau	South - West Asia
Colorado Plateau	South of Great Basin Plateau, USA
Deccan Plateau	Southern India
Great Basin Plateau	South of Colombia Plateau, USA
Plateau of Alaska	North - West North America
Plateau of Bolivia	Andes Mountain
Plateau of Brazil	Central - Eastern South America
Plateau of Colombia	USA
Plateau of Madagascar	Madagascar
Plateau of Mexico	Mexico
Tibetan Plateau	Between Himalayas and Quinloo Mountains

## Plains

- Plains are areas of flat land.
- It usually meets the oceans or seas, these are called **Coastal Plains**. In India, we have the Eastern Coastal Plains and the Western Coastal Plains.

- Some plains are formed by the action of rivers, these are called **River Plains**. In India the Northern Gangetic Plain is a river plain.

### Major Grasslands of the World

Grassland	Countries
African savannah	Africa
Cantebury	New Zealand
Downs	Australia
Pampas	Argentina
Prairie	USA
Pustaz	Hungary
Steppe	Eurasia
Veld	South Africa

### Islands

- An island is a piece of land surrounded by water on all sides.
- The continent of Australia is an island.
- Islands are formed due to volcanic activity or due to hot spots in the lithosphere.
- Coral islands are formed when the skeletal material of the corals piles up over a long period of time.
- A large group of islands close to each other together form an **archipelago**.
- The Lakshadweep islands are an example of an **archipelago**. The largest archipelago in the world is **Indonesia**.

### Loess

- Loess are deposits of silt mixed with little amount of sand and clay.
- Loess can be the result of wind or glacial activities.

### Deserts (Hot Desert)

- These are large, dry and hot areas of land which receive little or no rainfall throughout the year. These are covered with sand.
- Sand dunes are huge hills of sand formed by the winds.
- Deserts have extreme weather conditions, days could be very hot and nights very cold. This is because the sand absorbs heat fast during the day and gives off heat quickly at night.
- Thar Desert is the largest hot desert in India
- Sahara is the world's largest hot desert.

### Glaciers (Cold Desert)

- These are large areas of land covered with snow. They receive snowfall during the winters.
- Over 75% of the world's fresh water is presently locked up in these frozen reservoirs.
- The Antarctica is the world's biggest cold desert.
- The world's largest glacier is the **Lambert glacier** in **Antarctica**.

### Major Deserts in the World

Name	Area (km <sup>2</sup> )	Location
Antarctic Desert	13,829,430	Antarctica
Arctic	13,726,937	Alaska, Canada, Greenland, Iceland, Norway, Sweden, Finland, Russia
Sahara	9,400,000	Africa
Arabian Desert	2,330,000	Arabian Peninsula
Gobi Desert	1,300,000	China and Mongolia
Kalahari Desert	900,000	South Africa, Botswana, Namibia
Great Victoria Desert	647,000	Australia
Great Basin Desert	492,000	United States
Chihuahuan Desert	450,000	Mexico and United States
Great Sandy Desert	400,000	Australia
Colorado Plateau	337,000	United States
Taklamakan Desert	270,000	China
Thar Desert	200,000	India and Pakistan
Dasht-e Kavir	77,000	Iran

### Some other Landforms

- **Peninsula** is a piece of land that is surrounded by water from three sides. For example the southern part of India is a peninsula as it is surrounded by the Arabian sea, Bay of Bengal and the Indian ocean and is joined to land on the fourth side.
- **Cape** is a part of land extending in to a water body.
- **Isthmus** is a narrow stretch of land which joins to large land masses. *e.g.* Panama.

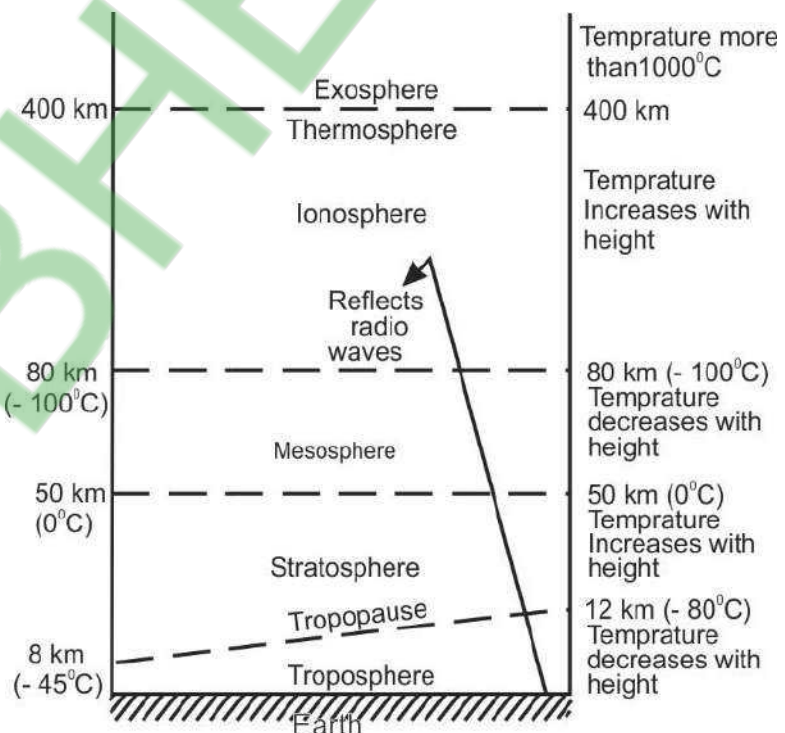
## ATMOSPHERE

- The atmosphere is a thin layer of gases that surrounds the Earth that is retained by Earth's gravity.
- It seals the planet and protects us from the vacuum of space.
- It protects us from electromagnetic radiation given off by the Sun and small objects flying through space such as meteoroids.
- The study of Earth's atmosphere and its processes is called atmospheric science or **aerology**.

### Composition

The atmospheric composition on Earth is largely governed by the by-products of the life that it sustains. Dry air from Earth's atmosphere contains 78.08% **nitrogen**, 20.95% **oxygen**, 0.93% **argon**, 0.038% **carbon dioxide**, and traces of hydrogen, helium, and other "noble" gases (by volume), but generally a variable amount of **water vapour** is also present, on average about 1% at sea level.

### LAYERS OF THE ATMOSPHERE



Layers	Range	Notes
<b>Troposphere</b>	0-12 km	<ul style="list-style-type: none"> <li>• Lowest region of Earth's atmosphere.</li> <li>• It contains 80% of the atmosphere's mass.</li> <li>• Weather and clouds occur in it.</li> </ul>
<b>Tropopause</b> is the boundary zone (or transition layer) between the troposphere and the stratosphere. It is characterized by little or no change in temperature altitude increases.		
<b>Stratosphere</b>	12-50 m	<ul style="list-style-type: none"> <li>• Earth's ozone layer is located in it.</li> <li>• It absorbs a lot of ultraviolet solar energy.</li> <li>• Airoplanes and Jet aircrafts fly in it.</li> <li>• Temperatures in the stratosphere are highest over the summer pole, and lowest over the winter pole.</li> </ul>
<b>Mesosphere</b>	50-80 km	<ul style="list-style-type: none"> <li>• temperature decreases with increase of height</li> <li>• Meteors burn up in this layer.</li> </ul>
A temperature minimum of $-90^{\circ}\text{C}$ is the <b>mesopause</b> .		
<b>Thermosphere</b>	80-400 km	<ul style="list-style-type: none"> <li>• Aurora and satellites occur in this layer.</li> <li>• Space shuttle orbits in this layer.</li> </ul>
<b>Ionosphere</b>	80-600 km	<ul style="list-style-type: none"> <li>• an abundant layer of electrons and ionized atoms and molecules.</li> </ul>
<b>Exosphere</b>	600-beyond	<ul style="list-style-type: none"> <li>• Outermost layer of Earth's atmosphere.</li> <li>• The lower boundary of the exosphere is called the critical level of escape, where atmospheric pressure is very low and the temperature is very low.</li> </ul>

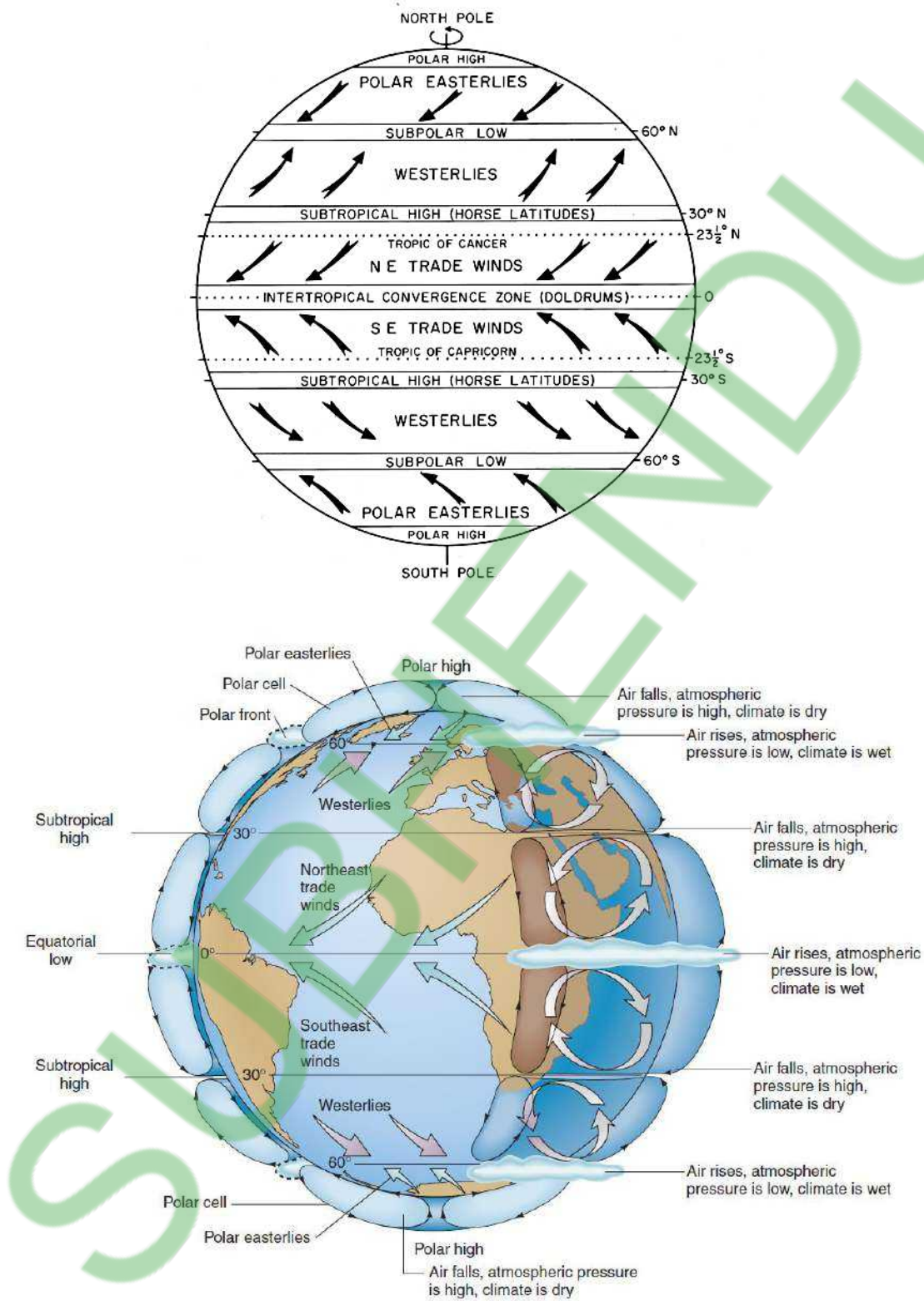
### Earth's Heat Budget

- The balance between incoming and outgoing heat is known as Earth's heat budget.
- The Earth receives energy from the sun as insolation is known as **Solar Insolation**. Some is lost as it passes through the atmosphere but overall the surface has a net gain of energy, the exception being the polar regions. Only about 24% of this insolation reaches the surface as it is either absorb, reflected or scattered.
- The atmosphere in contrast has a net deficit of energy. Because of this difference, heat is transferred from the surface to the atmosphere by radiation, conduction and by the release of latent heat.
- 51 units of solar insolation is received by earth as direct radiation. Received through direct Radiation= **34 units** and Received as diffused day light= **17 units**.

### Atmospheric Pressure or Barometric Pressure

- It is the pressure exerted by the weight of air in the atmosphere of Earth.
- It is the force exerted on a surface by the air above it as gravity pulls it to Earth.
- At sea level, the air pressure is about 6.6 kg per square inch.
- As your altitude increases (for example, if you climb a mountain), the air pressure decreases.
- At an altitude of 10,000 feet, the air pressure is 4.5 kg per square inch (and there is less oxygen to breathe).
- Atmospheric pressure is commonly measured with a **barometer**.
- The **standard atmosphere** (symbol: atm) is a unit of pressure.
- $1 \text{ atm} = 760 \text{ mmHg (torr)} = 1.01325 \text{ bar}$
- Near Earth's surface the pressure decreases with height at a rate of about 3.5 millibars for every 30 metres.

### The Global Pressure Belts



- The distribution of atmospheric pressure across the latitudes is termed global horizontal distribution of pressure.
- Its main feature is its zonal character known as pressure belts.
- On the earth's surface, there are in all seven pressure belts. They are the Equatorial Low, the two Sub-tropical Highs, the two Sub-polar Lows, and the two Polar Highs. Except the Equatorial low the others form matching pairs in the Northern and Southern Hemispheres.
- There is a pattern of alternate high and low pressure belts over the earth. This is due to the spherical shape of the earth—different parts of the earth are heated unequally.
- The Equatorial region receives great amount of heat throughout the year. Warm air being light, the air at the Equator rises, creating a low pressure.
- At the poles the cold heavy air causes high pressure to be created/formed. It is also due to the rotation of the earth.
- In the Sub-polar region around latitudes 60° to 65° North and South of the Equator, the rotation of the earth pushes up the bulk of the air towards the Equator, creating a low pressure belt in this region.

#### **Equatorial Low Pressure Belts**

- This low pressure belt extends from 0 to 5° North and South of Equator. Due to the vertical rays of the sun here, there is intense heating.
- The air therefore, expands and rises as convection current causing a low pressure to develop here. This low pressure belt is also called as **doldrums**, because it is a zone of total calm without any breeze.

#### **Sub-tropical High Pressure Belts**

- At about 30° North and South of Equator lies the area where the ascending equatorial air currents descend. This area is thus an area of high pressure. It is also called as the Horse latitude.

- Winds always blow from high pressure to low pressure. So the winds from sub tropical region blow towards Equator as Trade winds and another wind blows towards Sub-Polar Low-Pressure as **Westerlies**.

#### **Circum-polar Low Pressure Belts**

- These belts located between 60° and 70° in each hemisphere are known as Circum-polar Low Pressure Belts.
- In the Sub-tropical region the descending air gets divided into two parts. One part blows towards the Equatorial Low Pressure Belt. The other part blows towards the **Circum-polar Low Pressure Belt**. This zone is marked by ascent of warm Sub-tropical air over cold polar air blowing from poles. Due to earth's rotation, the winds surrounding the Polar region blow towards the Equator.
- Centrifugal forces operating in this region create the low pressure belt appropriately called Circum-polar Low Pressure Belt. This region is marked by violent storms in winter.

#### **Polar High Pressure Areas**

- At the North and South Poles, between 70° to 90° North and South, the temperatures are always extremely low.
- The cold descending air gives rise to high pressures over the Poles.
- These areas of Polar high pressure are known as the **Polar Highs**. These regions are characterised by permanent Ice Caps.

#### **Shifting of pressure belts**

- The earth is inclined 23 1/2° towards the sun.
- On account of this inclination, differences in heating of the continents, oceans and pressure conditions in January and July vary greatly. January represents winter season and July, summer season in the



Northern Hemisphere. Opposite conditions prevail in the Southern Hemisphere.

- When the sun is overhead on the **Tropic of Cancer (21 June)** the pressure belts shift 5° northward and when it shines vertically overhead on **Tropic of Capricorn (22 December)**, they shift 5° southward from their original position.
- The shifting of the pressure belts cause seasonal changes in the climate, especially between latitudes 30° and 40° in both hemispheres. In this region the Mediterranean type of climate is

experienced because of shifting of permanent belts southwards and northwards with the overhead position of the sun.

- During winters Westerlies prevail and cause rain. During summers dry Trade Winds blow offshore and are unable to give rainfall in these regions.
- When the sun shines vertically over the **Equator on 21st March and 23rd September (the Equinoxes)**, the pressure belts remain balanced in both the hemispheres.

### Cyclone & Anticyclone

Cyclones	Anticyclones
It is an area of low pressure surrounded by high pressure.	It is an area of high pressure surrounded by low pressure.
Winds converge at the eye (central low pressure) of the cyclone, wind moves in a spiral motion.	Winds diverge from the central high pressure to the surrounding low pressure.
Stormy conditions prevail.	Light cool winds blow.
Winds blow in an anti-clock-wise direction in the Northern hemisphere and vice-versa in the Southern hemisphere.	Winds blow in a clockwise direction in the Northern hemisphere and vice-versa in the Southern hemisphere.

Different name of Cyclons	
Cyclone names	Region
Cyclone	Indian ocean
Hurricane	Western Atlantic, Eastern Pacific, <b>Carabian Sea</b>
Typhoon	Western Pacific, <b>China Sea</b>
Tornado	<b>USA</b>
Willy Wilies	Nothern Australia

List of Cyclone Names in the Indian Ocean	
Countries	Cyclone Names
Bangladesh	Onil, Ogni, Nisha, Giri, Helen, Chapala, Ockhi, Fani
India	Agni, Akash, Bijli, Jal, Lehar, Megh, Sagar, Vayu
Maldives	Hibaru, Gonu, Aila, Keila, Madi, Roanu, Makunu, Hikaa
Myanmar	Pyarr, Yemyin, Phyan, Thane, Na-Nauk, Kyant, Daye, Kyarb
Oman	Baaz, Sidr, Ward, Murjan, Hudhud, Nada, Luban, Maha
Pakistan	Fanoos, Nargis, Laila, Nilam, Nilofar, Vardah, Tittli, Bulbul
Sri Lanka	Mala, Rashmi, Bandu, Mahasen, Priya, Asiri, Gigum, Soba
Thailand	Mukda, Khai-muk, Phet, Phailin, Komen, Mora, Phethai, Amphan

\* *The 1999 Orissa cyclone is the strongest storm to hit the Indian coast, as well as the strongest in the basin till date, with a minimum central pressure of 912 mbar (26.93 inHg).*

### Thunderstorm

- It is a storm with thunder and lightning and typically also heavy rain or hail.
- Thunderstorms occur in association with a type of cloud known as a **cumulonimbus**.
- They are usually accompanied by strong winds, heavy rain and sometimes snow, sleet, hail, or, in contrast, no precipitation at all.
- Thunderstorms may line up in a series or rainband, known as a squall line. Strong or severe thunderstorms may rotate, known as **supercells**.

### Jet stream

- Jet streams are relatively narrow bands of strong wind in the upper levels of the atmosphere.
- The winds blow from west to east in jet streams but the flow often shifts to the north and south. Jet streams follow the boundaries between hot and cold air.

- Since these hot and cold air boundaries are most pronounced in winter, jet streams are the strongest for both the northern and southern hemisphere winters.
- The major jet streams on Earth are westerly winds (flowing west to east).
- This rapid current is typically thousands of kilometers long, a few hundred kilometers wide, and only a few kilometers thick. Jet streams are usually found somewhere between 10-15 km (6-9 miles) above the earth's surface. The position of this upper-level jet stream denotes the location of the strongest surface temperature contrast.

### Local Winds

Local winds are small scale convective winds of local origin caused by temperature differences. Local terrain has a very strong influence on local winds, and the more varied the terrain, the greater the influence.

Winds	Nature	Region
Abrolhos	Violent	Southeastern coast of Brazil
Bayamo	Violent	Cuba's southern coast
Blizzard	Very Cold	Tundra region
Calima	Dusty	Saharan Air Layer across the Canary Islands
Chubasco	Violent	Central America
Diablo	Hot, Dry	San Francisco Bay Area
Foehn	Hot, Dry	Alps
Föhn	Dry	Central Europe
Monsoon	Seasonal Reversing	South Asia
Purga	Cold	Russian tundra
Santa Ana	Warm	Southern California
Squamish	Strong, Violent	British Columbia
Taku	Strong, Gusty	Alaska
Zonda	Hot	Andes, Central Argentina

## The Monsoon

- The monsoon season is also known as the rainy season, coming about due to a shift in wind directions that bring excessive rainfall. The monsoons of South Asia are the most famous, but they also occur in North America, Africa and South America.
- The south-west monsoon winds are called '**Nairutya Maarut**' in India.
- During the winter monsoon, a persistent and large high pressure zone over Asia drives cool, dry air southward toward the tropics. This provides the monsoon region with its dry season.
- Then during May and June of each year, the summer monsoon arrives with persistent southerly wind flow driven by a warm air mass with low pressure at the surface that forms over southern Asia as it is warmed by the sun.
- Air from the relatively higher pressure air mass over the Indian and tropical western Pacific Ocean flows northward toward the low pressure over land, bring with it torrential rains.
- It is estimated that there are approximately 500,000 lightning strikes during a monsoon.
- The word monsoon is believed to be derived from the Arabic word 'mausim'. Mausim means a shift in wind or season.
- India experiences the most dramatic monsoons in the world.

## El Niño and La Niña effect

El Niño and La Niña are opposite phases of what is known as the El Niño-Southern Oscillation (ENSO) cycle. The ENSO cycle is a scientific term that describes the fluctuations in temperature between the ocean and atmosphere in the east-central Equatorial Pacific (approximately between the International Date Line and 120 degrees West).

La Niña is sometimes referred to as the cold phase of ENSO and El Niño as the warm phase of ENSO. These deviations from normal surface temperatures can have large-scale impacts not only on ocean processes, but also on global weather and climate.

El Niño and La Niña episodes typically last nine to 12 months, but some prolonged events may last for years. Typically, El Niño occurs more frequently than La Niña.

## El Niño

El Niño means The Little Boy, or Christ Child in Spanish.

El Niño was originally recognized by fishermen off the coast of South America in the 1600s, with the appearance of unusually warm water in the Pacific Ocean. The name was chosen based on the time of year (around December) during which these warm waters events tended to occur.

The term El Niño refers to the large-scale ocean-atmosphere climate interaction linked to a periodic warming in sea surface temperatures across the central and east-central Equatorial Pacific.

## La Niña

La Niña means The Little Girl in Spanish. La Niña is also sometimes called El Viejo, anti-El Niño, or simply "a cold event."

La Niña episodes represent periods of below-average sea surface temperatures across the east-central Equatorial Pacific. Global climate La Niña impacts tend to be opposite those of El Niño impacts. In the tropics, ocean temperature variations in La Niña also tend to be opposite those of El Niño.

During a La Niña year, winter temperatures are warmer than normal in the Southeast and cooler than normal in the Northwest.

## Humidity and related Aspects

- It is the amount of water vapour in the atmosphere.
- Higher humidity reduces the effectiveness of sweating in cooling the body by reducing the rate of evaporation of moisture from the skin. This effect is calculated in a **humidex**.
- A **psychrometer** or **hygrometer** is used to measure humidity.
- There are three main measurements of humidity: **absolute**, **relative** and **specific**.
- **Absolute humidity** is the water content of air at a given temperature expressed in gram per cubic metre.
- **Relative humidity**, expressed as a percent, measures the current absolute humidity relative to the maximum (highest point) for that temperature.
- Relative humidity = (Absolute humidity / Humidity capacity) x 100

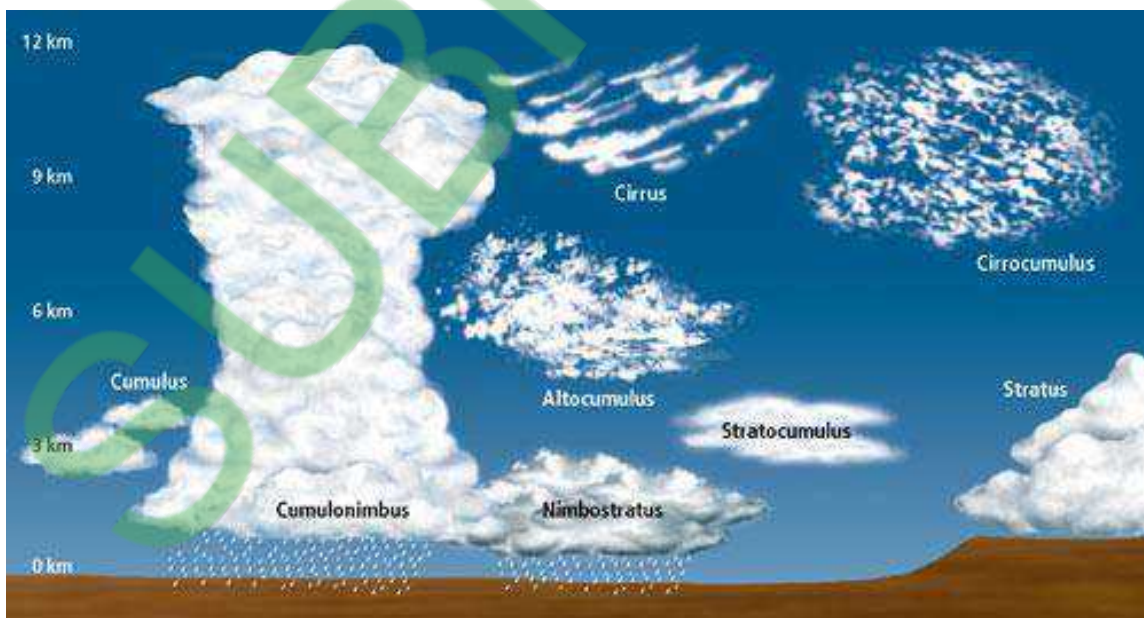
- **Specific humidity** is a ratio of the water vapor content of the mixture to the total air content on a mass basis.
- **Humidity capacity** of air of certain volume at certain temperature to retain maximum amount of moisture content.

## Dew Point and Frost Point

- Dew point is the temperature at which water vapor saturates from an air mass into liquid or solid usually forming rain, snow, frost, or dew.
- If the dew point is below freezing, it is referred to as the frost point
- Dew point normally occurs when a mass of air has a relative humidity of 100%. This happens in the atmosphere as a result of cooling through a number of different processes.

## CLOUDS

*It is a large gathering of droplets of water or frozen crystals made of water or various chemicals.*



### Formation of Cloud

- Clouds are formed when air containing water vapor is cooled below a critical temperature called the dew point and the resulting moisture condenses into droplets on microscopic dust particles (condensation nuclei) in the atmosphere.
- The air is normally cooled by expansion during its upward movement.
- Upward flow of air in the atmosphere may be caused by convection resulting from intense solar heating of the ground; by a cold wedge of air (cold front) near the

ground causing a mass of warm air to be forced aloft; or by a mountain range at an angle to the wind.

- Clouds are occasionally produced by a reduction of pressure aloft or by the mixing of warmer and cooler air currents.

### Types of Clouds

In meteorology clouds can be divided into 4 types, which are in different heights of the troposphere: **High level** clouds (altitudes of 5-13 km), **medium level** clouds (2-7 km), **low level** clouds (0-2 km) and clouds with large **vertical extending** (0-13 km).

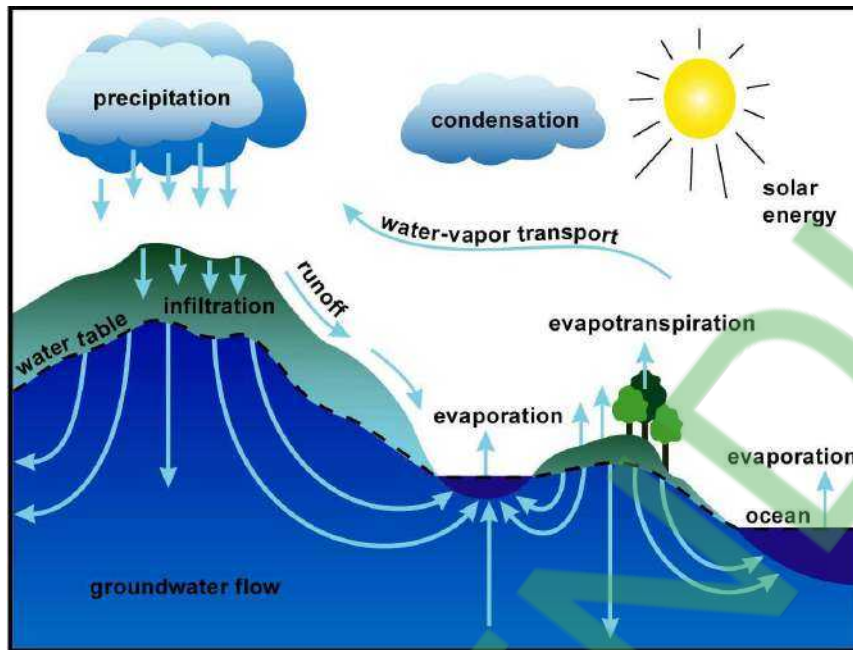
Name	Abbr.	Meaning
<b>High level clouds at heights of 5-13 km</b>		
Cirrus	Ci	Fibrous, threadlike, white feather clouds of ice crystals, whose form resembles hair curls.
Cirrostratus	Cs	Milky, translucent cloud veil of ice crystals, which sometimes causes halo appearances around moon and sun.
Cirrocumulus	Cc	Fleecy cloud; Cloud banks of small, white flakes.
<b>Medium level clouds at heights of 2-7 km</b>		
Alto cumulus	Ac	Grey cloud bundles, sheds or rollers, compound like rough fleecy cloud, which are often arranged in banks.
Altostratus	As	Dense, gray layer cloud, often evenly and opaquely, which lets the sun shine through only a little.
<b>Low level clouds at heights of 0-2 km</b>		
Stratocumulus	Sc	Cloud plaices, rollers or banks compound dark gray layer cloud.
Stratus	St	Evenly grey, low layer cloud, which causes fog or fine precipitation and is sometimes frazzled.
<b>Clouds with large vertical extending at heights of 0-13 km</b>		
Cumulus	Cu	Heap cloud with flat basis in the middle or lower level, whose vertical development reminds of the form of towers, cauliflower or cotton.
Cumulonimbus	Cb	In the middle or lower level developing thundercloud, which mostly up-rises into the upper level.
Nimbostratus	Ns	Rain cloud. Grey, dark layer cloud, indistinct outlines.

### Meanings of the Latin names

The names for clouds are usually are combinations of the following prefixes or suffixes:

- Cirrus = High Clouds looking like feather
- Cumulus = Flat bases and round tops looking like a heap
- Stratus = Flat/layered and smooth
- Alto = High level cloud
- Nimbus = Rain-bearing cloud

### Water cycle or Hydrological cycle or H<sub>2</sub>O cycle



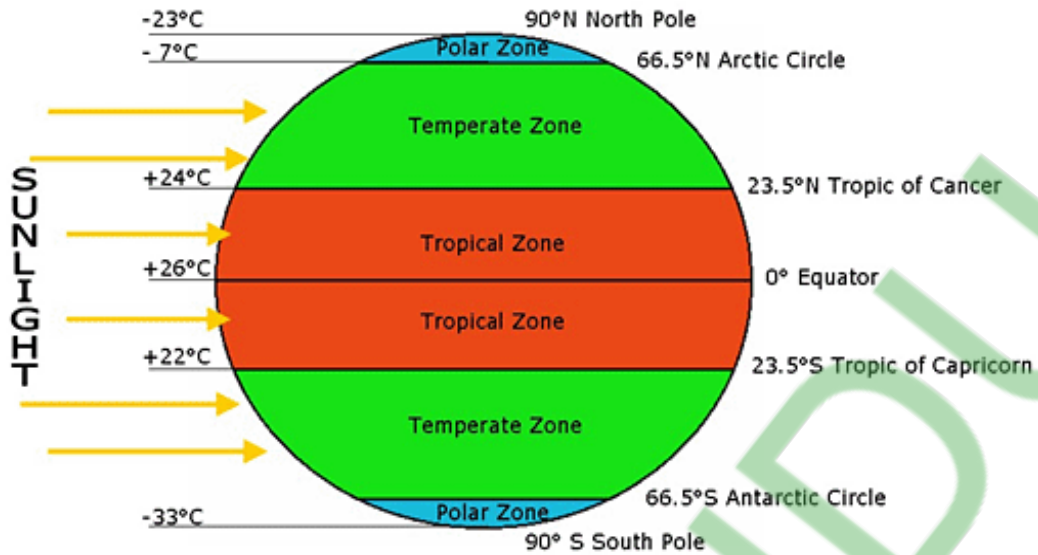
- It describes the continuous movement of water on, above and below the surface of the Earth.
- The mass of water on Earth remains fairly constant over time but the partitioning of the water into the major reservoirs of ice, fresh water, saline water and atmospheric water is variable depending on a wide range of climatic variables.
- The water moves from one reservoir to another, such as from river to ocean, or from the ocean to the atmosphere, by the physical processes of evaporation, condensation, precipitation, infiltration, runoff, and subsurface flow. In doing so, the water goes through different phases: liquid, solid (ice), and gas (vapor).
- The water cycle involves the exchange of energy, which leads to temperature changes. For instance, when water evaporates, it takes up energy from its surroundings and cools the environment. When it condenses, it releases energy and warms the environment. These heat exchanges influence climate.
- The evaporative phase of the cycle purifies water which then replenishes the land with freshwater.
- The flow of liquid water and ice transports minerals across the globe.
- It is also involved in reshaping the geological features of the Earth, through processes including erosion and sedimentation.

#### **Climate**

- It is the statistics of weather, usually over a 30-year interval.
- It is measured by assessing the patterns of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count and other meteorological variables in a given region over long periods of time.
- A region's climate is generated by the climate system, which has five components: atmosphere, hydrosphere, cryosphere, land surface, and biosphere.

#### **World Climate Zones**

World Climate zones are areas with distinct climates, which occur in east-west direction around the Earth, and can be classified using different climatic parameters. Generally, climate zones are belt-shaped and circular around the Poles.



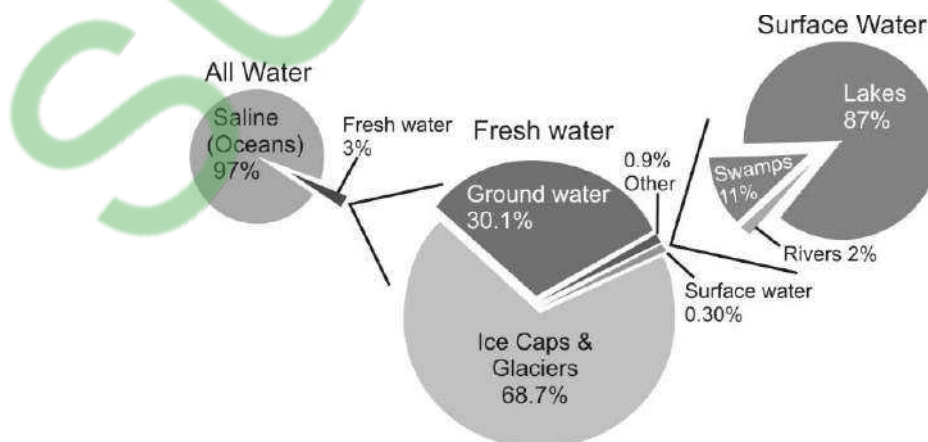
Climate Zone	Range	Climate Type
Tropical Zone	0° - 23.5°	Hot, Warm, Dry, Tropical Monson, Heavy Rainfall
Temperature Zone	23.5° - 66.5°	Spring, Summer Warm / Hot, Autumn (fall), and Winter Cool / Cold
Polar Zone	66.5° - 90°	Cold & dry with short cold summers, Freezing Temperature

## HYDROSPHERE : OCEANS OF EARTH

- It is the liquid water component of the Earth.
- It covers about 70% of the surface of the Earth.
- It includes all liquid and frozen surface waters, groundwater held in soil and rock, and atmospheric water vapour.
- It includes the oceans, seas, lakes, ponds, rivers and streams.
- About 1.4 billion cubic kilometres of water in liquid and frozen form make up the oceans, lakes, streams, glaciers, and groundwaters found there.



### Composition of Hydrosphere



## Ocean & Sea

- It is a body of **saline water** that composes a large part of earth hydrosphere.
- There are five oceans. In the descending order of area they are, **Pacific** Ocean, **Atlantic** Ocean, **Indian** Ocean, **Southern** (Antarctic) Ocean, and **Arctic** Ocean.
- The word **sea** is often used interchangeably with "**ocean**" in American English but, strictly speaking, a sea is a body of saline water (generally a division of the World Ocean) partly or fully enclosed by land.

### Oceanic divisions

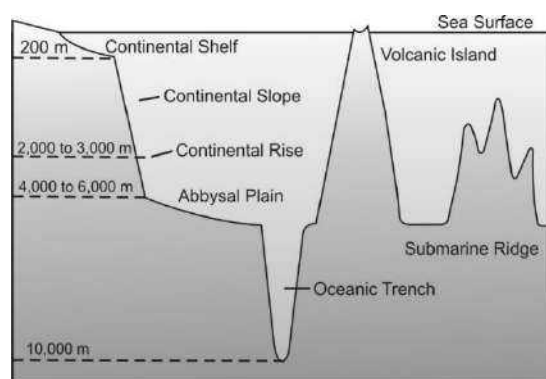
Ocean	Area in km <sup>2</sup> and %	Covers	Greatest known depth in (m)
Pacific Ocean	168,723,000 46.6%	Separates Asia and Oceania from the Americas	Mariana Trench 11,033 m
Atlantic Ocean	85,133,000 23.5%	Separates the Americas from Eurasia and Africa	Puerto Rico Trench 9,219 m
Indian Ocean	70,560,000 19.5%	Washes upon southern Asia and separates Africa and Australia	Sunda Trench 7,455 m
Southern Ocean	21,960,000 6.1%	Sometimes considered an extension of the Pacific, Atlantic and Indian Oceans, which encircles Antarctica	South Sandwich Trench 7,235 m
Arctic Ocean	15,558,000 4.3%	Sometimes considered a sea of the Atlantic, which covers much of the Arctic and washes upon northern North America and Eurasia	77°45'N; 175°W 4,632 m

### Major Seas and their Greatest known depth

Name	Area (sq. km)	Average Depth (m)	Greatest known depth place	Greatest known depth (m)
Mediterranean Sea	2,965,800	1,429	Off Cape Matapan, Greece	4,632
Caribbean Sea	2,718,200	2,647	Off Cayman Islands	6,946
South China Sea	2,319,000	1,652	West of Luzon	5,016
Bering Sea	2,291,900	1,547	Off Buldir Island	4,773
Gulf of Mexico	1,592,800	1,486	Sigsbee Deep	3,787
Okhotsk Sea	1,589,700	838	146°10'E; 46°50'N	3,658
East China Sea	1,249,200	188	25°16'N; 125°E	2,782
Hudson Bay	1,232,300	128	Near entrance	183
Japan Sea	1,007,800	1,350	Central Basin	3,742
Andaman Sea	797,700	870	Off Car Nicobar Island	3,777
North Sea	575,200	94	Skagerrak	660
Red Sea	438,000	491	Off Port Sudan	2,211
Baltic Sea	422,200	55	Off Gotland	421



## Relief of the Ocean Basin



### Dominant Topographic Features

- **Continental Shelf** is a shallow gently sloping part of the continental crust that borders the continents.
- **Continental slope** is typically about 20 km wide, consists of muds and silts, and is often crosscut by submarine canyons. The world's combined continental slope is believed to cover a total approximate length of 300,000km.
- **Continental Rise** is an underwater feature found between the continental slope and the abyssal plain. It can be found all around the world, and it represents the final stage in the boundary between continents and the deepest part of the ocean. The general slope of the continental rise is between 0.5 degrees and 1.0 degrees.
- **Abyssal Plain** is an underwater plain on the deep ocean floor, usually found at depths between 3000 and 6000 m. Lying generally between the foot of a continental rise and a mid-ocean ridge, abyssal plains cover more than 50% of the Earth's surface.
- **Oceanic Trench** or submarine valley is the deepest parts of the ocean. The **Mariana Trench** or **Marianas Trench** is the deepest part of the world's oceans. It is located in the western Pacific Ocean, to the east of the Mariana Islands.
- **Volcanic Island** is a solitary mountain formed by volcanic activity. It rises from

the sea floor, but reaches above the ocean's surface, sometimes just barely.

**Mauna Loa**, one of the volcanic islands that make up the big island of **Hawaii**, is the most massive single mountain in the world.

- **Submarine Ridge** is an elongated steep-sided elevation of ocean and sea floors.

### Salinity of Seawater

- Salt in the ocean comes from rocks on land.
- Two of the most prevalent ions in seawater are chloride and sodium. Together, they make up over 90 percent of all dissolved ions in the ocean. Sodium and Chloride are 'salty.'
- The concentration of salt in seawater (salinity) is about 35 parts per thousand. About 3.5 percent of the weight of seawater comes from the dissolved salts; in a cubic mile of seawater, the weight of the salt (in the form of sodium chloride) would be about 120 million tons.
- Seawater pH is limited to the range **7.5** to **8.4**.
- The freezing point of seawater decreases as salt concentration increases.
- The **Red Sea** and the **Mediterranean Sea** contain some of the saltiest water on Earth.

### Seawater composition (by mass) (salinity = 3.5)

Element	Percent	Element	Percent
Oxygen	85.84	Sulfur	0.091
Hydrogen	10.82	Calcium	0.04
Chloride	1.94	Potassium	0.04
Sodium	1.08	Bromine	0.0067
Magnesium	0.1292	Carbon	0.0028
Vanadium	1.5-3.3	-	-

### Most Saline Water Bodies

Salinity (%)	Saline Water Bodies	Region or Countries
44%	Don Juan Pond	Antarctica
34.8%	Lake Assal	Djibouti
34.2%	Dead Sea	Israel, Jordan, Palestinian Authority

5-27%	Great Salt Lake	United States
18%	Little Manitou Lake	Canada
8.5%	Lake Urmia	Iran
3.5%	Atlantic Ocean	-
0.01-3.17%	Chilika Lake	India

## Ocean Waves

- Ocean Waves are the forward movement of the ocean's water due to the oscillation of water particles by the frictional drag of wind over the water's surface.
- The peak of the waves is called as **crest** and the lowest point on the wave is called as **troughs**.
- **Swells** are rolling waves that travel long distances through the ocean.
- Waves travel in groups called **wave trains**.
- The tallest wave ever measured was **1719** feet at **Lituya Bay, Alaska**.

## Types of Ocean waves

Wave type	Typical wavelength
Capillary wave	< 2 cm
Wind wave	60–150 m (200–490 ft)
Seiche	Large, variable; a function of basin size
Seismic sea wave (tsunami)	200 km
Tide	Half the circumference of Earth

## Tsunami

- It is a Japanese word meaning "**harbor wave**".
- A tsunami is a type of wave that is not started by the wind.
- It is defined as a series of waves caused by an earthquake, underwater volcanic eruption, landslide or other abrupt disturbance.
- Tsunamis can result in massive destruction when they arrive onshore.
- This fact became evident in March of 2011 when Japan was struck by a large tsunami that was triggered by a 9.0 magnitude earthquake. The tsunami

claimed the lives of more than 15,000 people, damaged several nuclear power plant reactors and caused billions of dollars in damage.

- The 2004 Indian Ocean tsunami was among the deadliest natural disasters in human history with over 230,000 people killed in 14 countries bordering the Indian Ocean.

## Ocean Current

- Ocean current, stream made up of horizontal and vertical components of the circulation system of ocean waters that is produced by gravity, wind friction, and water density variation in different parts of the ocean.
- Water in motion is called a **current**; the direction toward which it moves is called **set**, and its speed is called **drift**.
- The measurement device of Ocean Current is **RCM-9** or **Recording Current Meter**.
- The unit of Ocean currents is measured in **Sverdrup (Sv)**, where **1Sv** is equivalent to a volume flow rate of **1,000,000 m<sup>3</sup> per second**.

## Types of Ocean Current

There are two type of Ocean Currents:

### Surface Currents & Deep Water Current

#### Surface Currents

- Water on the surface of oceans moves along surface currents. The surface current consists of the first **400 meters** of water. In total, surface currents contain about **10%** of the total volume of water in all the oceans.
- Surface currents tend to move in circular patterns and develop into the shape of a mound with a broad base and a relatively narrow top. These circular currents are found in each ocean and are known as **gyres**.
- In the northern hemisphere, the gyres rotate in a clockwise direction, while the gyres in the southern hemisphere rotate in a counterclockwise direction.

## Deep Water Currents

- The remaining **90%** of the ocean moves with deep water currents. Deep water is different from surface water in two distinct ways.
- Deep water is much colder than surface waters, and deep water has a higher salt content. When salty water from a warm region is transported to a region that is cold, it tends to sink. This difference in density causes deep water currents.

## Major Ocean Currents

Ocean Current	Ocean
*Agulhas Current	Indian
* Alaska Current	North Pacific
# Benguela Current	South Atlantic
*Brazil Current	South Atlantic
#California Current	North Pacific
#Canaries Current	North Atlantic
*East Australian Current	South Pacific
*Equatorial Current	Pacific
*Gulf Stream	North Atlantic
#Humboldt (Peru) Current	South Pacific
*Kuroshio (Japan) Current	North Pacific
#Labrador Current	North Atlantic
*North Atlantic Drift	North Atlantic
*North Pacific Drift	North Pacific
#Oyashio (Kamchatka) Current	North Pacific
#West Australian Current	Indian
#West Wind Drift	South Pacific
* (star) mark refers to warm currents and # (hash) mark refers to cool current.	

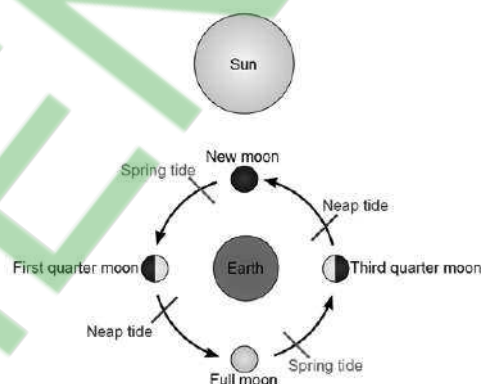
## Ocean Tides

- The periodic rise and fall of the sea level due to the combined effect of attraction of Sun and Moon and Earth's centrifugal force is called tide.
- It may happen once or twice daily, but in enclosed places like gulf etc it is more in frequency. The interval between two tides is 12 hours and 25 minutes.
- Moon's attraction is more than that of Sun and centrifugal force acts as counter balance to these gravitational pull. The resultant force are responsible for creating two major tidal bulges on the Earth.

- One bulge is due to direct attraction in the places facing the Moon and other bulge is observed at opposite of it where centrifugal force is dominant. Tide generating force is the difference between these two forces.
- Tidal bulges have greater height of wide continental shelves and are low mid-oceanic islands. At bay or estuaries intensity of tides also magnified by the shape of the water body. Here the tide is called tidal current.

## Types of Tides

There are **two** type of tides according to range variation : **Spring tide** and **Neap tide**



## Spring Tides

- When the moon is full or new, the gravitational pull of the moon and sun are combined (a condition known as syzygy). At these times, the high tides are very high and the low tides are very low. This is known as a spring high tide. Spring tides are especially strong tides (they do not have anything to do with the season Spring).
- They occur when the Earth, the Sun, and the Moon are in a line.
- The gravitational forces of the Moon and the Sun both contribute to the tides.
- Spring tides occur during the full moon and the new moon.

The **Proxigean Spring Tide** is a rare, unusually high tide. This very high tide occurs when the moon is both unusually close to the Earth (at its closest perigee, called the proxigee) and in the New Moon phase (when the Moon is between the Sun and the Earth). The proxigean spring tide occurs at most once every 1.5 years.

### Neap Tides

- During the moon's quarter phases the sun and moon work at right angles, causing the bulges to cancel each other. The result is a smaller difference between high and low tides and is known as a neap tide.
- Neap tides are especially weak tides.
- They occur when the gravitational forces of the Moon and the Sun are perpendicular to one another (with respect to the Earth).
- Neap tides occur during quarter moons.

### Coral Reefs

Coral reefs are underwater rock outcrops covered by a thin layer of living **coral polyps**. These outcrops can be huge, sometimes over a kilometer (1 km = 0.7 miles) thick and hundreds of kilometers in length. But the coral polyps that build these massive structures form a layer only a few millimeters thick.

Reef-building coral polyps live in a protective shell made from **calcium carbonate** (CaCO<sub>3</sub>), and as they divide and grow they form colonies. These colonies form the basic

structure of the reef, helped by other organisms, like **coralline algae**.

### Types of Coral Reef Formations

It is divided into four classes: **fringing reefs**, **barrier reefs**, **atolls**, and **patch reefs**.

1. **Fringing Reef** is the most common type of reef. They are located very close to land, and often form a shallow lagoon between the beach and the main body of the reef.
2. **Barrier Reef** resembles a fringing reef, but they are located further from the shore and can be much bigger than fringing reefs. For example, the Great Barrier Reef in Australia lies 300 – 1000m (328 - 1093 yards) from shore, and 2000km (1243 miles) long.
3. **Atoll** is a roughly circular (annular) oceanic reef system surrounding a large (and often deep) central lagoon. In the South Pacific, most atolls occur in mid-ocean. The Indian Ocean also contains numerous atoll formations. *e.g.* Maldives and Chagos island groups, the Seychelles, and in the Cocos Island group.
4. **Patch reefs** are small, isolated reefs that grow up from the open bottom of the island platform or continental shelf. They usually occur between fringing reefs and barrier reefs. They vary greatly in size, and they rarely reach the surface of the water.

### Important Coral Reefs of the world

Coral Reefs	Length / Area	Location
Great Barrier Reef	2,500 km	Coral Sea near Australia
Red Sea Coral Reef	1,900 km	Red Sea near Israel, Egypt and Djibouti
New Caledonia Barrier Reef	1,500 km	Pacific Ocean near New Caledonia
The Mesoamerican Barrier Reef	943 km	Atlantic Ocean near Mexico, Belize, Guatemala and Honduras
Florida Reef	322 km	Atlantic Ocean and Gulf of Mexico near Florida
Andros Coral Reef	200 km	Bahamas between the islands of Andros and Nassau
Zhongsha Islands	81 km	South China Sea
Saya Del Malha	40,000 sq km	Indian Ocean
Great Chagos Bank	12,000 sq km	The Maldives
Reed Bank	8,866 sq km	South China Sea, claimed by the Philippines

## ECOSYSTEM, FOOD CHAIN AND ENVIRONMENT POLLUTION

### Ecosystem

- Ecosystem was defined in its presently accepted form by Eugene Odum as, “an unit that includes all the organisms, i.e., the community in a given area interacting with the physical environment so that a flow of energy leads to clearly defined trophic structure, biotic diversity and material cycles, i.e., exchange of materials between living and non-living, within the system”.
- The term ecosystem was coined in 1935 by the Oxford ecologist Arthur Tansley.
- The living and non-living components of an ecosystem are known as biotic and abiotic components, respectively.
- The structure of an ecosystem is related to its species diversity in the sense that complex ecosystem have high species diversity.
- The function of ecosystem is related to energy flow and material cycles within and outside the system.

### Types of Ecosystem

The major types of ecosystems are **Natural** and **Artificial** Ecosystem.

#### Natural Ecosystems

- These ecosystems are capable of operating and maintaining themselves without any major interference by man. A classification based on their habitat can further be made Terrestrial and Aquatic ecosystems.
- **Terrestrial ecosystems:** forest, grassland and desert.
- **Aquatic ecosystems:** fresh water ecosystem, viz. pond, lake, river and marine ecosystems, viz. ocean, sea or estuary.

### Artificial Ecosystem

These are maintained by man. These are manipulated by man for different purposes, e.g., croplands, artificial lakes and reservoirs, townships and cities.

#### Basic components of an Ecosystem

- An ecosystem has two basic components : Biotic and Abiotic components
- **Holocoenosis** is the relationship between the abiotic components and the biotic components of the ecosystem.
- **Biotic components** are living or once-living organisms in the ecosystem. These are obtained from the biosphere and are capable of reproduction. Examples of biotic factors are animals, birds, plants, fungi, and other similar organisms.
- **Abiotic components** refer to non-living physical and chemical elements in the ecosystem. Abiotic resources are usually obtained from the lithosphere, atmosphere, and hydrosphere. Examples of abiotic factors are water, air, soil, sunlight, and minerals.

### Food Chain

A food chain shows the different species of an organism in an ecosystem, and what eats what.

A food chain shows how each living thing gets its food. Some animals eat plants and some animals eat other animals. For example, a simple food chain links the trees & shrubs, the giraffes (that eat trees & shrubs), and the lions (that eat the giraffes). Each link in this chain is food for the next link. A food chain always starts with plant life and ends with an animal.

1. Plants are called **producers** because they are able to use light energy from the Sun to produce food (sugar) from carbon

dioxide and water. The process by which plants make food is called **photosynthesis**.

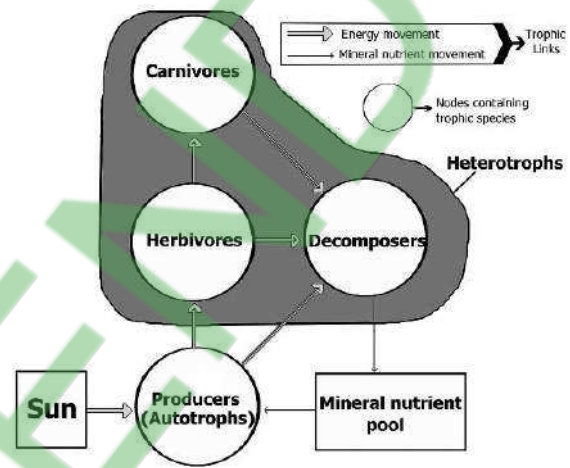
2. Animals cannot make their own food so they must eat plants and/or other animals. They are called consumers. There are three groups of consumers.
  - Animals that eat **only plants** are called **herbivores** (or primary consumers).
  - Animals that eat **other animals** are called **carnivores**.
  - carnivores that eat herbivores are called **secondary consumers**
  - carnivores that eat other carnivores are called **tertiary consumers**
  - e.g., killer whales in an ocean food web ... phytoplankton → small fishes → seals → killer whales
3. Animals and people who eat both animals and plants are called **omnivores**.
4. Then there are **decomposers** (bacteria and fungi) which feed on decaying matter. These decomposers speed up the decaying process that releases mineral salts back into the food chain for absorption by plants as nutrients.

**Food chains** were first introduced by the African-Arab scientist and philosopher **Al-Jahiz** in the **9th century** and later popularized in a book published in **1927** by **Charles Elton**, which also introduced the **food web** concept.

## Food Web

- A food web (or food cycle) is the natural interconnection of food chains and generally a graphical representation (usually an image) of what-eats-what in an ecological community.
- It is also called as consumer-resource system.

## Taxonomy of a Food Web

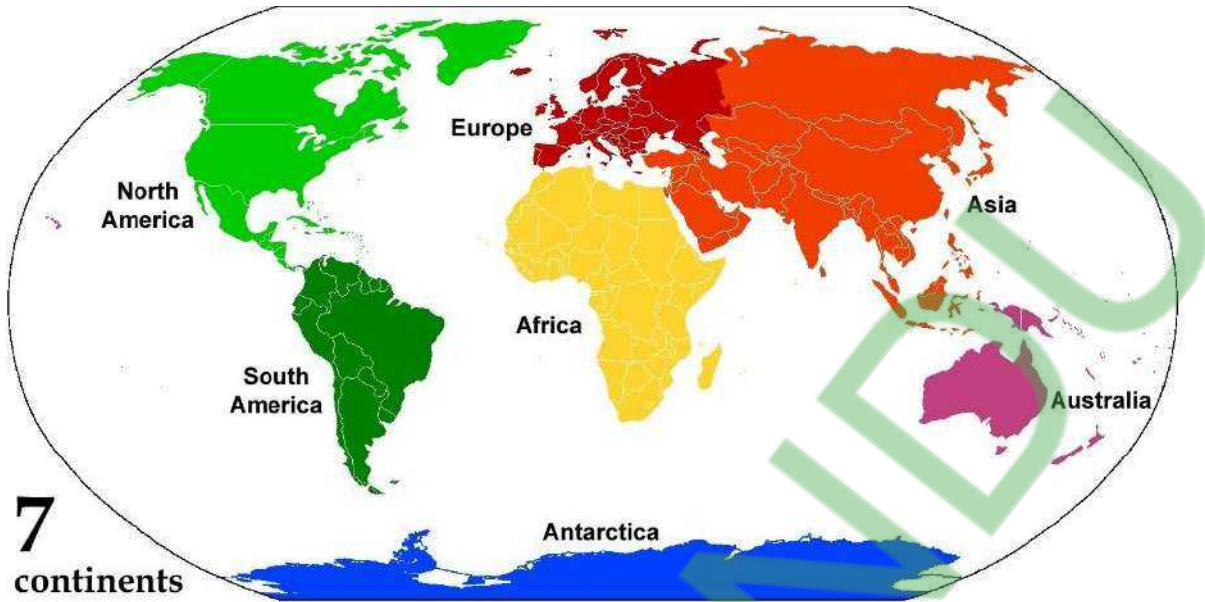


A simplified food web illustrating a three trophic food chain (producers-herbivores-carnivores) linked to decomposers. The movement of mineral nutrients is cyclic, whereas the movement of energy is unidirectional and noncyclic. Trophic species are encircled as nodes and arrows depict the links.

## Environment Pollution

Environment Pollution is briefly described in **General Science > Chemistry > AIR, WATER, SOIL and THEIR POLLUTION**. So Please check there for more details.

## CONTINENTS OF THE WORLD



### Continent

It is one of several very large landmasses on Earth. There are seven continents of earth. These are Asia, Africa, North America, South America, Antarctica, Europe, and Australia.

Continent	Percent of total landmass	Percent of total population	Most populous city (proper)
Asia	29.5%	60%	Shanghai, China
Africa	20.4%	15%	Lagos, Nigeria
North America	16.5%	8%	Mexico City, Mexico
South America	12.0%	6%	Sao Paulo, Brazil
Antarctica	9.2%	0%	McMurdo Station
Europe	6.8%	11%	Moscow, Russia
Australia	5.9%	0.4%	Sydney, Australia

### COUNTINETS OF THE WORLD : by size, population & number of countries

Continents (by size)	Continents (by population)	Continents (no. of countries)
Asia	Asia	Africa
Africa	Africa	Europe
North America	Europe	Asia
South America	North America	North America
Antarctica	South America	Australia
Europe	Australia	South America
Australia	Antarctica	Antarctica

## HIGHEST AND LOWEST POINTS OF THE WORLD

Continent	Highest Point (HP)	Elevation (m)	Country or territory of HP	Lowest Point (LP)	Elevation (m)	Country or territory of LP
Asia	Mount Everest	8,848	China & Nepal	Dead Sea	-422	Israel, Jordan & Palestine
South America	Aconcagua	6,960	Argentina	Laguna del Carbon	-105	Argentina
North America	Mount McKinley	6,198	United States	Death Valley	-86	United States
Africa	Mount Kilimanjaro	5,895	Tanzania	Lake Assal	-155	Djibouti
Europe	Mount Elbrus	5,642	Russia	Caspian Sea	-28	Russia
Antarctica	Vinson Massif	4,892	British Antarctic Territory	Deep Lake, Vestfold Hills	-50	Australian Antarctic Territory
Australia	Puncak Jaya	4,884	Indonesia (Papua)	Lake Eyre	-15	Australia

### Variations of Continents

#### Supercontinents

Supercontinents, largely in evidence earlier in the geological record, are landmasses that comprise more than one craton or continental core. These have included Laurasia, Gondwana, Vaalbara, Kenorland, Columbia, Rodinia, and Pangaea.

#### Subcontinents

Certain parts of continents are recognized as subcontinents, particularly those on different tectonic plates from the rest of the continent. The most notable examples are the Indian subcontinent and the Arabian Peninsula.

Greenland, generally reckoned as the world's largest island on the northeastern periphery of the North American Plate, is sometimes referred to as a subcontinent.

### Submerged Continents

Some areas of continental crust are largely covered by the sea and may be considered submerged continents. Notable examples are Zealandia, emerging from the sea primarily in New Zealand and New Caledonia, and the almost completely submerged Kerguelen continent in the southern Indian Ocean.

#### Microcontinents

Some islands lie on sections of continental crust that have rifted and drifted apart from a main continental landmass. While not considered continents because of their relatively small size, they may be considered microcontinents. Madagascar, the largest example, is usually considered an island of Africa but has been referred to as "the eighth continent" from a biological perspective.



**ASIA**



**Countries :** 49

**Demonym :** Asian

**Latitude :** 10° S and 80° N

**Longitude :** 25° E and 170° W

**Area :** 44,579,000 km<sup>2</sup> (1<sup>st</sup> in World Rank)

**Population :** 4,164,252,000 (1<sup>st</sup> in World Rank)

**Pop. Density :** 87/km<sup>2</sup>

**Time zones :** UTC+2 to UTC+12

**Major Languages :** Mandarin, Hindi, Russian and Arabic

**Physical Aspects of Asia**

Oceans and Seas	Artic Ocean, Pacific Ocean, Indian Ocean, Red Sea, Gulf of Aden, Persian Gulf, Gulf of Oman, Arabian Sea, Bay of Bengal, China Sea, Yellow Sea of Okhotsk and Bering Sea
Rivers	Ob, Yenisey, Amur, Yalu, Hwang Ho, Sikiang, Mekong, Tigris, Eupharates, Amu Darya and Syr Darya.
Lakes	Baikal, Balkash, Van Golu, Turnool, Asad, Dead Sea, Tonle Sap Toba, Lop Nor, Caspian Sea and Sea of Gallilee.
Straits	Straits of Malacca, Bering Strait
Mountains	Himalayas, Karakoram, Kailash, Kunlung shan, Tienshan, Altai,

	Sayan, Yablonovy, Stanvoy, Kolyama, Verkhyoyansk, Pegu Yoma, Arakan Yoma, Hindukush, Elburz, Sulaiman, Kirthar, Makran, Zagros, Pontic, Taurus.
Plains	Manchurian, Great Plain of China, West Siberian Plain, Mesopotamian, Rub-al-Khali, AI Nafud, Dasht-Deserts I-Kavir, Dasht -l-Lut, Gobi.
Plateaus	Ladakh, Tibet, Yunan, Takla Makan, Pamir, Armenian, Iranian, Mongolia, Alban, Indo-China, Shan, Deccan, Baluchistan, Arabian, Anatolia, Loess.
Peninsulas	Kamchatka Peninsula, Peninsula of Korea, Peninsula of Indo-China, Malay Peninsula, Indian Peninsula and Arabian Peninsula.

**FAST FACTS OF ASIA**

- Asia is situated in the eastern and northern hemispheres.
- World's Largest lake : **Caspian Sea**, which separates Europe from Asia.
- World' largest salt desert : **Dast-e-Kavlr**, Northern Iran
- Asia's longest river : **Yangtze Kiang**, China
- World's largest archipelago : **Indonesia**
- Asia's most saline water body : **Lake Van of Turkey**
- **Country of canals** : Pakistan
- **Land of Rising Sun** : Japan
- Lop Nor lake in China is a site for numerous nuclear tests.
- China's Sorrow : **Hwang Ho** or **Yellow river**.

## AFRICA



**Countries :** 54 (and 2 disputed)

**Demonym :** African

**Latitude :** 35° S and 37° N

**Longitude :** 50° E and 17° W

**Area :** 30,221,532 km<sup>2</sup> (2<sup>nd</sup> in World Rank)

**Population :** 1,032,532,974 (2<sup>nd</sup> in World Rank)

**Pop. Density :** 30.51/km<sup>2</sup>

**Time zones :** UTC-1 to UTC+4

**Major Languages :** Arabic, Somali, Berber, Amharic, Oromo, Swahili, Hausa, Igbo and Yoruba

### Physical Aspects of Africa

Oceans and Seas	Indian Ocean, Red Sea, Atlantic Ocean, Gulf of Guinea, Mediterranean
Rivers	Nile, Zaire or Congo, Niger, Orange, Limpopo, Zambezi
Lakes	Kariba, Nayasa, Mweru, Tanganyika, Edward, Tana, Nasser, Chad, Volta and Assal, Victoria
Straits	Straits of Bab-el-Mandeb and Straits of Gibraltar
Mountains	Atlas, Ethiopian Highlands, Mt Kenya, Mt Elgon, Mt Kilimanjaro, Drakensberg, Mt Carneroon, Mt Rouwenzori, Katanga Plateau and Jos Plateau

Desert	Sahara, Sahel, Libyan, Arabian, Nubian, Namib and Kalahari
Plateaus	Great Karoo, South African Plateau, East African Plateau
Islands	Madagascar, Cape Verde Islands, the Connors, Mauritius and Seychelles.

### FAST FACTS OF AFRICA

- It is the second largest continent.
- It is also called as '**Dark Continent**' or the '**Cradle of Mankind**' because the africa is immensely rich in mineral and natural resources.
- Africa's largest lake : **Lake Victoria**
- World's longest river : **Nile**
- **Congo river** cuts equator twice.
- **Orange river** forms the natural boundary between South Africa and Namibia.

## NORTH AMERICA



**Countries :** 23

**Demonym :** North American, American

**Latitude :** 7° N and 84° N

**Longitude :** 20° W and 180° W

**Area :** 24,709,000 km<sup>2</sup> (3<sup>rd</sup> in World Rank)

**Population :** 528,720,588 (4<sup>th</sup> in World Rank)

**Pop. Density :** 22.9/km<sup>2</sup>

**Time zones :** UTC-10 to UTC

**Major Languages :** English, Spanish, French

### Physical Aspects of North America

Oceans and Seas	Atlantic Ocean, Pacific Ocean, Caribbean Sea, Gulf of California, Gulf of Alaska, Bering Sea and Hudson Bay
Rivers	Mississippi-Missouri, St Lawrence, Colorado, Columbia Sacramento, Rio Grande, Yukon, Mackenzie, Nelson, Saskatchewan Peace etc.
Lakes	Great Bear, Great Salve, Athabasca, Winnipeg, Superior Michigan, Huron, Erie, Ontario, Great Salt and Mead.
Straits	Straits of Canada, Straits of the Caribbean, Straits of the Greenland
Mountains	Brook's range, Alaska, Aleutian ranges, Cascade range, Rocky mountains, Coast range, Sierra Nevada etc.
Peninsula	Ungava, Yucatan and Kenai
Plateaus	Columbia-Snake, Colorado and Mexican.
Desert	Chihuahuan, Colorado, Mojave, Sonoran
Islands	Greenland, Baffin, Victoria, New Foundland, Cuba, Jamaica and Haiti

### FAST FACTS OF NORTH AMERICA

- It is located in the northern and western hemisphere of the earth.
- World's longest coast line : **Canada**
- World's largest sweet water lake : **Lake Superior**
- **49th parallel** forms the boundary between Canada and USA.
- The Panama Canal connects Atlantic and Pacific ocean.

### SOUTH AMERICA



**Countries :** 13

**Demonym :** South American, American

**Latitude :** 12° N and 55° N

**Logitude :** 35° W and 81° W

**Area :** 17,840,000 km<sup>2</sup> (4<sup>th</sup> in World Rank)

**Population :** 387,489,196 (5<sup>th</sup> in World Rank)

**Pop. Density :** 21.4 per km<sup>2</sup>

**Time zones :** UTC-2 to UTC-5

**Major Languages :** Portuguese, Spanish, English, Dutch, French, Italian, Arabic

### Physical Aspects of South America

Oceans and Seas	Atlantic Ocean, Caribbean Sea, Pacific Ocean, Gulf of Paria, Gulf of Panama, Gulf of San Matias, Gulf of San Jorge, Gulf of Penas, Scotia Sea
Rivers	Amazon, Magdalena. Orinico, Parana and La Plata
Lakes	Maracaibo, Titicaca, Popo
Straits	Straits of Magellan
Mountains	Western Mountains, Andes, Brazilian highlands and Guiana Highlands
Plateaus	Bolivian and Patagonia
Deserts	Atacama and Patagonia

## FAST FACTS OF SOUTH AMERICA

- It is located in the Western Hemisphere and in the Southern Hemisphere. A small part of the continent is also located in the Northern Hemisphere.
- **Latin America, South America** has the greatest north-south extension.
- World's highest waterfall : **Angel fall** in Venezuela on Orinico river.
- South America's Largest river : **Amazon river** (World's largest rain forest)
- Driest place on Earth : **Atacama desert**
- World's largest reserves of iron : **Serra dos carajas hills**, Brazil
- Coffee Bowl of World : **Brazil**

## ANTARCTICA



**Latitude/Longitude** : 90° S, 0.00° E

**Area** : 14,000,000 km<sup>2</sup> (5<sup>th</sup> in World Rank)

**Population** : Officially none, but governmental research stations are populated with small groups of scientists at all times. In addition, during the 2009/2010 season, nearly 37,000 tourists visited the continent.

**Demonym** : Antarctic

**Oceans and Seas** : Atlantic Ocean, Pacific Ocean, Souther Ocean, Indian Ocean, Ross Sea

## FAST FACTS OF ANTARCTICA

- It is also known as **White Continent**.
- It is the **southernmost continent** in the world.
- It was discovered in **1820**.
- **Ronald Amundsen** was the first man to reach geographical South pole in Antarctica.
- It is located in the Antarctic region in the southern hemisphere, underlying the South Pole, Antarctica is surrounded by the Southern Ocean.
- The **Antarctic** (or Antarctica) **Circle** is one of the five major circles or parallels of latitude that mark maps of the Earth.
- **Mt. Erebus** is the only active volcano on Antarctica.
- **Mt. Vinson** (5140 m) is the highest peak of Antarctica.

## EUROPE



**Countries** : 50

**Demonym** : European

**Latitude** : 35° N and 73° N

**Logitude** : 25° W and 65° E

**Area** : 10,180,000 km<sup>2</sup> (6<sup>th</sup> in World Rank)

**Population** : 739,165,030 (3<sup>rd</sup> in World Rank)

**Pop. Density** : 72.5/km<sup>2</sup>

**Time zones** : UTC to UTC+6

**Major Languages :** Romance, Germanic, English, French, Italian, Spanish, Baltic, Slavic, Albanian, Celtic, Armenian and Greek

**Physical Aspects of Europe**

Oceans and Seas	Atlantic Ocean, Arctic Sea, Mediterranean Sea, Black Sea, White Sea, Baltic Sea, Norwegin Sea, North Sea, Alboran Sea, Gulf of Bothnia, Gulf of Finland, Celtic Sea, Aegean Sea, Adriatic Sea, Sea of Azov
Rivers	Po, Tiber, Rhine, Ebro, Garrone, Loire, Seine, Weser, Elbe, Wista, Onega, Dvina, Mezen, Volga, Don, Dniepr, Dnester and Danube, Rhine
Lakes	Ladoga, Onega, Saimaa, Peipus, Belye, Inari, Markermeer, Iron Gates
Straits	Straits of Gibraltar, Straits of Dover
Mountains	Vesuvius, Appennines, Vosges, Alps, Mt Etna, Dinaric Alps, Carpathian, Pindus, Ural, Caucasus, Black Forest, Mt Stromboli, Kjolen, Pennine, Cantabarian Pyrenees, Sierra Morena and Sierra Nevada
Plateaus	Massif Central, Meseta Central, Hardangervidda, Romanian Plateaus
Peninsula	Iberian, Balkan and Kola
Islands	Greenland, British Isles, Iceland, Sardinia, Siciely, Crete
Gulf	Gulf of Bothnia (Sweden and Finland), Gulf of Lions (South of France)
Bay	English Channel (Britain and France), Bay of Biscay (France and Spain)

**FAST FACTS OF EUROPE**

- It is the second smallest continent in the world in terms of surface area.
- World's largest island : Greenland
- **Balkan States** It is a group of 9 countries namely Serbia and Montenegro, Slovenia, Croatia, Bosnia Herzegovina, Macedonia, Bulgaria, Greece, Romania and Albania.

However, Montenegro became an independent state in 2006.

- **Finland** is known as the **land of forests and lakes**.
- **United Kingdom** is the name given to the combination of Great Britain and Northern Ireland. Great Britain consists of England, Scotland and Wales.
- World's largest country of the : **Russia**
- World's smallest country : **Vatican City**, Rome

**AUSTRALIA**



**Countries :** 4 (Australia, Papua New Guinea, East Timor and portions of Indonesia)

**Demonym :** Australian

**Area :** 8,600,000 km<sup>2</sup> (7<sup>th</sup> in World Rank)

**Population :** 36 million (6<sup>th</sup> in World Rank)

**Pop. Density :** 4.2 /km<sup>2</sup>

**Time zones :** GMT+10, GMT+9.30, GMT+8

**Major Languages :** English, Indonesian, Tok Pisin, Hiri Motu

**Physical Aspects of Australia**

Oceans and Seas	Indian Ocean, Pacific Ocean, Timor Sea, Arfura Sea, Coral Sea, Tasman Sea
Rivers	Murray, Darling, Swan, Lachlan, Cooper Creek, Paroo River
Lakes	Blue Lake, Lake eye, Pink Lake,

	Lake Albina, Numby Numby, Club Lake
Straits	Bass, Endeavour, Backstairs
Mountains	Great Dividing range, Darling range, Musgrave, Flinders and Australian alps
Desert	Gibson, Great Sandy, Great Victoria, Simpson, Little Sandy, Western desert, Rangipo and Tanami
Island	Tasmania

### FAST FACTS OF AUSTRALIA

- Australia is known as Forgotten land.
- Australia is the world's largest island, but smallest continent.
- It lies entirely in the Southern hemisphere. The Tropic of Capricorn runs almost through the middle of the continent and divides the continent in two equal parts.
- It is the only continent that is also a country and it lies between Pacific and Indian ocean.
- World's largest reef system : **Great Barrier Reef**
- Australia's Largest city : **Sydney**

### GEOGRAPHICAL EPITHETS - WORLD

Geographical Epithets	Place	Geographical Epithets	Place
America's Motor City	Detroit	Kashmir of Europe	Switzerland
Britain of the South	New Zealand	Key to Mediterranean	Gibraltar
China's Sorrow	River Hwang Ho	Land of Five Seas	South West Asia
City of Dreaming Spires	Oxford (England)	Land of Lakes	Scotland
City of Eternal Springs	Quito (S.America)	Land of Golden Pagoda	Myanmar
City of Flowers	Cape Town (S.Africa)	Land of Kangaroo	Australia
City of Golden Gate	San Francisco (USA)	Land of Golden Fleece	Australia
City of Magnificent Buildings	Washington (USA)	Land of Lilies	Canada
City of Quiet thoroughfares	Venice	Land of Maple	Canada
City of Seven Hills	Rome (Italy)	Land of Midnight Sun	Norway
City of Skyscrapers	New York (USA)	Land of Morning Calm	Korea
Cockpit of Europe	Belgium	Land of Rising Sun	Japan
Dark Continent	Africa	Land of Setting Sun	United Kingdom
Emerald Isle	Ireland	Land of Thousand Elephants	Laos
Empire City	New York	Land of Thousand Lakes	Finland
Eternal City of Hopes	Rome, Italy	Land of Thunderbolt	Bhutan
Forbidden City	Lhasa (Tibet)	Land of White Elephant	Thailand
Garden City	Chicago	Loneliest Island	Tristan De Gumha
Garden in the desert	Ethiopia	Manchester of Japan	Osaka (Japan)
Garden of England	Kent (England)	Pillars of Hercules	Straits of Gibraltar
Gate of tears	Strait of bab-el-Mandeb	Play Ground of Europe	Switzerland
Golden City	Johannesburg	Quaker City	Philadelphia
Gibraltar of Indian	Ocean Aden	Queen of the Adriatic	Venice
Gift of Nile	Egypt	Roof of the World	The Pamirs (Tibet)
Granite City	Aberdeen	River in the Sea	Gulf Stream
Hanging Valleys	Valley of Switzerland	Sickman of Europe	Turkey
Hermit Kingdom	Korea	Sugar Bowl of the world	Cuba
Herring Pond	Atlantic Ocean	Venice of the East	Bangkok
Holy Land	Palestine	Venice of the North	Stockholm
Human Equator of the Earth	Himalayas	White City	Belgrade
Island Continent	Australia	Windy City	Chicago
Island of Cloves	Zanzibar	Workshop of Europe	Belgium
Island of Pearls	Bahrain (Persian Gulf)	World's Loneliest Island	Tristan Da Cunha
Islands of Sunshine	West Indies	Yellow River	River HwangHo (China)

## GEOGRAPHICAL DISCOVERY & EXPLORATION

Discovery	Discoverer	Discovery	Discoverer
America	Christopher Columbus	New Foundland	Gobot Sebastian
Sea route to India via Cape of Good Hope	Vasco-da-Gama	Hudson Bay	Henry Hudson
Solar system	Copernicus	Sailor of the world	Magellan
Planets	Kepler	Mount Everest	Edmund Hillary
South Pole	Amundsen	First person to set foot on the moon	Neil Armstrong
North Pole	Robert Peary	Tasmania island	Tasman
China	Marco Polo	Cape of the Good Hope	Baurtho Romeiodeis

### MAJOR RIVERS (BY LENGTH)

River	Continent	Length in km
Nile	Africa	6,825
Amazon	S.America	6,437
Chang Jiang (Yangtze)	Asia	6,380
Mississippi/Missouri	N.America	5,971
Yenisey-Angara	Asia	5,536
Huang (Yellow)	Asia	5,464
Ob-Irtysh	Asia	5,410
Amur	Asia	4,416
Lena	Asia	4,400
Congo	Africa	4,370
Mackenzie-Peace	N.America	4,241
Mekong	Asia	4,184
Niger	Africa	4,171

### DEEPEST LAKES (BY GREATEST DEPTH)

Lakes & Location	Depth in ft
Baikal, Russian Fed.	5,315
Tanganyika, Africa	4,800
Caspian Sea, Asia-Europe	3,363
Malawi or Nyasa, Africa	2,317
Issyk-Kul, Kyrgyzstan	2,303

### MAJOR ISLANDS (BY SIZE)

Islands	Size in sq km
Greenland	2,175,600
New Guinea	792,500
Borneo	725,500
Madagascar	587,000
Baffin	507,500
Sumatra	427,300
Honshu	227,400
Great Britain	218,100
Victoria	217,300
Ellesmere	196,200
Celebes	178,650
New Zealand (south)	151,000
Java	126,700
New Zealand (north)	114,000
Newfoundland	108,900

### MAJOR LAKES (BY SIZE)

Lakes	Continent	Size in sq km
Caspian Sea	Asia-Europe	371,000
Superior	North America	82,100
Victoria	Africa	69,500
Huron	North America	59,600
Michigan	North America	57,800
Tanganyika	Africa	32,900
Baikal	Asia	31,500
Great Bear	North America	31,300
Aral Sea	Asia	30,700
Malawi	Africa	28,900
Great Slave	Canada	28,568
Erie	North America	25,667
Winnipeg	Canada	24,387
Ontario	North America	19,529
Balkhash	Kazakhstan	18,300

### MAJOR WATERFALLS (BY HEIGHT)

Waterfall	Height in m	Country
Angel Falls	979	Venezuela
Tugela Falls	948	South Africa
Las Tres Hermanas Cataracts	914	Peru
Olo'upena Falls	900	United States
Yumbilla Falls	896	Peru
Vinnufossen	860	Norway
Balåifossen	850	Norway
Pu'uka'oku Falls	840	United States
James Bruce Falls	840	Canada
Browne Falls	836	New Zealand

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# INDIAN GEOGRAPHY

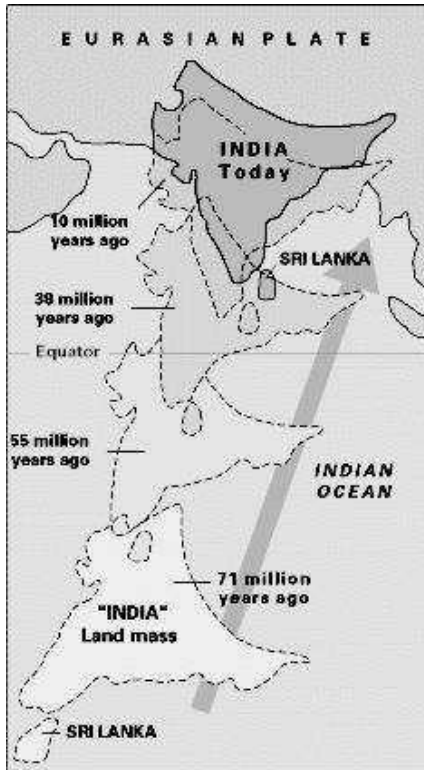




# INDIAN GEOGRAPHY

## FAST FACTS OF INDIAN GEOGRAPHY

Continent & Region	Asia, South Asia, Indian subcontinent
Tectonic plate	Indian Plate; is moving northeast at 5 cm/yr
Longitude	68° 7' and 97° 25' east longitude
Latitude	8° 4' and 37° 6' north latitude
Area	3,287,263 km <sup>2</sup> , 7th in World Rank
Population	1,210,193,422, 2nd in World Rank (2011 census)
No. of States	29
No. of UTs	7
Territorial Sea	12 nm (nautical miles)
Contiguous Zone	24 nm
National park	103
Wildlife sanctuaries	515
North-South extent	3,214 km
East-West extent	2,933 km
Land Frontiers	15,200 km
Highest point	Kanchenjunga: 8,586 m (28,169 ft)
Lowest point	Kuttanad, Kerala : -2.2 m (-7.2 ft)
Northern most point	Karakoram Pass, near the Siachen Glacier, Indian-administered Kashmir
Southern most point	Indira Point, Great Nicobar, Andaman & Nicobar Islands
Southern most point of India (Mainland)	Cape Comorin near Kanyakumari, Tamil Nadu
Eastern most point	Kibithu, Arunachal Pradesh
Western most point	Guhar Moti in Kutch, Gujarat
Coastline length	7,517 km ; 5,423 km belong to peninsular India and 2,094 km to the Andaman, Nicobar, and Lakshadweep island chains.
Land boundaries	13,888 km
Border Countries	<b>Afghanistan</b> and <b>Pakistan</b> to the north-west; <b>China</b> , <b>Bhutan</b> and <b>Nepal</b> to the north; <b>Myanmar</b> to the east; and <b>Bangladesh</b> to the east of West Bengal. <b>Sri Lanka</b> is separated from India in the south by a narrow channel of sea, formed by Palk Strait and the Gulf of Mannar.
Terrain	The mainland comprises of four regions, namely the great mountain zone, plains of the Ganga and the Indus, the desert region, and the southern peninsula.
Longest River	The Ganges or Ganga (Length 2,525 km)
Largest Lake	Chilika Lake, Odisha (Length 64.3 km)
Largest than other countries	4 times largest than Pakistan 12 times larger than UK 8 times larger than Japan
State with maximum borders states	Uttar Pradesh border maximum number of states : 8 (Uttarakhand, Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand and Bihar)
Tropic of Cancer passes through	8 states: Gujarat, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand, West Bengal, Tripura and Mizoram.



Border Countries with Indian States	
Country	Indian States situated on the border
Afghanistan	Jammu and Kashmir
Bangladesh	West Bengal, Mizoram, Meghalaya, Tripura and Assam
Bhutan	West Bengal, Sikkim, Arunachal Pradesh and Assam
China	Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim & Arunachal Pradesh
Myanmar	Arunachal Pradesh, Nagaland, Manipur and Mizoram
Nepal	Bihar, Uttarakhand, Uttar Pradesh, Sikkim and West Bengal
Pakistan	Jammu and Kashmir, Punjab, Rajasthan and Gujrat

## PHYSICAL DIVISIONS OF INDIA

*India is a country of physical diversity.*



There are high mountain peaks in some areas while in others, lie the flat plains formed by rivers. On the basis of physical features, India can be divided into following six divisions:

1. The Northern Mountains
2. The Northern Plains or *Indo Gangetic Plains*
3. The Peninsular India
4. The Indian Desert
5. The Coastal Plains
6. The Islands

## THE NORTHERN MOUNTAINS

- The northern mountains were formed by the ongoing tectonic collision of the Indian and Eurasian plates.
- It contains of the **Himalayas, Hindu Kush, and Patkai ranges** which marks the northern Indian subcontinent.
- These mountains are the boundary between two of the Earth's great ecozones: the **temperate Palearctic** that covers most of Eurasia and the **tropical and subtropical Indomalaya ecozone** which includes the Indian subcontinent, Southeast Asia and Indonesia.
- It is divided into three groups. These are : the **Himalayas, the Trans Himalayas and the Puranchal hills.**

### Important Features of Mountains

- **Pass** is a natural gap or a route between a ridges, hill.
- **Range** is the large landmass consisting of mountains, ridges and peaks.
- **Peak** is the highest point or tip of a mountain range.
- **Valley** is a depression or a flat land between two elevated areas.
- **Dun** is the longitudinal valleys existing between Himachal and Shiwaliks.

### The Himalayas and its Origin

- The Himalayas is the highest and one of the youngest mountain ranges in the world. It acts as natural barrier.
- The extreme cold, snow and rugged topography discourage the neighbors to enter India through Himalayas.
- They run from west-east direction from Indus to Brahmaputra along the northern boundary of India covering a distance of 2500 km. Their width varies from 400 in the west and 150 km in the East.
- Its origin can be traced in the Jurassic Era, which is about 80 million years ago.
- This mountain ranges are mostly formed of sedimentary and metamorphic rocks, it has been subjected to intense folding and faulting.
- The Geosynclinal Origin has been supported by **Argand, Kober and Suess.**

- The Plate Tectonic Origin of the Himalayas was put forward by **W.J. Morgan** in 1967.

The Himalayas may be divided into three parallel ranges:

1. **Greater Himalayas** or *Himadari*
2. **Lesser Himalayas** or *Himachal*
3. **Outer Himalayas** or *Siwaliks*.

### The Greater Himalayas or Himadari

- It comprises of the northern most ranges and peaks.
- It has an average height of 6000 metres and width lies between 120 to 190 Km.
- It is the most continuous range. It is snow bound and many glaciers descend from this range.
- It has high peaks like Mt. Everest, Kanchenjunga, Makalu, Dhaulagiri, Nanga Parbat etc. having a height of more than 8000 metres.
- Mt. Everest (8848 m) is the highest peak of the world and Kanchenjunga is the highest peak of Himalaya in India.
- High Mountain passes also exist in this range, namely, Bara Lacha-La, Shipki-La, Nathu-La, Zoji-La, Bomidi-La etc. The Ganga and Yamuna rivers originates from this Himalayas.

### **The Lesser Himalayas or Himachal**

- The altitude of this range lies between 1000 and 4500 metres and the average width is 50 km.
- The Prominent ranges in this are Pir Panjal, Dhaula Dhar and Mahabharata ranges.
- It comprises of many famous hill stations like Shimla, Dalhousie Darjeeling, Chakrata, Mussoorie, Nainital etc.
- It also comprises of famous valleys like Kashmir, Kullu, Kangra etc.

### **The Outer Himalayas or the Siwaliks**

- It is the outer most range of the Himalayas.
- The altitude varies between 900 to 1100 meters and the width lies between 10 to 50 km.
- They have low hills like Jammu Hills, etc.
- The valleys lying between Siwalik and Lesser Himalayas (Himachal) are called 'Duns' like Dehra Dun, Kotli Dun and Patli Dun.

### **The Trans-Himalayan ranges**

- It extends north of greater Himalaya and parallel to it is called **Zaskar Range**.
- North of Zaskar range lies Ladakh range. The Indus River flows between Zaskar and Ladakh range.
- The Karakoram range lie extreme north of the country. K2 is the second highest peak of the world.

### **The Purvanchal hills**

- It comprises Mishami, Patkoi, Naga, Mizo hills which are located in eastern side.
- The Meghalaya plateau is also part of these hills which includes the hills of Garo, Khasi and Jaintia.

### **The Significance of the Himalayas**

The Himalayas comprise the most dominating geographical feature of India. The Himalayas are the **body and soul of India**.

*The following few points are the significance of the Himalayan Mountains to India.*

#### **Climatic Influence**

- By virtue of their high altitude, length and direction, they effectively intercept the summer monsoons coming from the Bay of Bengal and Arabian Sea and cause precipitation in the form of rain or snow.
- Besides, they prevent the cold continental air masses of central Asia from entering into India.
- According to the latest meteorological studies, the Himalayas are responsible for splitting the jet stream into two branches and these in turn play an extremely important role in bring monsoons in India.

#### **Defence**

- The Himalayas have been protecting India from outside invaders since the early times thus serving as a defence barrier.
- But the Chinese aggression on India in October, 1962 has reduced the defence significance of the Himalayas to a considerable extent.
- In spite of advancement in modern warfare technology, the defence significance of the Himalayas cannot be ignored altogether.

#### **Source of Rivers**

- Almost all the great rivers of India have their sources in the Himalayan ranges.
- Abundant rainfall and vast snow-fields as well as large glaciers are the feeding grounds of the mighty rivers of India.
- Snow melt in summer provides water to these rivers even during dry season and these are perennial rivers.

- The Himalayan Rivers, along with hundreds of their tributaries, form the very basis of life in the whole of north India.

### **Fertile Soil**

- The great rivers and their tributaries carry enormous quantities of alluvium while descending from the Himalayas. This is deposited in the Great Plain of North India in the form of fertile soil, making the plain one of the most fertile lands of the world.
- It has been estimated that the Ganga and the Indus carry 19 and 10 lakh tonnes of silt, per day respectively and the silt carried by the Brahmaputra is even more.

### **Hydroelectricity**

- The Himalayan region offers several sites which can be used for producing hydroelectricity.
- There are natural waterfalls at certain places while dams can be constructed across rivers at some other places.

### **Forest Wealth**

- The Himalayan ranges has vegetal cover from the tropical to the Alpine, in their altitude.
- The Himalayan forests provide fuel wood and a large variety of raw materials for forest based industries.
- Many medicinal plants grow in the Himalayan region.

### **Agriculture**

- The Himalayas do not offer extensive flat lands for agriculture but some of the slopes are terraced for cultivation. Rice is the main crop on the terraced slopes.
- The other crops are wheat, maize, potatoes, tobacco and ginger.

- Tea is a unique crop which can be grown on the hill slopes only.
- A wide variety of fruits such as apples, pears, grapes, mulberry, walnut, cherries, peaches, apricot, etc. are also grown in the Himalayan region.

### **Tourism**

- By virtue of their scenic beauty and healthy environment, the Himalayan ranges have developed a large number of tourist spots.
- Srinagar, Dalhousie, Dharamshala, Chamba, Shimla, Kulu, Manali, Mussoorie, Nainital, Ranikhet, Almora, Darjeeling, Mirik, Gangtok, etc. are important tourist centres in the Himalayas.

### **Pilgrimage**

- The Himalayas are proud of being studded with sanctified shrines which are considered to be the abodes of the Gods. Large number of pilgrims trek through difficult terrain to pay their reverence to these sacred shrines.
- Kailas, Amarnath, Badrinath, Kedamath, Vaishnu Devi, Jwalaji, Uttarkashi, Gangotri, Yamunotri, etc. are important places of pilgrimage.

### **Minerals**

- There are vast potentialities of mineral oil in the tertiary rocks.
- Coal is found in Kashmir.
- Copper, lead, zinc, nickel, cobalt, antimony, tungsten, gold, silver, limestone, semi-precious and precious stones, gypsum and magnesite are known to occur at more than 100 localities in the Himalayas.

### Major Himalayan peaks

Peak Name	Elevation in (m)	Peak Name	Elevation in (m)
Everest	8,848	Gyachung Kang	7,952
K2 (Godwin Austen)	8,611	Gasherbrum IV	7,925
Kangchenjunga	8,586	Nuptse	7,861
Lhotse	8,516	Masherbrum	7,821
Makalu	8,462	Nanda Devi	7,817
Cho Oyu	8,201	Rakaposhi	7,788
Dhaulagiri	8,167	Tirich Mir	7,708
Manaslu	8,156	Gangkhar Puensum	7,570
Nanga Parbat	8,126	Ismoil Somoni Peak	7,495
Annapurna	8,091	Langtang Lirung	7,227
Gasherbrum I	8,080	Machapuchare	6,993
Broad Peak	8,047	Dorje Lakpa	6,966
Gasherbrum II	8,035	Ama Dablam	6,848
Shishapangma	8,013	Kailash	6,638

### Major Himalayan Passes and Routes

Pass or route	Elevation in (m)	Location and facts
Aghil Pass	5000	Situated to the north of K2 in the Karakoram; joins Ladakh with the Xinjiang (Sinkiang) Province of China.
Banihal Pass	2835	Situated in the Pir-Panjal Range; joins Jammu with Srinagar. Jawahar Tunnel (inaugurated in December 1956) or Banihal Tunnel is a road tunnel of Jammu and Kashmir.
Bara Lacha	4843	Situated in Jammu and Kashmir ; connecting Manali and Leh.
Bomdi La	4331	Situated to the east of Bhutan; connects Arunachal Pradesh with Lhasa, the capital of Tibet.
Burzail Pass	4100	It is an ancient pass and caravan route between Srinagar in Kashmir and Gilgit. This route was active up to Pakistan's independence.
Chang-La	5360	It is a high mountain pass in Ladakh
Debsa Pass	5360	It is a high mountain pass in Greater Himalayas between the Kullu and Spiti districts of Himachal Pradesh
Diphu Pass	4587	It is a mountain pass at the tri-point of the borders of India, China, and Myanmar.
Gangtok	4310	It is in Sikkim to Lhasa in Tibet, via the Nathu La and Jelep La Passes
Jelep La	4538	It connects Sikkim with Lhasa. It passes through Chumbi Valley.
Khardung La	6000	It is the highest motorable pass in the country. It joins Leh with Siachin glacier.
Khunjerab Pass	4693	It is a high mountain pass in the Karakoram Mountains in a strategic position on the northern border of Pakistan's Gilgit-Baltistan Hunza - Nagar District on the southwest border of the Xinjiang region of China.
Lanak La	5466	Situated in the Aksai-Chin (Ladakh); connects Ladakh with Lhasa.

Lipu Lekh	5334	Situated in the Pithoragarh District (Uttarakhand); connects Uttarakhand with Tibet. The pilgrims of Manasarovar Lake travel through this pass. It is one of the most important border post for trade with China.
Mana Pass	5545	Located in Uttarakhand, it is a border between India and Tibet.
Mohan Pass	800	Located in the Siwalik Hills, the southernmost and geologically youngest foothills running parallel to the main Himalayas in Sikkim.
Nathu La	4310	Situated on the Indo-China border; connects the Indian state of Sikkim with China's Tibet Autonomous Region. After the 1962 war it was opened in 2006.
Pensi La	4400	Situated in the Ladakh region of Jammu and Kashmir, which is known as the Gateway to Zaskar. It connects the Valley of Kashmir with Kargil (Ladakh).
Rohtang Pass	3979	Located on the eastern Pir Panjal Range of the Himalayas; connects the Kullu, the Lahul and Sipti valleys of Himachal Pradesh.
Shipki La	5669	Located in Kinnaur district in the state of Himachal Pradesh, India, and Tibet, China. The Sutlej river enters India through this pass.
Thang La	5328	It is a mountain pass in Ladhak. It is the second highest motorable mountain pass in Indian after Khardung La.
Trail's Pass	5212	Located between Nanda Devi and Nanda Kot peaks in the Uttarakhand.
Zoji La	3528	It joins Srinagar with Kargil and Leh.

## THE NORTHERN PLAINS or INDO GANGETIC PLAINS

- The Northern Plains are located between south of the Himalayas and north of the Peninsular plateau.
- It is formed by the deposition of the sediments brought by three main river systems namely : the Indus, the Ganga and the Brahmaputra.
- The plains encompass an area of 700,000 km<sup>2</sup>.
- From Punjab in the west to Assam in the east, this plain is about 2400 km long.
- Its width varies from about 300 km in the west to about 150 km in the east.
- It mainly includes the states of Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal and Assam. This plain is very fertile due to alluvial sediments brought by the rivers from the Himalayas.
- This plain is one of the largest and most fertile plains of the world. Major crops such as wheat, rice, sugarcane, pulses, oil seeds and jute are grown here.
- The major rivers of this system are the Ganga and the Indus along with their tributaries; Beas, Yamuna, Gomti, Ravi, Chambal, Sutlej and Chenab.
- The northern plain is divided into three sections, i.e. the **Punjab Plain**, the **Ganga Plain** and the **Brahmaputra Plain**.



### **Punjab Plains**

- This plain is formed by five important rivers of Indus system. Punjab literally means “(The Land of) Five Waters” referring to the following rivers: the Jhelum, Chenab, Ravi, Sutlej, and Beas.
- The plain is primarily made up of ‘doabs’ - the land between two rivers.
- The total area of this plain is about 1.75 lakh sq km.
- The average elevation of the plain is about 250 m above mean sea level.
- The area between the Ghaggar and the Yamuna rivers lies in Haryana and often termed as ‘Haryana Tract’. It acts as water-divide between the Yamuna and the Satluj rivers.
- The only river between the Yamuna and the Satluj is the Ghaggar which is considered to be the present day Successor of the legendary Saraswati River.

### **Ganga Plains**

- This is the largest unit of the Great Plain of India stretching from Delhi to Kolkata (about 3.75 lakh sq km).
- The northern states, Haryana, Delhi, UP, Bihar, part of Jharkhand and West Bengal in the east lie in the Ganga plains.
- The general slope of the entire plain is to the east and south east.
- Almost all the rivers keep on shifting their courses making this area prone to frequent floods. The Kosi river is very notorious in this respect. It has long been called the ‘Sorrow of Bihar’.

### **Brahmaputra Plains**

- This is also known as the Brahmaputra valley or Assam Valley or Assam Plain as most of the Brahmaputra valley is situated in Assam.
- Its western boundary is formed by the Indo-Bangladesh border as well as the boundary of the lower Ganga Plain. Its

eastern boundary is formed by Purvanchal hills.

- It is an aggradation plain built up by the depositional work of the Brahmaputra and its tributaries.

### **Physical Features of the Northern plains**

#### **Bhabar Region or belt**

- It is 8 to 16 km wide, region lies along the foothills of Himalayas between Indus and Teesta rivers.
- It contains pebbles & stones which are extremely pervious.
- Small river and streams disappear underground on reaching this region.

#### **Terai Region or belt**

- 15 to 30 km wide belt found south of the Bhabar region is called as Terai.
- It is a marshy tract and zone of excessive dampness with the thick grown of forests and high biological diversity.
- The speed of river flow in Terai region is slow.
- In Terai region rice is grown mostly of the lands for cultivation. *e.g.*: Sitapur, Rampur, Lakhimpur, Philibhit, Bareilly region of Uttar Pradesh.

#### **Bangar Region or belt**

- It is the higher part of the plains, where the floodwater cannot reach.
- It is made up of old alluvium and it contains pebbles and coarser sediments.
- These plains are less fertile. In this region, whenever the high lands are created by stones and sand, it is locally called as ‘Bhur’. *e.g.* Bhurs are found in the upper parts of Ganga-Yamuna doab.

#### **Khadar Region or belt**

- It lies in lowland areas after the Bangar belt.

- It is made up of new alluvium. In this region, floods bring new alluvium every year.
- It is mainly found along the river banks and contains fine particles or clays so it is fertile region.

#### **Deltaic Plain**

- It is an extension of the Khadar land.
- It covers about 1.9 lakh sq km of area in the lower reach of the Ganga River.
- It formed by very fine alluvial soils formed by river deltas contain mainly clays.
- The uplands are called '**Chars**' while the marshy areas are known as '**Bels**' in the delta regions.
- These are very fertile and are suitable for jute & rice cultivation. *e.g.* The Ganga-Brahmaputra delta, spread in India and Bangladesh.

#### **Significance of the Great Plains of India**

- It is the most productive region of India and literally called as the '**Granary of India**'.
- Farming on the Indus-Ganga Plain primarily consists of rice and wheat grown in rotation. Other crops include maize, sugarcane, and cotton.

- These plains have sedimentary geological structure, these plains have large deposits of fossil fuels. Road and rail transport can be developed in this region, relatively with ease, due to its little or no slope gradient.
- The great plain of India with its deep, fertile, stoneless, alluvial soil and its many rivers, is the most favourable and most desirable part of the sub-continent. The five rich states of the plain (Punjab, Haryana, Uttar Pradesh, Bihar and West Bengal), which contain about one-third of the total land area, but in which about 40% of the country's population lives, support one of the densest populations in the world.
- The plains have a fertile soil and because of the slow moving perennial water courses and favourable climate and they are, the great agricultural tracts of the country, raising bumper crops of rice, wheat, oilseeds, sugarcane, tobacco and jute.
- These plains have given birth to and nursed and nourished the unique Hindu civilizations in its river valleys—the Harappa, Mohenjodaro, Pilibanga, Lothal civilizations.

## THE PENINSULAR INDIA

- It is the largest physiographic division of India, covering an area of about **16 lakh sq km**.
- It constitutes an irregular triangle with its base lying between the **Delhi Ridge** and the **Rajmahal Hills** and the apex formed by **Kanyakumari**.
- It is bounded by the **Aravallis** in the north-west, **Maikal Range** in the north, **Hazaribagh** and **Rajmahal Hills** in the northeast, the **Western Ghats (Sahayadri Mountains)** in the west, the **Eastern Ghats** in the east.
- The highest peak of peninsular India is **Anamudi** (Elevation : 2695 m) in Kerala.

### Physical Features of the Peninsular India

The Peninsular India is divided into **Central Highlands** and the **Deccan Plateau**.

#### Central Highlands

##### Aravallis Range

It is a range that runs from north-east to south-west for about 800 km between Delhi to Palanpur (Gujarat). Its highest peak **Guru-Sikhar** is only 1722 metres in height.

##### Malwa Plateau

- It is bordered by the Aravallis in the South, the Vindhyan Range in the south and the Bundelkhand Plateau in the east.
- It is spread across Rajasthan, Madhya Pradesh and Gujarat. The average elevation of the Malwa plateau is 500 metres, and the landscape generally slopes towards the north.
- Most of the region is drained by the **Chambal River** and its tributaries; the western part is drained by the upper reaches of the **Mahi River**.

##### Vindhya Range

- It extends from Jobat (Gujarat) and Chittorgarh (Rajasthan) to Sasaram in Bihar. It extends for about 1050 km with the average elevation of these hills is from 300 m to 600 m and rarely goes above 700 meters.
- Apart from the Kaimur Hills in the east, the Maikal Range forms a connecting link

between the Vindhyan and the Satpura mountains.

- It separates northern India from southern India.

##### Satpura Range

- It begins in eastern Gujarat near the Arabian Sea coast and runs east across Maharashtra, Madhya Pradesh and Chhattisgarh.
- It extends 900 km with many peaks rising above 1,000 m (3,300 ft).
- It is triangular in shape, with its apex at Ratnapuri and the two sides being parallel to the Tapti and Narmada rivers.
- It runs parallel to the Vindhya Range, which lies to the north, and these two east-west ranges divide the Indo-Gangetic plain from the Deccan Plateau located north of River Narmada.

##### Chotanagpur Plateau

- It is situated in eastern India, covering much of Jharkhand and adjacent parts of Odisha, Bihar and Chhattisgarh. Its total area is approximately 65,000 km<sup>2</sup> and is made up of three smaller plateaus — the Ranchi, Hazaribagh, and Kodarma plateaus.
- The plateaus at the highest elevation of about 1100m in the mid-western part are known as Pat lands. The average elevation of the plateau is 700 m above sea level.
- The Kathiawar peninsula in western Gujarat is bounded by the Gulf of Kutch and the Gulf of Khambat.

- The Barakar, the Damodar, the Subarnarekha and Koel rivers drain the Chhotnagpur Plateau.

### The Meghalaya Plateau and Mikir Hills

- It has been separated from the main block of the peninsular plateau by a wide gap known as the Garo-Rajmahal Gap.
- It slopes down to Brahmaputra valley in the north and the Surma and Meghna valleys in the south.
- Its western boundary more or less coincides with the Bangladesh border.
- The western, central and the eastern parts of the plateau are known as the Garo Hills (900 m), the Khasi-Jaintia Hills (1500 m) and the Mikir Hills (700 m).
- **Shillong** (1961 m) is the highest point of the plateau.
- **Norkek** (1515 m) is the highest peak of the Garo Hills.

- **Mawsynram** about 16 km of Cherrapunji records the highest rainfall in the world.

### Deccan Plateau

- It is a large triangular plateau, bounded by the Vindhyas to the north and flanked by the Eastern and Western Ghats.
- It covers a total area of 1.9 million km<sup>2</sup>.
- It is mostly flat, with elevations ranging from 300 to 600 m.
- It is divided into two parts such as north Deccan Plateau or Maharashtra plateau and the south Deccan consisting of Karnatak, Telangana and Tamil Nadu Plateaus.
- It slopes gently from west to east and gives rise to several peninsular rivers such as the Godavari, the Krishna, the Kaveri and the Mahanadi which drain into the Bay of Bengal.

### Western Ghats and Eastern Ghats

Variables	Western Ghats	Eastern Ghats
Known as	Sahyadri	Purva Ghat or Mahendra Parvatam
Length	1,600 km	1,450 km
Average elevation	1000 m	520 m
States	Gujarat, Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu	Odisha, Andhra Pradesh, Karnataka and Tamil Nadu
Highest point	Anamudi (2,695 m)	Arma Konda (1,680 m)
Peaks	Kudermukh (1892m) Puspagiri (1714m) Kalsubai (1646 m) Salher (1567 m) Mahabaleshwar (1438 m) Harischandra (1424 m)	Deomali (1672 m) Gali Konda (1643 m) Sinkram Gutta (1620 m) Dewodi-Munda (1598 m) Singa-Raju (1561 m) Mahendragiri (1,501 m)
Rivers flowing through	Godavari, Tungabhadra, Krishna, Thamiraparani and Kaveri.	Godavari, Kaveri, Krishna, Mahanadi and Tungabhadra
Major Waterfalls	Thoseghar Falls, Jog Falls, Kunchikal Falls, Dudhsagar Falls, Sivasamudram Falls, Unchalli Falls.	Barehipani Falls, Kiliyur Falls, Nuranang Falls, Lalguli Falls, Thalaiyar Falls
Highest waterfall	Thoseghar Falls (500 m)	Barehipani Falls (399)
* In the Nilgiris the Western Ghats joins the Eastern Ghats.		

### Major Passes in Peninsular India

Pass	Location
Amba Ghat	Ratnagiri-Kolhapur road (NH 204) in Maharashtra
Bhor Ghat or Bor Ghat	Karjat and Khandala in Maharashtra
Chorla Ghat	It is a nature destination located on the intersection of the borders of Goa, Karnataka and Maharashtra.
Haldighati pass	connects Rajsamand and Pali district of Rajasthan
Kasara Ghat or Thal Ghat	Kasara in Maharashtra, is located on the busy Mumbai–Nashik route
Kumbharli Ghat	Connects the coastal Ratnagiri District of Maharashtra with the Satara District in Desh region.
Malshej Ghat	Thane district of Maharashtra
Nane Ghat	Junnar in Pune district of Maharashtra
Palakkad Gap or Palghat Gap	between Coimbatore in Tamil Nadu and Palakkad in Kerala
Varandha Ghat	located between NH4 and Konkan in Maharashtra

### Significance of Peninsular Plateau

- The Peninsular region of India is rich in both the metallic and non-metallic minerals. About 98% of the Gondwana coal deposit of India is found in the peninsular region.
- A substantial part is covered by black earth (Regur soil) facilitating rich harvest of cotton, millet, maize, pulses, oranges etc.
- Some areas are also useful for cultivation of rubber, tea, coffee, citrus fruits, spices, tobacco, groundnut and oilseeds.
- On the southern and eastern parts of Peninsular India are large stretches of Archaean, Dharwar, Cuddapah and Vindhyan formations in which red, brown and laterite soils have developed over time.
- The Western Ghats, Nilgiris and the Eastern Ghats are covered by thick tropical moist deciduous and semi-evergreen forests.
- The rivers flowing eastward into the Bay of Bengal make several gorges, waterfalls, rapids and cataracts, which have been harnessed for the generation of hydro-electricity. The rivers originating from the Western Ghats offer great opportunity for the generation of hydel power and irrigation of agricultural crops and orchards.
- There are numerous hill stations and hill resorts, of which Ooty, Udhagamandalam, Kodaikonal, Mahabaleshwar, Khandala, Metheron, Pachmarhi, and Mount Abu are the most important.
- The hilly and mountainous areas of the Peninsula are the abodes of many scheduled tribes. South of the Vindhyans is a predominance of Dravidian culture.

## THE INDIAN DESERT or THAR DESERT

- It is the world's 17th largest desert, and the world's 9th largest subtropical desert.
- In India, it covers about 320,000 km<sup>2</sup>, of which 60% is in Rajasthan and extends into Gujarat, Punjab, and Haryana.
- About 85% of the Thar Desert is in India, and the remaining part in Pakistan.
- The desert continues into Pakistan as the **Cholistan Desert**.
- Annual temperatures can range from 0°C in the winter to over 50°C during the summer.
- This region gets very less rainfall which is less than 150 mm in a year.
- Luni is the only large river but some streams appear during rainy season.
- The Luni is a river of western Rajasthan. It originates in the Pushkar valley of the Aravalli Range, near Ajmer and ends in the marshy lands of Ran of Kutch in Gujarat.
- Crescent-shaped dunes (barchans) are found in this area.

### Great Rann of Kuchhh

- It is a seasonal salt marsh located in the Thar Desert in the Kutch District of Gujarat, India.
- In India's summer monsoon, the flat desert of salty clay and mudflats, which average 15 meters above sea level, fills with standing water. In very wet years, the wetland extends from the Gulf of Kutch on the west through to the Gulf of Cambay on the east.
- This is one of the hottest areas of India - with summer temperatures averaging and peaking at 49.5 °C. Winter temperatures reduce dramatically and can go below 0 °C (32 °F).

## THE COASTAL PLAINS

- The coastal plains of India are located along the Arabian Sea coast in the west and along the Bay of Bengal coast in the east.
- The coastal plains were formed by the depositional action of the rivers and the erosional and depositional actions of the sea-waves.
- According to their location to the east or west of the peninsular, they are called: East coastal plain, and West coastal plain.

### Eastern and Western Coastal Plain

	Eastern Coastal Plain	Western Coastal Plain
Located	From Tamil Nadu in the south to West Bengal in the north.	From Gujarat in the north and end at Kerala in the south.
Length	1100 km	1400 km
Width	100 to 130 km	10 to 80 km
Parts	Northern part = Northern Circars ; between Mahanadi and Krishna Southern part = Coromandel Coast ; between Krishna and Kaveri rivers	Northern part = Konkan (Mumbai-Goa) Central stretch = Kanara (Coastal Karnataka) Southern stretch = Malabar Coast (Western Konkan – Kanyakumari)
Rivers	Mahanadi, Godavari, Kaveri, and Krishna	Tapi (Tapati), Narmada, Mandovi and Zuari.
* <b>Chilika Lake</b> (Length : 64.3 km) is the largest brackish water in the country is located on the East Coast. It is the largest coastal lagoon in India and the second largest lagoon in the world.		

## THE ISLANDS

India has two group of islands (i.e. **Lakshadweep** in the Arabian Sea and **Andaman & Nicobar Islands** in the Bay of Bengal).

### Lakshadweep Islands

- It lie 200 to 300 km off the coast of Kerala in the Arabian Sea with an area of 32 km<sup>2</sup>.
- They consist of twelve **atolls**, three **reefs**, and five **submerged banks**, with a total of about 36 islands and islets.

### Andaman and Nicobar Islands

- It located 1,255 km from Kolkata and 193 km from Cape Negrais in Burma.
- This group of islands can be divided into two groups. The Andaman is in the north and the Nicobar is in the south.
- These islands are located close to equator and thus, experience equatorial type of climate and also have thick forest cover.
- These islands too have rich biodiversity (flora & fauna).
- The **Barren Island** in the Andaman has an active volcano. **Narcondam** is another volcanic island in the Bay of Bengal.

### Major islands of India

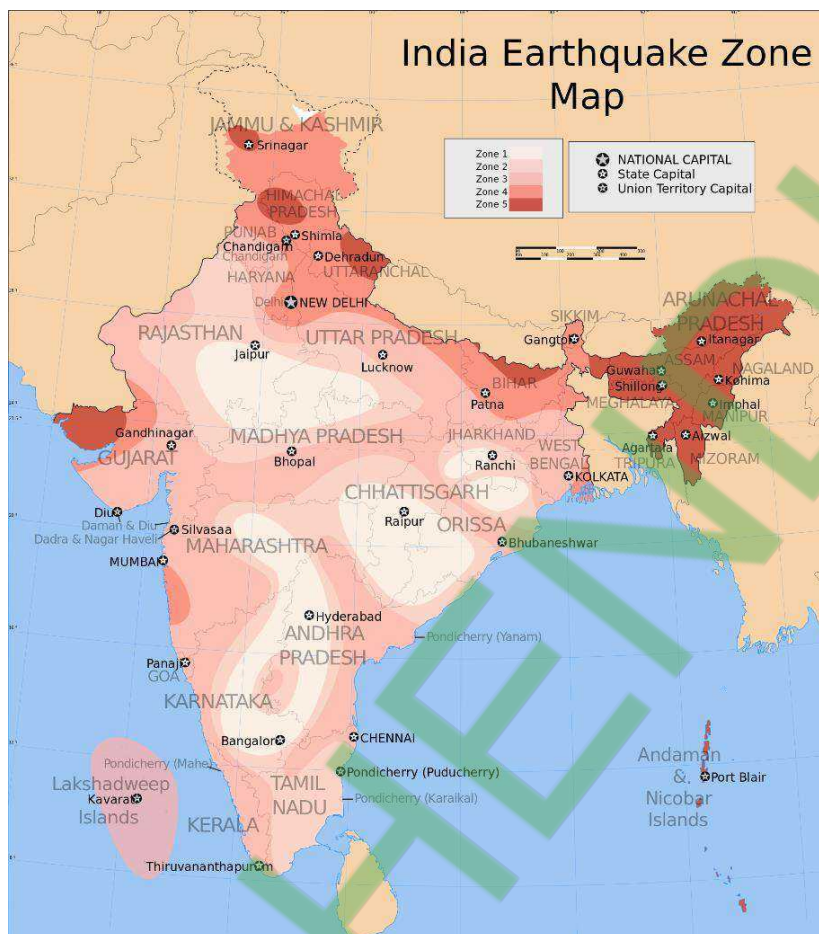
- **Chorao** is an island along the river Mandovi near Panaji, Goa, India.
- **Elephanta** Island is one of the islands in Mumbai Harbor.
- **Kalpeni** is an island in the Union Territory of Lakshadweep, India.
- **Rameswaram** Island is a small island in the Gulf of Munnar.
- **Willingdon** Island is the home of the modern port that serves Kochi in Kerala, India.
- **Majuli** is a river island of the Brahmaputra river, Assam, India.
- **Sriharikota** is a barrier island in Andhra Pradesh.
- **Salsette** Island is India's most populated island on which the city of Mumbai is located.
- Forty-two islands in the Gulf of Kutch constitute the **Marine National Park**.

## EARTHQUAKES IN INDIA

- The major reason for the high frequency and intensity of the earthquakes is that the Indian plate is driving into Asia at a rate of approximately 47 mm/year.
- Center for Seismology, Ministry of Earth Sciences is nodal agency of Government of India dealing with various activities in the field of seismology and allied disciplines.
- The earthquake zoning map of India divides India into 4 seismic zones (Zone 2, 3, 4 and 5)
- The **Modified Mercalli** (MM) intensity, which measures the impact of the earthquakes on the surface of the earth, broadly associated with various zones, is as follows:

Seismic Zone	Intensity on MMI scale
II (Low intensity zone)	VI (or less)
III (Moderate intensity zone)	VII
IV (Severe intensity zone)	VIII
V (Very severe intensity zone)	IX (and above)

### Indian Earthquake Zones



### Major Earthquakes in India

Dates	Location	Magnitude
December 26, 2004	off west coast northern Sumatra India Sri Lanka Maldives	9.3
August 15, 1950	Arunachal Pradesh	8.6
June 12, 1897	Shillong, Assam	8.3
June 16, 1819	Gujarat	8.2
June 26, 1941	Andaman Islands	8.1
June 12, 1897	Shillong	8.1
December 31, 1881	Andaman Islands	7.9
April 25, 2015	Northern India, North East India	7.8
April 4, 1905	Himachal Pradesh	7.8
October 26, 2015	Northern India	7.7
August 10, 2009	Andaman Islands	7.7
May 31, 1935	Quetta, Baluchistan	7.7
October 8, 2005	Kashmir	7.6
January 26, 2001	Gujarat	7.6
September 18, 1737	Kolkata	7.6
May 12, 2015	Northern India, North East India	7.3
October 20, 1991	Uttarkashi, Uttarakhand	7.0
September 18, 2011	Gangtok, Sikkim	6.9
January 3, 2016	North East India	6.7



### RIVER SYSTEM IN INDIA

River System	Length (km)	Originates From	Ends in	Places Benifited
Indus	3100	In Tibet Kalish Range 5080 mts.	Arabian sea	India and Pakistan
Ganga (Bhagirati)	2480	Gangothri	Bay of Bengal	Uttar Pradesh, Uttarakhand, Bihar, West Bengal
Yamuna (Jamuna)	1370	Garhwal in Yamunotri	Bay of Bengal	Delhi, Haryana and UP
Brahmaputra	725	Lake Manasarovar	Bay of Bengal	North Eastern state
Kaveri (Dakshina Ganga" or Ganges of the south)	805	Hills of Coorg, Karnataka	Bay of Bengal	Karnataka and Tamilnadu
Godavari	1465	Nasik Hills	Bay of Bengal	South-easterly part of Andhra Pradesh
Krishna	1400	Near Mahabaleshwar in Maharashtra	Bay of Bengal	Maharashtra & Andhrapradesh
Narmada	1312	Amarkantak hill in Madhya Pradesh	Arabian sea	Madhya Pradesh and Maharashtra
Tapti	724	Bettul	Arabian sea	Madhya Pradesh and Maharashtra
Mahanadi	858	Amarkantak Plateau	Bay of Bengal	Jharkhand, Chhattisgarh, Odisha
Vaigai	240	Cardaman Hills	Bay of Bengal	Madurai and Ramanathapuram in Tamil Nadu
Periyar	244	Cardaman Hills	Bay of Bengal	Tamil Nadu and Kerala
Thamiraparani	123	Agasthiyar Hills	Gulf of Mannar	Thirunelveli in Tamil Nadu

### INDIAN MAJOR CITIES ON RIVER BANKS

State	City	River
Andhra Pradesh	Nellore	Pennar
Andhra Pradesh	Rajahmundry	Godavari
Andhra Pradesh	Vijayawada	Krishna
Assam	Dibrugarh	Brahmaputra
Assam	Guwahati	Brahmaputra
Bihar	Bhagalpur	Ganges
Bihar	Hajipur	Ganges
Bihar	Patna	Ganges
Daman	Daman	Daman Ganga River
Delhi	New Delhi	Yamuna
Gujarat	Ahmedabad	Sabarmati
Gujarat	Bharuch	Narmada
Gujarat	Surat	Tapi
Gujarat	Vadodara	Vishwamitri
Jammu & Kashmir	Srinagar	Jhelum
Karnataka	Bagalkot	Ghataprabha
Karnataka	Bangalore	Vrishabhavathi
Karnataka	Bhadravathi	Bhadra
Karnataka	Honnavar	Sharavathi
Karnataka	Hospet	Tungabhadra
Karnataka	Karwar	Kali
Karnataka	Mangalore	Netravati, Gurupura

State	City	River
Karnataka	Shimoga	Tunga River
Madhya Pradesh	Gwalior	Chambal
Madhya Pradesh	Jabalpur	Narmada
Madhya Pradesh	Ujjain	Shipra
Maharashtra	Karad	Krishna, Koyna
Maharashtra	Karjat	Ulhas
Maharashtra	Kolhapur	Panchaganga
Maharashtra	Mahad	Savitri
Maharashtra	Malegaon	Girna River
Maharashtra	Nanded	Godavari
Maharashtra	Nashik	Godavari
Maharashtra	Pune	Mula, Mutha
Maharashtra	Sangli	Krishna
Odisha	Banki	Mahanadi
Odisha	Brahmapur	Rushikulya
Odisha	Chhatrapur	Rushikulya
Odisha	Cuttack	Mahanadi
Odisha	Rourkela	Brahmani
Odisha	Sambalpur	Mahanadi
Punjab	Ferozpur	Sutlej
Rajasthan	Kota	Chambal
Tamil Nadu	Chennai	Cooum, Adyar
Tamil Nadu	Coimbatore	Noyyal
Tamil Nadu	Erode	Kaveri

Tamil Nadu	Madurai	Vaigai
Tamil Nadu	Thiruchirapalli	Kaveri
Tamil Nadu	Tiruchirapalli	Kaveri
Tamil Nadu	Tirunelveli	Thamirabarani
Telangana	Hyderabad	Musi
Telangana	Nizamabad	Godavari
Uttar Pradesh	Agra	Yamuna
Uttar Pradesh	Allahabad	Ganges
Uttar Pradesh	Auraiya	Yamuna
Uttar Pradesh	Ayodhya	Saryu
Uttar Pradesh	Chakeri	Ganges
Uttar Pradesh	Etawah	Yamuna
Uttar Pradesh	Farrukhabad	Ganges
Uttar Pradesh	Fatehgarh	Ganges

Uttar Pradesh	Gorakhpur	Rapti
Uttar Pradesh	Jaunpur	Gomti
Uttar Pradesh	Kannauj	Ganges
Uttar Pradesh	Kanpur	Ganges
Uttar Pradesh	Kanpur Cantonment	Ganges
Uttar Pradesh	Lucknow	Gomti
Uttar Pradesh	Mathura	Yamuna
Uttar Pradesh	Mirzapur	Ganga
Uttar Pradesh	Shuklaganj	Ganges
Uttar Pradesh	Varanasi	Ganges
Uttarakhand	Badrinath	Alaknanda
Uttarakhand	Haridwar	Ganges
West Bengal	Kolkata	Hugli

### MAJOR LAKES OF INDIA

1. Largest fresh water lakes India : Wular Lake, Jammu and Kashmir (Length: 16 km)
2. Largest artificial lake in India : Bhojtal or Upper lake, Madhya Pradesh (Length: 31.5 km)
3. Largest saline water lake in India : Chilika Lake, Odisha (Length : 64.3 km)
4. Highest Lake in India : Cholamu Lake or Tso Lhamo lake, Sikkim (Altitude : 5,330 m)

### Other state-wise lakes

State	Lakes
Andhra Pradesh	Kolleru Lake, Pulicat Lake
Assam	Deepor Beel, Chandubi Lake, Haflong Lake, Son Beel
Bihar	Kanwar Lake
Gujarat	Hamirsar Lake, Kankaria Lake, Nal Sarovar, Narayan Sarovar, Thol Lake, Vastrapur Lake, Lakhota Lake, Sursagar Lake
Himachal Pradesh	Brighu Lake, Dashir Lake, Dhankar Lake, Kareri (Kumarwah) lake, Khajjiar Lake, Macchial Lake, Maharana Pratap Sagar, Manimahesh Lake, Suraj Taal, Chandra Taal
Haryana	Badkhal Lake, Brahma Sarovar, Karna Lake, Sannihit Sarovar, Surajkund Lake, Tilyar Lake, Blue Bird Lake
Jammu and Kashmir	Dal Lake, Pangong Tso, Tso Moriri, Wular Lake, Manasbal Lake, Mansar Lake, Sheshnag Lake
Karnataka	Bellandur Lake, Ulsoor Lake, Sankey Lake, Hebbal Lake, Lalbagh Lake, Agara Lake, Pampa Sarovar
Kerala	Ashtamudi Lake, Maanaanchira Lake, Padinjare chira Lake, Paravur Kayal, Punnamada Lake (Vembanad lake), Shasthamkotta lake, Vadakkechira, Vellayani Lake
Madhya Pradesh	Upper Lake, Lower Lake
Uttar Pradesh	Moti Jheel, Kanpur
Maharashtra	Gorewada Lake, Lonar Lake, Pashan Lake, Powai Lake, Rankala Lake, Shivajisagar lake, Talao Pali Lake, Upvan Lake, Venna Lake
Meghalaya	Umiam Lake
Manipur	Loktak Lake
Mizoram	Palak Dil Lake, Tam Dil Lake
Odisha	Chilka Lake, Anshupa Lake, Kanjia lake
Punjab	Kanjli Wetland, Harike Wetland, Ropar Wetland
Rajasthan	Dhebar Lake, Kaylana Lake, Nakki Lake, Pachpadra Lake, Pushkar Lake, Ana Sagar Lake, Rajsamand Lake, Sambhar Salt Lake, Ramgarh Lake, Siliserh lake, Alwar, Man Sagar lake, Lake Salusagar, Dudh Talai, Fateh Sagar Lake, Pichola lake, Rangsagar lake, Swaroopsagar lake
Sikkim	Gurudongmar Lake, Khecheopalri Lake, Lake Tsongmo, Lake Cholamu
Telangana	Hussain Sagar, Osman Sagar, Himayat Sagar, Shamirpet Lake, Mir Alam Tank, Durgam Cheruvu (Secret Lake), Saroonagar Lake, Alwal Cheruvu Lake

Tamil Nadu	Berijam Lake, Chembarambakkam Lake, Kodaikanal Lake, Ooty Lake, Red Hills Lake (Puzhal lake), Singanallur Lake, Sholavaram Lake, Veeranam Lake
Uttar Pradesh	Ramgarh Taal Lake, Keetham Lake, Belasagar Lake, Barua Sagar Tal, Sheikha Jheel
Uttarakhand	Bhimtal Lake, Dodital, Nainital Lake, Naukuchiatal, Sat Tal
West Bengal	Rabindra Sarobar (Dhakuria Lake), Senchal Lake, East Calcutta Wetlands, Santragachhi Lake

### Major River Projects and their Beneficiary States

Project	River	Purpose	Beneficiary States
Beas Project	Beas	Power and Irrigation	Rajasthan, Haryana, Punjab and Himachal Pradesh
Bhakra Nangal Project	Sutlej	Power and Irrigation	Punjab, Himachal Pradesh, Haryana and Rajasthan
Chambal Project	Chambal	Power and Irrigation	Madhya Pradesh and Rajasthan
Damodar valley	Damodar	Power, Irrigation and flood control	Jharkhand and Paschim, Banga, shared by Madhya Pradesh
Durgapur Barrage	Damodar	Irrigation and navigation	Karnataka, Paschim Banga and Jharkhand
Farakka Project	Ganga, Bhagirathi	Power, Irrigation	Paschim Banga
Gandak River Project	Gandak	Power and Irrigation	Bihar, Uttar Pradesh, Nepal (Joint Venture of India and Nepal)
Hirakud	Mahanadi	Power and Irrigation	Odisha
Iddukki Project	Periyar	Hydroelectricity	Kerala
Kakrapara Project	Tapti	Irrigation	Gujarat
Kosi Project	Kosi	Flood Control, Power and Irrigation	Bihar and Nepal
Kundah Project	Kundah	Hydroelectricity and Irrigation	Tamil Nadu
Mahanadi Delta Project	Mahanadi	Irrigation	Odisha
Mahi Project	Mahi	Irrigation	Gujarat
Malaprabha Project	Malaprabha	Irrigation	Karnataka
Mandi Project	Beas	Irrigation	Himachal Pradesh
Matatilla Project	Betwa	Multipurpose Power and Irrigation	Uttar Pradesh and Madhya Pradesh
Nagarjunasagar Project	Krishna	Power and Irrigation	Andhra Pradesh and Telangana
Poochampad Project	Godavari	Irrigation	Telangana
Rajasthan Canal Project	Sutlej, Beas and Ravi	Irrigation	Rajasthan, Haryana, Punjab
Ramganga Multipurpose Project	Chisot stream near kala	Power and Irrigation	Uttar Pradesh
Rihand Scheme	Rihand	Hydroelectricity	Uttar Pradesh
Shivasamudram Project	Cauveri	Irrigation	Karnataka
Tata Hydrel Scheme	Bhima	Hydroelectricity	Maharashtra
Tawa Project	Tawa (Narmada)	Irrigation	Madhya Pradesh
Tehri Dam Project	Bhilagana, Bhagirathi	Hydroelectricity	Uttarkhand
Thein Project	Ravi	Irrigation	Punjab
Tugabhadra Project	Tungabhadra	Power and Irrigation	Andhra Pradesh and Karnataka
Ukai Project	Tapti	Power and Irrigation	Gujarat

## CLIMATE IN INDIAN SUBCONTINENT

- India has 'Tropical Monsoon' type of climate. The word monsoon has been derived from the Arabic word 'Mausim' which means seasonal reversal of the winds during the course of the year.
- The whole of India has a tropical monsoonal climate, since the greater part of the country lies within the tropics, and the climate is influenced by the monsoons.
- The position of the mountain ranges and direction of the rain-bearing winds are the two main factors that determine the climate of India.
- The climate in India is strongly influenced by the **Himalayas** and the **Thar Desert**.
- During the winter season, the winds generally blow from northeast to southwest (land to sea), while in summer season the winds blow from southwest to northeast (sea to land).
- The average annual rainfall is less than **13 cm** over the **western Rajasthan**, while at **Mawsynram** in the Meghalaya has as much as **1141 cm**. It is the **wettest place** on the earth.

### Seasons in India

Ritu	Season	Gregorian month
Vasanta	Spring	~ March to May
Grishma	Summer	~ May to July
Varsha	Monsoon	~ July to September
Sharad	Autumn	~ September to November
Hemanta	Fall winter	~ November to January
Shishira	Winter	~ January to March

### Factors Affecting the Climate of India

#### Latitude

India lies between 8° 4' N and 37° 6' N latitudes. The Tropic of Cancer passes through the middle of India, thus making the southern half of India in the **Torrid Zone** and the northern half in the **Temperature Zone**.

#### Himalaya Mountains

The Himalayas play an important role in lending a sub-tropical touch to the climate of India. The lofty Himalaya Mountains form a barrier which affects the climate of India. It prevents the cold winds of north Asia from blowing into India, thus protecting it from severely cold winters. It also traps the Monsoon winds, forcing them to shed their moisture within the sub-continent.

#### Altitude

Temperature decreases with height. Places in the mountains are cooler than places on the plains.

#### Distance from the sea

With a long coastline, large coastal areas have an equable climate. Areas in the interior of India are far away from the moderating influence of the sea. Such areas have extremes of climate.

#### Geographical Limits

**Western Disturbances:** The low pressure systems that originate over the eastern Mediterranean region in winter and move eastwards towards India passing over Iran, Afghanistan and Pakistan are responsible for the winter rain in northern India.

### **Conditions in the Regions Surrounding**

**India:** Temperature and pressure conditions in East Africa, Iran, Central Asia and Tibet determine the strength of the monsoons and the occasional dry spells. For example, high temperatures in East Africa may draw the monsoon winds from the Indian Ocean into that region thus, causing a dry spell.

**Conditions over the Ocean:** The weather conditions over the Indian Ocean and the China Sea may be responsible for typhoons which often affect the east coast of India.

**Jet Streams:** Air currents in the upper layers of the atmosphere known as jet streams could determine the arrival of the monsoons and departure of the monsoons. The Scientists are studying the jet streams and how it may affect the climate of India but much remains to be learned about this phenomena.

### **Climatic Regions of India**

#### **Tropical Rain Forest**

- This type of climate is found on the west coastal plain and Sahyadris and in parts of Assam
- The temperatures are high, not falling below 18.2 degree c even during winter and rising to 29 degree C in April and May, the hottest months.

#### **Tropical savanna**

- Most of the peninsula, except the semiarid zone in the leaside of the Sahyadris experiences this type of climate.
- A long dry weather lasting through winter and early summer and high temperature remaining above 18.2 degree C even during the winter seasons and rising as high as 32 degree C in summer are the chief characteristics of this climate.
- Nagpur has a mean temperature of 35.4 degree C for May which is the hottest month and 20.7 degree C for December the coldest month in the year.

- The natural vegetation all over the area is savanna.

#### **Tropical Semi-Arid Steppe Climate**

- The rain-shadow belt, running southward from central Maharashtra to Tamil Nadu, in the leaside of the Sahyadris and Cardamom Hills come under this type of climate of low and uncertain rainfall.
- Temperature varying from 20 degree C to 23.8 degree C for December and 32.8 degree C for May. Agriculturally, the climate is suitable only for dry farming and livestock rearing.

#### **Tropical and Sub-Tropical Steppe**

- This type of climate occurs over a broad crescent from Punjab to Kachchh between the Thar Desert to its west and the more humid climates of the Ganga Plain and the Peninsula to its east and south respectively.
- The climate, therefore, is transitional between these two areas. The annual rainfall is not only low but it is also highly erratic.

#### **Tropical Desert**

- The western part of Barmer, Jaisalmer and Bikaner districts of Rajasthan and most of the part of Kachchh form the sandy wastes of the Thar which experiences a typical desert climate.
- Ganganagar has recorded a maximum temperature of 50 degree C, the highest record.

#### **Humid Sub-Tropical with Winter**

- A large area to the south of the Himalayas, east of the tropical and sub-tropical steppe and north of the tropical savanna running in a long belt from Punjab to Assam with a south-westward extension into Rajasthan east of the Aravalli Range, has this type of climate.

- Winters are dry except for a little rain received from the westerly depressions.

reach, has a dry and cold climate and a sparse and stunted vegetation.

### Mountain Climate

- The Himalayan and Karakoram ranges experience this type of climate with sharp contrasts between the temperatures of the sunny and shady slopes, high diurnal range of temperatures and high variability of rainfall.
- The trans-Himalayan region, Ladakh, where the south-west monsoon fails to

### Drought in India

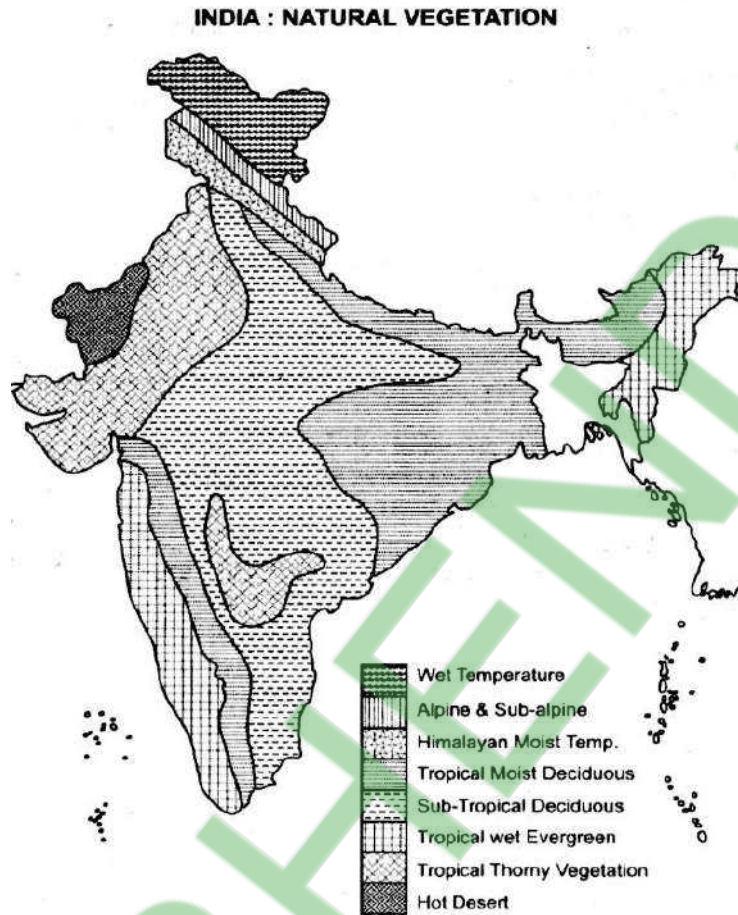
- The dry areas of Rajasthan and the adjoining part of Haryana and Gujarat are liable to frequent drought conditions.
- Another area liable to frequent drought lies on the leeward side of the Western Ghats.

### Characteristics of Rainfall in India

Type of Rainfall	Areas
Areas of very little rainfall (lower than 50 cm)	Western Rajasthan, northern part of Kashmir, the Deccan Plateau and Punjab.
Areas of low precipitation (50-100 cm)	Eastern Rajasthan, Upper Ganga basin, Southern plains of Karnataka, Punjab, Tamil Nadu, and Andhra Pradesh.
Areas of comparatively heavy rainfall (100-200 cm)	Southern areas of Gujarat, north-eastern Peninsular region, east Tamil Nadu, eastern Maharashtra, Western Ghats, Orissa, Madhya Pradesh, and the central Gangetic basin.
Areas of heavy rainfall (more than 200 cm)	The western seashores, the Western Ghats, Hills of Meghalaya, and the Sub-Himalayan range territories in North East. West Bengal, Assam, Western Coast, and southern part of east Himalayas.

## FOREST AND NATURAL VEGETATION

*India's forest cover to be about 68 million hectares, or 24% of the country's area.*



*The types of forests in India can be divided into five major types on the basis of certain common features like dominant natural vegetation, climatic regions etc. These are (1) Tropical Evergreen and Semi-Evergreen forests, (2) Tropical Deciduous Forests, (3) Tropical Thorn Forests, (4) Montane Forests and (5) Littoral and Swamp Forests.*

### **Tropical Evergreen and Semi-Evergreen Forests**

- **Tropical Evergreen forests** are typically found in warm and humid areas with rainfall more than 200cm and mean annual temperature more than 22 degrees.
- These forest are found in western slopes of Western Ghats, hilly areas of N.E states, Andaman and Nicobar islands.
- No fixed seasons for flowering, shedding or fruiting in these forests. They are green all the year round.
- Very dense forests and well stratified. Very tall Trees which can go upto **60m** or above are found in Tropical Evergreen forests.
- Major Species of Evergreen forests are **Rosewood, Ebony, Mahogany** etc.
- **Tropical Semi-Evergreen Forests** are found in less rainy areas of the region. These forests have mix of Evergreen and Deciduous varieties.
- Major species of Semi-evergreen forests are **White Cedar, Hillock or Jhalna, Kail, Oak, Chestnut** etc.

### Tropical Deciduous Forests

- These are the most widespread forests out of all the types of forests in India, and also known as **Monsoon Forests**.
- They are found in the regions having rainfall between 70-200 cm.
- Tropical Deciduous Forests are further classified into two types of forests on the basis of rainfall- **Tropical Moist Deciduous Forests** and **Tropical Dry Deciduous Forests**.
- **Tropical Moist Deciduous Forests** are present in the areas having rainfall between 100-200 cm and found in eastern slopes of Western Ghats, foothills of Himalayas in North-eastern states and Odisha. **Major Species** : *Teak, Sal, Sheshum, Amla, Kusum, Mahua, Sandalwood etc.*
- **Tropical Dry Deciduous Forests** are present in the areas having rainfall between 70-100 cm and found in rainier areas of peninsula and the plains of Uttar Pradesh and Bihar. During Dry seasons, Trees shed their leaves completely and the forest appears like a **Grassland**. **Major Species**: *Khair, Tendu, Palas, axlewood, bel etc.*

### Tropical Thorn Forests

- These forests are found in areas having less than **50 cm** of Rainfall.
- Variety of Grasses and Shrubs are found in these thorn forests.
- They are present in dry and semi-dry areas of south-west Punjab, Haryana, Gujarat, Rajasthan, Madhya Pradesh and Uttar Pradesh.
- Trees remain leafless for most part of the year.
- Tussocky Grass grows upto 2m in these areas.

### Montane Forests

- This type of Forest is found in the **Mountainous** or **Hilly regions**.
- Montane Forests in India can be classified in two types of forests – the **Northern Montane Forests** and the **Southern Montane Forests**.

#### Northern Montane Forests

- These forests are found in the Himalayan ranges.
- The vegetation type changes with increase in altitude from Tropical To Tundra.
- Deciduous forests are found at the foothills of the mountains.
- Between 1000 – 2000 m, wet-temperate type of Forests are found.
- Evergreen broad-leaf trees such as Oak, Chestnut are commonly found in some areas at this height.
- Between 1500 – 1750 m, Pine and Deodar trees are found in some areas. Chinar and Walnut trees are present in Kashmir Himalayas at this altitude.
- Between 2200 – 3000 m, Blue Pine and Spruce appear.
- At an altitude of 3000 – 4000 m, Silver firs, Junipers, pines, birch and rhododendrons are found.
- At Higher altitudes, Mosses and Lichens are present.

#### Southern Montane Forests

- They are found in three major areas in Southern India – Hills of Western Ghats, Nilgiri Hills and Vindhya.
- As, the Hills in Southern India are closer to the tropics and with average height of 1500m , they only show two types of vegetation – Temperate in higher regions at sub-tropical in lower regions.
- The Temperate Forests of Nilgiri, Annamalai and Panini Hills are called as **Sholas**.



- **Major Species:** *Magnolia, Laurel, cinchona* and *wattle*.

### Littoral and Swamp Forests or Wetland Forests

- India has rich variety of these types of forests.
- These forests are mainly found in reservoirs of Deccan Plateau, saline coastline of Gujarat, Rajasthan and Gulf of Kachchh, eastern coast deltas, lake and rivers of Kashmir and Ladakh, swamps in north-east India etc.
- Mangroves Forests grow along coast in the salt-marshes, tidal creeks and estuaries.
- Mangroves are home to a large variety of Birds.

- Also, contains a number of Salt-tolerant species of plants.
- Mangroves in India are largely present in Andaman and Nicobar Island,
- Sunderban Deltas and Mahanadi, Godavari, Krishna deltas.

### Top 5 states of Forest Area

State	Forest Area (in million hectares)
Madhya Pradesh	7.75
Arunachal Pradesh	6.73
Chhattisgarh	5.6
Maharashtra	5.06
Odisha	5.03

## SOILS IN INDIA

*In India, various types of soils are found and their formations are influenced by certain factors such as altitude, climate disproportionate rainfall and many others. The major types of soils found in India are:*

Soil type	Occurrence States	Compositions	Crops Grow
Alluvial	Punjab, Haryana, Uttar Pradesh Bihar, Jharkhand	Rich in potash and lime, but deficient in nitrogen and phosphoric acid	Large variety of Rabi and Kharif crops such as wheat, rice, sugarcane, cotton and jute
Black or Regur	Deccan Plateau, Valleys of Krishna and Godavari, Andhra Pradesh, Madhya Pradesh and Tamil Nadu	Rich in iron, lime, aluminum, magnesium, calcium, but lacks in nitrogen, phosphorus and humus.	Cotton, sugarcane, jowar, tobacco, wheat, rice
Red	Eastern parts of Deccan Plateau, Tamil Nadu, Goa, Odisha and Meghalaya	Rich in iron and potash, but deficient in lime, nitrogen phosphorus and humus	Wheat, rice, cotton, sugarcane and Pulses
Laterite	Summits of Eastern and Western Ghats, Assam hills, Andhra Pradesh, Karnataka, West Bengal and Odisha	Rich in iron but poor in silica, lime, phosphorus, potash and humus	Tea, coffee, rubber, cashew and millets
Desert	West and North-West India, Rajasthan, North Gujarat and Southern Punjab.	Rich in soluble salts, but deficient in organic matter. rich enough in phosphate though poor in nitrogen	lime, millets, barley, cotton, maize and pulses (with irrigation)
Mountain	Hills of Jammu and Kashmir Uttarakhand and Assam hills	Rich in iron and humus, but deficient in lime	tea, fruits and medicinal plants (with fertilizers)
Saline and Alkaline	Drier parts of Bihar, Jharkhand, Uttar Pradesh, Haryana, Punjab, Rajasthan and Maharashtra	Many salts such as sodium, magnesium and calcium	Unfit for agriculture
Peaty and Marshy	Kerala, coastal regions of Odisha, Tamil Nadu and Sundarbans of West Bengal	Contain large amount of soluble salts and organic matter, but lack in potash and phosphates	Rice and jute

## AGRICULTURE IN INDIA

India is the world's largest producer of many fresh fruits and vegetables, milk, major spices, select fibrous crops such as jute, staples such as millets and castor oil seed. India is the second largest producer of wheat and rice, the world's major food staples.

The **Indian Council of Agricultural Research (ICAR)** is the principal authority in farming and ancillary industries, which comprise learning and research.

*For more details about AGRICULTURE, please go to **Indian Economy (Chapter – AGRICULTURE)** and **General Science – Biology Chapter – AGRICULTURE** in this book.*

### MAJOR CROPS OF INDIA

Crop	Major Crop Producing States
<b>Cereals</b>	
Wheat	Uttar Pradesh, Punjab and Haryana
Rice	West Bengal and Tamil Nadu
Gram	Madhya Pradesh and Tamil Nadu
Barley	Maharashtra, Uttar Pradesh and Rajasthan
Bajra	Maharashtra, Gujarat and Rajasthan
<b>Cash Crops</b>	
Sugarcane	Uttar Pradesh and Maharashtra
Poppy	Uttar Pradesh and Himachal Pradesh
<b>Oil Seeds</b>	
Coconut	Kerala and Tamil Nadu
Linseed	Madhya Pradesh and Uttar Pradesh
Groundnut	Andhra Pradesh, Gujarat and Tamil Nadu
Rape and mustard	Rajasthan and Uttar Pradesh
Sesame	Uttar Pradesh and Rajasthan
Sunflower	Maharashtra and Karnataka
<b>Spices</b>	
Pepper	Kerala, Karnataka and Tamil Nadu
Cashewnuts	Kerala, Tamil Nadu and Andhra Pradesh
Ginger	Kerala and Uttar Pradesh
Turmeric	Andhra Pradesh and Odisha
<b>Fibre Crops</b>	
Cotton	Maharashtra and Gujarat
Jute	West Bengal and Bihar
Silk	Karnataka and Kerala
Hemp	Madhya Pradesh and Uttar Pradesh
<b>Plantations</b>	
Coffee	Karnataka and Kerala
Rubber	Kerala and Karnataka
Tea	Assam and Kerala
Tobacco	Gujarat, Maharashtra and Madhya Pradesh

## MINERAL RESOURCES OF INDIA

Mineral	Mines
<b>Metallic Mineral Mines</b>	
Iron	Karnataka, Odisha, Chhattisgarh, Goa
Manganese	Karnataka, Odisha, Madhya Pradesh, Maharashtra
Chromite	Odisha, Bihar, Karnataka, Maharashtra and Andhra Pradesh
Copper	Madhya Pradesh, Jharkhand
Bauxite	Odisha, Gujarat, Jharkhand, Maharashtra, Chhattisgarh
Gold	Karnataka, Andhra Pradesh
<b>Non-Metallic Mineral Mines</b>	
Limestone	Andhra Pradesh, Rajasthan, Madhya Pradesh, Gujarat, Chhattisgarh
Dolomite	Madhya Pradesh, Chhattisgarh, Odisha, Gujarat, Karnataka, West Bengal
Asbestos	Rajasthan, Andhra Pradesh and Karnataka
Gypsum	Rajasthan, Jammu and Kashmir
Graphite	Odisha, Bihar
<b>Atomic Mineral Mines</b>	
Uranium	Jharkhand, Bihar, Uttar Pradesh
Thorium	Kerala, Jharkhand, Bihar, Tamil Nadu and Rajasthan
Lithium	Jharkhand, Madhya Pradesh, and Rajasthan
Zirconium	Kerala and Jharkhand
Beryllium	Andhra Pradesh, Sikkim, Jammu and Kashmir
Antimony	Himachal Pradesh and Madhya Pradesh

## TRANSPORT, COMMUNICATION AND TRADE

*The transport system in India includes: Road, Rail, Inland waterways, Coastal shipping and Airways.*

### ROAD

India has a road network of about 46 lakh kilometres.

India has the second largest road network in the world.

#### Indian Road Network

Types of Roads in India	Length (km)
Expressways	1,208
National Highways	92,851
State Highways	1,63,898
Major and other district roads	17,05,706
Rural & other roads	27,49,805

### National Highways Authority of India (NHAI)

The National Highways Authority of India was constituted by an act of Parliament, the National Highways Authority of India Act, 1988. It is responsible for the development, maintenance and management of National Highways entrusted to it and for matters connected or incidental thereto. The Authority was operationalised in Feb, 1995.

### National Highway Development Programme (NHDP)

The National Highways Development Project is a project to upgrade, rehabilitate and widen major highways in India to a higher standard. The project was implemented in 1998 under the leadership of Atal Bihari Vajpayee.

Golden Quadrilateral connects Four Metropolitan Cities (i.e. Delhi-Mumbai-Chennai-Kolkata-Delhi).

NS (North-South) Corridor Connects Srinagar to Kanniakumari and EW (East-West) Corridor Connects Porbandar to Silchar.

The project-wise details NHDP all Phases as below.

NHDP Phase	Particulars	Length
NHDP-I & II	Balance work of GQ and EW-NS corridors	13,000 km
NHDP-III	4-laning	10,000 km
NHDP-IV	2-laning	20,000 km
NHDP-V	6-laning of selected stretches	5,000 km
NHDP-VI	Development of expressways	1,000 km
NHDP-VII	Ring Roads, Bypasses, Grade Separators, Service Roads etc.	700 km

### Major National Highways

NH No.	Route	Distance in km
NH-1	New Delhi - Ambala - Jalandhar - Amritsar	456
NH-2	Delhi - Mathura - Agra - Kanpur - Allahabad - Varanasi - Kolkata	1465
NH-3	Agra - Gwalior - Nasik - Mumbai	1161
NH-4	Mumbai - Pune - Bangalore - Chennai	1235
NH-5	Jharpokharia - Bhubaneshwar - Vijaywada - Chennai	1533
NH-6	Hajira - Kolkata	1949
NH-7	Varanasi - Nagpur - Hyderabad - Bangalore - Kanyakumari	2369
NH-8	Delhi - Jaipur - Ahmedabad - Mumbai	1428
NH-9	Pune - Hyderabad - Vijaywada	841
NH-10	Delhi - Fazilka	403
NH-11	Agra - Jaipur - Bikaner	582
NH-12	Jabalpur - Bhopal - Jaipur	890
NH-15	Pathankot - Bikaner - Samakhiali	1526
NH-17	Panvel - Mangalore - Edapally	1269
NH-31	Barhi - Guwahati	1125
NH-76	Pindwara - Allahabad	1007
NH-86	Kanpur - Dewas	674
NH-200	Raipur - Chandikhole	740
NH-217	Raipur - Gopalpur	508

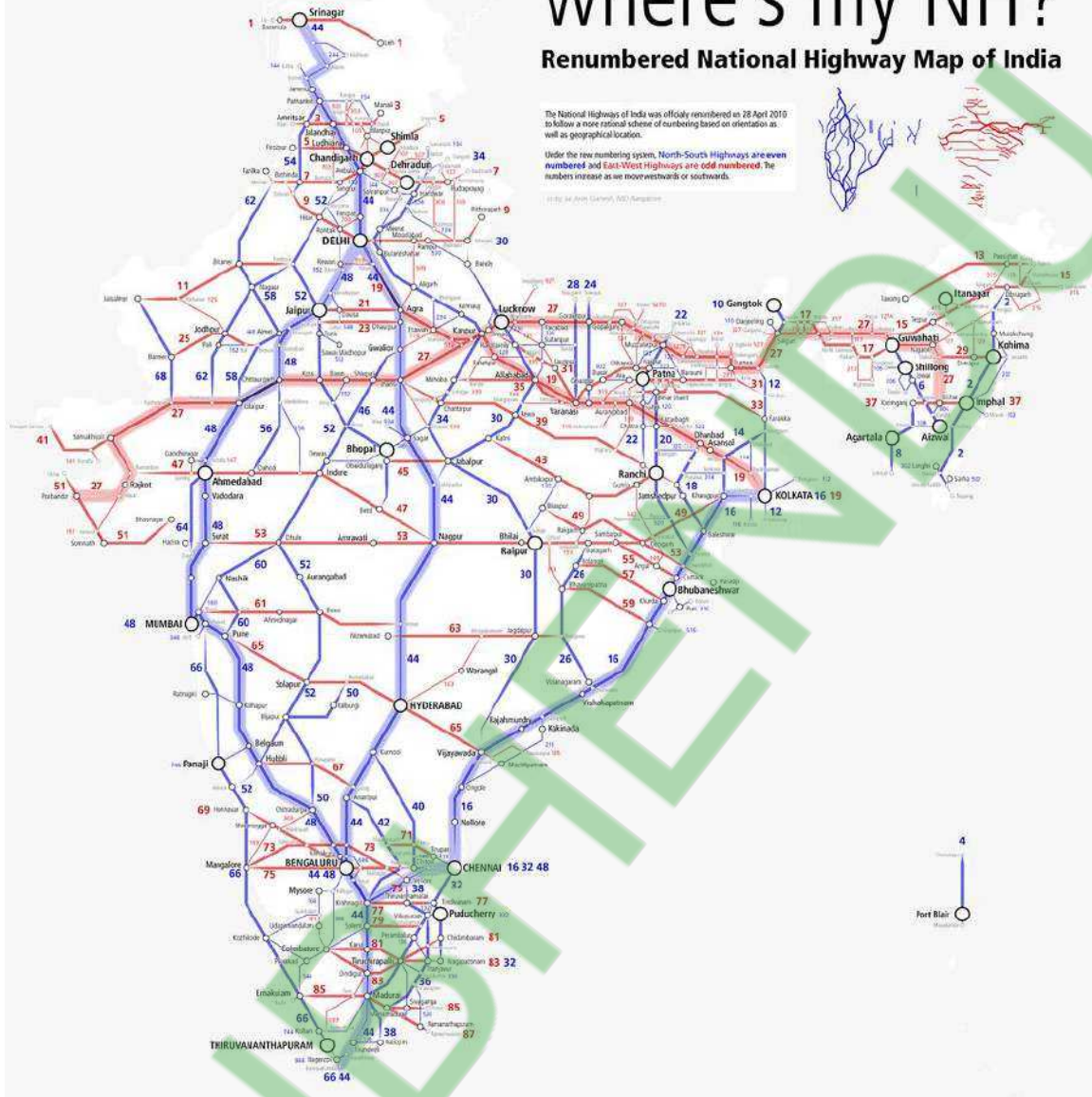
# where's my NH?

## Renumbered National Highway Map of India

The National Highways of India was officially renumbered on 28 April 2010 to follow a more rational scheme of numbering based on orientation as well as geographical location.

Under the new numbering system, North-South Highways are even numbered and East-West Highways are odd numbered. The numbers increase as we move westward or southwards.

By: Anil Kumar, MD Bangalore



## RAILWAYS

- Rail operations in India are handled by **Indian Railways**, a state-owned organization of the Ministry of Railways.
- It is one of the world's largest railway networks comprising 115,000 km of track over a route of 65,808 km and 7,112 stations.

### FAST FACTS OF INDIAN RAILWAYS

First Passenger Train Ran On	16th April 1853 (between Bombay to Thane)
First Railway Bridge	Dapoorie Viaduct on the Mumbai-Thane route
First Rail Tunnel	Parsik Tunnel (1865) near Thane
First Ghats Covered by the Rail lines	Thal and Bhore Ghats
First Underground Railway	Calcutta METRO
First Computerized Reservation System started in	New Delhi (1986)
First Electric Train ran on	3rd Feb' 1925 (between Bombay VT and Kurla)
Toilets on Trains were introduced in	1891 (1st Class) & 1907 (lower classes)
Shortest Station Name	lb (Odisha)
Longest Station Name	Venkatanarasimharajuvapieta (Tamil Nadu)
Longest Railway Platform in the World	Gorakhpur Junction railway station (1.35 km length)
Longest Railway Bridge	Vembanad Rail Bridge (4,620 m length)
Longest Tunnel	Pir Panjal Railway Tunnel (11,215 m length)
Oldest Preserved Locomotive	Fairy Queen (1855), still in working order
Indian Railway's Fastest Train	Bhopal-Shatabdi (runs at a speed up to 195 km/h)
Train with Maximum Number of Halts	Howrah-Amritsar Express (115 halts)
<ul style="list-style-type: none"><li>• The manufacture of steam locomotives in the country was stopped in <b>1972</b>.</li><li>• The <b>Rail Museum in Delhi</b> is the largest in Asia.</li><li>• The longest running train covers a distance of 4273 km between Dibrugarh and Kanyakumari: It's called the <b>Vivek Express</b>.</li><li>• The shortest distance covered between two successive stations is <b>3 kilometers</b></li><li>• The railway station of <b>Navapur</b> is built in two states; half in Maharashtra and the rest is in Gujarat.</li><li>• Indian Railways has a mascot – <b>Bholu</b>, the <b>Guard Elephant</b>.</li><li>• <b>The Maharajas' Express</b> is a luxury train owned and operated by Indian Railway Catering and Tourism Corporation. The Maharajas' Express was voted "The World's Leading Luxury Train" thrice, in a row at The World Travel Awards, 2012, 2013 and 2014.</li><li>• <b>Diamond Quadrilateral</b> is a project of the Indian railways to establish high speed rail network in India. It will connect the four metro cities in India, i.e. Delhi, Mumbai, Chennai and Kolkata.</li></ul>	

## Railway Zones in India

There are **16 zones** and the **68 divisions** in Indian Railways.

Name Railway : Abbreviation	Length in km	Date Established	Headquarters
Central : CR	3905	05-11-1951	Mumbai
East Central : ECR	3628	01-10-2002	Hajipur
East Coast : ECoR	2572	01-04-2003	Bhubaneswar
Eastern : ER	2414	14-04-1952	Kolkata
North Central : NCR	3151	01-04-2003	Allahabad
North Eastern : NER	3667	14-04-1952	Gorakhpur
North Western : NWR	5459	01-10-2002	Jaipur
Northeast Frontier : NFR	3907	15-01-1958	Guwahati
Northern : NR	6968	14-04-1952	Delhi
South Central : SCR	5803	02-10-1966	Secunderabad
South East Central : SECR	2447	05-04-2003	Bilaspur
South Eastern : SER	2631	01-08-1955	Kolkata
South Western : SWR	3177	01-04-2003	Hubli
Southern : SR	5098	14-04-1951	Chennai
West Central : WCR	2965	01-04-2003	Jabalpur
Western : WR	6182	05-11-1951	Mumbai



A bullet train of Japan's E3-1000 series. *Source: Wikipedia*

### THE PROJECT

**Rs 1.10 lakh cr**

Cost of bullet train project, being executed under a tripartite agreement, signed in 2016, among Ministry of Railways, High Speed Rail Corporation of India Ltd (HSRC) and funding

agency Japan International Cooperation Agency (JICA).

**81%**

Project cost component to be funded by Japan, through a soft loan that will be repaid by the Ministry of Railways at 0.01% interest over 15 years. The general consultancy agreement is to provide design and bidding assistance for public works and systems.

**320 kph**

Speed envisaged for bullet trains, which Indian officials say may go up to 350 kph.

**3 hours**

Expected travel time between Ahmedabad & Gujarat, once durations of halts are finalised; there could be up to 30 trips either way every day.

## WATER TRANSPORT

*The Central Water Transport Corporation (CIWTC) formed in 1967, headquartered in Kolkata, is mainly involved in transportation of goods, and the Inland Waterways Authority of India (IWAI) formed on October 27, 1986 for the development and regulation of inland waterways for shipping and navigation.*

Number	Stretch	Estd. In	Distance covered
NW 1	Allahabad - Haldia stretch of the Ganges - Bhagirathi - Hooghly river system	October 1986	1620 km
NW 2	Sadiya - Dhubri stretch of Brahmaputra river	September 1988	891 km
NW 3	Kottapuram - Kollam stretch of the West Coast Canal, Champakara Canal and Udyogmandal Canal	February 1993	205 km
NW 4	Kakinada - Pondicherry stretch of canals and the Kaluvelly Tank, Bhadrachalam - Rajahmundry stretch of River Godavari and Wazirabad - Vijayawada stretch of River Krishna	November 2008	1095 km
NW 5	Talcher - Dhamra stretch of the Brahmani River, the Geonkhali - Charbatia stretch of the East Coast Canal, the Charbatia - Dhamra stretch of Matai river and the Mangalgadi - Paradip stretch of the Mahanadi River Delta	November 2008	623 km
NW 6	Lakhipur to Bhanga of river Barak	2013	121 km

\* NW = National Waterway

## PORTS

- Indian coastline is about 7516.6 kilometers and it is one of the biggest peninsulas in the world.
- India has 12 Major ports that handle large volume of traffic and 200 minor ports in India.
- The **Major Ports** are administered by the central government's shipping ministry.
- The **Minor and Intermediate ports** are administered by the relevant departments or ministries in the nine coastal states.
- The Coastal States in India are *Andhra Pradesh, Odisha, West Bengal, Tamil Nadu, Kerala, Karnataka, Goa, Maharashtra and Gujarat.*

### Major Ports in India

Name and Coast	State	Sea	Facts
Chennai - EC	Tamil Nadu	Bay of Bengal	Second largest port
Cochin - WC	Kerala	Arabian Sea	Natural Harbour
Ennore - EC	Tamil Nadu	Bay of Bengal	Most modern-in private hands
Jawaharlal Nehru - WC	Maharashtra	Arabian Sea	Largest container port
Kandla - WC	Gujarat	Arabian Sea	First special economic zone
Kolkata - EC	West Bengal	Bay of Bengal	Oldest operating port
Maormugoa - WC	Goa	Arabian Sea	Goa's main port
Mumbai - WC	Maharashtra	Arabian Sea	Busiest and biggest port
New Mangalore - WC	Karnataka	Arabian Sea	Exports Kudremukh iron-ore
Paradip - EC	Odisha	Bay of Bengal	Exports raw iron to Japan
Tuticorin - EC	Tamil Nadu	Bay of Bengal	Southernmost
Vishakhapatnam - EC	Andhra Pradesh	Bay of Bengal	Deepest Port

\* WC : Western Coast & EC : Eastern Coast



## AIR TRANSPORT

- India has bilateral Air Service Agreement with 103 countries.
- There are 450 airports in the country in various stages of development.
- Airports Authority of India (AAI), constituted in April 1995.
- The Government of India has introduced 'Open Air Policy' for cargo in 1992.
- The Air India was established in 1947 deals mainly with international air service. Indian Airlines set up in 1953, is a major domestic air carrier of the country.

### International Airports in India

Airport	City	State/Union Territory
Veer Savarkar International Airport	Port Blair	Andaman and Nicobar Islands
Visakhapatnam Airport	Visakhapatnam	Andhra Pradesh
Lokpriya Gopinath Bordoloi International Airport	Guwahati	Assam
Gaya International Airport	Gaya	Bihar
Indira Gandhi International Airport	New Delhi	Delhi
Goa International Airport	Goa	Goa
Sardar Vallabhbhai Patel International Airport	Ahmedabad	Gujarat
Srinagar International Airport	Srinagar	Jammu & Kashmir
Bengaluru International Airport	Bengaluru	Karnataka
Mangalore International Airport	Mangalore	Karnataka
Cochin International Airport	Kochi	Kerala
Calicut International Airport	Kozhikode	Kerala
Trivandrum International Airport	Thiruvananthapuram	Kerala
Raja Bhoj International Airport	Bhopal	Madhya Pradesh
Chhatrapati Shivaji International Airport	Mumbai	Maharashtra
Dr. Babasaheb Ambedkar International Airport	Nagpur	Maharashtra
Tulihal International Airport	Imphal	Manipur
Biju Patnaik International Airport	Bhubaneswar	Odisha
Sri Guru Ram Dass Jee International Airport	Amritsar	Punjab
Jaipur International Airport	Jaipur	Rajasthan
Chennai International Airport	Chennai	Tamil Nadu
Coimbatore International Airport	Coimbatore	Tamil Nadu
Madurai International Airport	Madurai	Tamil Nadu
Tiruchirapalli International Airport	Tiruchirapalli	Tamil Nadu
Rajiv Gandhi International Airport	Hyderabad	Telangana
Chaudhary Charan Singh Airport	Lucknow	Uttar Pradesh
Lal Bahadur Shastri Airport	Varanasi	Uttar Pradesh
Netaji Subhash Chandra Bose International Airport	Kolkata	West Bengal

**GEOGRAPHICAL EPITHETS OF INDIA (NICKNAME AND PLACES)**

<b>Nickname</b>	<b>Place</b>	<b>Nickname</b>	<b>Place</b>
Abode of the God	Prayag (Allhabad)	HITECH City	Hyderabad
Athens of the East	Madurai	Hollywood of India	Mumbai
Auto Hub of India	Chennai	Holy City	Varanasi
Banking Capital of India	Chennai	Land of Black Diamond	Asansol
Bengal's Sorrow	Damodar River	Land of Five Rivers	Punjab
Blue City	Jodhpur	Land of Sunrise	Arunachal Pradesh
Blue Mountains	Nilgiri Hills	Leather City of the World	Kanpur
Boston of India	Ahmedabad	Little Tibet	Ladakh
California of India	Nasik	Manbhum City	Purulia
Capital of Dravida	Chennai	Manchester of India	Ahmedabad
Capital of Kongu Nadu	Coimbatore	Manchester of North India	Kanpur
Cashew Capital of the World	Kollam	Manchester of South India	Coimbatore
City of Buildings	Kolkata	Mango City	Malda, Salem
City of Castles	Kolkata	Old Ganga	Godavari
City of Destiny	Visakhapatnam	Oldest living city on Earth	Varanasi
City of Diamonds	Surat	Orange City	Nagpur
City of Dreams	Mumbai	Paris of India	Jaipur
City of Festivals	Madurai	Paris of the East	Pondicherry
City of Four Junctions	Madurai	Pensioners Paradise	Kakinada
City of Ghats and Temples	Varanasi	Pink City	Jaipur
City of Golden Temple	Amritsar	Pittsburg of India	Jamshedpur
City of Handloom	Panipat	Poorman's Ooty	Yercaud
City of Hospitality	Siliguri	Power Hub City	Mundi
City of Learning	Varanasi	Prince of Arabian sea	Kollam
City of Lights	Varanasi	Queen of Arabian sea	Cochin
City of Nawabs	Lucknow	Queen of Deccan	Pune
City of Palaces	Kolkata and Chandigarh	Queen of the Hills	Darjeeling
City of Pearls	Hyderabad	Queen of the Mountains	Mussoorie
City of Rallies	New Delhi	Religious capital of India	Varanasi
City of Sages	Rishikesh	Royal City	Patiala
City of Seven Islands	Mumbai	Ruhr of India	Durgapur
City of Weavers	Panipat	Sacred river	Ganga
City of Wrestlers	Kolhapur	Scotland of India	Coorg
Cosmopolitan City	Coimbatore	Siliccn Vallaey of India	Bangalore
Dakshin Queen	Godavari	Sleepless City	Madurai
Detroit of India	Chennai	Sorrow of Bihar	Kosi river
Egg bowls of India	Andhra Pradesh	Soya region	Madhaya Pradesh
Electronic City of India	Bangalore	Space city	Bangalore
Engineering City of India	Coimbatore	Spice Garden of India	Kerala
Garden City of India	Bangalore	Spiritual capital of India	Varanasi
Gateway of India	Mumbai	Steel City of India	Jamshedpur (Tatanagar)
Gateway of North East India	Siliguri	Sun City	Jodhpur
Gateway of South India	Chennai	Switzerland of India	Kashmir
Gateway to backwaters	Kollam	Taj Nagri	Agra
Gateway to Kerala	Kochi	Temple City of India	Bhubaneswar
Gateway to the Dooars	Siliguri	Textile City of India	Surat
God's Own Country	Kerala	Twin Cities	Hyderabad-Secunderabad
Golden City	Amritsar	Venice of East	Cochin
Grape city of India	Nasik	White City	Udaipur
Health Capital of India	Chennai	Wine capital of India	Nasik
Heaven of India	Jammu & Kashmir	Yoga City	Rishikesh

### INDIAN TOWN ASSOCIATED WITH INDUSTRIES

Town	State	Industries
Ahmedabad	Gujarat	Cotton Textiles
Agra	Uttar Pradesh	Stoneware, Marble, Leather, & Carpets
Aligarh	Uttar Pradesh	Locks
Ankleshwar	Gujarat	Oil
Ambarnath	Maharashtra	Machine Tools, Prototype Factory
Amritsar	Punjab	Shawls, acid, Carpet, Woollen
Anand	Gujarat	Butter, Cheese & Baby Foods
Alwaye	Kerala	Aluminium, Monazite, Rare Earths
Ambala	Haryana	Scientific goods
Aliabet	Gujarat	Oil Well
Arvi	Maharashtra	T.V. Reception Station
Avadi	Tamil Nadu	Heavy Vehicles Factory
Bokaro	Jharkhand	Steel Plant
Bangaluru	Karnataka	Telephone, Aircraft, Motors, Information Technology, Toy
Batanagar	West Bengal	Shoes
Bareilly	Uttar Pradesh	Resin, Industries, Woodwork
Bhilai	Chhattisgarh	Steel Plant
Barauni	Jharkhand	Silk
Burnpur	West Bengal	Iron & Steel
Bhurkunda	Jharkhand	Glass Industries
Bhagalpur	Bihar	Silk industries
Bhandara	Maharashtra	Explosives
Bhadravati	Karnataka	Alloy Steel
Bongaigaon	Assam	Petroleum
Bhadoi	Uttar Pradesh	Carpets
Bhopal	Madhya Pradesh	Heavy Electricals
Bailadila	Madhya Pradesh	Iron ore, Mechanised mine
Bodra	West Bengal	Oil Refinery

Churk	Madhya Pradesh	Cement
Cyberabad	Andhra Pradesh	Electronics, Computers, Information technology
Chittaranjan	West Bengal	Locomotives
Cochin	Kerala	Ship building, coconut oil, rubber
Calicut	Kerala	Coffee, coconut
Coimbatore	Tamil Nadu	Cotton industries
Cambay	Gujarat	Petroleum
Chindwara	Madhya Pradesh	Limestone, Coal
Chennai	Tamil Nadu	Information Technology, Car Manufacturing
Dhariwal	Punjab	Woolen goods
Durgapur	West Bengal	Steel Plant, Dry Ice
Digboi	Assam	Petroleum
Delhi	Delhi	DDT, Textiles & Housing Factory
Dalmianagar	Bihar	Cement
Darjeeling	West Bengal	Tea
Dindigul	Tamil Nadu	Cigar, Tobacco
Damanjodi	Orissa	Aluminium
Debari	Rajasthan	Zinc
Dhuvaran	Gujarat	Thermal Power
Digboi	Assam	Petroleum
Ernakulam	Kerala	Cables
Firozabad	Uttar Pradesh	Glass
Guntur	Andhra Pradesh	Cotton Manufacture, Tobacco
Gwalior	Madhya Pradesh	Pottery, Textiles
Gomia	Jharkhand	Explosives
Haridwar	Uttarakhand	Heavy electricals
Hatia	Jharkhand	Heavy Engineering Corporation
Haldia	West Bengal	Chemical fertilizer
Hazira	Gujarat	Artificial Rayon
Hissar	Haryana	Indo - Australian sheep farm

Hirzapur	Uttar Pradesh	Carpet, pottery, stoneware
Hoshangabad	Madhya Pradesh	Security Paper Mill
Jamshedpur	Jharkhand	Iron & Steel goods
Jalandhar	Punjab	Surgical goods and sports articles
Jaipur	Rajasthan	Embroidery
Jharia	Jharkhand	Coal
Jabalpur	Madhya Pradesh	Bidi industry
Jainakot	Jammu & Kashmir	H.M.T watch
Japla	Jharkhand	Cement
Jaduguda	Jharkhand	Uranium Ore Mill
Jalsindhi	Maharashtra	Hydro - electric
Jalahalli	Karnataka	Machine Tool Factory
Jharia	Jharkhand	Coal
Kolkata	West Bengal	Jute Manufacture, Electric lamps
Kanpur	Uttar Pradesh	Leather, Shoes
Katni	Madhya Pradesh	Cement
Korba	Chhattisgarh	Coal Mine, Aluminium
Koyna	Maharashtra	Aluminium
Koyali	Maharashtra	Power Generation
Kolar	Karnataka	Gold mine
Kota	Rajasthan	Atomic power plant
Kanchipuram	Tamil Nadu	Silk clothes
Karnal	Haryana	Dairy product
Kandla	Gujarat	Fertilizer
Khetri	Rajasthan	Copper industries
Kakrapara	Gujarat	Atomic Power Plant
Kalol	Gujarat	Fertiliser
Kalpakkam	Tamil Nadu	Atomic Power Plant
Kavalur	Tamil Nadu	Telescopic Observatory
Khari	Rajasthan	Lignite

Kirloskarvadi	Maharashtra	Agricultural Implements
Kochi	Kerala	Ship building
koodankulam	Tamil Nadu	Atomic Power Plant
Kozhikode	Kerala	Calico, Rubber coir
Kurukunta	Karnataka	Cement Plant
Ludhiana	Punjab	Hosiery
Lucknow	Uttar Pradesh	Gold, Silver, Lac
Madurai	Tamil Nadu	Cotton and Silk Weaving
Mirzapur	Uttar Pradesh	Carpet, Pottery, Brass industries
Moradabad	Uttar Pradesh	Utensils
Mathura	Uttar Pradesh	Oil refinery
Mysooru	Karnataka	Silk
Meerut	Uttar Pradesh	Publication work, Sports goods, Scissors making
Mumbai	Maharashtra	Cotton Textile & Industries
Modinagar	Uttar Pradesh	Nylon thread
Moorie	Jharkhand	Aluminium
Majhagaon	Maharashtra	Ship building
Manali	Tamil Nadu	Fertiliser / Oil Refinery
Mithapur	Gujarat	Fertiliser
Motipur	Uttar Pradesh	Mechanised Farming
Nagpur	Maharashtra	Cotton mills, Oranges
Nepanagar	Madhya Pradesh	Newsprint
Nasik	Maharashtra	Security Printing Press
Neyveli	Tamil Nadu	Lignite
Noonmati	Assam	Oil refinery
Narora	Uttar Pradesh	Atomic Power Plant
Nangal	Punjab	Fertilizer, Heavy Water Plant
Nagapattinam	Tamil Nadu	Oil Refinery
Ogalewadi	Maharashtra	Hurricane lanterns, Stoves
Panna	Madhya Pradesh	Diamond mining

Pinjore	Haryana	Machines Tools
Perambur	Tamil Nadu	Integral coach factory
Pimpri, Pune	Maharashtra	Antibiotics
Pilani	Rajasthan	Thermal Power
Panki	Uttar Pradesh	Fertilizer
Pinjore	Haryana	Machine Tools
Ranigunj	Jharkhand	Coal mining
Rourkela	Odisha	Steel plant
Rana Pratap Sagar	Rajasthan	Hydro Power Plant
Renukoote	Uttarakhand	Aluminium
Roopnarayanpur	W. Bengal	Cables
Rishikesh	Uttarakhand	Antibiotic Plant
Rangapur	Andhra Pradesh	Observatory
Renukoot	Uttarkhand	Aluminium
Rupanagar	West Bengal	Telephone Cables
Saharanpur	Uttar Pradesh	Mangoes, Cigarette factory
Sindri	Jharkhand	Chemical fertilizers
Srinagar	Kashmir	Woolen shawl, embroidery
Surat	Gujarat	Textiles
Surajpur	Haryana	Cement factory
Suratgarh	Rajasthan	Agriculture implements
Singhbhum	Jharkhand	Copper
Singareni	Andhra Pradesh	Coal
Salem	Tamil Nadu	Stainless Steel
Samastipur	Bihar	Jute, Paper, Tobacco, Sugar
Sivakasi	Tamil Nadu	Fire Works, Printing
Sriharikota	Andhra Pradesh	Satellite Station
Suriyur	Tamil Nadu	Small Arms
Tarapur	Maharashtra	Nuclear Power
Titagarh	West Bengal	Paper

Thiruvananthapuram	Kerala	Wood Carving, Coir matting
Trombay	Maharashtra	Atomic Reactors, Plutonium, Fertilizer, Thorium Plant
Tiruchirapalli	Tamil Nadu	Cigar, B.H.E.L
Tirupati	Andhra Pradesh	Scooter
Tanjore	Tamil Nadu	Silk clothes
Thumba	Kerala	Rocket launching
Tirupur	Tamil Nadu	Textiles
Tiruverumbur	Tamil Nadu	Pressure Boiler
Tuticorin	Tamil Nadu	Fertilizer, Thermal Power, Copper smelter plant
Udaipur	Rajasthan	Zinc Project
Vijaypur	Madhya Pradesh	Fertilizers
Viiaynagar	Karnataka	Steel Plant
Visakhapatnam	Andhra Pradesh	Ship building
Varanasi	Uttar Pradesh	Rail Engines and Saari industries
Worli	Maharashtra	Baby food
Zainkot	Jammu & Kashmir	HMT Watches

#### WIND ENERGY POWER PLANTS IN INDIA

Power plant	Location	State
Puthlur RCI	Puthlur	Andhra Pradesh
Jasdan	Jasdan	Gujarat
Lamda Danida	Lamba	Gujarat
Jogmatti BSES	Chitradurga District	Karnataka
Shah Gajendragarh	Gadag	Karnataka
Shah Gajendragarh	Gadag	Karnataka
Acciona Tuppadahalli	Chitradurga District	Karnataka
Ramakkalmedu	Ramakkalmedu	Kerala
Jamgudrani MP	Dewas	Madhya Pradesh
Brahmanvel windfarm	Dhule	Maharashtra
Dhalgaon windfarm	Sangli	Maharashtra
Vankusawade Wind Park	Satara District.	Maharashtra
Vaspet	Vaspet	Maharashtra
Jath	Jath	Maharashtra
Welturi	Welturi	Maharashtra
Damanjodi Wind Power Plant	Damanjodi	Odisha
Jaisalmer Wind Park	Jaisalmer	Rajasthan
Dangiri Wind Farm	Jaiselmer	Rajasthan
Muppandal windfarm	Kanyakumari	Tamil Nadu
Cape Comorin	Kanyakumari	Tamil Nadu
Kayathar Subhash	Kayathar	Tamil Nadu
Gudimangalam	Gudimangalam	Tamil Nadu



Chennai Mohan	Chennai	Tamil Nadu
Perungudi Newam	Perungudi	Tamil Nadu
Kethanur Wind Farm	Kethanur	Tamil Nadu
Muppandal Madras	Muppandal	Tamil Nadu
Poolavadi Chettinad	Poolavadi	Tamil Nadu
Shalivahana Wind	Tirupur	Tamil Nadu
Hyderabad TSRTC	Hyderabad	Telangana

#### GEOTHERMAL FIELDS IN INDIA

State	Power plant
Chhattisgarh	Tattapani
Gujrat	Cambay Garben
Himachal Pradesh	Manikaran Kullu, Kasol Kullu
Jammu and Kashmir	Puga
Jharkhand	Surajkund Hazaribagh
Uttarakhand	Badrinath Chamoli, Tapoban Chamoli

#### TIDAL, WAVE and SOLAR ENERGY PLANTS IN INDIA

Tidal Energy	Gulf of Khambat, Gulf of Kuchchh (Gujarat) Sunderban (West Bengal)
Wave Energy	Vizhinjam (Kerala)
Solar Energy	Tirupati (Andhra Pradesh)

#### THERMAL PLANTS IN INDIA

States	Plants
Andhra Pradesh	Nellore, Vijayawada, Ramagundam
Assam	Kamrup, Bongaigaon
Bihar	Barauni
Chhattisgarh	Korba, Bhilai
Delhi	Badarpur, Indraprastha
Gujarat	Ukai, Sikka, Ahmedabad, Sabarmati
Haryana	Faridabad, Panipat
Jammu and Kashmir	Pampore
Jharkhand	Bokaro
Madhya Pradesh	Satpura, Amarkantak, Pench
Maharashtra	Nashik, Uran, Chandrapur, Trombay, Dabhol
Odisha	Talcher, Rourkela
Punjab	Bhatinda, Ropar
Rajasthan	Kota
Tamil Nadu	Ennore, Tuticorin, Neyveli
Telangana	Kothagudam
Tripura	Rokhia
Uttar Pradesh	Obra, Panki, Singrauli
West Bengal	Kolkata, Titagarh, Durgapur

**FAMOUS TOURIST SITES IN INDIA**

<b>Tourist Sites</b>	<b>Location</b>	<b>Tourist Sites</b>	<b>Location</b>
Adina Mosque	Pandua (West Bengal)	Lalgarh Palace	Bikaner
Ajanta Caves	Aurangabad (Maharashtra)	Lingaraj Temple	Bhubaneswar
Akbar's Tomb	Sikandra, Agra	Mahakaleshwar Temple	Ujjain
Aksherdham	Gandhinagar, Gujarat	Maheshmurti (Trimurti)	Elephanta Caves
Amarnath Cave	Kashmir	Mahmud Gawan's Mosque	Bidar
Amber Palace	Jaipur (Rajasthan)	Malabar Hill	Mumbai
Anand Bhawan	Allahabad	Marble Rocks	Jabalpur
Bibi Ka Maqbra	Aurangabad	Marina	Chennai
Birla Planetarium	Kolkata	Minakshi Temple	Madurai
Black Pagoda	Konarak (Odisha)	Mt Girnar (Jain Temples)	Junagadh
Bodhistava	Ajanta Caves	Nagin Lake	Srinagar
Brihadeeswara	Tanjore Temple	Nataraja	Chennai
Brindaban Gardens	Mysore	Nishat Bagh	Srinagar
Buland Darwaza	Fatehpur Sikri	Padmanabha Temple	Thiruvanthapuram
Char Minar	Hyderabad	Palitana	Junagadh
Cheena Kesava Temple	Bellur	Panch Mahal	Fatehpur Sikri
Chilka Lake	Odisha	Pichola Lake	Udaipur
Dal Lake	Srinagar	Qutab Minar	Delhi
Dilwara Temples	Mt Abu	Raj Ghat	Delhi
Elephanta Caves	Mumbai	Rashtrapati Bhawan	Delhi
Ellora Caves	Aurangabad	Red Fort	Delhi
Gateway of India	Mumbai	Sanchi Tope (The Great Stupa)	Sanchi, Bhopal
Golden Temple	Amritsar	Santa Cruz	Mumbai
Gol Gumbaz	Bijapur	Shakti Sthal	Delhi
Hanging Gardens	Mumbai	Shalimar Bagh	Srinagar
Hawa Mahal	Jaipur	Shahi Chashma	Srinagar
Howrah Bridge	Kolkata	Shanti Van	Delhi
Island Palace	Udaipur	Shore Temple	Mahabalipuram
Itmad-ud-Daulah's Tomb	Agra	Sidi Sayyid Mosque	Ahmedabad
Jagannath Temple	Puri	Somnathpur Temple	Mysore
Jahaz Mahal	Mandu	Statue of Gomateswara	Mysore
Jai Stambha (Tower of Victory)	Chittorgarh	Statue of Ugra	Hampi
Jama Masjid	Delhi	Sunderbans	West Bengal
Jantar Mantar	New Delhi	Sun Temple	Konarak
Jog (Gersoppa) Falls	Mysore	Taj Mahal	Agra
Kailasa Temple	Ellora	Tehzeeb Mahal	Srinagar
Kalan Masjid	Delhi	Tirupati Temple	Andhra Pradesh
Kanyakumari Temple	Cape Comorin (Tamil Nadu)	Tower of Silence	Mumbai (of the Parsis)
Khajuraho	Bhopal	Victoria Memorial	Kolkata
Lakshmi Vilas Palace	Baroda	Victoria Garden	Mumbai
Lal Bagh Garden	Bengaluru	Vijay Ghat	Delhi

## TRIBAL GROUPS IN INDIA

Tribal Group	State(s)
Abor	Arunachal Pradesh
Adiyan	Karnataka, Kerala, Tamil Nadu
Agaria	Madhya Pradesh, Maharashtra
Andh	Arunachal Pradesh, Madhya Pradesh, Maharashtra
Apatani	Arunachal Pradesh
Arakh	Madhya Pradesh, Maharashtra
Asur (Gond)	Bihar, Madhya Pradesh, Maharashtra, West Bengal
Baiga	Bihar, Madhya Pradesh, Maharashtra, West Bengal
Bakarwal	Jammu & Kashmir
Barda	Gujarat, Karnataka, Maharashtra
Bhagalia	Gujarat, Karnataka, Maharashtra, Rajasthan
Chakma	Assam, Meghalaya, Mizoram, Tripura, West Bengal
Chenchu	Andhra Pradesh, Karnataka, Odisha
Gaddi	Himachal Pradesh, Jammu & Kashmir
Galong	Arunachal Pradesh
Garo	Assam, Meghalaya, Mizoram, Nagaland, West Bengal
Gond	Andhra Pradesh, Bihar, Gujarat, Karnataka, MP, Maharashtra, Odisha, West Bengal
Gujjar	Himachal Pradesh, Jammu & Kashmir
Ho	Bihar, Odisha, West Bengal
Jaintia	Assam, Meghalaya, Mizoram
Juang	Odisha
Kanikkar	Kerala, Tamil Nadu
Kawar	Madhya Pradesh, Maharashtra, Odisha
Kharia	Bihar, Madhya Pradesh, Maharashtra, Odisha, (Lodha) West Bengal
Khasi	Assam, Meghalaya, Mizoram
Khond	Bihar, Madhya Pradesh, Maharashtra, Odisha, West Bengal
Kol	Madhya Pradesh, Maharashtra, Chhattisgarh
Kolam	Andhra Pradesh, Madhya Pradesh, Maharashtra
Kolha	Odisha
Kota	Karnataka, Kerala, Tamil Nadu
Koya	Andhra Pradesh, Karnataka, Madhya Pradesh, Maharashtra, Odisha
Lahaula	Himachal Pradesh
Lepcha	Sikkim, Tripura, West Bengal
Mahali	Odisha, West Bengal
Munda	Bihar, Madhya Pradesh, Odisha, Tripura, West Bengal
Naga	Assam, Arunachal Pradesh, Meghalaya, Mizoram, Nagaland
Onges	Andaman & Nicobar Islands
Oraon	Bihar, Madhya Pradesh, Maharashtra, Odisha, West Bengal
Santal	Bihar, Odisha, Tripura, West Bengal
Saora	Odisha
Sema	Manipur
Shom Pens	Andaman & Nicobar Islands
Sitlhou	Assam, Meghalaya, Mizoram
Sonr	Madhya Pradesh
Tadvi	Gujarat, Maharashtra, Odisha, Rajasthan
Thoti	Andhra Pradesh, Maharashtra
Uibuh	Assam, Meghalaya, Mizoram
Uraly	Kerala, Tamil Nadu
Varli	Gujarat, Karnataka, Maharashtra, Goa, Daman & Diu, Dadra & Nagar Haveli
Wade Maria	Madhya Pradesh, Maharashtra
Zou	Manipur

### DIFFERENCE BETWEEN NATIONAL PARK, WILDLIFE SANCTUARY AND BIOSPHERE RESERVE

National Park	Wildlife Sanctuary	Biosphere Reserve
It is a reserved area for preservation of natural vegetation, wild life and natural beauty.	It is a reserved area for preservation of endangered species.	It is a Multipurpose projected area to preserve genetic diversity in representative ecosystem.
Protected area; No human activity is allowed; under Wildlife Protection Act 1972 (India)	Protected area; Limited human activity is allowed; under Wildlife Protection Act 1972 (India)	It is voluntary, cooperative, conservation reserve created to protect the biological and cultural diversity of a region while promoting sustainable economic development.
Boundaries are fixed by legislation.	Boundaries are not sacrosanct.	Boundaries are fixed by legislation.

### NATIONAL PARKS IN INDIA

State	National Parks	Started	Area (in km <sup>2</sup> )	Attractions
Andaman Nicobar Islands	Wandur National Park	1983	281.50	Estuarine Crocodiles, Coconut Crab
Arunachal Pradesh	Namdapha National Park	1983	1985.23	Leopard, Gaur, Himalayan Black Bear
Assam	Kaziranga National Park	1974	471.71	Rhinos, Elephants, Tigers
	Manas National Park	1990	500	Assam Roofed Turtle, Golden Langur
Chhattisgarh	Indravati National Park	1981	1258.37	Tiger, Leopard, Blue Bull,
Gujarat	Gir National Park	1975	258.71	Asiatic Lion
	Marine National Park	1980	162.89	
Himachal Pradesh	Great Himalayan National Park	1984	754.40	
	Pin Valley National Park	1987	675	Himalayan Snowcock, Chukar
Jammu And Kashmir	Dachigam National Park	1981	141	Himalayan Black Bears, Leopard
	Hemis National Park	1981	4100	Snow Leopard
	Kishtwar National Park	1981	400	Himalayan Jungle Crow
Jharkhand	Hazaribagh National Park	1976	186	Tigers, Wild Boar, Nilgai
	Palamu National Park	1974	1123	Tigers, Dhole, Elephants
Karnataka	Bandipur National Park	1974	874.20	Asian Elephants, Tiger
	Bannerghatta National Park	1974	104.27	Tiger, Lion
	Nagarhole National Park	1988	643.39	Elephant, Jackal, Tiger
Kerala	Eravikulam National Park	1978	97	Nilgiri Tahr, Atlas Moth, Elephant
	Periyar National Park	1982	350	Nilgiri Langur, Flying Squirrel
	Silent Valley National Park	1984	89.52	Nilgiri Tahr, Nilgiri Langur, Tiger
Madhya Pradesh	Bandhavgarh National Park	1982	448.85	Tigers, Leopards, Bears
	Kanha National Park	1955	940	Tigers, Leopards, Elephant
	Madhav National Park	1959	375.22	Indian Gazelle, Nilgai, Sambar
	Panna National Park	1973	542.67	Tiger, Wolf, Chital, Sloth Bear
Maharashtra	Pench National Park	1975	292.85	Tiger, Leopard, Sloth Bear
	Navegaon National Park	1975	133.88	Tiger, Panther, Bisons
	Tadoba National Park	1955	116.55	Tiger, Leopards, Sloth Bears
Odisha	Chandaka Elephant Reserve	1982	175.79	Elephant, Hital, Bear, Pea-Fowl
	Nandan Kanan National Park	1960	4.006	White Tiger, Asiatic Lion, Crocodiles
	Simlipal National Park	1980	845.70	Tiger, Leopard, Elephants
Rajasthan	Desert National Park	1980	3162	Great Indian Bustard, Harriers
	Keoladeo National Park	1981	28.73	Siberian Cranes, Ruddy Shelducks
	Ranthambore National Park	1980	392	Tigers, Leopards, Boars
	Sariska National Park	1982	273.80	Four-Horned Deer, Carecal, Leopard

Sikkim	Khangchendzonga National Park	1977	1829	Wild Ass, Snow Leopard, Musk Deer, Himalayan Tahr
Uttar Pradesh	Dudhwa National Park	1977	490.29	Tiger, Rhinoceros
Uttarakhand	Corbett National Park	1936	520.82	Tigers, Leopards, Elephants
	Govind National Park	1990	472.08	Black Bear, Leopard, Snow Cock
	Nandadevi National Park	1988	5,860.69	Tiger, Leopard
	Rajaji National Park	1983	820.42	Tigers, Leopards, Elephants,
	Valley of Flowers National Park	1980	87.50	Snow Leopard, Musk Deer, Red Fox
West Bengal	Sundarbans National Park	1984	1330.10	Royal Bengal Tiger; Fishing Cats

### NATIONAL WILDLIFE CONSERVATION PROJECTS

Project	Year	Project	Year
Project Hangul	1970	Project Manipur Thamin	1977
Project Gir	1972	Project Rhino	1987
Project Tiger	1973	Project Elephant	1992
Project Olive Ridley Turtles	1975	Project Red Panda	1996
Crocodile Breeding Scheme	1975	Project Vulture	2006

### MAJOR SANCTUARIES IN INDIA

State/UTs	Name
Andaman & Nicobar Islands	Spike Island Wildlife Sanctuary
Andhra Pradesh	Nelapattu Bird Sanctuary, Gundla Brahmeswaram Wildlife Sanctuary
Arunachal Pradesh	Dibang Wildlife Sanctuary
Assam	Hoollongapar Gibbon Sanctuary
Bihar	Kaimur Wildlife Sanctuary, Bhimbandh Wildlife Sanctuary
Chandigarh	Sukhna
Chhattisgarh	Achanakmar Wildlife Sanctuary
Delhi	Indira Priyadarshini
Goa	Bhagwan Mahavir
Gujarat	Kutch Desert Wildlife Sanctuary, Indian Wild Ass Sanctuary
Haryana	Chautala
Himachal Pradesh	Rupi Bhabha Sanctuary, Sechu Tuan Nala Wildlife Sanctuary, Tundah Wildlife Sanctuary
Jammu and Kashmir	Karakoram Wildlife Sanctuary, Lachipora, Changtang Wildlife Sanctuary
Karnataka	Dandeli Wildlife Sanctuary
Kerala	Periyar National Park, Waynad
Madhya Pradesh	Bori Wildlife Sanctuary, Nauradehi Wildlife Sanctuary, Pachmarhi Sanctuary
Maharashtra	Great Indian Bustard Sanctuary
Manipur	Yagoupokpi Lokchao
Meghalaya	Nongkhylliem
Mizoram	Dampa Tiger Reserve
Nagaland	Intanki
Odisha	Badrama Sanctuary, Baisipalli Wildlife Sanctuary, Chilika Bird Sanctuary, Nalbana Bird Sanctuary, Satkosia Gorge Wildlife Sanctuary, Sunabeda Wildlife Sanctuary
Punjab	Abohar
Rajasthan	Keladevi Wildlife Sanctuary, Kumbhalgarh
Sikkim	Barsey Rhododendron Sanctuary
Tamil Nadu	Sathyamangalam Wildlife Sanctuary
Telangana	Eturnagaram Wildlife Sanctuary, Kawal Wildlife Sanctuary
Tripura	Gumti Wildlife Sanctuary
Uttar Pradesh	Kaimoor Sanctuary
Uttarakhand	Askot Musk Deer Sanctuary
West Bengal	Murti Wildlife

## BIOSPHERE RESERVES OF INDIA

Name	State	Type
Great Rann of Kutch	Gujarat	Desert
Gulf of Mannar	Tamil Nadu	Coasts
Sundarbans	West Bengal	Gangetic Delta
Cold Desert	Himachal Pradesh	Western Himalayas
Nanda Devi National Park & Biosphere Reserve	Uttarakhand	Western Himalayas
Nilgiri Biosphere Reserve	Tamil Nadu, Kerala and Karnataka	Western Ghats
Dihang-Dibang	Arunachal Pradesh	Eastern Himalaya
Pachmarhi Biosphere Reserve	Madhya Pradesh	Semi-Arid
Seshachalam Hills	Andhra Pradesh	Eastern Ghats
Simlipal	Odisha	Deccan Peninsula
Achanakamar - Amarkantak	Madhya Pradesh, Chhattisgarh	Maikala Hills
Manas	Assam	East Himalayas
Khangchendzonga	Sikkim	East Himalayas
Agasthyamalai Biosphere Reserve	Kerala, Tamil Nadu	Western ghats
Great Nicobar Biosphere Reserve	Andaman and Nicobar Islands	Islands
Nokrek	Meghalaya	East Himalayas
Dibru-Saikhowa	Assam	East Himalayas
Panna	Madhya Pradesh	Catchment area of the Ken River

## TIGER RESERVES IN INDIA

The largest tiger reserve by area is 3,568 km<sup>2</sup> Nagarjunsagar-Srisaillam Tiger Reserve in Andhra Pradesh.

State	Tiger Reserve (TR)
Andhra Pradesh	Nagarjunsagar-Srisaillam TR
Arunachal Pradesh	Namdapha TR, Pakhui TR
Assam	Manas TR, Nameri TR, Kaziranga TR
Bihar	Valmiki TR
Chhattisgarh	Udanti and Sitanadi TR, Achanakmar TR, Indravati TR
Jharkhand	Palamau TR
Karnataka	Bandipur TR, Bhadra TR, Dandeli-Anshi TR, Nagarhole TR, Biligiri Rangaswamy Temple TR
Kerala	Periyar TR, Parambikulam TR
Madhya Pradesh	Kanha TR, Pench TR, Bandhavgarh TR, Panna TR, Bori-Satpura TR, Sanjay Dubri TR
Maharashtra	Melghat TR, Tadoba-Andhari TR, Bor TR, Pench TR, Sahyadri TR, Nawegaon-Nagzira TR
Mizoram	Dampa TR
Odisha	Simlipal TR, Satkosia TR
Rajasthan	Ranthambhore TR, Sariska TR, Mukundara Hills TR
Tamil Nadu	Kalakad-Mundathurai TR, Mudumalai TR, Sathyamangalam TR, Anamalai TR
Telangana	Kawal TR
Uttar Pradesh	Dudhwa TR, Amangarh TR, Pilibhit TR
Uttarakhand	Jim Corbett TR
West Bengal	Buxa TR, Sunderbans TR

### ELEPHANT RESERVES IN INDIA

Range	Reserve Name	State
Eastern India (South West Bengal – Jharkhand – Odisha)	Mayurbhanj ER	West Bengal
	Singhbhum ER	Jharkhand
	Mayurbhanj ER	Odisha
	Mahanadi ER	Odisha
	Sambalpur ER	Odisha
	Baitarni ER	Odisha
	South Odisha ER	Odisha
North Brahmaputra (Arunachal – Assam)	Kameng ER	Arunachal
	Sonitpur ER	Assam
South Brahmaputra (Assam – Arunachal)	Dihing-Patkai ER	Assam
	Deomali ER	Arunachal
Kaziranga (Assam – Nagaland)	Kaziranga – Karbi Anglong ER	Assam
	Dhansiri-Lungding ER	Assam
	Intanki ER	Nagaland
Eastern Dooars (Assam - W. Bengal)	Chirang-Ripu ER	Assam
	Eastern Dooars ER	W. Bengal
E. Himalayas (Meghalaya)	Garo Hills ER	Meghalaya
	Khasi Hills ER	Meghalaya
Nilgiri–Eastern Ghat (Karnataka – Kerala – Tamil Nadu – Andhra)	Mysore ER	Karnataka
	Bhadra ER	Karnataka
	Wayanad ER	Kerala
	Nilgiri ER	Tamil Nadu
	Rayala ER	Andhra
South Nilgiri (Kerala - Tamil Nadu)	Nilambur ER	Kerala
	Coimbatore ER	Tamil Nadu
Western Ghat (Tamil Nadu – Kerala)	Anamalai ER	Tamil Nadu
	Anamudi ER	Kerala
Periyar (Kerala - Tamil Nadu)	Periyar ER	Kerala
	Srivilliputtur ER	Tamil Nadu
Northern India (Uttarakhand-Uttar Pradesh)	Shivalik ER	Uttarakhand

### RAMSAR SITES IN INDIA

Location	Name
Andhra Pradesh	Kolleru Lake
Assam	Deepor Beel
Gujarat	Nalsarovar Bird Sanctuary
Himachal Pradesh	Pong Dam Lake, Renuka Wetland, Chandra Taal
Jammu and Kashmir	Hokera Wetland, Surinsar-Mansar Lakes, Tsomoriri, Wular Lake
Kerala	Sasthamkotta Lake, Vembanad-Kol Wetland, Ashtamudi Wetland
Madhya Pradesh	Bhoj Wetland
Manipur	Loktak Lake
Odisha	Chilika Lake, Bhitarkanika Mangroves
Punjab	Harikeri Wetland, Kanjli Wetland, Ropar
Rajasthan	Keoladeo National Park, Sambhar Lake
Tamil Nadu	Point Calimere Wildlife and Bird Sanctuary
Tripura	Rudrasagar Lake
Uttar Pradesh	Upper Ganga River (Brijghat to Narora Stretch)
West Bengal	East Calcutta Wetlands

**CRITICALLY ENDANGERED ANIMAL SPECIES OF INDIA**

<b>Birds</b>	Jerdon's Courser, Forest Owlet, White-bellied Heron, White-backed Vulture, Slender-billed Vulture, Long-billed Vulture, Red-headed Vulture, Bengal Florican, The Himalayan Quail, Pink-headed Duck, Sociable Lapwing, Spoon Billed Sandpiper, Siberian Crane, Great Indian Bustard
<b>Mammals</b>	Pygmy Hog, Andaman White-toothed Shrew, Jenkin's Andaman Spiny Shrew, Nicobar White-tailed Shrew, Kondana Rat, Large Rock Rat, Namdapha Flying Squirrel, Malabar Civet, Sumatran Rhinoceros, Javan Rhinoceros, Red Panda, Snow Leopard, Asiatic Lion, Nilgiri Langur, Indian Wild Dog, Black buck, Bengal Tigers
<b>Reptiles</b>	Gharial, Hawksbill Turtle, Leatherback Turtle, River Terrapin, Red-crowned Roofed Turtle, Sispara day gecko
<b>Amphibians</b>	Anamalai Flying Frog, Gundia Indian Frog, Kerala Indian Frog, Charles Darwin's Frog, Amboli Bush Frog, Chalazodes Bubble-Nest Frog, Small Bush Frog, Green-eyed Bush Frog, Resplendent Shrub Frog, Tiger toad
<b>Fish</b>	Pondicherry Shark, Ganges Shark, Knife-tooth Sawfish, Large-tooth Sawfish, Ganges River Dolphin
<b>Spiders</b>	Rameshwaram Parachute Spider, Peacock Tarantula
<b>Corals</b>	Fire corals

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# INDIAN

## POLITY & CONSTITUTION



## INDIAN POLITY AND CONSTITUTION



### CONSTITUTION

- *It is a written document that contains a set of rules for a government.*
- *It defines the fundamental political principles, and establishing the structure, procedures, powers and duties, of a government. It also guarantee certain rights to the people.*
- *The term constitution can be applied to any overall law that defines the functioning of a government.*

#### HISTORY OF INDIAN CONSTITUTION

##### *Before Independence*

##### **The Company Rule (1773-1858)**

There are certain acts in the British rule that laid down the legal framework for the organisation and administration in British India. They are explained below in the chronological order

##### **Regulating Act of 1773**

- To control and regulate the affairs of the East India Company in India.
- It designated the Governor of Bengal (Fort William) as the Governor-General (of Bengal).
- Warren Hastings became the first Governor-General of Bengal.
- It subordinated the Governors of Bombay and Madras to the Governor-General of Bengal.
- The Supreme Court was established at Fort William (Calcutta) as the Apex Court in 1774.

##### **Pitt's India Act of 1784**

- Distinguished between commercial and political functions of the company.
- Court of Directors for Commercial functions and Board of Control for political affairs.
- Placed the Indian affairs under the direct control of the British Government.
- The companies territories in India were called "the British possession in India".
- Governor's councils were established in Madras and Bombay.

##### **Charter Act of 1813**

The Company's monopoly over Indian trade terminated; Trade with India open to all British subjects.

##### **Charter Act of 1833**

- Governor-General (of Bengal) became as the Governor-General of India.
- First Governor-General of India was Lord William Bentick.

- This was the final step towards centralization in the British India.
- Beginning of a Central legislature for India as the act also took away legislative powers of Bombay and Madras provinces.
- The Act ended the activities of the East India Company as a commercial body and it became a pure administrative body.

#### **Charter Act of 1853**

- The legislative and executive functions of the Governor-General's Council were separated.
- 6 members in Central legislative council. Four out of six members were appointed by the provisional governments of Madras, Bombay, Bengal and Agra.
- It introduced a system of open competition as the basis for the recruitment of civil servants of the Company (Indian Civil Service opened for all).

#### **The Crown Rule (1858 – 1947)**

##### **Government of India Act of 1858**

- The Company rule was replaced by the Crown rule in India.
- The powers of the British Crown were to be exercised by the Secretary of State for India.
- He was assisted by the Council of India, having 15 members.
- He was vested with complete authority and control over the Indian administration through the Viceroy as his agent.
- The Governor-General was made the Viceroy of India.
- Lord Canning was the first Viceroy of India.

##### **Indian Councils Act of 1861**

- It introduced for the first time Indian representation in the institutions like Viceroy's executive + legislative council (non-official). 3 Indians entered Legislative council.
- Legislative councils were established in Center and provinces.

- It provided that the Viceroy's Executive Council should have some Indians as the non-official members while transacting the legislative businesses.
- It accorded statutory recognition to the portfolio system.
- Initiated the process of decentralisation by restoring the legislative powers to the Bombay and the Madras Provinces.

##### **India Council Act of 1892**

- Introduced indirect elections (nomination).
- Enlarged the size of the legislative councils.
- Enlarged the functions of the Legislative Councils and gave them the power of discussing the Budget and addressing questions to the Executive.

##### **Indian Councils Act of 1909**

###### *Morley-Minto Reforms*

- Direct elections to legislative councils; first attempt at introducing a representative and popular element.
- It changed the name of the Central Legislative Council to the Imperial Legislative Council.
- The member of Central Legislative Council was increased to 60 from 16.
- Introduced a system of communal representation for Muslims by accepting the concept of 'separate electorate'.
- Indians for the first time in Viceroy's executive council. (Satyendra Prasad Sinha, as the law member)

##### **Government of India Act of 1919**

###### *Montague-Chelmsford Reforms*

- The Central subjects were demarcated and separated from those of the Provincial subjects.
- The scheme of dual governance, 'Dyarchy', was introduced in the Provincial subjects.
- Under dyarchy system, the provincial subjects were divided into two parts – transferred and reserved. On reserved subjects Governor was not responsible to the Legislative council.

- The Act introduced, for the first time, bicameralism at center.
- Legislative Assembly with 140 members and Legislative Council with 60 members.
- Direct elections.
- The Act also required that three of the six members of the Viceroy's Executive Council (other than Commander-in-Chief) were to be Indians.
- Provided for the establishment of Public Service Commission.

### **Simon Commission**

- It was appointed by the British Government in November 1927.
- It was a 7 member Commission.
- The Chairman of the Commission was Sir John Simon.
- The purpose of the commission was to report on the condition of India under the new constitution (GOI 1919).
- It submitted the report in the year 1930.
- The three round table conferences held between 1930 and 1932.
- Mahatma Gandhi attended the second round table conference only.
- On the basis of these discussions a white paper on constitutional reforms was prepared and the same was submitted to the Parliament.
- The recommendations were incorporated in the GOI Act of 1935.



1928 :: Protests against Simon Commission

### **Communal Award**

- It was announced by Ramsay MacDonald (The then British Prime Minister) on August 4, 1932.

- This is meant for providing extending separate electorate to Scheduled Castes.
- In fact the concept of separate electorate for depressed classes was raised by Dr. B.R. Ambedkar.
- The proposal was accepted by the British and announced the Communal Award.
- Gandhi opposed this and began indefinite hunger strike in Yerwada jail (Pune, Maharashtra) against the separate electorate for Scheduled Castes.

### **Poona Pact of 1932**

It refers to an agreement between Dr. Babasaheb Ambedkar and Mahatma Gandhi signed on 24 September 1932 at Yerwada Central Jail in Pune (now in Maharashtra), India. It was signed by Pt. Madan Mohan Malviya and Dr. B.R. Ambedkar and some Dalit leaders to break the fast unto death undertaken by Gandhi in Yerwada jail to annul Macdonald Award giving separate electorate to Dalits for electing members of state legislative assemblies in British India.

### **Government of India Act of 1935**

- The Act provided for the establishment of an All-India Federation consisting of the Provinces and the Princely States as units, though the envisaged federation never came into being.
- The Act divided the powers between the Centre and the units in items of three lists, namely the Federal List, the Provincial List and the Concurrent List.
- The Federal List for the Centre consisted of 59 items, the Provincial List for the provinces consisted of 54 items and the Concurrent List for both consisted of 36 items
- The residuary powers were vested with the Governor-General.
- The Act abolished the Dyarchy in the Provinces and introduced 'Provincial Autonomy'.
- It provided for the adoption of Dyarchy at the Centre.
- Introduced bicameralism in 6 out of 11 Provinces.

- These six Provinces were Assam, Bengal, Bombay, Bihar, Madras and the United Province.
- Provided for the establishment of Federal Court.
- Abolished the Council of India.

### August Offer

The Demand for the **Constituent Assembly** was for the first time and authoritatively conceded by the British Government in the year 1940 through August Offer.

### Cripps Mission, 1942

- India would be given the 'Dominion Status'.
- The Cripps Mission came to India in 1942 headed by Sir Stafford Cripps, a socialist member of the war cabinet, to negotiate with Indian leaders on behalf of the British Government.
- It included the earliest possible realization of self-government in India.
- A new Indian union would be created which would be a dominion, associated with the United Kingdom and the other dominions by a common allegiance to the crown, but equal to them in every respect.
- India would be free to frame its own Constitution after the war.

### Cabinet Mission Plan, 1946

- Cabinet Mission was composed of three Cabinet Ministers of England Sir Pethick Lawrence, Sir Stafford Cripps (Secretary of State for India) and V. Alexander.
- The cabinet mission recommended an undivided India and turned down the Muslim league's demand for a separate Pakistan.
- It provided for formation of the constituent assembly on democratic principle of population.
- It recognized Indian Right to cede from the Commonwealth.
- The Princely states would retain all subjects and all residuary powers.
- A Constituent Assembly will be formed of the representatives of the Provincial Assemblies and the Princely states. Each province had to be allotted a total number of seats in proportion to its population.

- The **Constituent assembly** had to comprise 293 Members from the British Provinces and 93 members from the Princely states. The representation of the Provincial legislatures was to be break up into 3 sections.

### Mountbatten Plan

- It is also known as June 3 Plan.
- Principle of Partition of India was accepted by the British Government.
- Successor governments would be given dominion status.
- Implicit right to secede from the British Commonwealth.

### Indian Independence Act of 1947

- It declared India as an Independent and Sovereign State.
- Established responsible Governments at both the Centre and the Provinces.
- Designated the Viceroy India and the provincial Governors as the Constitutional (normal heads).
- It assigned dual functions (Constituent and Legislative) to the Constituent Assembly and declared this dominion legislature as a sovereign body.

### Interim Government, 1946

It formed on 2nd September, 1946, from the newly elected Constituent Assembly of India, had the task of assisting the transfer of power from British rule to Independent India.

### Interim Cabinet

Member	Portfolio Held
Jawaharlal Nehru	Vice President of the Executive Council, External Affairs and Commonwealth Relations
Rajendra Prasad	Agriculture and Food
Ibrahim Ismail Chundrigar	Commerce
Baldev Singh	Defence
Liaquat Ali Khan	Finance
C. Rajagopalachari	Education
Ghazanfar Ali Khan	Health
Vallabhbhai Patel	Home Affairs Information and Broadcasting
Jagjivan Ram	Labour
Jogendra Nath Mandal	Law
Abdur Rab Nishtar	Railways and Communications Post and Air
C.H. Bhabha	Works, Mines and Power

## MAKING OF THE INDIAN CONSTITUTION

- The first meeting of the Indian Constituent Assembly took place in the year 1946, on the 9th of December under the chairmanship of Sachchidananda Sinha for the dominion of India.
- The total strength of the assembly was 389, out of these 296 were elected to represent the British India and 93 seats to the princely states. Out of 296 members, 292 members were to be elected by the provincial Legislatures while 4 members were to represent the four Chief Commissioner's provinces, one from each. 93 seats reserved for princely states remained unfilled as they stayed away from the Constituent Assembly.
- Dr Sachidanand Sinha was the first President of the Constituent Assembly; when it met on 9th December, 1946.
- Later, Dr. Rajendra Prasad was unanimously elected as the permanent President of the Assembly on 11 December 1946.

### INDIAN CONSTITUENT ASSEMBLY COMMITTEES & CHAIRMEN

Union Powers Committee	Jawaharlal Nehru
Union Constitution Committee	Jawaharlal Nehru
States Committee	Jawaharlal Nehru
Drafting Committee	B.R. Ambedkar
Steering Committee	Rajendra Prasad
Committee on the Rules of Procedure	Rajendra Prasad
Finance and Staff Committee	Rajendra Prasad
Ad hoc Committee on the National Flag	Rajendra Prasad
Fundamental Rights Sub-Committee	J.B. Kripalani
Credential Committee	Alladi Krishnaswami Ayyar
House Committee	B. Pattabhi Sitaramayya
Committee on the Functions of the Constituent Assembly	G.V. Mavalankar
Advisory Committee on Fundamental Rights, Minorities and Tribal and Excluded Areas	Vallabhbhai Patel

#### Drafting Committee

- The Constituent Assembly appointed a Drafting Committee on 29th August 1947.
- The Chairman of the Drafting Committee Dr. B.R. Ambedkar, was submitted first Draft of Constitution of India to the President of the Assembly on 21st February, 1948 and second draft in October, 1948.

#### Enactment and Enforcement of Constitution of India

- The Constitution was finally adopted on November 26, 1949.
- The Constitution of India came in to existence on 26 January 1950 (Republic Day of India). This date is referred to in the Constitution as the **Date of its Commencement**.
- It took 2 years 11 months and 18 days to frame the Constitution.
- The original Constitution had a Preamble, 395 Articles, 18 Parts and 8 schedules.
- The Indian Constitution has undertaken 98 Amendments in the 66 years since its enactment. The Constitutions, in its current form, consists of a Preamble, 25 Parts, 465 Articles and 12 Schedules.

## SOURCES OF INDIAN CONSTITUTION

1. **Government of India Act, 1935** : Federal Scheme, Office of Governor, Judiciary, Public Service Commissions, Emergency provisions, Administrative details.
2. **British Constitution** : Parliamentary government, Rule of Law, Legislative procedure, Single citizenship, Cabinet System, Prerogative Writs.
3. **US Constitution** : Fundamental Rights, Independence of Judiciary, Judicial Review, Impeachment of the President, Removal of Supreme Court and High Court judges and post of Vice-President.
4. **Irish Constitution** : Directive Principles of State Policy, nomination of members to Rajya Sabha and method of election of President, Federation with a strong centre, Vesting of residuary powers in the Centre, appointment of State Governors by the Centre and advisory jurisdiction of the Supreme Court.
5. **Canadian Constitution** : Federation with a strong centre, residuary powers with the centre, appointment of state governors by the centre and advisory jurisdiction of the Supreme Court.
6. **Australian Constitution** : Concurrent List, Freedom of trade, commerce and intercourse joint sitting of the two Houses of Parliament.
7. **Weimar Constitution** : Suspension of Fundamental Rights during Emergency.
8. **Soviet Constitution** : Fundamental duties, the ideal of justice (social, economic and political) in the Preamble.
9. **French Constitution** : Republic and the ideals of liberty equality and fraternity in the Preamble.
10. **South African Constitution** : Procedure for amendment, the Constitution and election of the members of Rajya Sabha.
11. **Japanese Constitution** : Procedure established by law. The drafted Constitution was finally adopted on November 26, 1949.

## THE PREAMBLE

"WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC and to secure to all its citizens:

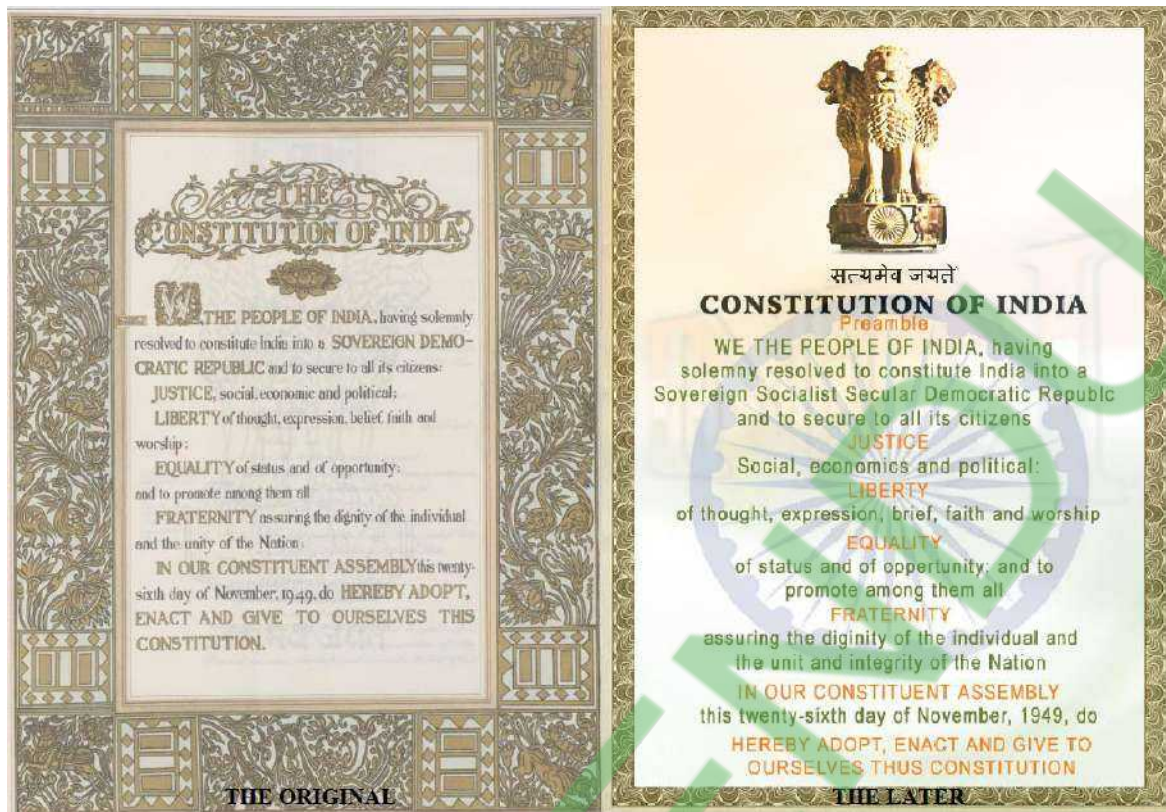
JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all;

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation;

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949 do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION."



- It is based on the **Objectives Resolution** which was drafted and moved in the Constituent Assembly by **Jawaharlal Nehru** on 13 December 1946.
- The words **SOCIALIST**, **SECULAR**, and **INTEGRITY** were not in the original constitution and have been inserted by **42nd amendment act 1976**. Thus, the express declaration that India is a secular state came only with the 42nd amendment.
- Currently, the word “secular appears in constitution for two times – in Preamble and then in Article 25.
- The preamble indicates that the source of constitution is “we the people of India”. It has been also called Political Horoscope of Indian Constitution (by **KM Munshi**), Soul of the Constitution (by **Thakurdas Bhargav**) and identity card of the constitution (by **NA Palkhiwala**).

### Article 368 & the Constitution

With the help of Article 368 Parliament can amend the constitution.

Every part of constitution can be amended by the Parliament except “basic structure” of the constitution as held by the Supreme Court.

Any law which violates the basic structure of the constitution is declared unconstitutional & invalid by the court.



## FEATURES OF THE INDIAN CONSTITUTION

### **Longest Written Constitution**

- Indian constitution is the longest written constitution in the world.
- Single constitution for Centre and all the states
- Dominance of legal luminaries in the Constituent Assembly

### **Directive Principles of State Policy**

- Non-justiciable in nature (i.e. they are not legally enforceable by the court of law)
- Dr. B.R. Ambedkar described it as “novel feature” of Constitution
- Promotes social and economic democracy
- Aims to establish welfare state

### **Rigidity and Flexibility**

- The Constitution of India is neither purely rigid nor purely flexible. There is a harmonious blend of rigidity and flexibility.
- Some parts of the Constitution can be amended by the ordinary law-making process by Parliament.
- Certain provisions can be amended, only when a Bill for that purpose is passed in each house of Parliament by a majority of the total membership of that house.

### **Federal System with a strong centre**

- Indian constitution establishes India as the federal system of government.
- Federal system means a political system where there is division of powers between centre and state.
- But Indian federal system is unique in itself as it has a strong centre.

### **Three Tier Government**

- Indian constitution provides three tier government.
- Originally, it was two tier i.e. Centre and the State
- But by 73rd and 74th Amendment Act, 1992 three tier government has been established. (Centre, State & Local self-government)

### **Independent Bodies**

Indian constitution not only provides for the legislative, executive and judicial organs of the government (Central and state) but also establishes certain independent bodies for effective & unbiased administration in certain areas.

### **Single Citizenship**

People of India have been given single citizenship even if any person belongs to different state in India.

### **Universal Adult Franchise**

Indian constitution adopts universal adult franchise as a basis of elections to the Lok Sabha and the State Legislative Assemblies. Those, who above the age of 18 can vote.

### **Secular State**

India has no official religion of the Indian State. Any person in India has the right to preach and practice religion of his choice.

### **Integrated and Independent Judiciary**

- Indian judiciary is not controlled by the executive. It is independent in nature & has no control over it.
- It is integrated & hierarchical in nature where Supreme Court is at the top followed by high court & then subordinate courts.

### **Parliamentary form of government**

- The constitution of India envisages for the British Parliamentary system of government rather than American Presidential System of Government.
- The Parliamentary system is based on the principle of cooperation and coordination between the legislative and executive organs while the presidential system is based on the doctrine of separation of powers between the two organs.

### **Emergency Provisions**

- The Constitution makers also foresaw that there could be situations when the government could not be run as in ordinary times.

- To cope with such situations, the Constitution elaborates on emergency provisions.
- There are three types of emergency; a) emergency caused by war, external aggression or armed rebellion; b) emergency arising out of the failure of constitutional machinery in states; and c) financial emergency.

## PARTS OF INDIAN CONSTITUTION

Parts	Deals with	Articles Covered
PART I	The Union and its Territory	Art. (1-4)
PART II	Citizenship	Art. (5-11)
PART III	Fundamental Rights	Art. (12-35)
PART IV	Directive Principles of State Policy	Art.(36-51)
PART IVA	Fundamental Duties	Art.(51A)
PART V	The Union	Art.(52-151)
PART VI	The States	Art.(152-237)
PART VII	The States in Part B of the first Schedule	Art.(238)
PART VIII	The Union Territories	Art.(239-243)
PART IX	Panchayats	Art.(243-243-zg)
PART IXA	Municipalities	Art.(243-243-zg)
PART X	The Scheduled and Tribal Areas	Art.(244-244A)
PART XI	Relations between the Union and the States	Art.(245-263)
PART XII	Finance, Property, Contracts and Suits	Art.(264-300A)
PART XIII	Trade, Commerce and Intercourse within the Territory of India	Art.(301-307)
PART XIV	Services under the Union and the States	Art.( 308-323)
PART XIVA	Tribunals	Art.(323A-323-B)
PART XV	Elections	Art.(324-329A)
PART XVI	Special provisions relating to certain classes	Art.(330-342)
PART XVII	Official Language	Art.(343-351)
PART XVIII	Emergency Provisions	Art.(352-360)
PART XIX	Miscellaneous	Art.(361-367)
PART XX	Amendment of the Constitution	Art.(368)
PART XXI	Temporary, Transitional and Special Provisions	Art.(369-392)
PART XXII	Short Title, Commencement, Authoritative text in Hindi and Repeals	Art.(393-395)

## SCHEDULES IN INDIAN CONSTITUTION

First Schedule	Lists the states and territories of India, lists any changes to their borders and the laws used to make that change.
Second Schedule	Lists the salaries of officials holding public office, judges, and Comptroller and Auditor General of India.
Third Schedule	Forms of Oaths – This lists the oaths of offices for elected officials and judges.
Fourth Schedule	Allocation of seats in the Rajya Sabha (the upper house of Parliament) per State or Union Territory.
Fifth Schedule	The administration and control of Scheduled Areas and Scheduled Tribes
Sixth Schedule	Provisions made for the administration of tribal areas in Assam, Meghalaya, Tripura, and Mizoram.
Seventh Schedule	The union (central government), state, and concurrent lists of responsibilities.
Eighth Schedule	The official languages.
Ninth Schedule	Validation of certain Acts and Regulations.
Tenth Schedule	"Anti-defection" provisions for Members of Parliament and Members of the State Legislatures.
Eleventh Schedule	Panchayat Raj (Rural Local Government)
Twelfth Schedule	Municipalities (Urban Local Government).

## Appendices

**Appendix I :** The Constitution (Application to Jammu and Kashmir) Order, 1954.

**Appendix II :** Re-statement, with reference to the present text of the Constitution, of the exceptions and modifications subject to which the Constitution applies to the State of Jammu and Kashmir.

**Appendix III :** Extracts from the Constitution (Forty-fourth Amendment) Act, 1978.

**Appendix IV :** The Constitution (Eighty-sixth Amendment) Act, 2002.

**Appendix V :** The Constitution (Eighty-eighth Amendment) Act, 2003.

## UNION AND ITS TERRITORY

Part I of Indian Constitution is titled The Union and its Territory. It includes articles from 1- 4.

**Article 1 :** *Name and territory of the Union*

- (1) India, that is Bharat, shall be a Union of States.
- (2) The States and the territories thereof shall be as specified in the First Schedule.
- (3) The territory of India shall comprise –
  - (a) the territories of the States;
  - (b) the Union territories specified in the First Schedule; and
  - (c) such other territories as may be acquired.

**Article 2 :** *Admission or establishment of new States*

Parliament may by law admit into the Union, or establish, new States on such terms and conditions as it thinks fit.

Under Article 2a Sikkim was made part of Indian Union.

**Article 3 :** *Formation of new States and alteration of areas, boundaries or names of existing States*

Parliament may by law –

- (a) form a new State by separation of territory from any State or by uniting two or more States or parts of States or by uniting any territory to a part of any State;
- (b) increase the area of any State;
- (c) diminish the area of any State;
- (d) alter the boundaries of any State;
- (e) alter the name of any State.

In this article, in clauses (a) to (e), “State” includes a Union territory, but in the proviso, “State” does not include a Union territory.

The power conferred on Parliament by clause (a) includes the power to form a new State or Union territory by uniting a part of any other State or Union territory to any other State of Union territory.

Under Article 3 Telangana was made part of Indian Union.

Article 3 original provision was amended by Constitution (Fifth Amendment) Act, 1955 on 24 December 1955.

**Article 4 :** *Laws made under articles 2 and 3 to provide for the amendment of the First and the Fourth Schedule and supplemental, incidental and consequential matters.*

## NEW STATES IN INDIA CREATED AFTER 1950

State	Description
Andhra Pradesh	Created by the State of Andhra Pradesh Act 1953 by carving out some areas from the State of Chennai
Gujarat and Maharashtra	The State of Mumbai was divided into two States i.e. Maharashtra and Gujarat by the Mumbai (Reorganisation) Act 1960
Kerala	Created by the State Reorganisation Act, 1956. It comprised Travancor and Cochin areas
Karnataka	Created from the Princely State of Mysuru by the State Reorganisation Act, 1956. It was renamed Karnataka in 1973
Nagaland	It was carved out from the State of Assam by the State of Nagaland Act, 1952
Haryana	It was carved out from the State of Punjab by the Punjab (Reorganisation) Act, 1966
Himachal Pradesh	The Union Territory of Himachal Pradesh was elevated to the status of State by the State of Himachal Pradesh Act, 1971
Meghalaya	First carved out as a sub-State within the State of Assam by 23 Constitutional Amendment Act, 1969. Later in 1971, it received the status of a full-fledged State by the North-Eastern Areas (Reorganisation) Act 1971
Manipur and Tripura	Both these States were elevated from the status of Union-Territories by the North-Eastern Areas (Reorganisation) Act 1971
Sikkim	Sikkim was first given the Status of Associate State by the 35th Constitutional Amendment Act 1974. It got the status of a full State in 1975 by the 36th Amendment Act, 1975
Mizoram	It was elevated to the status of a full State by the State of Mizoram Act, 1986
Arunachal Pradesh	It received the status of a full state by the State of Arunachal Pradesh Act, 1986
Goa	Goa was separated from the Union-Territory of Goa, Daman and Diu and was made a full-fledged State of Goa, Daman and Diu Reorganisation Act 1987. But Daman and Diu remained as Union Territory
Chhattisgarh	Formed by the Constitutional Amendment Act, 2000 by dividing Madhya Pradesh on November 1, 2000
Uttarakhand	Formed by the Constitutional Amendment Act, 2000 by dividing Uttar Pradesh on November 9, 2000
Jharkhand	Formed by the Constitutional Amendment Act, 2000 by dividing Bihar on November 15, 2000
Telangana	It was carved out of Andhra Pradesh and became the 29th State of the Union of India on 2 June 2014. Formed by Andhra Pradesh Reorganisation Act, 2014.

## NEW NAMES OF STATES & UTs

Erstwhile States/Regions	New Names	Years of Change
United Province	Uttar Pradesh	1950
Madras	Tamil Nadu	1969
Mysore	Karnataka	1973
Laccadive, Minicoy and Amindivi Islands	Lakshadweep	1973
Union Territory of Delhi	National Capital Region (69th Amendment Act)	1991
Orissa	Odisha	2011

## CITIZENSHIP

The Citizenship provisions are covered under **Articles 5 to 11** of the Indian Constitution.

**Article 5 :** *Citizenship at the commencement of the Constitution*

At the commencement of this Constitution, every person who has his domicile in the territory of India and –

- (a) who was born in the territory of India; or
- (b) either of whose parents was born in the territory of India; or
- (c) who has been ordinarily resident in the territory of India for not less than five years immediately preceding such commencement, shall be a citizen of India.

**Article 6 :** *Rights of citizenship of certain persons who have migrated to India from Pakistan before the commencement of the Constitution.*

This provides 2 types of distinctions.

- A person migrated before July 19, 1948 shall be deemed to be a citizen of India on the commencement of the Constitution if, the person or his/her parents or grandparents (born in India as defined by the GOI Act, 1935) and has been ordinarily residing in India since the date of the migration.
- In case of migration after July 19, 1948, the person should have been registered as a citizen of India by an officer appointed for the purpose by the government of India and has been residing in India for at least 6 months immediately preceding the date of application.

**Article 7 :** *Rights of citizenship of certain migrants to Pakistan*

- A person who migrated to Pakistan from India after March 1, 1947, but later returned to India for resettlement could become a citizen of India. For this the person he/she had to be the resident of India for 6 months preceding the date of his application for registration.

- The person migrating from Pakistan to India, after January 26, 1950 are governed by the Citizenship Act, 1955.

**Article 8 :** *Rights of citizenship of certain persons of Indian origin residing outside India*

- A person or any of his/her parents or any of his/her grandparents born in India as defined by the Government of India Act, 1935 but ordinarily residing outside India shall become a citizen of India if registered as a citizen of India by the diplomatic representative of India in that country.
- This is with respect to before or after the commencement of the Constitution of India.

**Article 9 :** *Persons voluntarily acquiring citizenship of a foreign State not to be citizens*

No person shall be a citizen of India by virtue of Article 5, or be deemed to be a citizen of India by virtue of Article 6 or Article 8, if he has voluntarily acquired the citizenship of any foreign State.

**Article 10 :** *Continuance of the rights of citizenship*

Every person who is or is deemed to be a citizen of India under any of the foregoing provisions of this Part shall, subject to the provisions of any law that may be made by Parliament, continue to be such citizen.

**Article 11 :** *Parliament to regulate the right of citizenship by law*

Nothing in the foregoing provisions of this Part shall derogate from the power of Parliament to make any provision with respect to the acquisition and termination of citizenship and all other matters relating to citizenship.

### Acquisition of Indian Citizenship

*as per Citizenship Act 1955*

Indian Citizenship can be acquired under the following ways

### **By Birth**

Every person born in India on or after 26th January, 1950, shall be a citizen of India by birth, irrespective of the nationality of his parents. But, the children of foreign diplomats posted in India and enemy aliens cannot acquire the Indian citizenship by birth.

### **By Descent**

A person born outside India on or after January 26, 1950 is a citizen of India by descent if, his/her father was an Indian citizen at the time of his/her birth.

### **By Registration**

There are several groups that can apply for Indian citizenship by registration, including the following:

- Persons of Indian origin who have been residents of India for seven years. The applicant or one of his/her parents must have been born in India
- Persons of Indian origin who are ordinarily residents of any country or place outside India
- Persons who are or have been married to a citizen of India and who have been residents of India for seven years
- Minor children whose parents are Indian citizens
- A person of full age and capacity; whose parents are registered as citizen of India.

### **By Naturalization**

A person can acquire Indian citizenship by naturalization if he/she have been a resident of India for twelve of the last fourteen years. In addition, he/she must have spent the twelve months preceding your application in India, without interruption.

### **By Incorporation of Territory**

#### *Foreign Territory*

If any new territory becomes a part of India, the Government of India specifies the people of that territory to be citizens of India.

### **Termination of Indian Citizenship**

#### *as per Citizenship Act 1955*

One can lose citizenship of India in three ways

**Renunciation** : The Indian citizen after acquiring the citizenship of another country gives up his Indian citizenship.

**Termination** : The Indian citizen voluntarily acquires the citizenship of another country, he automatically ceases to be an Indian citizen.

**Deprivation** : The Indian citizenship terminates by the Government of India on the basis of fraud, false representation and concealment of material, fact or being disloyal to the Constitution.

### **Persons of Indian Origin (PIO) Card**

A PIO card applicant has to be a person of Indian origin who is a citizen of any country, other than Pakistan, Bangladesh, Sri Lanka, Bhutan, Afghanistan, China and Nepal; or a person who has held an Indian passport at any time or is the spouse of an Indian citizen or a person of Indian origin.

### **Overseas Citizen of India (OCI) card**

It is for foreign nationals who were eligible to become a citizen of India on 26.01.1950 or was a citizen of India on or after that date. Applications from citizens of Bangladesh and Pakistan are not allowed.

### **Overseas Indian Card**

A new Bill is pending in Parliament [The Citizenship (Amendment) Bill], which seeks to do away with the existing overseas citizen of India (OCI) card and the person of Indian origin (PIO) card, and replace them with a new overseas Indian card.

## FUNDAMENTAL RIGHTS

- The Fundamental Rights have been described in Articles 12 to 35.
- According to Dr. B R Ambedkar it is the most criticized part of the Constitution.
- In the original Constitution 7 Fundamental Rights are mentioned.
  1. Right to Equality (Articles 14 to 18)
  2. Right to Freedom (Articles 19 to 22)
  3. Right Against Exploitation (Articles 23 to 24)
  4. Right to Freedom of Religion (Articles 25 to 28)
  5. Cultural and Educational Rights (Articles 29 to 30)
  6. Right to property (Article 31) (Deleted through the 44th amendment in 1978)
  7. Right to Constitutional Remedies (Article 32)

**Article 12 :** *In this part, unless the context otherwise requires, "the State" includes the Government and Parliament of India and the Government and the Legislature of each of the States and all local or other authorities within the territory of India or under the control of the Government of India.*

**Article 13 :** *Laws inconsistent with or in derogation of the fundamental rights*

- All laws in force in the territory of India immediately before the commencement of this Constitution, in so far as they are inconsistent with the provisions of this Part, shall, to the extent of such inconsistency, be void.
- The State shall not make any law which takes away or abridges the rights conferred by this Part and any law made in contravention of this clause shall, to the extent of the contravention, be void.

### Right of Equality

**Article 14 :** *Equality before law*

The State shall not deny to any person equality before the law or the equal protection of the laws within the territory of India. Prohibition of discrimination on grounds of religion, race, caste, sex or place of birth.

**Article 15 :** *Prohibition of discrimination on grounds of religion, race, caste, sex or place of birth*

1. The State shall not discriminate against any citizen on grounds only of religion, race, caste, sex, place of birth or any of them.
2. No citizen shall, on grounds only of religion, race, caste, sex, place of birth or any of them, be subject to any disability, liability, restriction or condition with regard to-
  - (a) access to shops, public restaurants, hotels and palaces of public entertainment; or
  - (b) the use of wells, tanks, bathing ghats, roads and places of public resort maintained wholly or partly out of State funds or dedicated to the use of the general public.
3. Nothing in this article shall prevent the State from making any special provision for women and children.
4. Nothing in this article or in clause (2) of Article 29 shall prevent the State from making any special provision for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes and the Scheduled Tribes.

**Article 16 :** *Equality of opportunity in matters of public employment*

1. There shall be equality of opportunity for all citizens in matters relating to employment or appointment to any office under the State.
2. No citizen shall, on grounds only of religion, race, caste, sex, descent, place of birth, residence or any of them, be

ineligible for, or discriminated against in respect or, any employment or office under the State.

3. Nothing in this article shall prevent Parliament from making any law prescribing, in regard to a class or classes of employment or appointment to an office under the Government of, or any local or other authority within, a State or Union territory, any requirement as to residence within that State or Union territory] prior to such employment or appointment.
4. Nothing in this article shall prevent the State from making any provision for the reservation of appointments or posts in favour of any backward class of citizens which, in the opinion of the State, is not adequately represented in the services under the State.
5. Nothing in this article shall affect the operation of any law which provides that the incumbent of an office in connection with the affairs of any religious or denominational institution or any member of the governing body thereof shall be a person professing a particular religion or belonging to a particular denomination.

#### **Article 17 : Abolition of Untouchability**

"Untouchability" is abolished and its practice in any form is forbidden. The enforcement of any disability arising out of "Untouchability" shall be an offence punishable in accordance with law.

#### **Article 18 : Abolition of titles**

- No title, not being a military or academic distinction, shall be conferred by the State.
- No citizen of India shall accept any title from any foreign State.
- No person who is not a citizen of India shall, while he holds any office of profit or trust under the State, accept without the consent of the President any title from any foreign State.
- No person holding any office of profit or trust under the State shall, without the consent of the President, accept any present, emolument, or office of any kind from or under any foreign State

### **Right to Freedom**

#### **Article 19 : Protection of certain rights**

1. Right to freedom of speech and expression  
19 (1) (a) : freedom of expression means the right to express one's opinion by words of mouth, writing, printing, picture, or in any other manner
2. Right to assemble peacefully and without arms
3. Right to form associations
4. Right to move freely throughout the territory of India
5. Right to reside and settle in any part of the territory of India
6. Right to practice any profession or to carry on any occupation, trade or business

*Right to acquire, hold, and dispose of property (deleted through 44th amendment)*

#### **Article 20 : Protection in respect of conviction for offences**

**No Ex-Post-Facto Legislation :** No person shall be convicted of any offence except for violation of the law in force at the time of the commission of the act charged as an offence, nor be subjected to a penalty greater than that which might have been inflicted under the law in force at the time of the commission of the offence.

**No Double Jeopardy :** No person shall be prosecuted and punished for the same offence more than once.

**No Self-incrimination :** No person accused of any offence shall be compelled to be a witness against himself.

#### **Article 21 : Protection of life and personal liberty**

No person shall be deprived of his life or personal liberty except according to procedure established by law.

**Article 21 A : Right to free and compulsory education for all the children of the age 6 to 14 years in such manner as the State may, by law, determine.**



This was present in Article 45 of the constitution. Through 86th amendment in 2002 it was made a fundamental right. This came into force on April 1, 2010.

**Article 22 :** *Protection against arrest and detention in certain cases.*

**Under punitive detention:** right to be informed of the grounds of arrest, consult a legal practitioner, and produce before the magistrate within 24 hours.

**Under preventive detention:** grounds of detention should be communicated, provide an opportunity to make representation.

### **Right Against Exploitation**

**Article 23 :** *Prohibition of traffic in human beings and forced labour.*

**Article 24 :** *Prohibition of employment of children in factories.*

### **Right to Freedom of Religion**

**Article 25 :** All persons are equally entitled to *Freedom of conscience and free profession, practice and propagation of religion*

**Article 26 :** *Freedom to manage religious affairs*

Subject to public order, morality and health, every religious denomination or any section thereof shall have the right-

1. to establish and maintain institutions for religious and charitable purposes;
2. to manage its own affairs in matters of religion;
3. to own and acquire movable and immovable property; and
4. to administer such property in accordance with law.

**Article 27 :** *Freedom as to payment of taxes for promotion of any particular religion*

No person shall be compelled to pay any taxes, the proceeds of which are specifically appropriated in payment of expenses for the promotion or maintenance of any particular religion or religions denomination.

**Article 28 :** *Freedom as to attendance at religious instruction or religious worship in certain educational institutions*

No religious instruction shall be provided in any educational institute wholly maintained out of state funds. Religious instructions permitted if it is established by endowments or trust.

### **Cultural and Educational Rights**

**Article 29 :** Protection of interests of minorities

1. Any section of the citizens residing in the territory of India or any part thereof having a distinct language, script or culture of its own shall have the right to conserve the same.
2. No citizen shall be denied admission into any educational institution maintained by the State or receiving aid out of State funds on grounds only of religion, race, caste, language or any of them.

**Article 30 :** Right of minorities to establish and administer educational institutions

1. All minorities, whether based on religion or language, shall have the right to establish and administer educational institutions of their choice.

1A. In making any law providing for the compulsory acquisition of any property of an educational institution established and administered by a minority, referred to in clause (1), the State shall ensure that the amount fixed by or determined under such law for the acquisition of such property is such as would not restrict or abrogate the right guaranteed under that clause.

2. The state shall not, in granting aid to educational institutions, discriminate against any educational institution on the ground that it is under the management of a minority, whether based on religion or language.

### **Right to Constitutional Remedies**

According Dr. B.R. Ambedkar Article 32 is the heart and soul of the Indian Constitution.

The Supreme Court and High Courts can issue writs.

Right to move Supreme Court for the enforcement of Fundamental Rights including the writs of Habeas corpus, Mandamus, Prohibition, Certiorari and Quo-warranto.

### **Habeas Corpus (to produce the body)**

It is an order issued by the court to a person who has detained another person, to produce the body of the latter before it. Hence this is against arbitrary detention. This can be issued to a private person or public authorities.

### **Mandamus (to command)**

Issued to a public official asking him to perform his official duties that he has failed or refused to perform. (this cannot be issued against President or Governor or Chief Justice of a High-Court or against any private person).

### **Prohibition (to forbid)**

Issued by a higher court to a lower court or tribunal to prevent the latter from exceeding its jurisdiction or usurping a jurisdiction that it does not possess.

### **Certiorari (To be certified or to be informed)**

Issued by a higher court to a lower court or tribunal either to transfer case pending with the latter to it or to squash the order of the latter in a case.

### **Quo-warranto (By what Authority?)**

It is issued by a court to enquire into the legality of claim of a person to a public office.

**Article 33 :** *Power of Parliament to modify the rights conferred by this Part in their application etc.*

The Parliament is empowered to abrogate the fundamental rights of the members of armed forces, Para-military forces, police forces, intelligence agencies and other related agencies.

**Article 34 :** *Restriction on rights conferred by this Part while martial law is in force in any area*

**Article 35 :** *Legislation to give effect to the provisions of this Part*

## **DIRECTIVE PRINCIPLES OF STATE POLICY**

It contained Articles **36 to 51**.

**Dr. B.R. Ambedkar**, described the Directive Principles are the **novel feature** of the Indian Constitution.

The Directive Principles may be classified into 3 broad categories :

1. Socialistic Principles (*Article 38, 39, 39A, 41, 42*)
2. Gandhian Principles (*Article 40, 43, 46, 47, 48*)
3. Liberal-intellectual Principles (*Article 44, 45, 48, 48A, 49, 50, 51*)

**Article 36 :** *Definition* : In this Part, unless the context otherwise requires, "the State" has the same meaning as in Part III.

**Article 37 :** *Application of the principles contained in this Part*

The provisions contained in this Part shall not be enforceable by any court, but the principles therein laid down are nevertheless fundamental in the governance of the country and it shall be the duty of the State to apply these principles in making laws.

**Article 38 :** *State to secure a social order for the promotion of welfare of the people*

The State shall strive to promote the welfare of the people by securing and protecting as effectively as it may a social order in which justice, social, economic and political, shall inform all the institutions of the national life.

The State shall, in particular, strive to minimize the inequalities in income, and endeavor to

eliminate inequalities in status, facilities and opportunities, not only amongst individuals but also amongst groups of people residing in different areas or engaged in different vocations.

**Article 39 :** *Certain principles of policy to be followed by the State :- The State shall, in particular, direct its policy towards securing-*

- (a) that the citizens, men and women equally, have the right to an adequate means to livelihood;
- (b) that the ownership and control of the material resources of the community are so distributed as best to subserve the common good;
- (c) that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment;
- (d) that there is equal pay for equal work for both men and women;
- (e) that the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength;
- (f) that children are given opportunities and facilities to develop in a healthy manner and in conditions of freedom and dignity and that childhood and youth are protected against exploitation and against moral and material abandonment.

**Article 39A :** *Equal justice and free legal aid*

The State shall secure that the operation of the legal system promotes justice, on a basis of equal opportunity, and shall, in particular, provide free legal aid, by suitable legislation or schemes or in any other way, to ensure that opportunities for securing justice are not denied to any citizen by reason of economic or other disabilities.

**Article 40 :** Organisation of village panchayats

The State shall take steps to organize village panchayats and endow them with such powers and authority as may be necessary to enable them to function as units of self-government.

**Article 41 :** Right to work , to education and to public assistance in certain cases.

**Article 42 :** Provision for just and humane conditions of work and maternity relief

The State shall make provision for securing just and humane conditions of work and for maternity relief.

**Article 43 :** To secure a Living wage adecent standard of life and social and cultural opportunities for workers

**Article 43A :** Participation of workers in management of industries

**Article 44 :** Uniform civil code for the citizens

The State shall endeavour to secure for the citizens a uniform civil code throughout the territory of India.

**Article 45 :** Provision for free and compulsory education for children

**Article 46 :** Promotion of educational and economic interests of Scheduled Castes, Scheduled Tribes and other weaker sections

**Article 47 :** Duty of the State to raise the level of nutrition and the standard of living and to improve public health

**Article 48 :** Organisation of agriculture and animal husbandry

**Article 48A :** Protection and improvement of environment and safeguarding of forests and wild life

**Article 43B :** To promote professionally run co-operative societies added by the 97th Constitutional Amendment Act, 2011.

**Article 49 :** Protection of monuments and places and objects of national importance

**Article 50 :** Separation of judiciary from executive

The State shall take steps to separate the judiciary from the executive in the public services of the State.

**Article 51 :** Promotion of international peace and security

The State shall endeavour to -

- (a) promote international peace and security;
- (b) maintain just and honourable relations between nations;

- (c) foster respect for international law and treaty obligations in the dealings of organised peoples with one another; and encourage settlement of international disputes by arbitration.

## FUNDAMENTAL DUTIES

- The Fundamental Duties were added on the recommendation of Swaran Singh Committee (1976).
- The 10 Fundamental Duties were added to the Constitution in the year 1976 through 42nd amendment.
- The 11th Fundamental Duty was added in the year 2002 through the 86th amendment of the Indian Constitution.

### 11 Fundamental Duties

These duties are laid down in the Article 51A.

*It shall be the duty of every citizens of India-*

1. to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
2. to cherish and follow the noble ideals which inspired our national struggle for freedom;
3. to uphold and protect the sovereignty, unity and integrity of India;
4. to defend the country and render national service when called upon to do so;
5. to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
6. to value and preserve the rich heritage of our composite culture;
7. to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures;
8. to develop the scientific temper, humanism and the spirit of inquiry and reform;
9. to safeguard public property and to abjure violence;
10. to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;
11. to provide opportunities for education to his child or ward between the age of 6 to 14 years.

## UNION EXECUTIVE

### PRESIDENT (Article 52)

There shall be a President of India. He is the first citizen of India.

#### Qualifications for election as President (Article 58)

1. No person shall be eligible for election as President unless he-
  - (a) is a citizen of India,
  - (b) has completed the age of thirty-five years, and
  - (c) is qualified for election as a member of the House of the People.
2. A person shall not be eligible for election as President if he holds any office of profit under the Government of India or the Government of any State or under any local

or other authority subject to the control of any of the said Governments.

### **Election of President (Article 54)**

The President shall be elected by the members of an electoral college consisting of –

- (a) the elected members of both Houses of Parliament; and
- (b) the elected members of the Legislative Assemblies of the States.

### **Position of Indian President**

The Constitution of India has provided for a Parliamentary form of Government, and the President has been made only a nominal executive the real executive being the Council of Ministers headed by the Prime Minister.

### **Conditions of President's office (Article 59)**

- The President shall not be a member of either House of Parliament or of a House of the Legislature of any State, and if a member of either House of Parliament or of a House of the Legislature of any State be elected President, he shall be deemed to have vacated his seat in that House on the

date on which he enters upon his office as President.

- The President shall not hold any other office of profit.
- The President shall be entitled without payment of rent to the use of his official residences and shall be also entitled to such emoluments, allowances and privileges as may be determined by Parliament by law and, until provision in that behalf is so made, such emoluments, allowances and privileges as are specified in the Second Schedule.
- The emoluments and allowances of the President shall not be diminished during his term of office.

### **Oath or affirmation by the President (Article 60)**

- The oath of the president is administered by the Chief Justice of India and in his absence, the senior most judge of the Supreme Court.
- Acting President should also take similar type of oath.
- The President takes an oath to preserve, protect and defend the Constitution and the law.

## **Presidents of India**

<b>Name</b>	<b>From</b>	<b>To</b>	<b>Important Facts</b>
Dr. Rajendra Prasad	26.01.1950	13.05.1962	First President; He also had the longest tenure of 12 years
Dr. S. Radhakrishnan	13.05.1962	13.05.1967	He was also the First Vice President of India
Dr. Zakir Hussain	13.05.1967	03.05.1969	First Muslim President; First President to die in office; Shortest Tenure
Shri Varahagiri Venkata Giri	03.05.1969	20.07.1969	First acting President of India
Justice M Hidayatullah	20.07.1969	24.08.1969	He was also the Chief Justice of India
Shri Varahagiri Venkata Giri	24.08.1969	24.08.1974	He was the only person worked both President and Acting President.
Shri Fakhruddin Ali Ahmed	24.08.1974	11.02.1977	He died in office.
Basappa Danappa Jatti	11.02.1977	25.07.1977	He was the acting president.
Shri Neelam Sanjiva Reddy	25.07.1977	25.07.1982	He was the first CM of Andhra Pradesh.
Shri Giani Zail Singh	25.07.1982	25.07.1987	First Sikh President
Shri R. Venkataraman	25.07.1987	25.07.1992	He worked with 4 Prime Minister and appointed 3 of them.
Dr.S.D. Sharma	25.07.1992	25.07.1997	He earlier worked as CM of Madhya Pradesh. Also Served as Governor of Andhra Pradesh, Punjab and Maharashtra
Shri K R Narayanan	25.07.1997	25.07.2002	First Dalit President
Dr. A.P.J.Abdul Kalam	25.07.2002	25.07.2007	First Scientist to become President
Pratibha Patil	25.07.2007	25.07.2012	First woman to become President
Pranab Mukherjee	25.07.2012	25.07.2017	First Bengali President
Ram Nath Kovind	25.07.2017	Incumbent	He is the second Dalit president after K. R. Narayanan.

### **Term of the President (Article 56)**

- The term of office is 5 years from the date on which the President enters upon his office.
- The President can resign to his office by writing under his hand addressed to the Vice President of India.

### **Impeachment of the President (Article 61)**

- The President can be removed from the office by a process of impeachment on the grounds of "Violation of the Constitution".
- Charges can be initiated by any house of the Parliament.
- All the members of Lok Sabha and Rajya Sabha (Elected and nominated) take part in the impeachment process of the President.
- Assembly members are not permitted to take part in the impeachment process of the President of India.
- The charges should be signed by 1/4th of the members of the house. 14 days' notice is given to the President.
- After it is passed by the 2/3rd majority of the total membership of the house it is sent to the other house.
- If the other house also passes the same with 2/3rd majority of the total then the President stands impeached.
- No Indian President has been impeached so far.

### **Vacancy in the President's Office (Article 62)**

- A vacancy in the President's Office can occur on the expiry of tenure of 5 years, Resignation, Impeachment Death of the President. Otherwise, if the election of the President is declared void by the Supreme Court.
- In case of vacancy in the office of the President the Vice President acts as the President.
- In case of vacancy in the office of the Vice President the Chief Justice of India acts as the President.
- In case of vacancy the election should be held within a period of six months. The newly elected President remains in office for a full term of five years.

## **POWERS AND FUNCTIONS OF THE PRESIDENT**

They can be classified as Executive powers, Legislative powers, Judicial powers, Financial powers, Diplomatic powers, Military powers Emergency powers.

### **Executive Powers**

- The President is the head of the Republic of India;
- He appoints the Prime Minister and his council of ministers;
- He appoints Governors of the states, the Chief Justice of the Supreme Court, judges of the Supreme Court and the High Courts, and the Attorney General;
- He appoints the chairman and members of the Union Public Service Commission;
- He appoints the three chiefs of the armed forces. He himself is the supreme commander of the armed forces;
- He appoints ambassadors and other diplomats to other countries;
- He nominates two members to the Lok Sabha and twelve to the Rajya Sabha.

### **Legislative Powers**

- He can summon or prorogue the Parliament;
- He can dissolve the sitting Lok Sabha and call for fresh elections;
- He addresses a joint session of both the houses of the Parliament and gives an inaugural speech;
- He gives his assent to every bill to become an act;
- He issues ordinances when the Parliament is not in session.

### **Financial Powers**

- The President is required to lay before the parliament the annual and the supplementary budget;
- He is in charge of the contingency fund from which he can lend money during an unforeseen calamity;
- His sanction is required before a money bill is introduced in the Parliament.

### Judicial Powers

- He has the power to grant pardon, reprieve, or remit the sentence of punishment passed by a court, on an appeal for mercy; and
- He can commute a death sentence to a life imprisonment.

### Diplomatic Powers

- The international treaties and agreements are negotiated and concluded on behalf of the President.
- Sends and receives diplomats like Ambassadors, High Commissioners, and so on.

### Military Powers

- He is the Supreme Commander of the defence forces of India.
- He appoints the Chiefs of the Army, the Navy and the Air Force.
- He can declare war or conclude peace, subject to the approval of the Parliament.

### Emergency Powers

The President can declare an emergency when:

- The Security of the country is threatened by a foreign aggression or by internal disturbances;
- There is a breakdown of the constitutional machinery; and
- There is a threat to the nation's financial stability.

**National Emergency** (Article 352) arising out of war, external aggression or armed rebellion within the country.

**Constitutional Emergency** (Article 356) arising out of the failure of the constitutional machinery in the states. It is also known as President's Rule.

**Financial Emergency** (Article 360) arising out of a threat to financial stability or credit of India.

### Emergency Declaration in India

1. **First Emergency** : Between 26 October 1962 to 10 January 1968 during the India-China war
2. **Second Emergency** : Between 3 December 1971 to 21 March 1977

originally proclaimed during the Indo Pakistan war, and later extended along with the third proclamation

3. **Third emergency** : Between 25 June 1975 to 21 March 1977 under controversial circumstances of political instability under Indira Gandhi's prime ministership

### Veto Power

This is the authority of the President to withhold assent to the bills passed by the Parliament. (A bill is introduced in Parliament, after it is passed by both the houses with the assent of the President bill becomes an act).

### Classification of Veto Powers

**Absolute Veto:** The power of the President to withhold the assent to a bill passed by the Parliament.

**Qualified Veto :** Sending back of a bill, which can be overridden by the Legislature with a higher majority.

**Suspensive Veto:** The President returns the bill for the reconsideration of the Parliament. If the bill is again passed by the Parliament with or without amendments, it is obligatory for the President to give assent to the bill.

**Pocket veto:** The President neither rejects nor returns the bill, but simply keeps the bill pending for an indefinite period of time.

### Pardoning Powers (Article 72)

The Constitution provided the President with five types of pardoning powers.

1. **Pardon:** This removes both the sentence and the conviction and completely absolves the convict all sentences, punishments and disqualifications.
2. **Commutation:** This is the substitution of one form of punishment for a lighter form.
3. **Remission:** Reducing the period of sentence without changing its character.
4. **Respite:** Awarding a lesser sentence in place of one originally awarded because of some special facts.
5. **Reprieve:** This is the stay of execution of a sentence for a temporary period.

### Emoluments (Salary)

The present salary of the President is ₹1.5 lakh.

## VICE-PRESIDENT (Article 63)

There shall be a Vice-President of India.

The Vice-president occupies the second highest office in the country.

**Article 64:** The Vice President shall be the ex-officio Chairman of the Rajya Sabha.

**Article 65:** The Vice President shall act as the President in the event of a vacancy in the office of the President by reason of his death, resignation or removal or otherwise.

### Qualifications

- should be a citizen of India,
- should have completed 35 years of age.
- should not hold any office of profit.
- should be qualified for election as a Member of Rajya Sabha.

### Oath

**Article 69 :** the oath of office of the Vice-President is administered by the President or some person appointed in that behalf by him.

### The term of office (Article 67)

- The term of office of the Vice President is 5 years
- The office may be terminated by resignation or removal.
- A formal impeachment is not required.
- The election to the office of the Vice President has to be completed before the expiration of the term.

### Resignation

He can submit the resignation letter to the President of India.

### Removal

14 days advance notice should be given. The Vice President is removed by a resolution of the Rajya Sabha passed by majority of all the then members of the council and agreed to by the House of the People.

### Re-election

- Sitting Vice President can be reelected to the office any number of terms.
- So far only the first VP of India Dr. S. Radhakrishnan was the only person who got elected to the office of VP for two terms.
- The sitting Vice President Hamid Ansari reelected to the office for the second term in the year 2012.

### Vacancy

A vacancy in the Vice-President's Office can occur

- on the expiry of term 5 years.
- by death
- by resignation
- by removal from the office
- otherwise, In case of vacancy the election must be held as soon as possible.

*The newly elected VP remains in office for a full term of 5 years from the date of assuming charges.*



### Vice-Presidents of India

Vice President	From	To
Dr. Sarvepalli Radhakrishnan	13.05.1952	12.05.1962
Dr. Zakir Hussain	13.05.1962	12.05.1967
Sh. Varahagiri Venkata Giri	13.05.1967	03.05.1969
Gopal Swarup Pathak	31.08.1969	30.08.1974
Basappa Danappa Jatti	31.08.1974	30.08.1979
Justice Muhammad Hidayatullah	31.08.1979	30.08.1984
Ramaswamy Venkataraman	31.08.1984	24.07.1987
Shankar Dayal Sharma	03.09.1987	24.07.1992
Kocheril Raman Narayanan	21.08.1992	24.07.1997
Krishan Kant	21.08.1997	27.07.2002
Bhairon Singh Shekhawat	19.08.2002	21.07.2007
Mohammad Hamid Ansari	11.08.2007	11.08.2017
Muppavarapu Venkaiah Naidu	11.08.2017	Incumbent

#### Powers and Functions of the Vice President

The Vice President of India, after the President, is the highest dignitary of India, and certain powers are attached to the office of the Vice President. These are:

- He shall discharge the functions of the President during the temporary absence of the President due to illness or any other cause due to which the President is unable to carry out his functions.
- He shall act as the President, in case of any vacancy in the office of the President by reason of his death, resignation, removal through impeachment or otherwise. The Vice President shall take over the duties of the President until a new President is elected and resumes office.
- He is the ex-officio Chairman of the Council of States.
- When he acts as, or discharges the functions of the President, he or she immediately ceases to perform the normal functions of being the Chairman of the Council of States.

#### Interesting Facts

- Dr. Sarvepalli Radhakrishnan was the first Vice President of independent India, elected to the office in 1952.
- Krishna Kant was the first Vice-President to die in office.
- The only Vice President to be re-elected for a second term was Dr. S Radhakrishnan, who again became the Vice President in the year 1957.
- K R Narayanan, Shankar Dayal Sharma, R Venkataraman, V V Giri, Zakir Hussain and Dr. S Radhakrishnan, each of whom was a President of India at different points in time, remained Vice Presidents before they were elected as Presidents.
- The present Vice President of India, Mohammad Hamid Ansari, has served as an ambassador to many countries across the world, such as U.A.E, Saudi Arabia, Afghanistan, Iran and others.

#### Emoluments (Salary)

The present salary of the Vice-President is **₹1.25 lakh**.

## PRIME MINISTER

- In the scheme of Parliamentary system of government, the President is the nominal executive authority (de jure executive) and Prime Minister is the real executive authority (de facto executive).
- Prime Minister is the head of the government while President is the head of the state of the Republic of India.
- Article 75 says that the Prime Minister shall be appointed by the President.

### Oath, Term and Emoluments (Salary)

- The oath of office of a Minister is administered by the President.
- The term is not fixed. The Prime Minister holds the office during the pleasure of the President.
- As long as the Prime Minister enjoys the majority support in the Lok Sabha, he cannot be removed by the President.
- The salary of the Prime Minister is decided by the Parliament and revised from time to time.
- As on 31 July 2012 the monthly pay and allowances of the Prime Minister of India was ` 1.6 lakh.

### Role of Prime Minister

- The Prime Minister is the leader of the Council of Ministers and serves as the channel of communication between the President and the Council of Ministers.
- He allocates portfolios among the ministers and distributes work among various ministries and offices.

### In-Charge of Ministries

Prime Minister also retains certain portfolios that are not allocated to other ministers. He is generally in charge of the following ministries/departments:

1. Ministry of Personnel, Public Grievances and Pensions
2. Ministry of Planning
3. Department of Atomic Energy
4. Department of Space
5. Appointments Committee of the Cabinet

### Powers/Authorities of Prime Minister

#### Head of the Government

The Prime Minister of India is the head of the Government. Though the President is the head of the State, most of the executive decisions are taken by the Prime Minister. All the important decision-making bodies in India, like the Union Cabinet and the Planning Commission, run under his supervision.

#### Leader of the Council of Ministers

As far as the Prime Minister's relation to the Council of Ministers is concerned, his position is that of "First among Equals". In the case of death or resignation of the Prime Minister, the entire Council of Ministers has to resign. The ministers directly report to the Prime Minister. He can also remove a minister by asking for his resignation or having him dismissed by the President. If any difference of opinion arises between the Prime Minister and any other minister, the opinion of the Prime Minister prevails.

#### Leader of the Parliament

The Prime Minister is the Leader of the House to which he belongs. He can also take part in debates in the House of which he is not a member. He can also advise the President to dissolve the Lok Sabha.

#### Representative of the Country

In international affairs, he is the spokesperson of the country. The Prime Minister plays a major role in directing India's foreign policy.

### Prime Ministers of India

Prime Minister	To	From
Jawaharlal Nehru	15.08.1947	27.05.1964
Gulzarilal Nanda	27.05.1964	09.06.1964
Lal Bahadur Shastri	09.06.1964	11.01.1966
Gulzarilal Nanda	11.01.1966	24.01.1966
Indira Gandhi	24.01.1966	24.03.1977
Morarji Desai	24.03.1977	28.07.1979
Charan Singh	28.07.1979	14.01.1980
Indira Gandhi	14.01.1980	31.10.1984
Rajiv Gandhi	31.10.1984	02.12.1989
V. P. Singh	02.12.1989	10.01.1990
Chandra Shekhar	10.01.1990	21.06.1991
P. V. Narasimha Rao	21.06.1991	16.05.1996
Atal Bihari Vajpayee	16.05.1996	01.06.1996
H. D. Deve Gowda	01.06.1996	21.04.1997
I. K. Gujral	21.04.1997	19.03.1998
Atal Bihari Vajpayee	19.03.1998	22.05.2004
Manmohan Singh	22.05.2004	26.05.2014
Narendra Modi	26.05.2014	Incumbent

### Interesting Facts about Indian Prime Ministers

- Jawaharlal Nehru was the longest serving Indian Prime Minister, starting from India's independence in 1947 to his death in 1964.
- Gulzari Lal Nanda served twice as the acting Prime Minister of India after the death of Jawaharlal Nehru and Lal Bahadur Shastri.
- Indira Gandhi was named “Woman of the Millennium” in a poll organised by the British Broadcasting Corporation (BBC) in 1999.
- Former Prime Minister Indira Gandhi was the first woman to receive the Bharat Ratna. She was also awarded Bangladesh’s highest civilian award “Bangladesh Swadhinata Samman” in 2011.
- Morarji Desai was the first non-Congress Prime Minister of India. He was also the first Prime Minister to resign without completing his full term.
- Morarji Desai is the only Indian Prime Minister to be conferred upon the Nishaan-e-Pakistan (Pakistan’s highest civilian award).
- Rajiv Gandhi was the youngest Indian Prime Minister; he assumed office at the age of 40.
- Rajiv Gandhi was the first Prime Minister of India to live in 7, Race Course.
- P.V. Narasimha Rao was the first Prime Minister from South India.
- H.D. Deve Gowda was the first Prime Minister of India who was a member of the Rajya Sabha.
- Dr. Manmohan Singh (First Sikh Prime Minister) was the longest-serving Prime Minister of India who was a member of the Rajya Sabha (2004-2014).

## UNION COUNCIL OF MINISTERS

- The Council of Ministers is headed by the PM.
- **Article 74(1):** There shall be a Council of Ministers headed by the PM to aid and advice the President.

### Appointment of Ministers

- **Article 75 (1):** The PM is appointed by the President and other Ministers are also appointed by the President on the advice of the PM.
- A Minister (PM is also a Minister) must be a member of either Lok Sabha or Rajya Sabha.

### Oath and Salary of Ministers

- **Article 75 (4):** The oath of office of a Minister is administered by the President.
- This is decided by the Parliament from time to time.

### Deputy Prime Minister

- The office the Deputy Minister is not mentioned in the Constitution.
- Except Prime Minister no other Minister is mentioned in the Constitution.

### Deputy Prime Ministers of India

Name	To	From
Sardar Vallabhai Patel	15 August 1947	15 December 1950
Morarji Desai	21 March 1967	6 December 1969
Charan Singh	24 March 1977	28 July 1979
Jagjivan Ram	24 March 1977	28 July 1979
Yashwantrao Chavan	28 July 1979	14 January 1980
Chaudhary Devi Lal	2 December 1989	21 June 1991
L. K. Advani	5 February 2002	22 May 2004

### Categories of Ministers

There are three categories of ministers, in descending order of rank:

**Cabinet Minister:** member of cabinet

**Minister of State (Independent Charges):** junior minister not reporting to a cabinet minister

**Minister of State (MoS):** junior minister reporting to a cabinet minister, usually tasked with a specific responsibility in that ministry.

*The word "Cabinet" is not originally mentioned in the Constitution. It was added in Article 352 in the year 1978 through 44th amendment.*

## UNION LEGISLATURE (Parliament)

- It consists of the President and two Houses, known as Council of States (Rajya Sabha) and House of the People (Lok Sabha).
- In 1954, the Hindi names 'Rajya Sabha' and 'Lok Sabha' were adopted for the Council of States and the House of People respectively.
- Articles 79 to 122 in Part V of the Constitution deal with the organization, composition, duration, officers, procedures, privileges, powers of the Parliament.
- The first hour (i.e. between 11 to 12 noon) is known as the **Question Hour**. During this MPs put forward questions about the policies, government and different bills. Around 12 noon MPs can discuss any important topic with prior notice to the Speaker. This is known as **Zero Hour**.

### **Rajya Sabha (Article 80)**

- It is the Upper House of Parliament.
- It is a permanent body and can't be dissolved.
- It can have a maximum of 250 members in all. (238 members elected by state MLAs +12 nominated by President for contributions to art, literature, science services and social.)
- Representation of People Act (1951) provided the term of office of a member of Rajya Sabha shall be 6 years.
- 1/3 members retire every 2 years.

### **Lok Sabha (Article 81)**

- It is the Lower House of Parliament.
- It can have a maximum of 545 members in all. It comprises 543 members who are elected from the (parliamentary) constituencies and two members of Anglo-Indian community who are nominated by the President of India.
- Out of the 543 parliamentary constituencies, 131 seats belong to the reserved category, 84 seats are reserved for the people belonging to Scheduled Casts (SC) and 47 seats are reserved for Scheduled Tribes (ST) categories.
- The term of office of a member of Lok Sabha is 5 years. Then the term is automatically dissolved.

### **Qualification for membership of Parliament (Article 84)**

A person shall not be qualified to be chosen to fill a seat in Parliament unless he

- is a citizen of India, and makes and subscribes before some person authorised in that behalf by the Election Commission an oath or affirmation according to the form set out for the purpose in the Third Schedule;
- is, in the case of a seat in the Rajya Sabha, not less than **30 years** of age and, in the

case of a seat in the Lok Sabha, not less than **25 years** of age; and

- possesses such other qualifications as may be prescribed in that behalf by or under any law made by Parliament.

### **Disqualification's for membership of Parliament (Article 102)**

1. A person shall be disqualified for being chosen as, and for being, a member of either House of Parliament-
  - (a) if he holds any office of profit under the Government of India or the Government of any State, other than an office declared by Parliament by law not to disqualify its holder;
  - (b) if he is of unsound mind and stands so declared by a competent court;
  - (c) if he is an undischarged insolvent;
  - (d) if he is not a citizen of India, or has voluntarily acquired the citizenship of a foreign State, or is under any acknowledgement of allegiance or adherence to a foreign State;
  - (e) if he is so disqualified by or under any law made by Parliament.
2. A person shall be disqualified for being a member of either House of Parliament if he is so disqualified under the Tenth Schedule.

### **Oath and Salary (Article 99)**

- Every member has to make and subscribe to an oath or affirmation before the President or some other person appointed by him for this purpose.
- Salaries and allowances are determined by Parliament.

### **Leadership in Rajya Sabha**

- **Chairman** : Venkaiah Naidu, Independent Since 11 August 2017
- **Deputy Chairman** : P. J. Kurien, INC, Since 21 August 2012
- **Leader of the House** : Arun Jaitley, BJP, Since July 2014
- **Leader of the Opposition** : Ghulam Nabi Azad, INC, Since July 2014

### Allocation of Seats in Parliament

S.N.	States / UTs	In Rajya Sabha	In Lok Sabha
1	Andhra Pradesh	11	25
2	Arunachal Pradesh	1	2
3	Assam	7	14
4	Bihar	16	40
5	Chhattisgarh	5	11
6	Goa	1	2
7	Gujarat	11	26
8	Haryana	5	10
9	Himachal Pradesh	3	4
10	Jammu and Kashmir	4	6
11	Jharkhand	6	14
12	Karnataka	12	28
13	Kerala	9	20
14	Madhya Pradesh	11	29
15	Maharashtra	19	48
16	Manipur	1	2
17	Meghalaya	1	2
18	Mizoram	1	1
19	Nagaland	1	1
20	Odisha	10	21
21	Punjab	7	13
22	Rajasthan	10	25
23	Sikkim	1	1
24	Tamil Nadu	18	39
25	Telangana	7	17
26	Tripura	1	2
27	Uttarakhand	3	5
28	Uttar Pradesh	31	80
29	West Bengal	16	42
<b>Union Territories</b>			
1	Andaman and Nicobar Islands	-	1
2	Chandigarh	-	1
3	Dadra and Nagar Haveli	-	1
4	Daman and Diu	-	1
5	National Capital Territory of Delhi	3	7
6	Lakshadweep	-	1
7	Puducherry	1	1
<b>Nominated Member</b>		12	2
<b>Total</b>		<b>245</b>	<b>545</b>

### Speaker of Lok Sabha (Article 93)

He/she is the presiding officer of the Lok Sabha.

He/she is elected in the very first meeting of the Lok Sabha following general elections. Serving for a term of 5 years, he/she is chosen from amongst the members of the Lok Sabha, and is by convention a member of the ruling party or alliance.

### Eligibility Criteria of a Speaker

Since the Speaker is a Member of the Parliament, the eligibility criteria for the position are same as that of the other members in the House. They are as follows, He/she

1. must be a citizen of India.
2. must not be less than 25 years of age.
3. should not hold any office of profit under the Government of India, or the Government of any other state.

4. should not be of unsound mind.

### Power and Functions of Speaker

The Speaker

- presides over the sittings of the Lok Sabha.
- advises the Prime Minister and decides the programme of the Lok Sabha.
- allows the members of the Lok Sabha to present their motions. They have to obey his authority.
- gives warnings to the members in order to maintain discipline in the House.
- can postpone the sittings of the Lok Sabha.
- signs the bills after the Lok Sabha has passed them. He/she send them to the Rajya Sabha or to the President.
- presides over joint-sessions of the Parliament.
- has a right to cast his vote, too.

### Speakers of Lok Sabha

Name	From	To
Ganesh Vasudev Mavalankar	15.05.1952	27.02.1956
M. A. Ayyangar	08.03.1956	10.05.1957
	11.05.1957	16.04.1962
Sardar Hukam Singh	17.04.1962	16.03.1967
Neelam Sanjiva Reddy	17.03.1967	19.07.1969
Gurdial Singh Dhillon	08.08.1969	19.03.1971
	22.03.1971	01.12.1975
Bali Ram Bhagat	05.01.1976	25.03.1977
Neelam Sanjiva Reddy	26.03.1977	13.07.1977
K. S. Hegde	21.07.1977	21.01.1980
Balram Jakhar	02.01.1980	15.01.1985
	16.01.1985	18.12.1989
Rabi Ray	19.12.1989	03.07.1991
Shivraj Patil	10.07.1991	22.05.1996
P. A. Sangma	23.05.1996	23.03.1998
G. M. C. Balayogi	24.03.1998	21.10.1999
	27.10.1999	03.03.2002
Manohar Joshi	10.05.2002	20.02.2004
Somnath Chatterjee	05.06.2004	02.06.2009
Meira Kumar	03.06.2009	04.06.2016
Sumitra Mahajan	06.06.2014	Incumbent

### Facts about Speakers of India

- The first woman Speaker in the history of the Indian Parliament is Meira Kumar, who presided over the 15th Lok Sabha session beginning in 2009.
- The first Speaker in India was G V Mavlankar, who presided over the Lok Sabha from 1952 to 1956. He is known as the Father of Lok Sabha, for his immense contribution in redesigning the country's parliamentary proceedings with intricate impartiality.
- The only Speaker to have presided over the Parliament in two consecutive terms, for the full five-year periods was Balram Jakhar.
- Speaker Rabi Ray is popularly called the Son of Soil, due to his immense straightforwardness and eye for detail in the workings of the Parliament.
- One of the most eloquent Speakers in the history of the Indian Parliament to this day is, P A Sangma.

### Deputy Speaker

- He/she is the vice-presiding officer of the Lok Sabha.
- He/she acts as the presiding officer in case of leave or absence caused by death or illness of the Speaker of the Lok Sabha.
- It is by convention that position of Deputy Speaker is offered to opposition party in India.
- **Anthasayanam Ayyangar** was the First Deputy Speaker of Lok Sabha
- **M. Thambidurai** was the present Deputy Speaker of the Lok Sabha.

### Chairman of Rajya Sabha (Article 89)

- The Vice-President is the Ex-officio Chairman of Rajya Sabha.
- As a presiding officer, the powers and functions of the Chairman of Rajya Sabha are similar to those of Speaker of Lok Sabha.

### Deputy Chairman

- Elected by Rajya Sabha itself from amongst its members. Deputy Chairman is not subordinate to the Chairman.
- He/she is directly responsible to the Rajya Sabha.

### Joint Session (Article 108)

It can be ordered by President to consider a particular bill in case

1. A bill passed by one house is rejected by other.
  2. The amendments made by the other house are not acceptable to the house where the bill originated.
  3. In case, a bill remains pending un-passed for more than 6 months.
- Joint session is presided over by the Speaker of the Lok Sabha. The deadlock over a Bill is resolved by a majority of the total numbers of the members of both the Houses present and voting.
  - In the history of Indian Parliament only 3 joint-sittings have been held in 1960, 1977 and 2002.

### Session of Parliament

The period during which the House meets to conduct its business is called a session.

1. **Budget session:** February to May
2. **Monsoon session:** July to September
3. **Winter session:** November to December



## LEGISLATIVE PROCEDURE IN PARLIAMENT

### *Law-making procedure in India*

- The Legislative procedure in India for the Union Government requires that proposed bills pass through the Lok Sabha and the Rajya Sabha.
- A Bill is the draft of a legislative proposal. Bills may be classified under four heads. These are **Ordinary, Money, Financial and Constitutional Amendment Bills**. The Legislative procedure of government bills and private members bill is same.
- Money Bills cannot be introduced in the Rajya Sabha. The other bills can be introduced in either House.

### **Stages of Bills to become an Act**

A bill has to pass through various stages before it become an Act of Parliament.

#### **First Reading**

The legislative process starts with the introduction of a Bill in either House of Parliament - Lok Sabha or Rajya Sabha.

A Bill can be introduced either by a Minister or by a private member. In the former case it is known as a Government Bill and in the latter case it is known as a Private Member's Bill.

It is necessary for a member-in-charge of the Bill to ask for leave to introduce the Bill. If leave is granted by the House, the Bill is introduced. This stage is known as the First Reading of the Bill.

#### **Publication in Gazette**

After a Bill has been introduced, it is published in the Official Gazette. Even before introduction, a Bill might, with the permission of the Speaker, be published in the Gazette.

In such cases, leave to introduce the Bill in the House is not asked for and the Bill is straightaway introduced.

#### **Reference of Bill to Standing Committee**

After a Bill has been introduced, Presiding Officer of the concerned House can refer the Bill to the concerned Standing Committee for examination and make report thereon.

#### **Second Reading**

It consists of consideration of the Bill which is in two stages.

**First Stage:** It consists of general discussion on the Bill as a whole when the principle underlying the Bill is discussed. At this stage it is open to the House to refer the Bill to a Select Committee of the House or a Joint Committee of the two Houses or to circulate it for the purpose of eliciting opinion thereon or to straightaway take it into consideration.

**Second Stage:** It consists of clause-by-clause consideration of the Bill as introduced or as reported by Select/Joint Committee.

#### **Third Reading**

It is the final reading. It is more or less a formal affair. The debate is confined to the acceptance or rejection of the Bill. The Bill is submitted to the vote of the House and has to be accepted or rejected altogether.

#### **Bill in the other House**

- After the Bill is passed by one House, it is sent to the other House for concurrence with a message to that effect, and there also it goes through the stages described above except the introduction stage.
- If the Bill, having been passed by one House, has not been passed by the other House with amendments and returned to the House in which it originated, no amendment shall be proposed to the Bill other than such amendments (if any) as are made necessary by the delay in the passage of the Bill;
- If the Bill has been so passed and returned, only such amendments as aforesaid shall be proposed to the Bill and such other amendments as are relevant to the matters with respect to which the Houses have not

agreed; and the decision of the person presiding as to the amendments which are admissible under this clause shall be final.

- A joint sitting may be held under this article and a Bill passed thereat, notwithstanding that a dissolution of the House of the People has intervened since the President notified his intention to summon the Houses to meet therein.

#### **Assent of the President**

- When a Bill is passed by both Houses, the Secretariat of the House which is last in possession of the Bill obtains the assent of the President.

- The Bill becomes an Act only after the President has given his assent to it.
- The President may give his assent or withhold his assent to a Bill.
- The President may also return the Bill with his recommendations to the Houses for reconsideration, and if the Houses pass the Bill again with or without amendments the President cannot withhold his assent to the Bill.
- The President, however, is bound to give his assent to a Constitution Amendment Bill passed by the Houses of Parliament by the requisite special majority and, where necessary, ratified by the States.

## **STATE EXECUTIVE GOVERNOR**

- **Articles 153 and 154 :** The Governor is the head of a state and the same Governor can act as Governor of more than one state . The Governor is the nominal head of a state.
- **Article 155 :** The Governor is appointed by the President by warrant under his hand and seal.

#### **Eligibility Criteria (Article 158)**

As per the Constitution of India, the following are the eligibility criteria for the appointment of the Governor in a particular state:

- He/she must be a citizen of India.
- He/she must have completed 35 years of age.
- He/she must not hold any other office of profit.
- He/she must not be a member of both the Houses of Parliament or of a House of Legislative Assembly or Legislative Council (if any).

#### **Term of the Governor**

- A governor of a state in India holds office for a period of five years.
- **Article 156 :** The Governor holds office during the pleasure of the President.

- The Governor may, by writing under his hand addressed to the President, resign his office.

#### **Oath and Salary**

- The oath of the Governor is administered by the Chief justice of the concerned State High Court and in his absence, the senior, most judge of that court.
- The Salary of the Governor is ₹ 1.1 lakh per month.

#### **Powers and Functions of Governor**

##### **Executive Powers**

- He/she appoints the leader of the majority party as the Chief Minister;
- He/she appoints the members of the council of minister on the advice of the Chief Minister;
- He/she appoints the Advocate General, Chairman and members of the respective State Public Commission;
- He/she nominates two Anglo-Indian members in the Vidhan Sabha;
- He can seek any information (administration of the affairs of the state and proposals for legislation) from the Chief Minister.

### Legislative Powers

- He/she is an integral part of the State Legislature
- He/she has the right of addressing and sending messages and of summoning proroguing and dissolving the State Assembly.
- He/she has the power to nominate one member of Anglo-Indian Community to the Legislative Assembly of the state.
- He/she appoints 1/6th members of Legislative Council.

### Judicial Powers

- He/she appoints the district judges.
- He/she is consulted in the appointment of the judges of the High Court by the President;
- He/she can, pardon, remit and commute the sentence of a person convicted by a state court.

### Financial Powers

- Money bills can be introduced in the State Legislative Assembly only on the prior recommendation of the governor.
- He/she also causes to be laid before the State Legislature the annual financial statement which is the State Budget.

### Discretionary Powers

- If no party gets an absolute majority, the Governor can use his discretion in the selection of the Chief Minister;
- During an emergency he can override the advice of the council of ministers. At such times, he acts as an agent of the President and becomes the real ruler of the state;
- He uses his direction in submitting a report to the President regarding the affairs of the state; and
- He can withhold his assent to a bill and send it to the President for his approval.

## CHIEF MINISTER

Chief Minister is the elected head of the council of ministers in a state.

### Appointment (Article 164), Oath

The CM is appointed by and sworn in by the Governor.

### Term and Salary

- Tenure of the CM is maximum for five years.
- The CM remains in office so far he is supported by the majority of the members of the Legislative Assembly.
- The CM resigns when the majority in Legislative Assembly goes against him.
- The salary of the CM is decided by the respective state legislatures in the country, as per Article 164 of the Indian Constitution. Thus it varies from one state to another.

### Power and Functions of Chief Minister

- The CM holds the executive powers of state government.
- He/she has the power to form his council of ministers, choosing members of his party for particular ministries within the working of the state.
- The core council of ministers is called the Cabinet, members of which are decided by the Chief Minister.
- The various departments are allotted to various ministers by the CM.
- Ministers are removed from their portfolios if the CM does not like his/her performance.
- The CM is the link between the Governor and the council of ministers. He is required to communicate to the Governor the workings of the various wings of the government. Similarly, the advice and suggestions of the Governor are communicated to the council of ministers by the CM.

- The CM has a pivotal role in the financial matters of a state, including the budget, basic infrastructural and developmental priorities of the state, financial planning and economic growth of the state and others.
- The Chief Minister is the chief spokesperson of the government of a state.

*All major decisions in the state are taken by the CM with the support of the council of ministers. Since the CM is the 'executive' head of the state, the technological, infrastructural and socio-economic development rests solely within his/her duty and jurisdiction. The state government is financially aided by the Centre, in terms of resources and materials.*

## STATE LEGISLATURE

*The Legislature of a State consists of the Governor and one or two Houses of Legislature, as the case may be. The two Houses of Legislature are **Legislative Council** or **Vidhan Parishad** and **Legislative Assembly** or **Vidhan Sabha**.*

### Membership of the State Legislature

**Article 173** : The following conditions must fulfilled by the members

1. He must be a citizen of India.
2. He must be not less than 30 years of age in the case of the Legislative Council and not less than 25 years of age in the case of the Legislative Assembly.
3. He must make and subscribe before the person authorised by the Election Commission an oath or affirmation according to the form prescribed in the Third Schedule.
4. He must possess other qualifications prescribed by Parliament, under Representation of People Act (1951).

**Oath of Affirmation** Administered by Governor or person appointed by him for this purpose.

### Duration of the Two Houses

- Legislative Council Same as Rajya Sabha.
- Legislative Assembly Same as Lok Sabha.

### Presiding Officers of State Legislature

- Speaker/Deputy Speaker in Legislative Assembly (Article 178).
- Chairman/Deputy Chairman in Legislative Council (Article 182).

### LEGISLATIVE COUNCIL or Vidhan Parishad (Article 171)

- It is the upper house in those states of India that have a bicameral legislature.
- As of 2014, seven (out of twenty-nine) states have a Legislative Council: Andhra Pradesh, Bihar, Jammu and Kashmir, Karnataka, Maharashtra, Telangana and Uttar Pradesh.
- In addition, Rajasthan and Assam are cleared by the parliament of India to make their own Vidhan Parishads.
- In 2015, Odisha state is preparing to set up a legislative council after conducting a study in Karnataka and Maharashtra.

### Composition of Vidhan Parishad

The size of the Vidhan Parishad cannot be more than one-third the membership of the Vidhan Sabha. However, its size cannot be less than 40 members (except in Jammu and Kashmir, where there are 36 by an Act of Parliament.)

- One-third are elected by members of local bodies such as Municipal Corporations, Municipalities, Gram Sabhas, Gram Panchayats, Panchayat Samitis and Zila Parishads.
- One-third are elected by members of Legislative Assemblies of the State from among the persons who are not members of the Assembly.

- One-twelfth are elected by persons who are graduates of three years' standing residing in that state.
- One-twelfth are elected by persons engaged for at least three years in teaching in educational institutions within the state not lower than secondary schools, including colleges and universities.
- One-sixth are nominated by the Governor from persons having knowledge or practical experience in fields such as literature, science, arts, the co-operative movement and social service.

### Chairman and Deputy Chairman of Legislative Council

The Legislative Council has two elected officials: the Chairman and Deputy Chairman. They are elected by the members of Legislative Council from amongst themselves. The Chairman, and in his absence the Deputy Chairman, presides over the meetings of the Legislative Council.

### LEGISLATIVE ASSEMBLY or Vidhan Sabha (Article 170)

- It is the lower house (in states with bicameral) or the sole house (in unicameral states) of the state legislature in the different States of India.
- The same name is also used for the lower house of the legislatures for two of the Union Territories, Delhi and Puducherry.
- Members of a Vidhan Sabha are direct representatives of the people of the particular state as they are directly elected by an electorate consisting of all citizens above the age of 18 of that state.
- Its maximum size as outlined in the Constitution of India is not more than 500 members and not less than 60 members. However, the size of the Vidhan Sabha can be less than 60 members through an Act of Parliament: such is the case in the states of Goa, Sikkim, Mizoram and the Union Territory of Puducherry.

### Speaker and Deputy Speaker of Vidhan Sabha

- Speaker of Vidhan Sabha who is responsible for the conduct of business of the body, and also a Deputy Speaker to preside during the Speaker's absence.
- The Speaker acts as a neutral judge and manages all debates and discussions in the house. Usually he or she is a member of the stronger political party.

### Strength of Legislative Assembly and Legislative Council

States / UTs	No. of Seats in LA	No. of Seats in LC
Andhra Pradesh	175	58
Arunachal Pradesh	60	-
Assam	126	-
Bihar	243	75
Chhattisgarh	90	-
Delhi (NCR)	70	-
Goa	40	-
Gujarat	182	-
Haryana	90	-
Himachal Pradesh	68	-
Jammu and Kashmir	87	36
Jharkhand	81	-
Karnataka	224	75
Kerala	140	-
Madhya Pradesh	230	-
Maharashtra	288	78
Manipur	60	-
Meghalaya	60	-
Mizoram	40	-
Nagaland	60	-
Odisha	147	-
Puducherry (UT)	30	-
Punjab	117	-
Rajasthan	200	-
Sikkim	32	-
Tamil Nadu	234	-
Telangana	119	40
Tripura	60	-
Uttarakhand	70	-
Uttar Pradesh	403	100
West Bengal	294	-

## JUDICIARY IN INDIA



- The Indian judicial system was formed by the British during their colonial rule in the country. This system is known as the **Common Law System** in which the judges develop the laws with their judgments, orders and decisions.
- The apex court of India is the **Supreme Court**, located in New Delhi, followed by the high courts in different states.
- The **High Courts** are followed by the **District Courts** and **Subordinate Courts** which are also known as the lower courts.

### Supreme Court in India

- It is the highest judicial body in India.
- It came into existence on January 28, 1950.
- It is the guardian of the Constitution and guarantor and protector of the Fundamental Rights of the citizens.
- It comprises the Chief Justice of India and 30 other judges. It has original, appellate and advisory jurisdictions.
- It was first set up in Calcutta for administration of justice. Now, it is situated in New Delhi.

### Eligibility of Supreme Court Judges, Article 124(3)

A judge of the Supreme Court must be

1. a citizen of India; and
2. either a distinguished jurist in the opinion of the President, or has been a judge of a High Court for 5 years, or has been an Advocate of a High Court (or two or more such courts in successions) for at least 10 years.

### Appointment of Supreme Court Judges

- The judges of the Supreme Court are appointed by the President.
- The Chief Justice of India (CJI) is appointed by the President after

consultation with such judges of the Supreme Court and High Courts as the President deems necessary.

- The other judges are also appointed by the President after consultation with the Chief Justice of India and such other judges of the Supreme Court and the High Court as the President deems necessary.

### Acting Chief Justice (Article 126)

The President can appoint a Judge of the Supreme Court as an acting CJI, when

- office of CJI is vacant; or
- the CJI is temporarily absent; or
- the CJI is unable to perform the duties of his office.

### Oath and Affirmation

Administered by the President of India or any person appointed by him for this purpose.

### Tenure (Term)

A judge holds the office till he/she attains the age of 65 years.

### Salary (Article 125)

- The salaries, privileges, leaves and pensions of the Supreme Court are

determined by the Parliament from time to time.

- At present the salary of the Chief Justice of India is ₹ 1 lakh.
- The Salary of other Judge of the Supreme Court is ₹ 90,000.
- The retired Chief Justice and Judges are entitled to 50% of their last drawn salary as monthly pension.

### Removal

A judge of the Supreme Court can be removed under the Constitution only on grounds of proven misconduct or incapacity and by an order of the President of India, after a notice signed by at least 100 members of the Lok Sabha (House of the People) or 50 members of the Rajya Sabha (Council of the States) is passed by a two-third majority in each House of the Parliament.

### Ad Hoc Judges, Article 127

Ad hoc judges can be appointed in the Supreme Court by “Chief Justice of India” with the prior consent of the President, if there is no quorum of judges available to hold and continue the session of the court. Only the persons who are qualified as to be appointed as Judge of the Supreme Court can be appointed as ad hoc judge of the Supreme Court.

### Retired Judges, Article 128

The President, request a retired Judge of the Supreme Court High Court, who is duly qualified for appointment as a Judge of the Supreme Court, to sit and act as a Judge of the Supreme Court.

The salary & allowance of such judge are decided by the president. The retired Judge who sits in such a session of the Supreme Court has all the jurisdiction, powers and privileges of the Judges BUT are NOT deemed to be a Judge.

### Seat of Supreme Court, Article 130

Seat of the Supreme Court is Delhi, but it can hold its meeting anywhere in India. The decision to hold a meeting anywhere in India is taken by the Chief Justice of India in consultation with President. There are no

regional benches though the demand was made in past. The demand was turned down by the Supreme Court.

### Independence of the Judges

*It is ensured by following provisions*

- Mode of appointment of CJI and judges of the Supreme Court.
- Conduct of judges cannot be discussed in Parliament or State Legislature.
- Security of tenure (removed only by the President).
- Ban on practice after retirement.
- Fixed service conditions (salary charged from Consolidated Fund of India).
- Freedom to appoint its staff.
- Power to punish its contempt.
- Separation from executive.
- Its jurisdiction cannot be curtailed.
- Difficult removal procedure.

### Powers of Supreme Court

**Article 141:** The law declared by Supreme Court is binding on all courts within the territory of India.

**Article 144 :** All authorities, civil & judicial, in the territory of India, are required to act in aid of the Supreme Court.

**Article 146 :** Exclusive power to Chief Justice of India in the matter of appointment of officers and servants of the Court.

**Article 137 :** Judicial Review is the power of the Supreme Court to examine the constitutionality of legislative enactments and executive order of both Central and State Government.

*Some famous cases, in which the Supreme Court used the power of judicial review are*

1. Golakanath Case (1967)
2. Bank Nationalisation Case (1970)
3. Privy Purse Abolition Case (1971)
4. Keshavananda Bharati Case (1973)
5. Minerva Mills Case (1980)

## **Jurisdiction of Supreme Court**

The Supreme Court has original, appellate and advisory jurisdiction.

### **Original jurisdiction**

The court has exclusive original jurisdiction over:

- Dispute between the Government of India and one or more States
- Dispute between the Government of India and any State or States on one side and one or more States on the other
- Between two or more States, if the dispute involves any question on which the existence or extent of a legal right depends
- **Writ Jurisdiction – Article 32:** Extensive original jurisdiction to the Supreme Court in regard to enforcement of Fundamental Rights through the issuance of writs.
- It is empowered to issue directions, orders or writs, including writs in the nature of habeas corpus, mandamus, prohibition, quo warranto and certiorari to enforce them.

### **Appellate jurisdiction**

The Supreme Court is primarily a court of appeal and hears appeals against the judgements of the lower courts. It enjoys a wide appellate jurisdiction, which can be classified under four heads

1. Appeals in constitutional matters.
2. Appeals in civil matters (Article 133)
3. Appeals in criminal matters (Article 134)
4. Appeal by special leave (Article 136)

### **Advisory jurisdiction**

The Supreme Court has special advisory jurisdiction in matters which may specifically be referred to it by the President of India - Article 143.

There are provisions for reference or appeal to this Court under:

Article 317(1) of the Constitution and several Acts of Parliament.

## **National Judicial Appointments Commission (NJAC)**

- It was a proposed body which would have been responsible for the appointment and transfer of judges to the higher judiciary in India.
- The Commission was established by amending the Constitution of India through the ninety-ninth constitution amendment vide the Constitution Act, 2014 passed by the Lok Sabha on 13 August 2014 and by the Rajya Sabha on 14 August 2014.
- The NJAC Bill and the Constitutional Amendment Bill, was ratified by 16 of the state legislatures in India, and subsequently assented by the President of India Pranab Mukherjee on 31 December 2014.
- The NJAC Act and the Constitutional Amendment Act came into force from 13 April 2015.

## **High Court in India**

- The High Court occupies the top position in the judicial administration of state.
- The first High Courts were set up in India in Calcutta, Bombay and Madras in 1862.
- In the year 1866 the fourth High Court was set up in Allahabad.
- The 7th amendment (1956) Act authorized the Parliament to establish a common High Court for 2 or more states or a state and a union territory.

## **Eligibility of judges of the High Court**

- Should be a citizen of India.
- Should have held a judicial office in the territory of India for 10 years, or
- Should have been an advocate of a High Court for 10 years.

## **Appointment of Judges, Article 217**

- The judges of the High Court are appointed by the President.
- The Chief Justice (CJ) is appointed by the President after consultation with the CJI and the Governor of the concerned state.
- In case of common High Court for 2 or more states the Governors of all the states are concerned by the President.



**Oath** administered by the Governor of the concerned state. In the absence of the Governor some other person appointed by the President would perform the same.

### Tenure (term)

A judge of High Court holds the office till he/she attains the age of 62 years. *Through 15th Amendment Act of 1963 the retirement age of the High Court judges has been increased from 60 to 62 years.*

### Salary

- Determined by the Parliament from time to time.
- At present the salary of the Chief Justice of High Court ₹ 90,000.
- The Salary of other Judge of the High Court is ₹ 80,000.

*Removed in the same manner like that of a Supreme Court.*

### Independence of High Court

Mode of appointment; Security of tenure; Fixed service conditions; Expenses charged on the consolidated fund of state; Conduct of judge cannot be discussed; Ban on practice after retirement; Power to punish for its contempt; Freedom to appoint its staff; its jurisdiction cannot be curtailed; Separation from executive.

### Jurisdiction and Powers of High Court

Original jurisdiction; Writ jurisdiction (Article 226); Appellate jurisdiction; Supervisory jurisdiction; Control over subordinate courts; A court of record; Power of judicial review.

The Supreme Court can issue writ jurisdiction, only where a Fundamental Right has been infringed. High Court can issue these writs Under Article 226 not only in such cases, but also where an ordinary legal right has been infringed.

High Court does not have advisory power as in case of Supreme Court.

### Jurisdiction and Seats of High Courts

High Court	Established	Jurisdiction	Seat
Allahabad	11 Jun 1866	Uttar Pradesh	Allahabad
Bombay	14 Aug 1862	Maharashtra, Goa, Dadra and Nagar Haveli, Daman and Diu	Mumbai
Calcutta	2 Jul 1862	West Bengal, Andaman and Nicobar Islands	Kolkata
Chhattisgarh	1 Nov 2000	Chhattisgarh	Bilaspur
Delhi	31 Oct 1966	National Capital Territory of Delhi	New Delhi
Gauhati	1 Mar 1948	Arunachal Pradesh, Assam, Nagaland, Mizoram	Guwahati
Gujarat	1 May 1960	Gujarat	Ahmedabad
Hyderabad	5 Jul 1954	Andhra Pradesh, Telangana	Hyderabad
Himachal Pradesh	1971	Himachal Pradesh	Shimla
Jammu and Kashmir	28 Aug 1943	Jammu and Kashmir	Srinagar/Jammu
Jharkhand	15 Nov 2000	Jharkhand	Ranchi
Karnataka	1884	Karnataka	Bengaluru
Kerala	1956	Kerala, Lakshadweep	Kochi
Madhya Pradesh	2 Jan 1936	Madhya Pradesh	Jabalpur
Madras	15 Aug 1862	Tamil Nadu, Puducherry	Chennai
Manipur	25 Mar 2013	Manipur,	Imphal
Meghalaya	25 Mar 2013	Meghalaya,	Shillong
Orissa	3 Apr 1948	Odisha	Cuttack
Patna	2 Sept 1916	Bihar	Patna
Punjab and Haryana	21 Mar 1919	Punjab, Haryana, Chandigarh	Chandigarh
Rajasthan	21 Jun 1949	Rajasthan	Jodhpur
Sikkim	16 May 1975	Sikkim	Gangtok
Tripura	26 Mar 2013	Tripura	Agartala
Uttarakhand	9 Nov 2000	Uttarakhand	Nainital

### District and Subordinate Courts

- The district and the subordinate courts are the courts below the high courts.
- These courts administer jurisdiction at the district level in India.
- The district courts are at the top of all the subordinate courts but fall under the administrative control of the state high court to which that district belongs to.
- The jurisdiction in the districts of the states is presided over by District and Sessions Judge.
- The judge is referred to as a District Judge when he presides over the civil cases and as a Sessions Judge when he presides over criminal cases.
- He is addressed as a Metropolitan Sessions Judge when he presides over a district court in a city which is recognised as a metropolitan city or area by the state government.
- The District Judge is also the highest judicial authority after the High Court Judge.

### Fast Track Courts (FTC)

- The fast track courts (FTC) in India were aimed at clearing the backlog of cases which were pending in the district and the session courts.
- These courts function on the similar procedures as session and trial courts.
- At the initial stage, the fast track courts were to look into the long-pending cases but later they were directed to look after specific cases especially for crimes against children and women.
- The scheme of fast track courts was recommended by the Eleventh Finance Commission.
- Under this scheme, the government sanctioned a sum of Rs. 502.90 crores to set up 1734 FTCs in the country.
- As per the Ministry of Law and Justice, by the end of March 2011, these courts had resolved approximately 32lakh cases.

### Lok Adalats

- The concept of Lok Adalat is based on the system of Alternative Dispute Resolution (ADR).
- They are based on the Gandhian principles of Gram Panchayats or Panch Parmeshwar.
- "Lok" stands for "people" and the meaning of "Adalat" is court and therefore this institution in general means "People's Court".
- The Lok Adalats are held by the several committees or authorities such as District Authority, State Authority, High Court Legal Services Committee, Supreme Court Legal Services and Taluk Legal Services Committee.
- These Lok Adalats are efficient to handle different cases such as motor accident compensation cases, matrimonial and family disputes, land acquisition disputes and partition claims, etc.

### Zonal Councils (Article 263)

The Zonal Councils have been created by the States Reorganization Act of 1956.

1. **Northern Zonal Council** : Consist of Punjab, Rajasthan, Haryana, Jammu and Kashmir, Himachal Pradesh, Chandigarh and Delhi. Head Quarter in Delhi
2. **Central Zonal Council** : Uttar Pradesh, Uttarakhand, Chhattisgarh and Madhya Pradesh. HQ in Allahabad
3. **Eastern Zonal Council** : Bihar, Jharkhand, West Bengal and Odisha. HQ in Kolkata
4. **Western Zonal Council** : Maharashtra, Goa, Gujarat and UTs of Dadra and Nagar Haveli and Daman Diu. HQ in Mumbai.
5. **Southern Zonal Council** : Andhra Pradesh, Tamil Nadu, Karnataka, Kerala and UT of Puducherry. HQ in Chennai.
6. **North Eastern Council** : It was created in 1972 by a separate Act of parliament for Asom, Manipur, Tripura, Meghalaya, Nagaland, Mizoram and Arunachal Pradesh. In 1994, Sikkim was included in it.

### **Special Status of Jammu and Kashmir, Article 370**

Jammu & Kashmir is accorded a special status. The prominent features of the special relationship of the State of Jammu and Kashmir with the Indian Union are as follows

- **Article 360** : The Union Government has no power to make a proclamation of Financial Emergency with respect to state of Jammu & Kashmir.
- J&K has its own Constitution, which was framed by a special Constituent Assembly and came into being on January 26, 1957.

- The Parliament cannot increase or decrease the area of the state or alter the name or boundary of the state without the consent of the State Legislature.
- The State Government shall be constituted by the centre before appointing a person as the Governor of Jammu & Kashmir.
- It has **dual citizenship**, only the citizens of Jammu & Kashmir can take part in the election to the State Legislative Assembly and only they can buy immovable property in Jammu & Kashmir.

## **PANCHAYATI RAJ**

*The Panchayati Raj in India generally refers to the system introduced by constitutional amendment in 1992 by the 73rd amendment to the Indian Constitution.*

### **73rd Amendment Act**

- It is about Rural Local Governments (which are also known as Panchayati Raj Institutions or PRIs).
- The term of the Panchayats is five years unless dissolved earlier. Seats shall be compulsorily reserved' for Scheduled' Castes and Scheduled Tribes. Seats to be reserved for backward classes is left at the discretion of the State Government.
- There is a provision of State Finance Commission to review the financial position of Panchayats and recommend grant-in-aids.
- 1/3 of the seats are reserved for women. A State Election Commission headed by the State Election Commissioner shall conduct elections for the Panchayats.
- The Constitution has provided for three tier system of Panchayats at the village, intermediate and district levels.

### **Various Committees on Panchayati Raj**

1. Balwant Rai Mehta : Estd 1957
2. V.T.Krishnamachari : 1960
3. Takhatmal Jain Study Group: 1966
4. Ashok Mehta Committee : 1977
5. G.V.K Rao committee :1985
6. Dr.L.M.Singhvi Committee:1986

### **Three Tier System**

Panchayati Raj was introduced in 1959 as a three - tier structure of self - government at the village, block and district levels.

### **Gram Panchayat**

- A Gram or village Panchayat is a statutory body covering one or more villages with an average population varying between 1,000 to 3,000 people, and an average area of about six square miles.
- It is a body of elected representatives.
- The number of member varies from 5 to 31, but is 15 on the average the village Panchayat area is generally divided into wards, each ward returning its representative to the Panchayat.

### **Panchayat Samiti**

- The next tier in Panchayat Samiti.
- It is called Anchalik Panchayat in Assam.
- Panchayat union council in Tamil Nadu, Taluka Development Board in Karnataka, Kshetra Samiti in Uttar Pradesh and Anchalik Parishad in west Bengal in Karnataka, It comprises the taluka; in Maharashtra, some samitis cover two or three blocks.

- Panchayat samitis in most cases are indirectly elected bodies, the sarpanchs of the constituent Panchayat being its member. There is a provision for co - option of or reservation for, woman, scheduled castes and scheduled tribes and for special interests, such as co - operative societies and banks.
- The MLAs and MPs representing samitis form part, One ex - offices members, generally without samiti is concurrent with that of Panchayat its president and vice - president are elected from among the elected members.

### **Zilla Parishad**

The highest tier is the Zilla Parishad, the jurisdiction of which generally extends over a district as in case of Panchayat Samiti the members of the Zilla Parishad are generally in directly elected, with the president of Panchayat provision is made for the co - option of woman, scheduled castes and scheduled tribes and special interests, such a co- operative banks and societies and persons interested in rural development.

## **URBAN LOCAL GOVERNMENTS (Nagarpalikas)**

*The 74th amendment made the provisions relating to Urban Local Governments (Nagarpalikas).*

It is divided in 3 different Government bodies (3 tier system).

1. **Municipal Corporations** or Mahanagar Palika or Mahanagar Nigam : It is an urban local government that works for the development of a city, which has a population of more than one million (ten lakh).
2. **Municipal councils** or Municipality or Nagar Palika : It is an urban local body that administers a city of population 100,000 or more.
3. **Nagar Panchayats** or Notified Area Council (NAC) or City Council : A Nagar Panchayat in India is a settlement which is in transition from rural to urban.

## **OFFICIAL LANGUAGE (Article 343 to 351)**

- The Official languages are mentioned in the **8th Schedule (Part XVII)** of the Constitution.
- **Article 343:** The official language of the Union shall be Hindi in Devanagari script.
- The Official Language Commission is appointed by the President.
- The first Official Language Commission was appointed in the year 1955.
- B G Kher was the chairman of the first Official Language Commission.
- A state can adopt more than one language.
- The original Constitution mentioned **14 languages** as the official languages.
- At present the number of languages mentioned in the 8th schedule is **22**.
- **Sindhi** was the 15th language added through 21st amendment in the year 1971.
- **Konakani, Nepali** and **Manipuri** languages were added through the 71st amendment in the year 1992.
- The next 4 languages that added through 100th amendment to the 8th schedule were **Bodo, Dogri, Maitihli** and **Santhali**.

- |             |               |              |            |
|-------------|---------------|--------------|------------|
| 1. Assamese | 7. Kannada    | 13. Marathi  | 19. Sindhi |
| 2. Bengali  | 8. Kashmiri   | 14. Nepali   | 20. Tamil  |
| 3. Bodo     | 9. Konkani    | 15. Odia     | 21. Telugu |
| 4. Dogri    | 10. Maithili  | 16. Punjabi  | 22. Urdu   |
| 5. Gujarati | 11. Malayalam | 17. Sanskrit |            |
| 6. Hindi    | 12. Manipuri  | 18. Santhali |            |

## MAJOR CONSTITUTIONAL BODIES IN INDIA

### Election Commission

- The Election commission is a constitutional body that is entrusted with the responsibility of conducting free and fair elections in the country.
- On October 16, 1989 for the first time the President appointed 2 election commissioners.
- The two election commissioners were appointed to cope with increased work of the election commission on the account of lowering the voting age from 21 to 18. This was done through 61st amendment act of 1988 and came into force in 1989.
- In October 1993 the President (Dr Shankar Dayal Sharma) appointed two more election commissioners. Since then the election commission is a multi member body.
- The Election Commission Conducts the election for the President, the Vice

President, the Lok Sabha, the Rajya Sabha, the State Legislative Assemblies, the State Legislative Councils. *Panchayats and Municipalities elections are conducted by the respective State Election Commissions.*

- The election commission prepares and revises the electoral rolls (voters List).
- The election Commission will notify the dates and schedules the elections.
- The election commission scrutinizes the nomination papers.
- The election commission recognizes the political parties.
- The election commission allots the election symbols to the political parties and also to the independent candidates.
- The election commission determines the code of conduct to be observed by the parties and the candidates at the time of elections.

### List of Chief Election Commissioners

Name	Took Office	Left Office
Sukumar Sen	21 March 1950	19 December 1958
Kalyan Sundaram	20 December 1958	30 September 1967
SP Sen Verma	1 October 1967	30 September 1972
Nagendra Singh	1 October 1972	6 February 1973
T. Swaminathan	7 February 1973	17 June 1977
S. L. Shakdhar	18 June 1977	17 June 1982
R. K. Trivedi	18 June 1982	31 December 1985
R. V. S. Peri Sastri	1 January 1986	25 November 1990
V. S. Ramadevi	26 November 1990	11 December 1990
T. N. Seshan	12 December 1990	11 December 1996
M. S. Gill	12 December 1996	13 June 2001
J. M. Lyngdoh	14 June 2001	7 February 2004
T. S. Krishnamurthy	8 February 2004	15 May 2005
B. B. Tandon	16 May 2005	29 June 2006
N. Gopalaswami	30 June 2006	20 April 2009
Navin Chawla	21 April 2009	29 July 2010
S. Y. Quraishi	30 July 2010	10 June 2012
V. S. Sampath	11 June 2012	15 January 2015
H. S. Brahma	16 January 2015	18 April 2015
Nasim Zaidi	19 April 2015	5 July 2017
Achal Kumar Jyoti	6 July 2017	Incumbent

### None of the Above (NOTA)

- It also known as "against all" or a "scratch" vote, is a ballot option in some jurisdictions or organizations, designed to allow the voter to indicate disapproval of all of the candidates in a voting system.
- It is based on the principle that consent requires the ability to withhold consent in an election, just as they can by voting no on ballot questions.

### Comptroller and Auditor General of India (CAG)

- It is established by the Constitution under Constitution of India, Article 148.
- It audits all receipts and expenditure of the Government of India and the state governments, including those of bodies and authorities substantially financed by the government.
- Article 148 to 151 of the Constitution deals with CAG's appointment, powers and audit reports.
- The CAG of India is appointed by the President for six years or till sixty five years, of age whichever is earlier.
- His removal process is similar to that of a judge of the Supreme Court. Shri V Narahari Rao, was the first Comptroller and Auditor General of India (1948-1954).
- Shashi Kant Sharma is the present CAG of India.

### Attorney General of India

- He is the Indian government's chief legal advisor, and its primary lawyer in the Supreme Court of India.
- He is appointed by the President of India under Article 76(1) of the Constitution and holds office during the pleasure of the President.
- He must be a person qualified to be appointed as a Judge of the Supreme Court.
- The 14th and current Attorney General is Mukul Rohatgi. He was appointed by Pranab Mukherjee, the President of India.
- He has been formally appointed as Attorney General of India with effect from 12 June 2014 and shall have a tenure of 5 years.

### Finance Commission

- Article 280 of the Constitution of India provides for a Finance Commission as a quasi-judicial body.
- It is constituted by the President of India every fifth year or at such earlier time as he considers necessary.
- *Finance Commission in India is briefly described in INDIAN ECONOMY.*

### Inter-state Council

- **Article 263** : It contains the provisions for the establishment of an inter-state council to effect coordination between the states and between the Centre and the states. The Sarkaria Commission on Centre-State Relations (1983-87) made a strong case for the establishment of a permanent Inter-State Council under this article.
- The Inter-State Council was established under the VP Singh Government in 1990.
- The Council consisted of:
  1. Prime minister as the Chairman
  2. Chief Ministers of all the states and the union territories having legislative assemblies
  3. Administrators of the union territories not having legislative assembly
  4. Six central ministers including the home minister, to be nominated by the prime minister

### Union Public Service Commission (UPSC)

- It was previously names as Federal Public Service Commission.
- It was given a Constitutional status with promulgation of Constitution of India on 26 January 1950.
- **Article 315**: There shall be a Public Service commission for the Union and Public service Commission for each state.
- The UPSC conduct examinations for All India Services and other central services. These are the services recruited by the central government but, posted in the states and salary is also paid by the states.
- The UPSC consists of a chairman and some other members.

- The Chairman and other members are appointed by the President.
- The strength is decided by the President of India.
- In general the UPSC consists of 9 to 11 members including the Chairman. As on January 5th 2014 the strength is 11 including the chairman.
- The Chairman or other members hold office for a term of 6 years **or** until they attain the age of 65 years, whichever is earlier.

#### **National Commission for Scheduled Castes**

- It is an Indian constitutional body established with a view to provide safeguards against the exploitation of Scheduled Castes to promote and protect their social, educational, economic and

cultural interests, special provisions were made in the Constitution.

- 1<sup>st</sup> Commission was constituted on 2004 with Suraj Bhan as the Chairperson.
- 2<sup>nd</sup> Commission was constituted on May 2007 with Buta Singh as the Chairperson.
- 3<sup>rd</sup> Commission has been constituted on October 2010 with P.L.Punia as the Chairperson.

#### **National Commission for Scheduled Tribes**

- It is an Indian constitutional body was established through Constitution (89th Amendment) Act, 2003.
- 1<sup>st</sup> Commission constituted on 2004 with Kunwar Singh as the chairperson.
- 2<sup>nd</sup> Commission constituted on 2007 with Urmila Singh as the Chairperson.
- 3<sup>rd</sup> Commission constituted on 2010 with Rameshwar Oraon as the Chairperson.

## **MAJOR NON-CONSTITUTIONAL BODIES**

*Planning Commission, NITI Aayog and National Development Council India are briefly described in INDIAN ECONOMY.*

#### **National Human Rights Commission (NHRC)**

- It is an autonomous public body constituted on 12 October 1993 under the Protection of Human Rights Ordinance of 28 September 1993.
- It is headquartered in New Delhi.

#### **National Commission for Women (NCW)**

- It is a statutory body of the Government of India, generally concerned with advising the government on all policy matters affecting women.
- It was established in January 1992 under the provisions of the Indian Constitution, as defined in the 1990 National Commission for Women Act.
- The first head of the commission was Jayanti Patnaik. On 17 September 2014 Lalitha Kumaramangalam was appointed Chairperson.

#### **National Commission for Minorities (NCM)**

- National Commission for Minorities Act, 1992 : States shall protect the existence of the National or Ethnic, Cultural, Religious and Linguistic identity of minorities within their respective territories and encourage conditions for the promotion of that identity.
- Six religious communities, viz; Muslims, Christians, Sikhs, Buddhists, Zoroastrians (Parsis) and Jains have been notified as minority communities by the Union Government.

#### **National Commission for Backward Classes**

- It is an Indian statutory body established on 14 August 1993, under the provisions of National Commission for Backward Classes Act, 1993 (Act No. 27 of 1993).
- It considers inclusions in and exclusions from the lists of communities notified as backward for the purpose of job reservations and tenders the needful advice to the Central Government

### **Law Commission of India**

- It is an executive body established by an order of the Government of India.
- Its major function is to work for legal reform. Its membership primarily comprises legal experts, who are entrusted a mandate by the Government.
- The Commission is established for a fixed tenure and works as an advisory body to the Ministry of Law and Justice.
- The first Law Commission was established during the British regime in 1834 by the Charter Act of 1833.
- Justice Balbir Singh Chauhan, a former judge of the Supreme Court was appointed Chairman of the 21st Law Commission on 10 March.

### **National Green Tribunal**

It handles the expeditious disposal of the cases pertaining to environmental issues, according to National Green Tribunal Act, 2010 (NGT). It assures the citizens of India the right to a healthy environment.

### **University Grants Commission (UGC)**

- It is a statutory body set up by the Indian Union government in accordance to the UGC Act 1956.
- It provides recognition to universities in India, and disburses funds to such recognised universities and colleges.
- It established in November 1956 and headquartered at New Delhi.

## **E-GOVERNANCE**

### **National e-Governance Plan (NeGP)**

- It is an initiative of the Government of India to make all government services available to the citizens of India via electronic media.
- It was formulated by the Department of Electronics and Information Technology (DeitY) and Department of Administrative Reforms and Public Grievances (DARPG).
- The Government approved the National e-Governance Plan, consisting of 27 "Mission Mode Projects" (MMPs) and Ten components, on 18 May 2006.

### **Strategies for E-Governance in India**

1. To build technical infrastructure / framework across India
2. To build institutional capacity
3. To build legal infrastructure
4. To build judicial infrastructure
5. To make all information available online
6. To popularise E-governance
7. Centre-State Partnership
8. To set standards



## MAJOR AMENDMENTS TO THE CONSTITUTION

**1951:** The First Amendment placed reasonable restrictions on free speech, and created the Ninth Schedule that protects laws placed in it from judicial scrutiny.

**1956:** The Seventh Amendment paved the way for reorganisation of states along linguistics lines.

**1960:** The Eight Amendment extended the period of reservation of seats for the SCs, STs and Anglo-Indians in the Lok Sabha and the State Legislative Assemblies till 1970. Since then, it is being extended every decade.

**1961:** The 12th Amendment led to incorporation of Goa, Daman and Diu as a Union Territory, consequent to acquisition from Portugal.

**1971:** The 26th Amendments led to abolition of Privy Purse paid to former rulers of princely states which were incorporated into the Indian Republic.

**1975:** The 35th and 36th Amendments made Sikkim part of the Indian Union.

**1975:** The 39th Amendment negated the judgment of Allahabad High Court invalidating PM Indira Gandhi's election to parliament. It placed restrictions on judicial scrutiny of post of PM.

**1976:** 42nd Amendment passed during Emergency curtailed fundamental rights, imposed a set of fundamental duties and added the words 'secular' and 'socialist' to the Preamble.

**1978:** The 43rd and 44th Amendments restored civil liberties post-Emergency and removed the Right to Property from the Fundamental Rights.

**1985:** The 52nd Amendment added 10th schedule to the Constitution i.e. anti defection law. It provides for disqualification of legislators in case of defection from one party to other.

**1989:** 61st Amendment lowered the voting age from 21 to 18.

**1992:** 73rd and 74th Amendments provided for direct election to all seats in Panchayats and urban local bodies.

**1994:** 76th Amendment enabled continuance of 69% reservation in Tamil Nadu by including the relevant Tamil Nadu Act under 9th Schedule of the constitution.

**2002:** The 86th Amendment provides for Right to Education until the age of fourteen and early childhood care until the age of six.

**2006:** The 93rd Amendment enables provision of reservation (27%) for OBCs in government as well as private educational institutions.

**2014:** The 99th Amendment paved the way for appointment and transfer in higher judiciary by creating National Judicial Appointment Commission. It was struck down by the SC in 2015.

**2015:** The 100th Amendment enabled exchange of certain enclaves with Bangladesh.

## SOME PARLIAMENTARY TERMS

### **Act**

A Bill passed by both Houses of Parliament/Legislature and assented to by the President/ Governor.

### **Ad hoc Committee**

A Committee constituted by the House or by the Chairman or by the presiding officers of both the Houses jointly to consider and report on specific matter.

### **Adjournment**

It is suspension of a session of the House for a day, few days or indefinitely. The presiding officer (the Speaker or the Chairman) has the discretion to do it.

### **Appropriation Bill**

A Money Bill passed annually (or at various times of the year) providing for the withdrawal or appropriation from and out of the Consolidated Fund of India, of moneys, voted by Lok Sabha and moneys charged on the Consolidated Fund for the services of a financial year or a part of a financial year.

### **Bill**

The draft of a legislative proposal put in the proper form which, when passed by both Houses of Parliament and assented to by the President becomes an Act.

### **Casting Vote**

The vote cast by the Chairman, or a Member acting as such in the House and by the Chairman or a Member acting as such in a Committee, in the case of an equality of votes on a matter.

### **Cut Motion**

The motion that seeks reduction in the amount of a demand presented by the government is known as the cut motion. The Speaker has the discretion to admit a cut motion. He may or may not admit it. This device is used by the members of the legislature to draw the attention of the government to a specific grievance or problem.

### **Calling Attention Motion**

With the prior permission of the Speaker, any member of the Parliament may call the attention of a Minister to a matter of urgent public importance. The Minister may make a brief statement about the matter or he may ask for time to make a statement later.

### **Censure Motion**

This motion seeks to censure the government for its 'lapses'. If the motion is passed in the Popular House, the government resigns.

### **Dissolve**

To 'dissolve' means to end the life of the Parliament. The President has the discretion to do it.

### **Maiden Speech**

The first speech of a member after his election/nomination to the Rajya Sabha in the House.

### **Prorogation**

The termination of a session of Rajya Sabha by an order made by the President under article 85(2)(a) of the Constitution.

### **No-confidence Motion**

It is a resolution introduced by the Opposition claiming that the House has lost its confidence in the government.

### **Privilege Motion**

It is a motion moved by a Member of Parliament. He charges the Minister with committing a breach of the privilege of the House by withholding or distorting facts.

### **Point of Order**

A Member of Parliament may raise a point of order if he feels that the proceedings of the House do not follow the normal rules. The presiding officer decides whether the point of order raised by the member should be allowed.

### **Prorogue**

It means the ending of a session of the Parliament. The President of India has the discretion to do it.

### **Quorum**

It is the minimum number of members of a legislature that must be present to make the proceedings valid. In case of the Parliament, the quorum of either House shall be one-tenth of the total number of members of the House.

### **Question Hour**

During the parliamentary session, the day's business normally begins with the question hour. The Ministers reply to the questions raised by the members of the Parliament.

### **Zero Hour**

The period follows the question hour and it starts at the noon and its duration is one hour (from 12 noon to 1 P.M.). During the zero hour, various issues of public importance are raised without prior notice.

### **Statutory Resolution**

A resolution in pursuance of a provision in the Constitution or an Act of Parliament.

### **Vote on Account**

There is usually a gap between the presentation of the budget and its approval. Sometimes, particularly in an election year, the budget may not be passed before the end of the current financial year and the beginning of the next financial year.

To meet this contingency, the vote on account is taken normally for two months for a sum equivalent to one sixth of the estimated expenditure for the entire year under demand grants. This enables the government to draw this amount from the Consolidated Fund of India to meet the expenses in the intervening period.

### **Whip**

Each party appoints a whip to control and discipline its members elected the legislature (either House of the Parliament or of the State Legislature). He is called party whip and he must be a member of the legislature.

On crucial occasions like voting no confidence motion and important bills, he exercises 'whip' to the members of the legislative wing of his party to attend the meeting and vote as directed by party leadership.

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# INDIAN ECONOMY

## INDIAN ECONOMY



### INTRODUCTION

- The word economics comes from the Ancient Greek word **oikonomia**, which means household management, administration.
- It is the study of how goods and services are produced, distributed and consumed – as resources are always in short supply – the British Economist Lionel Robbins in 1935 described the discipline as ‘the science of scarcity’.
- Economics is the "study of how societies use scarce resources to produce valuable commodities and distribute them among different people."
- "Economics is the science relating to the laws of production, distribution and exchange." - Adam Smith, Father of Economics

### Branches of Economics

*The two chief branches are*

1. **Microeconomics** is the study of economics at an individual, group or company level. It focuses on issues that affect individuals and companies.
2. **Macroeconomics** is the study of a national economy as a whole. It focuses on issues that affect the economy as a whole.

## ECONOMY

*It is a system of organizations and institutions that either facilitate or play a role in the production and distribution of goods and services in a society.*

### Open Economy

- It is not only involved in the process of production within its domestic territory but also can participate in production anywhere in the rest of the world. It involves itself in the following activities.
- It buys shares, debentures, bonds etc. from foreign countries and sells shares, debentures, bonds etc. to foreign countries.
- It borrows from foreign countries and lends to foreign countries.
- It can send gifts and remittances to foreigners and can receive the same from them.
- Normal residents of an open economy can move or be employed and are allowed to work in the domestic territory of other economies.
- Due to these reasons, Gross Domestic Product and Gross National Product are not same in an open economy. It is to be noted that at present all economies of the world are open economies.

### **Closed Economy**

- It does not have any sort of economic relation with rest of the world but is confined to itself only. It does not enter into any one of the following activities.
- It neither exports goods and services to the foreign countries nor imports goods and services from the foreign countries.
- It neither buys shares, debentures, bonds etc. from foreign countries nor sells shares, debentures, bonds etc. to foreign countries.
- It neither borrows from the foreign countries nor lends to the foreign countries.
- It neither receives gifts from foreigners nor sends gifts to foreigners.
- Normal residents of a closed economy cannot go to other countries to work in their domestic territory. No foreigner is allowed to work in the domestic territory of a closed economy.
- Due to all these reasons, Gross Domestic Product and Gross National Product are the same in a closed economy.

### **Present Status of Indian Economy**

- Indian Economy is the seventh-largest in the world by nominal GDP and the third-largest by purchasing power parity (PPP).
- The country is classified as a newly industrialised country, one of the G-20 major economies, a member of BRICS and a developing economy with an average growth rate of approximately 7% over the last two decades.
- Maharashtra is the wealthiest Indian state and has an annual GDP of US\$220 billion.
- India's economy became the world's fastest growing major economy with the GDP growth of 7.6% from the last quarter of 2014, replacing the People's Republic of China.
- India also topped the World Bank's growth outlook for 2015-16 for the first time with the economy having grown

7.6% in 2015-16 and expected to grow 7.7-8.0% in 2016-17.

- India's two major stock exchanges, Bombay Stock Exchange and National Stock Exchange of India, had a market capitalisation of US\$1.71 trillion and US\$1.68 trillion respectively as of Feb 2015, which ranks 11th & 12 largest in the world respectively according to the World Federation of Exchanges.
- India also home to world's third largest Billionaires pool with 111 billionaires in 2016 and fourth largest number of ultra-high-net-worth households that have more than 100 million dollars.
- India ranks second worldwide in farm output.
- The IT industry continues to be the largest private sector employer in India.
- India is also the fourth largest start-up hub in the world with over 3,100 technology start-ups in 2014-15.
- The agricultural sector is the largest employer in India's economy but contributes to a declining share of its GDP (17% in 2013-14).

### **Three Broad Sectors of Indian Economy**

#### **Primary Sector**

It includes agriculture and allied activities (forestry, logging and fishing), mining and quarrying.

#### **Secondary Sector**

It includes mainly industrial activities, like manufacturing, electricity, natural gas, power supply and construction.

#### **Tertiary Sector**

It includes business, trade, hotels, transport, communication, financing, insurance, public administration, defence and other services.

## Nature of Indian Economy

**Mixed Economy :** Mixed economy was coined by JM Keynes. In this economy public and private sector co-exist. The nature of Indian economy is a mixed economy.

**Developing Economy :** The following features shows that Indian economy is a developing economy

1. Rise in National Income
2. Rise in Low per capita income
3. Significant change in occupational distribution of population

4. Changes in distribution of domestic product
5. Steadily improving rate of capital formation
6. Development in banking and financial sector

**Agrarian Economy :** It relies primarily on agricultural industry including livestock farming or crop production. It is a form of economy whose major factor of production is the agricultural land.

## NATIONAL INCOME OF INDIA

- *A national income estimate measures the volume of commodities and services turned out during a given period counted without duplication.* - National Income Committee of India in 1949
- The total of national income measures the flow of goods and services in an economy.
- In India, the financial year is from 1<sup>st</sup> April to 31<sup>st</sup> March.
- Dadabhai Naoroji was the first to calculate the national income of India.

### National Income Equation

$NI = C + G + I + (X - M) + (R - P) - \text{Depreciation} - \text{Indirect tax} + \text{Subsidies}$ ,

NI = National Income

C = Total Consumption Expenditure

I = Total Investment Expenditure

G = Total Government Expenditure

X = Export

M = Import

(R - P) = Net Factor Income from abroad,

**National income at constant price :** When the National Income is measured at the base year price.

**National income at current year price :** When the national income is measured at the current year price.

When (Net national Product) NNP is calculated at Factor Cost (FC) it is called National Income. This measure is calculated by deducting indirect taxes and adding subsidies in NNP at Market Price (MP).

$NI = NNP_{FC} = NNP_{MP} - \text{Indirect Taxes} + \text{Subsidies} + \text{Government surplus}$

$NI = NNP + \text{Subsidies} - \text{Indirect taxes}$

## Methods for Measuring National Income

### Product Method

In this method, national income is measured as a flow of goods and services. We calculate money value of all final goods and services produced in an economy during a year. This represents Gross Domestic Product (GDP). Net income earned in foreign boundaries by nationals is added and depreciation is subtracted from GDP.

### Income Method

In this method, national income is measured as a flow of factor incomes. There are generally four factors of production labour, capital, land and entrepreneurship. Labour gets wages and salaries, capital gets interest, land gets rent and entrepreneurship gets profit as their remuneration. National income is obtained by adding receipts as total rent, total wages, total interest and total profit.

### Expenditure Method

In this method, national income is measured as a flow of expenditure. GDP is sum-total of private consumption expenditure. Government consumption expenditure, gross capital formation (Government and private) and net exports (Export-Import). National income is the addition of total consumption and total savings.

### Estimates of National Income in India

- During the British period (in 1868) the first attempt was made by Dadabhai Naoroji in his book 'Poverty and Un-British Rule in India'. He estimated the per capita annual income to be ₹ 20.
- Dr. V.K.R.V. Rao was the first person to adopt a scientific procedure for the estimation of national income in 1931.
- After independence, the Government of India appointed the National Income

Committee in August, 1949 with Prof. P.C. Mahalanobis as its Chairman and Prof. D.R. Gadgil and Dr. V.K.R.V. Rao as its two members so as to compile a national income estimates rationally on a scientific basis. The first report of this committee was prepared in 1951.

### National Income Committee

- The National Income Committee (NIC) set up in 1949 by the Government of India under the Chairmanship of Prof. P.C. Mahalanobis.
- The NIC recommended the holding of an annual conference on national income and wealth.
- The First Indian Conference on Research in National Income was organised by the Central Statistical Organisation (CSO) in early 1957.
- In 1964, this conference was converted into the Indian Association for Research in National Income and Wealth (IARNIW). Dr. V.K.R.V Rao was the first President of IARNIW.

### Central Statistical Organization (CSO)

It belongs to the Ministry of Statistics and Programme Implementation (MOSPI). It was set up in May 1951 in the Cabinet Secretariat with the primary object of providing technical leadership in building up the statistical system in the country.

### National Sample Survey Organisation (NSSO)

It is now known as National Sample Survey Office, is an organization under the Ministry of Statistics of the Government of India. It is the largest organisation in India conducting regular socio-economic surveys. It was established in 1950.



## NATIONAL INCOME AGGREGATES

### Gross Domestic Product (GDP)

An estimated value of the total worth of a country's production and services, within its boundary, by its nationals and foreigners, calculated over the course on one year.

$GDP = \text{Consumption} + \text{Investment} + (\text{Government spending}) + (\text{Exports} - \text{Imports})$

*Layman Usage* : Total value of products & Services produced within the territorial boundary of a country.

### Nominal GDP

It is evaluated at current market prices. Therefore, nominal GDP will include all of the changes in market prices that have occurred during the current year due to inflation or deflation.

### Real GDP

It is a better measurement of GDP, since it reflects the increase in quantity of goods and services by adjusting for any increase in prices. Real GDP is generally measured by using base year prices of goods and services.

### GDP Calculation Agency

In India, it is Central Statistics Office (CSO), which estimates GDP.

The international standards for measuring GDP are contained in the System of National Accounts (SNA), 1993, compiled by the International Monetary Fund (IMF), the European Commission (EC), the Organisation for Economic Cooperation and Development (OECD), the United Nations (UN) and the World Bank.

### Gross National Product (GNP)

An estimated value of the total worth of production and services, by citizens of a country, on its land or on foreign land, calculated over the course on one year.

$GNP = GDP + NR$  (Net income inflow from assets abroad or Net Income Receipts) - NP (Net payment outflow to foreign assets).

*Layman Usage* : Total value of Goods and Services produced by all nationals of a country (whether within or outside the country).

GDP at **market prices** ( $GDP_{MP}$ ) includes indirect taxes but excludes subsidies.

GDP at **factor cost** ( $GDP_{FC}$ ) excludes indirect taxes but includes subsidies.

$GDP_{FC} = GDP_{MP} - \text{Indirect Taxes} + \text{Subsidies}$

### Net National Product (NNP)

It is obtained by subtracting depreciation value (i.e., capital stock consumption) from GNP.  
 $NNP = GNP - \text{Depreciation}$

### Personal Income (PI)

It refers to an individual's total earnings from wages, investment enterprises, and other ventures.

$\text{Personal Income} = \text{national Income} - \text{Corporate Income Taxes} - \text{Undistributed Corporate Profits} - \text{Social Security Contribution} + \text{Transfer Payments}$

### Disposable Income (DI)

The income left after the payment of direct taxes from personal income is called Disposable Income. Disposable income means actual income which can be spent on consumption by individuals and families. Thus, it can be expressed as:

$$\text{Disposable Income} = \text{Personal Income} - \text{Direct Taxes}$$

From consumption approach,

$$\text{Disposable Income} = \text{Consumption Expenditure} + \text{Savings}$$

### Per Capita Income (PCI)

**Per Capita Income** of a country is derived by dividing the national income of the country by the total population of a country. Thus,

$$\text{PCI} = \frac{\text{Total National Income}}{\text{Total National Population}}$$

## ECONOMIC PLANNING IN INDIA

- In 1948, an Industrial Policy Statement was announced. It suggested the setting up of a National Planning Commission and framing the policy of a mixed economic system.
- On 26 January 1950, the Constitution came into force. As a logical sequence, the Planning Commission was set up on 15 March 1950 and the plan era started from 1 April 1951 with the launching of the First Five Year Plan (1951-56).
- However, the idea of economic planning in India can be traced back to the pre-independent days.
- “The idea of economic planning gained currency in India during and after the years of the Great Agricultural Depression (1929-33). The then Government of India was by and large guided by a policy of leaving economic matters to individual industrialists and traders.”

Timeline of planning in India	
1934	Visvesvaraya plan in this book “The planned economy of India”. He was an Engineer, Ex-Diwan of Mysore and Bharat Ratna recipient.
1938	Nehru’s Congress plan. But not implemented due to WW2.
1944	Bombay plan by noted industrialists such as JRD Tata, GD Birla, Kasturbhai Lalbhai et al.
1944	Sriman Narayan Agrawal’s Gandhian plan.
1945	MN Roy’s “people’s plan” – with socialist leanings.
1950	Jayprakash Narayan’s Sarvodaya Plan based on Vinoba Bhavé’s philosophy
1950, March 15	Cabinet resolution to form Planning commission.
1952, Aug.	National Development council (NDC) made by Cabinet resolution.
2014, Aug.	Prime Minister Narendra Modi shuts down planning commission.
2015, Jan	Government notified the formation of NITI Aayog National Institution for Transforming India.

## PLANNING COMMISSION

- It was an institution in the Government of India, which formulated India's Five-Year Plans, among other functions.
- It was set up by the Government of India on 15 March 1950.
- In his first Indian Independence Day, speech in 2014 Prime Minister Narendra Modi announced his intention to dissolve the Planning Commission. It has since been replaced by a new institution named NITI Aayog.

## NITI AAYOG

- The National Institution for Transforming India Aayog is a Government of India policy think-tank established by Prime Minister Narendra Modi to replace the Planning Commission.
- It came to existence on January 1, 2015.
- It will be providing strategic and technical advice to the Central and the State Governments.

### Composition of NITI Aayog

- **Chairperson :** Prime Minister
- **Governing Council :** Its members are Chief Ministers and Administrators of the Union Territories
- **Regional Councils :** These would be created as per need and its members would be chief ministers and administrators of UTs of respective regions.
- **Vice-Chairperson :** The Vice-chairperson of the NITI Aayog will be appointed by Prime Minister. The first Vice-Chairperson of NITI Aayog is Arvind Panagariya.

### Functions of NITI Aayog

- It will develop mechanisms for formulation of credible plans to the village level and aggregate these progressively at higher levels of government.
- Special attention will be given to the sections of the society that may be at risk of not benefitting adequately from economic progress.
- It will also create a knowledge, innovation and entrepreneurial support system through a collaborative community of national and international experts, practitioners and partners.
- It will offer a platform for resolution of inter-sectoral and inter-departmental issues in order to accelerate the implementation of the development agenda.
- It will also monitor and evaluate the implementation of programmes, and focus on technology upgradation and capacity building.

### National Development Council (NDC)

- It is the apex body for decision making and deliberations on development matters in India, presided over by the Prime Minister.
- It is also called as Rashtriya Vikas Parishad.
- It was set up on 6 August 1952.
- The Council comprises the Prime Minister, the Union Cabinet Ministers, Chief Ministers of all States or their substitutes, representatives of the Union Territories and the members of the Planning Commission.
- It is an extra-constitutional and non-statutory body.

### Functions of NDC

- To prescribe guidelines for the formulation of the National Plan, including the assessment of resources for the Plan;
- To consider the National Plan as formulated by the Planning Commission;
- To make an assessment of the resources that are required for implementing the Plan and to suggest measures for augmenting them.
- To consider important questions of social and economic policy affecting national development; and
- To review the working of the Plan from time to time and to recommend such measures as are necessary for achieving the aims and targets set out in the National Plan.
- To recommend measures for achievement of the aims and targets set out in the national Plan.

### Economic Growth

- It indicates quantitative improvement in the economic progress of a country
- It shows growth in natural income and per capita income over time
- A country may grow but it may not develop.
- Economic Growth = Size of output (A Quantitative aspect)

### Economic development

- It indicates qualitative improvement in the economic progress of a country
- It shows not only a sustained increase in national and per capita income but also

qualitative changes which leads to higher standard of living.

- It includes the notion of economic growth.
- Economic Development = Size of output + Welfare (A Qualitative aspect)

### The four factors contributing to growth are

1. capital formation (machines, factories, roads)
2. technology (science, engineering, management, entrepreneurship)
3. human resources (labour supply, education, discipline, motivation)
4. national resources (land, minerals, fuels, environmental quality)

## FIVE YEAR PLANS IN INDIA

Plan	Period	Theme/Model/target
1st	1951 1956	Harrod Domar Model Main focus: Agriculture, irrigation and power. Got more GDP growth than its original target.
2nd	1956 1961	P.C.Mahalanobis Model Socialist model, Rapid industrialization, heavy industries.
3rd	1961 1966	Sukhmoy Chakraborty and Sanddy Also called "Gadgil Yojana". Failed to achieve its target due to droughts and wars with Pak-China
Annual Plan	1966 1969	The difficulties encountered in the implementation of the Third plan and the inadequate rate of growth of the economy delayed the Fourth plan by three years. During this period annual plans were made.
4th	1969 1974	Ashok Rudra-Alon Manney growth with stability and self-reliance. [Garibi Hatao came here, says LucentGK] #EPICFAIL due to Bangladeshi refugee problem and drought.
5th	1974 1979	C.Subramaniam and later redrafting by D.P.Dhar Originally it was a 10 year long term perspective plan with focus on poverty removal and self-reliance
Annual plan	1978 1980	Morarji Desai's Janta government came up with Rolling plan system – It will measure progress every year and make new plans accordingly for next year.
6th	1980 1985	Poverty removal (Garibi Hatao), IRDP, NREM, TRYSEM etc. [Garibi Hatao came here says Ramesh Singh]
7th	1985 1989	Pranav Mukherjee Focus on employment. Jawahar Rozgar Yojana started.
Annual plan	1989 1991	Political instability at Centre. Hence only annual plans.
8th	1992 1997	John W.Miller model. PV Narasimha Rao- LPG reforms
9th	1997 2002	Growth with social justice and equity. Mostly "indicative" planning. #EPICFAIL due to global slowdown after Asian financial crisis.
10th	2002 2007	8% GDP growth rate, double per capita income in 10 years.
11th	2007 2012	Theme: "inclusive growth" C.Rangarajan framed it with targets: 8-10% growth rate, 70 million new jobs, lower IMR, CMR, TFR etc.

## 12TH FIVE YEAR PLAN (2012-17) OVERVIEW AND HIGHLIGHTS

- Theme: “Faster, More inclusive and sustainable growth”.
- The Twelfth Five-Year Plan of the Government of India has decided for the growth rate at 8.2% but the National Development Council (NDC) on 27 Dec 2012 approved 8% growth rate for 12th five-year plan.

### Economic Growth

- Real GDP Growth Rate of 8.2 per cent.
- Agriculture Growth Rate of 4.0 per cent.
- Manufacturing Growth Rate of 10.0 per cent.
- Every State must have a higher average growth rate in the XII Plan than that achieved in the Eleventh Plan.

### Poverty and Employment

- Head-count ratio of consumption poverty to be reduced by 10 percentage points over the preceding estimates by the end of XII Plan.
- Generate 50 million new work opportunities in the non-farm sector and provide skill certification to equivalent numbers during the XII Plan.

### Education

- Mean Years of Schooling to increase to seven years by the end of XII Plan.
- Enhance access to higher education by creating two million additional seats for each age cohort aligned to the skill needs of the economy.
- Eliminate gender and social gap in school enrolment (that is, between girls and boys, and between SCs, STs, Muslims and the rest of the population) by the end of XII Plan.

### Health

- Reduce IMR to 25 and MMR to 1 per 1000 live births, and improve Child Sex Ratio (0-6 years) to 950 by the end of the XII Plan.

- Reduce Total Fertility Rate to 2.1 by the end of XII Plan.
- Reduce under-nutrition among children aged 0-3 years to half of the NFHS-3 levels by the end of XII Plan.

### Infrastructure, Including Rural Infrastructure

- Increase investment in infrastructure as a percentage of GDP to 9 per cent by the end of XII Plan.
- Increase the Gross Irrigated Area from 90 million hectare to 103 million hectare by the end of XII Plan.
- Provide electricity to all villages and reduce AT&C losses to 20 per cent by the end of XII Plan.
- Connect all villages with all-weather roads by the end of XII Plan.
- Upgrade national and state highways to the minimum two-lane standard by the end of XII Plan.
- Complete Eastern and Western Dedicated Freight Corridors by the end of XII Plan.
- Increase rural tele-density to 70 per cent by the end of XII Plan.
- Ensure 50 per cent of rural population has access to 55 LPCD piped drinking water supply and 50 per cent of gram panchayats achieve the Nirmal Gram Status by the end of XII Plan.

### Environment and Sustainability

- Increase green cover (as measured by satellite imagery) by 1 million hectare every year during the XII Plan.
- Add 30000 MW of renewable energy capacity in the XII Plan.

- Reduce emission intensity of GDP in line with the target of 20 per cent to 25 per cent reduction by 2020 over 2005 levels.

### Service Delivery

- Provide access to banking services to 90 per cent Indian households by the end of XII Plan
- Major subsidies and welfare related beneficiary payments to be shifted to a direct cash transfer by the end of the XII Plan, using the Aadhar platform with linked bank accounts.

## DEMOGRAPHY

*“Demo” means “the people” and “graphy” means “measurement”. So, it is the study of statistics such as births, deaths, income, or the incidence of disease, which illustrate the changing structure of human populations.*

### Demographics of India

- India is the second most populous country in the world, with over 1.277 billion people (2015), more than a sixth of the world's population. Already containing 17.5% of the world's population, India is projected to be the world's most populous country by 2022, surpassing China, its population reaching 1.6 billion by 2050.
- Population : 1,236,344,631 (July 2014 est.)
- Density : 383 people per.sq.km
- Growth rate : 1.25%
- **Most Populous Metro cities** : Mumbai, Delhi, Kolkata, Chennai, Bangalore
- **Top five literate States/UTs** : Kerala, Lakshadweep, Mizoram, Goa, Tripura
- **Best Sex ratio of five States/UTs** : Kerala, Puduchery, Tamil Nadu, Andhra Pradesh, Manipur
- **Top growth rate of five States/UTs** : Dadra and Nagar Haveli, Daman and Diu, Puducherry, Meghalaya, Arunachal Pradesh
- **Top Least Populated States/UTs** : Lakshadweep, Daman and Diu, Dadra and Nagar Haveli, Andaman and Nicobar Islands, Sikkim

### Comparative demographics

Category	Global Ranking
Area	7th
Population	2nd
Population growth rate	102nd of 212
Population density (people per square kilometer of land area)	24th of 212
Male to Female ratio, at birth	12th of 214

## Ranks of States and UTs according to Population (2011 Census)

Rank	State or union territory	Population (2011 Census) and % of Total Population	Sex Ratio	Density
1	Uttar Pradesh	199,581,477 (16.49%)	908	829
2	Maharashtra	112,372,972 (9.28%)	946	365
3	Bihar	103,804,637 (8.58%)	916	1106
4	West Bengal	91,347,736 (7.55%)	947	1028
5	Andhra Pradesh	84,655,533 (7.00%)	992	308
6	Madhya Pradesh	72,597,565 (6.00%)	930	236
7	Tamil Nadu	72,138,958 (5.96%)	995	555
8	Rajasthan	68,621,012 (5.67%)	926	200
9	Karnataka	61,130,704 (5.05%)	968	319
10	Gujarat	60,383,628 (5.00%)	918	308
11	Odisha	41,947,358 (3.47%)	978	270
12	Kerala	33,387,677 (2.76%)	1,084	860
13	Jharkhand	32,966,238 (2.72%)	947	414
14	Assam	31,169,272 (2.58%)	954	398
15	Punjab	27,704,236 (2.30%)	893	551
16	Chhattisgarh	25,540,196 (2.11%)	991	189
17	Haryana	25,353,081 (2.09%)	877	573
18	Jammu and Kashmir	12,548,926 (1.04%)	883	56
19	Uttarakhand	10,116,752 (0.84%)	963	189
20	Himachal Pradesh	6,856,509 (0.57%)	974	123
21	Tripura	3,671,032 (0.30%)	961	350
22	Meghalaya	2,964,007 (0.24%)	986	132
23	Manipur	2,721,756 (0.22%)	987	115
24	Nagaland	1,980,602 (0.16%)	931	119
25	Goa	1,457,723 (0.12%)	968	394
26	Arunachal Pradesh	1,382,611 (0.11%)	920	17
27	Mizoram	1,091,014 (0.09%)	975	52
28	Sikkim	607,688 (0.05%)	889	86
NCT	Delhi	16,753,235 (1.38%)	866	11320
UT1	Puducherry	1,244,464 (0.10%)	1,038	2547
UT2	Chandigarh	1,054,686 (0.09%)	818	9258
UT3	Andaman and Nicobar Islands	379,944 (0.03%)	878	46
UT4	Dadra and Nagar Haveli	342,853 (0.03%)	775	700
UT5	Daman and Diu	242,911 (0.02%)	618	2191
UT6	Lakshadweep	64,429 (0.01%)	946	2149
<b>Total</b>	<b>India</b>	<b>1,210,193,422 (100%)</b>	<b>940</b>	<b>382</b>

### National Population Commission

- It is a commission of the Indian government.
- It is chaired by the prime minister with the Deputy Chairman Planning Commission as vice chairman. Chief ministers of all states, ministers of the related central ministries, secretaries of the concerned departments, eminent physicians, demographers and the representatives of the civil society are members of the commission.

### The commission has the mandate

- To review, monitor and give direction for implementation of the National Population Policy with the view to achieve the goals set in the Population Policy
- Promote synergy between health, educational environmental and developmental programmes so as to hasten population stabilization
- Promote inter sectoral coordination in planning and implementation of the programmes through different sectors and agencies in center and the states
- Develop a vigorous peoples programme to support this national effort.

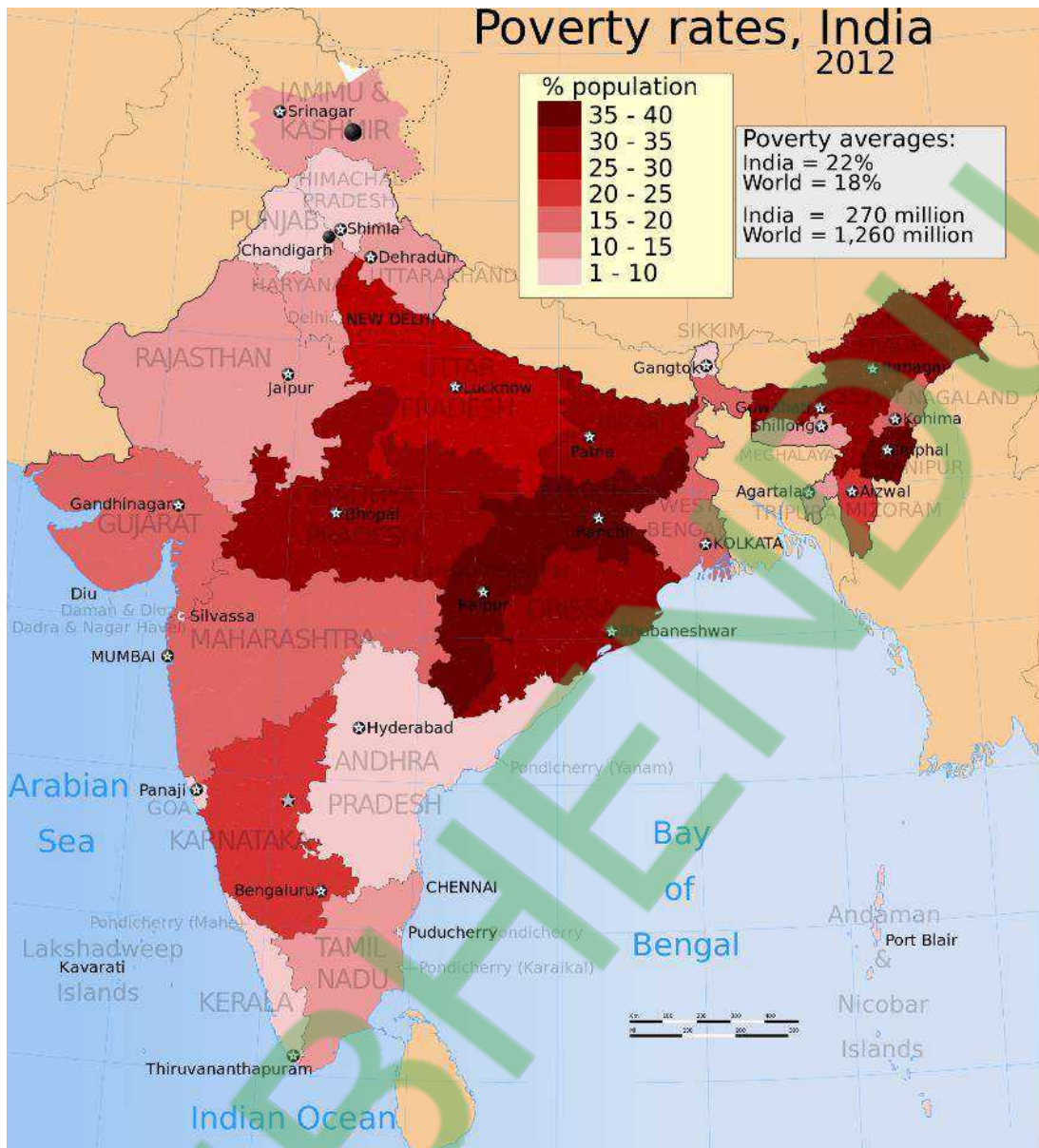
## POVERTY OF INDIA

- Poverty refers to a situation when people are deprived of basic necessities of life. It is often characterized by inadequacy of food, shelter and clothes.
- The World Bank reviewed and proposed revisions in May 2014, to its poverty calculation methodology and purchasing power parity basis for measuring poverty worldwide, including India. According to this revised methodology, the world had 872.3 million people below the new poverty line, of which 179.6 million people lived in India. In other words, India with 17.5% of total world's population, had 20.6% share of world's poorest in 2011.



- There are several definitions of poverty, and scholars disagree as to which definition is appropriate for India.
- The 19th century and early 20th century saw increasing poverty in India during the colonial era.
- **Mixed Recall Period**, gives consumer expenditure data for five non-food items, namely clothing, footwear, durable goods, education and institutional medical expenses for 365 days and consumption data for remaining items are collected for 30 days period.
- **Universal Recall Period**, consumption data for all items are collected for a 30 days recall period.





### Causes of Rural Poverty

- Illiteracy
- Regional disparities
- Joint family system
- Child marriage
- Rapid growth of Population
- Excessive population pressure on agriculture
- Lack of capital
- Lack of alternate employment opportunities other than agriculture
- Lack of proper implementation of PDS (Public Distribution System)

### Causes of Urban Poverty

- Lack of skilled labour
- Lack of housing facilities
- Limited job opportunities in cities
- Lack of vocational education/ training
- Migration from rural areas

### Redefined meaning of 'Slums'

- The Pranab Sen Committee has defined a slum as "a compact settlement of at least 20 households with a collection of poorly built tenements, mostly of temporary nature, crowded together usually with

inadequate sanitary and drinking water facilities in unhygienic conditions”.

- As reported by the Office of Registrar General of India (ORGI), Census 2011 will use the same definition as used by Census 2001 for delineating the slum blocks in the notified, recognized and identified slum areas of each statutory town.

### **A "corrupt" poverty line**

The poverty in India is measured by a poverty line that is probably one of the most disputed and incessantly attacked measure in the world. The World Bank's controversial poverty line has its origins in the Indian model! It is simply what some call a "starvation line", a line that accounts for the feeling of satiety: measured in calories.

### **Poverty in India - Statistics**

- 40% of Indians don't have proper shelter;
- 60% don't have access to decent toilets
- 35% of households don't have a nearby water source;
- 65% of villages don't have a secondary school
- 40% of villages don't have proper roads connecting them.

### **Reduction in poverty**

The World Bank's Global Monitoring Report for 2014-15 on the Millennium Development Goals says India has been the biggest contributor to poverty reduction between 2008 and 2011, with around 140 million or so lifted out of absolute poverty. Since the early 1950s, Indian government initiated various schemes to help the poor attain self-sufficiency in food production. These have included ration cards and price controls over the supply of basic commodities, particularly food at controlled prices, available throughout the country. These efforts prevented famines, but did little to eliminate or reduce poverty in rural or urban areas between 1950 and 1980.

One of the main reasons for record decline in Poverty is India's rapid economic growth rate since 1991. Another reason proposed is India's launch of social welfare programs such as Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) and Midday Meal Scheme in Government Schools.

### **Solution to Reduce Poverty**

- Farmers must get all facilities for irrigation.
- They should be trained and educated.
- Agriculture must be made profitable.
- The ever-rising population should be checked.
- Family planning schemes should be introduced.
- More and more industries should be set up to meet the needs of our country.
- Corruption must end. Our offices should work efficiently.

## UNEMPLOYMENT

- It can be understood as a situation in which no job is available for a person to earn means of livelihood.
- Its records in India are kept by the Ministry of Labour and Employment of India.
- It is found both in industrial and agricultural sector.
- Ten million Indians with graduate, post-graduate and technical degrees were looking for work, meaning that 15% of all Indians with the highest levels of education were seeking job as of 2011. Kerala had India's highest graduate unemployment rate at over 30 per cent.
- Unemployment Rate in India averaged 7.58 Percent from 1983 until 2012, reaching an all time high of 9.40 Percent in 2009 and a record low of 5.20 Percent in 2012. Unemployment Rate in India is reported by the Ministry of Labour and Employment, India.
- *The National Sample Survey (NSS) of India which conducts periodic surveys to estimate different categories of unemployment usually makes a three-fold classification of unemployment. These are:*

### Usual Status Unemployment (USU)

It relates to a person who is considered unemployed but has been trying to get the work. Here we measure it in terms of persons remaining unemployed.

### Current Weekly Status (CWS)

It relates to a person who has not been able to get employment even for a single hour throughout the week but wants to get the work. It is measured in terms of the number of persons.

### Current Daily Status (CDS)

CDS refers to the aggregate of all the unemployment days of all persons in the labour force during the week. This is a general concept which includes chronic unemployment and under-employment. It is measured in number of days during the survey week.

### Daily Status Unemployment

It is considered by the government to be the best indicator of unemployment situation in the country.

### Causes of Unemployment

- Rapid Population Growth
- Limited Land
- Seasonal Agriculture
- Fragmentation of Land
- Backward Method of Agriculture
- Decline of Cottage Industries
- Defective education
- Lack of transport and communication
- Inadequate Employment Planning

### TYPES OF UNEMPLOYMENT

#### Structural Unemployment

It is a form of unemployment caused by a mismatch between the skills that workers in the economy can offer, and the skills demanded of workers by employers (also known as the skills gap).

Basically India's unemployment is structural in nature.

#### Under Employment

It refers to that state in which the self-employed working people are not working according to their capacity. This type of unemployment is mostly visible in urban areas.

### **Open Unemployment**

It is a condition in which people have no work to do. They are able to work and are also willing to work but there is no work for them. They are found partly in villages, but very largely in cities.

The migration from rural to urban areas in search of work is very often found in India which is an example of open unemployment.

### **Disguised Unemployment**

It implies that many workers are engaged in productive work. For example, in Indian villages, where most of unemployment exists in this form, people are found to be apparently engaged in agricultural works.

The very large numbers of workers on Indian farms actually hinder agricultural works and thereby reduce production.

### **Frictional Unemployment**

Frictional unemployment is caused due to improper adjustment between supply of labour and demand for labour. This type of unemployment is due to immobility of labour, lack of correct and timely information, seasonal nature of work. etc.

### **Seasonal Unemployment**

It is unemployment that occurs during certain seasons of the year. In some industries and occupations like agriculture, holiday resorts, ice factories etc., production activities take place only in some seasons. So they offer employment for only a certain period of time in a year.

People engaged in such type of activities may remain unemployed during the off-season.

### **Cyclical Unemployment**

It is caused by trade cycles at regular intervals. Generally capitalist economies are subject to trade cycles. The down swing in business activities results in unemployment. It is normally a short-run phenomenon.

### **Casual Unemployment**

When a person is employed on a day-to-day basis, casual unemployment may occur due to short-term contracts, shortage of raw materials, fall in demand, change of ownership etc.

### **Technological Unemployment**

It is the result of certain changes in the techniques of production which may not warrant much labour. Modern technology being capital intensive requires less labourers and contributes to this kind of unemployment.

## **PRADHAN MANTRI JAN DHAN YOJANA**

*It is a scheme for comprehensive financial inclusion launched by the Prime Minister of India, Narendra Modi on August 28, 2014. He had announced this scheme on his first Independence Day speech on August 15, 2014. Account holders will be provided zero-bank account with Rupay debit card, in addition to accidental insurance cover of ₹ 1 lakh (to be given by 'HDFC Egro'), After six months of opening of the bank account, holders can avail ₹ 5000 overdraft from the bank.*

## BRIEF DESCRIPTIONS OF MAJOR PROGRAMMES

### Employment, Poverty, Rural and Urban Development Programmes

Name of the Programmes	Year of Beginning	Objectives/Descriptions
<b>Training Rural Youth for Self-Employment (TRYSEM)</b>	1979	Programme for training rural youth self-employment.
<b>Integrated Rural Development Programme (IRDP)</b>	1980	All round development of the rural poor through a programme of asset endowment for self-employment.
<b>National Rural Employment Programme (NREP)</b>	1980	To provide profitable employment opportunities to the rural poor.
<b>Rural Landless Employment Guarantee Programme (RLEGP)</b>	1983	For providing employment to landless farmers and laborers.
<b>Jawahar Rozgar Yojana</b>	1989	For providing employment to rural unemployed.
<b>Nehru Rozgar Yojana</b>	1989	For providing employment to urban unemployed.
<b>Scheme of Urban Wage Employment (SUWE)</b>	1990	To provide wages employment after arranging the basic facilities for poor people in the urban areas, where population is less than 1 lakh.
<b>Employment Assurance Scheme (EAS)</b>	1993	To provide employment of a least 100 days in a year in village.
<b>Swarana Jayanti Shahari Rozgar Yojana (SJSRY)</b> , it has been revamped with effect from April 2009. The revamped scheme has five components 1. Urban Self-Employment Programme (USEP); 2. Urban Women Self Help Programme (UWSP); 3. Skill Training for Employment Promotion amongst Urban Poor (STEP-UP); 4. Urban Wage Employment Programme (UWEP) Urban Community Development Network (UCDN)	1997	To provide gainful employment to urban unemployed and under employed poor through self-employment of wage employment.
<b>Swaranajayanti Gram Swarozgar Yojana (SSGSY)</b> , it replaced IRPD, DWCRA, Ganga Kalyan Yojana (1997). Million Wells Scheme (1989) and Supply Improved Tolls kits to Rural Artisans (1992)	1st April, 1999	For elimination rural property and unemployment and promoting self-employment through establishing micro enterprises in rural areas. Targets to cover 50% SCs/STs. 40% women, 15% minorities and 3% disabled.
<b>Pradhan Mantri Gramodya Yojana (PMGY)</b>	2000	Focus on village level development in 5 critical areas. i.e. primary health, primary education, housing, rural roads and drinking water and nutrition with the overall objective of improving the quality of life of people in rural areas.
<b>Annapurna Scheme</b>	2000	To ensure food security for all, create a hunger free India in the next five serve the poorest of the poor in rural and urban areas.
<b>Food Work Programme</b>	2001	To give food through wage employment in the drought affected areas in 8 states. Wages are paid by the State Governments, partly in cash and partly in food-grains.
<b>Jai Prakash Narayan Rozgar Guarantee Yojana (JPNRGY)</b>	Proposed in 2002-03 Budget	Employment guarantee is must poor districts.
<b>MGNREGS (Mahatma Gandhi National Rural Employment Guarantee Scheme)</b> . The scheme was notified throughout the	2nd February, 2006	It aims at enhancing livelihood security of households in rural areas of the country by providing at least 100 days on guaranteed wage employment in a financial

country with effect from 1st April, 2008. Renamed as MGNREGS from 2nd October, 2009 SGRY and Food for Work Programme merged into It.		year to every household, whose adult members volunteer to do unskilled manual work. It also mandates 33% participation for women. The primary objective of the scheme is to augment wage employment.
<b>Prime Minister's Employment Generation Programme (PMEGP)</b>	2008	To generate employment opportunities in rural as well as urban areas through setting up of self-employment ventures/projects/ micro enterprises.
<b>Rajeev Awas Yojana</b>	2010	To make India shine free in next 5 years.
<b>Nirmal Bharat Programme</b>	2012	To eradicate practice of open defecation by 2020.
<b>Direct Benefit Transfer</b>	2013	Anti-Poverty Programme, aimed to transfer subsidies directly to the people living below poverty line.
<b>HRIDAY – Heritage City Development and Augmentation Yojana</b>	Jan, 2015	The scheme seeks to preserve and rejuvenate the rich cultural heritage of the country.
<b>Smart Cities Mission</b>	June 25, 2015	To enable better living and drive economic growth stressing on the need for people centric urban planning and development.
<b>Atal Mission for Rejuvenation and Urban Transformation (AMRUT)</b>	June 25, 2015	To enable better living and drive economic growth stressing on the need for people centric urban planning and development.
<b>Pradhan Mantri Awas Yojana (PMAY)</b>	June 25, 2015	To enable better living and drive economic growth stressing on the need for people centric urban planning and development.

### Rural Development Programmes

Name of the Programmes	Year of Beginning	Objectives/Descriptions
<b>Community Development Programmes (CDP)</b>	1952	Overall development of rural areas with people's participation.
<b>National Fund for Rural Development (NFRD)</b>	1984	To grant 100% tax rebate to donors and also to provide financial assistance for rural development projects.
<b>Council for Advancement of People's Actions and Rural Technology (CAPART)</b>	1986	To provide assistance for rural prosperity.
<b>District Rural Development Agency (DRDA)</b>	1993	To provide financial assistance for rural development.
<b>Pradhan Mantri Gram Sadak Yojana (PMGSY)</b>	2000	To line all villages with pakka road.
<b>Bharat Nirman Programme</b>	2005	Development of rural infrastructure including six components: irrigation, water supply, housing, road, telephone and electricity.
<b>Indira Awas Yojana (IAY)</b>	1999	To help construction of new dwelling units as well as conversion of unserviceable kutcha houses into pucca/semi-pucca by members of SC/STs rural poor below the poverty line by extending them grant-in-aid.
<b>Twenty Point Programme</b>	1975	Poverty eradication and raising the standard of living
<b>Drought Prone Areas Programme (DPAP)</b>	1973 – 74	To minimise the adverse effects of drought on production of crops and livestock and productivity of land, water and human resources, ultimately leading to drought proofing of the affected areas.
<b>Annapurna Scheme</b>	2000	To ensure food security for all, create a hunger free India in the next 5 years and to reform and improve the Public Distribution System, so as to serve the poorest of the poor in rural and urban areas.

<b>National Rural Drinking Water Programme</b> (NRDWP) previously called Accelerated Rural Water Supply Programme	1st April, 2009	Aims to move forward from achieving habitation level coverage towards household level drinking water coverage through resorting to multiple sources like ground water, surface water etc.
<b>Total Sanitation Campaign</b> (TSC)	1st April, 1999	It follows a community led and people-centred approach and places emphasis on Information, Communication and Education (ICE) for demand generation of sanitation facilities.
<b>Nirmal Gram Puruskar</b> (NGP)	October, 2003	It is an incentive scheme to encourage PRIs to take up sanitation promotion.
<b>Desert Development Programme</b> (DDP)	1977-78	To mitigate the adverse effects of desertification.
<b>Integrated Wasteland Development Programme</b> (IWDP)	1989-90	For the development of wasteland and degraded lands.
<b>Valmiki Ambedkar Aawas Yojana</b> (VABAY)	December, 2001	Facilitates construction and upgradation of dwelling units for slum dwellers.
<b>Jawaharlal Nehru Urban Renewal Mission</b> (JNNURM)	3rd December 2005	To assist cities and towns in taking up housing and infrastructural facilities for the urban poor in 63 cities (now 65 cities) in the country.
<b>Member of Parliament Local Area Development Programme</b> (MPLAD)	1993	It provides for ₹ 2 crore to each MP to undertake development activities in its constituency. The amount has been raised to ₹ 5 crore from 2011.
<b>Affordable Housing in Partnership</b> (AHIP)	2009	Aims at constructing one million houses for the EWS/LLG/MIG with at least 25% for EWS category seeks to operationalize National Habitat Policy, 2007.
<b>Rajiv Aawas Yojana</b> (RAY)	2010	It aims at 'slum-free' India in next 5 years.
<b>Deen Dayal Upadhyaya Gram Jyoti Yojana</b>	2015	It is a Government of India program aimed at providing 24x7 uninterrupted power supply to all homes in Rural India

### Women Empowerment Programmes

Name of the Programmes	Year of Beginning	Objectives/Descriptions
<b>Support to Training and Employment Programme for Women</b> (STEP)	2003-04	To increase the self-reliance and autonomy of women by enhancing their productivity and enabling them to take up income generation activities.
<b>Rajiv Gandhi Scheme for Empowerment of Adolescent Girls</b> (RGSEAG)- 'Sabla'	19th November, 2010	It aims at empowering adolescent girls of 11 to 18 years by improving their nutritional and health status, upgradation of home skills and vocational skills.
<b>Rashtriya Mahila Kosh-</b> (National Credit Fund for Women)	1993	It extends micro-finance services through a client friendly and hassle-free loaning mechanism for livelihood activities, housing micro enterprises, family needs, etc. to bring about the socio-economic upliftment of poor women.
<b>Indira Gandhi Matritva Sahyog Yojana</b> (IGMSY)	2010	To improve the health and nutrition status of pregnant, lactating women and infants.
<b>Swayam Siddha</b>	2001	At organising women into Self-Help Groups to form a strong institutional base.
<b>Swadhar</b>	1995	To support women to become independent in spirit, in thought, in action and have full control over their lives rather than be the victim of other's actions.
<b>Support to Training and Employment Programme for Women</b> (STEP)	1986	To mobilise women in small viable groups and make facilities available through training and access to credit, to provide training for skill up gradation etc.
<b>Development of Women and Children in Rural Areas</b> (DWCRA)	1982	To improve the socio-economic status of the poor women in the rural areas through creation of groups of women for income generating activities on a self-sustaining basis.

<b>Dhan Laxmi</b>	March 2008	Condition cash transfer scheme for the girl child to encourage families to educate girl children and to prevent child marriage.
<b>Ujjwala</b>	4th, December 2007	A comprehensive scheme for prevention of trafficking with five specific components-prevention, rescue, rehabilitation, reintegration and repatriation of victims.
<b>National Mission for Empowerment of Women (NMEW)</b>	2010	To achieve empowerment of women socially, economically and educationally by securing convergence of schemes.
<b>Nirbhaya Homes</b>	2014	Centres for rape victims to be opened in 640 districts for the protection and welfare of the victims

### Child Welfare Programmes

Name of the Programmes	Year of Beginning	Objectives/Descriptions
<b>Integrated Child Development Services (ICDS)</b>	1975	It is aimed at enhancing the health nutrition and learning opportunities of infants, young children (0-6 years) and their mothers.
<b>Rajiv Gandhi National Creche Scheme for the Children of Working Mothers</b>	2006	Overall development of children, childhood protection, complete immunisation, awareness generation among parents of malnutrition, health and education.
<b>Reproductive and Child Health Programme</b>	1951	To provide quality integrated and sustainable Primary Health Care Services to the women in the reproductive age group and young children and special focus on family planning and immunisation.
<b>Integrated Child Protection Scheme (ICPS)</b>	2009-10	Providing a safe and secure environment for comprehensive development of children who are in need of care and protection as well as children in conflict with law.
<b>Scheme for Welfare of Working Children in Need of Care and Protection</b>	2008-09	Provides for non-formal education vocational training etc. to working children to facilitate their entry/re-entry into mainstream education.
<b>Bal Bandhu Scheme</b>	February 2011	Provides for protection of children in areas of civil unrest. It is implemented by NCPDR with grant from PM's National Relief Fund.

### Educational Programmes

Name of the Programmes	Year of Beginning	Objectives/Descriptions
<b>Mid-Day Meal Scheme</b> (largest feeding School programme in the world)	1995	Improving of the nutritional status of Children in classes I-VII in government, local body and government aided schools and EGS and AIE centers with the end objective of enabling disadvantaged and poor children to attend school regularly.
<b>Sarva Shiksha Abhiyan (SSA)</b>	2001	All Children (6-14) complete 5 years of primary schooling by 2007 all children complete 8 years of elementary schooling by 2010 bridge all gender and social category gaps at primary stage by 2007 and at elementary education level by 2010; universal retention by 2010.
<b>Kasturba Gandhi Balika Vidyalayas, (KGBVs) (with effect from) 1st April, 2007, merged with SSA)</b>	2004	To set up residential school at upper primary level for girls belonging to SC/ST/OBC/Minority communities. The scheme is being implemented in rural areas and urban areas with female literacy below 30% and national average respectively
<b>National Programme for Education of Girls at Elementary Level (NPEGEL)</b> important component of SSA	2003	Focused intervention to reach the 'Hardest to Reach' girls and provides for 'Model School' in every cluster with more intense community mobilisation and supervision of girls enrollment in schools.
<b>Inclusive Education for the Disabled at Secondary</b>	2009-10	Provides 100% central assistance for inclusive education of disabled children studying in class IX-XII in government, local body and



<b>Stage (IEDSS) replaced Integrated Education for Disabled Children (IEDS)</b>		government aided schools.
<b>Rashtriya Madyamik Shiksha Abhiyan (RMSA) or Scheme for Universalisation of Access for Secondary Education (SUCCESS)</b>	March 2009	Aims at raising the enrollment rate at secondary stage from 52.26% in 2005-06 to 75% in next 5 years by providing a secondary school within a reasonable distance of 5 km of any habitation: ensure universal access by 2017 and universal retention by 2020.
<b>Saakshar Bharat</b>	8 <sup>th</sup> Spet 2009	National Literacy Mission has been recased as 'Saakshar Bharat'. The aim is to cover all adults, is the age group of 15 and above, with its primary focus on women.

### Health Oriented Programmes

Name of the Programmes	Year of Beginning	Objectives/Descriptions
<b>National Rural Health Mission (NRHM)</b>	12 <sup>th</sup> April 2005	To provide effective healthcare to rural population with special focus on 18 states with weak health indices/infrastructure to raise public spending on health form 0.9% of GDP to 2.3% of GDP reduction of IMA and MMR and universal assess to health care with emphasis on women.
<b>Janani Suraksha Yojana (JSY)</b>	April 2005	Focus on demand promotion for institutional deliveries in states ad regions and targets lowering of MMR, it is conditional cash transfer programme to increase births in health facilities.
<b>Pradhan Mantri Swasthya Suraksha Yojana (PMSSY)</b>	2010	To correct regional imbalance in tertiary health-care and augmenting facilities for quality medical education in the country; and setting up six AIIMS-like Institution in phase-1 and In phase-2 two more AIIMS like institutions
<b>Central Government Health Scheme</b>	1954	Comprehensive medical care facilities to Central Government employees and their family members

### LATEST PUBLIC WELFARE SCHEMES

#### Swatchh Bharat Abhiyan

- Prime Minister Narendra Modi launched the ' Swatchh Bharat Mission' or 'Clean India Campaign' from the Valmiki Basti in New Delhi on 02 October, 2014.
- This campaign aims to accomplish the vision of 'clean India' by 150th birthday of Mahatma Gandhi, i.e. by 02 October 2019.
- The urban component of the Mission is proposed to be implemented over 5 years starting from 02 October 2014 in all 4041 statutory towns.

#### Saansad Adarsh Gram Yojana (SAGY)

- The scheme was launched on 11th October, 2014 on the occasion of birth anniversary of Lok Nayak Jai Prakash Narayan. The goal of the programme is to develop three Adarsh Grams by March 2019 of which one would be achieved by 2016.
- Thereafter, five such would Adarsh Grams (one per year) will be selected and developed by 2024.
- Under the scheme, each MP will take the responsibility of developing physical and institutional infrastructure in three villages by 2019.
- The MP would be free to identify a suitable Gram Panchayat for developing it into an Adarsh Gram, other than his/her own village or that of his/her spouse.
- A Gram Panchayat would be the basic unit. It will have a population of 3,000-5,000 in plain areas and 1,000-3,000 in hilly, tribal and difficult areas.

### **Beti Bachao, Beti Padhao Yojana**

- Government has introduced a new scheme called Beti Bachao, Beti Padhao, which will help in generating awareness and improving the efficiency of delivery of welfare services meant for women with an initial corpus of Rs 100 crore.
- Under the scheme, government would focus on campaigns to sensitize people of this country towards the concerns of the girl child and women.

### **Housing for All by 2022**

- With an aim to provide housing for all by 2022, the government will soon launch an urban housing mission named after Sardar Patel by merging and improving existing housing schemes.
- The focus of the mission is Low Cost Affordable Housing to be anchored in the National Housing Bank with a view to increase the flow of cheaper credit for affordable housing to the urban poor.

### **Soil Health Card Scheme for Every Farmer**

- Government has launched Soil Health Card Scheme to provide every farmer a Soil Health Card in a Mission mode. The card will carry crop wise recommendations of nutrients/fertilizers required for farms, making it possible for farmers to improve productivity by using appropriate inputs.
- The Soil Health Card is used to assess the current status of soil health and, when used over time, to determine changes in soil health that are affected by land management.

### **Neeranchal Scheme**

To give an added impetus to watershed development in the country, a new programme called “Neeranchal” with an initial outlay of ₹ 2,142 crores in the current financial year.

### **Pashmina Promotion Programme**

P-3 and programme for the development of other crafts of Jammu and Kashmir is being started. For this a sum of ₹ 50 crores is set aside.

### **Smart City Mission**

- Modi government declared the names of 98 cities selected for the 'Smart City Project'. This is a flagship project which was announced by Prime Minister Narendra Modi after his government was sworn into power last year.
- PM Modi's Union Cabinet announced the approval of Rs 48,000 crore that will be allocated to the Smart cities Project.
- The Union Development Ministry said that they will provide Rs 100 crore per city per year over the next five years.

### **One Rank One Pension (OROP) scheme**

- Under the OROP scheme the government said it would revise pension every five years where the veterans protested and demanded that it should be revised every two years.
- The government announced that OROP will be implemented from July 1, 2014 and the base year would be 2013 but the ex-servicemen objected and said it should nbe implemented from April 1, 2014 instead of July 1.

- The veterans even demanded that every person in the army should be a beneficiary under the OROP scheme.
- The estimated cost to implement OROP will be between Rs 8,000 crore to Rs 10,000 crore.

### **Skill India**

- Launching 'Skill India', Narendra Modi had said that India should emerge as the 'human resource capital' of the world as China has become a global 'manufacturing factory'.
- Skill India Mission is a part of the government's 'war against poverty'.
- The NDA government said it will work towards equipping over 40 crore people with adequate skill by 2022.

### **Atal Pension Yojana (APY)**

The scheme looks to provide monthly pension to subscribers from 60 years of age. The scheme mainly focusses on workers in the unorganised sector and is open to Indian citizens who are between 18-40 years of age.

### **Deen Dayal Upadhyaya Gram Jyoti Yojana**

This scheme launched by the NDA government is an Indian program which aims to provide 24\*7 power supply to all homes in rural India.

### **Digital India Programme**

Launched on July 1, 2015, the programme targets at empowering the nation digitally. The main aim of this programme is to ensure that government services are available to the citizens electronically and people get all the latest information and benefits of technology.

### **Pradhan Mantri Suraksha Bima Yojana**

This insurance scheme was launched on May 9, 2015 which says that a person will be given Rs 2 lakh for accidental death. In case of partial disability a person will be given Rs 1 lakh. This scheme is available for people whose age is between 18 to 70 years.

### **Pradhan Mantri Jeevan Jyoti Bima Yojana**

This is also an insurance scheme which gives a life insurance of Rs 2 lakh with a premium of Rs 330 per year.

### **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)**

This scheme launched by the NDA government deals with urban development and aims towards better living. It drives economic growth stressing on the need for people centric urban planning and development.

### **Pradhan Mantri Awas Yojana (PMAY)**

Launched on June 25, 2015, the PMAY is a Housing for All scheme which focusses to enable better living. The NDA government identified 305 cities and towns across nine states for implementation of this scheme.

### **Cashless Transaction Scheme : Effective From 2017**

A supporting scheme for demonetisation, the idea is to promote cashless transactions via the unique Aadhar Card issued to the citizens of India. The bank account will be linked to the Aadhar card in order to enable complete cash-free transactions.

### **Goods And Service Taxes Bill**

Launched on 1st April 2016.

The idea of this bill was developed long back, but Modi and Arun Jaitley came together at the beginning of the fiscal year 2016 to promote its immediate introduction. This bill states that a common service tax will be issued on all products across India and completely demolish state level taxes implied on goods.

### **Start-up India Loan Scheme**

Launched on 5th April 2016.

This scheme aims at providing financial aid to all aspirants who dream of opening their own businesses. A primary amount of 1 crore will be furnished to them after verifying their idea and the potential returns. This mainly aims at diminishing brain-drain and enabling development.

### **Pradhan Mantri Ujjwala Yojana**

Launched on 1st May 2016.

Pradhan Mantri Ujjwala Yojana is another welfare scheme started by Modi in order to provide LPG connections to domestic households that fall under the below the poverty line category. Basically, the scheme aims at providing a proper cooking fuel that will, in turn, improve the health of these poverty struck families.

### **Vidyanjali Yojana**

Launched on 16th June 2016.

Vidyanjali Yojana has been introduced to provide equal primary education to all budding children across India. The action plan is that volunteers will provide free primary education in all rural government schools.

### **Udaan Project**

Launched on 27 April 2017.

The Special Industry Initiative J&K 'Udaan' Scheme is to provide skills and enhance the employability of 40,000 youth over a period of five years in key high growth sectors. The scheme is being implemented by the National Skill Development Council (NSDC) and the corporate sector in PPP mode.

Udaan also aims to provide a platform that empowers girl students and provides them with better learning opportunities. The human resource development (HRD) ministry programme is designed to provide a comprehensive platform to deserving girl students aspiring to pursue higher education in engineering and assist them in preparing for the IIT-JEE while studying in Classes 11 and 12.

## MAKE IN INDIA

- It is an initiative of the Government of India to encourage multi-national, as well as domestic, companies to manufacture their products in India. It was launched by Prime Minister Narendra Modi on 25 September 2014.



*PM launches 'Make in India' global initiative*

- India would emerge, after initiation of the programme in 2015, as the top destination globally for foreign direct investment, surpassing China as well as the United States.
- With the demand for electronic hardware expected to rise rapidly to US\$400 billion by 2020, India has the potential to become an electronic manufacturing hub. The government is targeting to achieve net zero imports of electronics by 2020 by creating a level playing field and providing an enabling environment.
- In 2015, India received US\$63 billion in FDI.
- The major objective behind the initiative is to focus on job creation and skill enhancement in 25 sectors of the economy. The initiative also aims at high quality standards and minimising the impact on the environment. The initiative hopes to attract capital and technological investment in India.
- In August 2014, the Cabinet of India allowed 49% foreign direct investment

(FDI) in the defence sector and 100% in railways infrastructure. The defence sector previously allowed 26% FDI and FDI was not allowed in railways. This was in hope of bringing down the military imports of India. Earlier, one Indian company would have held the 51% stake, this was changed so that multiple companies could hold the 51%.

- Between September 2014 and November 2015, the government received INR 1.20 lakh crore (US\$18 billion) worth of proposals from companies interested in manufacturing electronics in India.
- 24.8% of smartphones shipped in the country in the April–June quarter of 2015 were made in India, up from 19.9% the previous quarter.

### Plans and Ease of doing business

- India emerged, after initiation of the programme in 2015 as the top destination globally for foreign direct investment, surpassing the United States of America as well as the People's Republic of China.
- With the demand for electronic hardware expected to rise rapidly to US\$400 billion by 2020, India has the potential to become an electronic manufacturing hub. The government is targeting to achieve net zero imports of electronics by 2020 by creating a level playing field and providing an enabling environment.
- India ranks 130th out of 189 countries in the World Bank's 2016 ease of doing business index, covering the period from June 2014 and June 2015. India was ranked 134th in the 2015 index.

## AGRICULTURE

- Agriculture plays a vital role in India's economy.
- Today, India ranks second worldwide in farm output. Agriculture and allied sectors like forestry and fisheries accounted for 13.7% of the GDP (gross domestic product), about 50% of the workforce.
- The growth rate for the agriculture and allied sectors is estimated to be 4.1 per cent for 2016-17.
- As per the First Advance Estimates (AE) released by Ministry of Agriculture and Farmers Welfare on 22nd September 2016, production of Kharif food-grains during 2016-17 is estimated at 135.0 million tonnes compared to 124.1 million tonnes in 2015-16.
- India is the largest producer, consumer and exporter of spices and spice products. India's fruit production has grown faster than vegetables, making it the second largest fruit producer in the world. India's horticulture output, is estimated to be 287.3 million tonnes (MT) in 2016-17 after the first advance estimate. It ranks third in farm and agriculture outputs. Agricultural export constitutes 10 per cent of the country's exports and is the fourth-largest exported principal commodity. The agro industry in India is divided into several sub segments such as canned, dairy, processed, frozen food to fisheries, meat, poultry, and food grains.

### MAJOR AGRICULTURE REVOLUTIONS

#### Green Revolution

- Also known as Seed-Water-Fertilizers-Pesticides Technology
- In 1965, the govt. of Mrs. Indira Gandhi decided to take a major step on Agriculture condition.
- Thus "Green Revolution" was applied to the period from 1967-1978 basically in parts of Punjab and Haryana, concern only with Wheat and Rice.
- Dr. M S Swaminathan from India led the Green Revolution as the Project.
- Father of Green Revolution Norman Borlaug, an American Scientist began conducting research in agriculture in Mexico in 1940 and developed new disease resistance high-yield varieties of wheat.

#### White Revolution

- 'Operation flood' a program started by National Dairy Development Board (NDDB) in 1970 made India the largest producer of the milk in the world.
- This program with its whopping success was called as 'The White Revolution'.

- The main architect of this project was Dr. Verghese Kurien, also called the father of White Revolution.
- In 1949 Mr. Kurien joined Kaira District Co-operative Milk Producers' Union (KDCMPUL), now famous as Amul (Anand Milk Union Limited).
- Later in 1965, Shri Lal Bahadur Shastri, Prime Minister of India, created the National Dairy Development Board (NDDB).
- Operation Flood : The Operation Flood was completed in three phases: Phase I (1970-79) , Phase II (1981-1985) , Phase III (1985-1996)

#### Yellow Revolution - For oil Seeds

- Also known as the People Power Revolution.
- It was a series of demonstrations from 1983-1986 in the Philippines.

#### Blue Revolution - Fisheries Development

**Brown Revolution** – Leather/non-conventional (India)/Cocoa Production.

A 'brown revolution' is happening in the tribal areas of Visakhapatnam district.

The tribal people are being taught, and encouraged, to grow "socially responsible and environment friendly" coffee to cater to the demand from developed countries.

**Black Revolution** – Petroleum Production

**Grey Revolution** – Fertilizer Development.

### **Golden Revolution**

- It is about horticulture production and Honey Production.
- In India, the period between 1991-2003 is termed as 'Golden Revolution'.
- As a result, during this period, there was a huge increase in the production of various fruits, vegetables, spices and other horticulture products.

**Golden Fibre Revolution** - Jute Production.

**Pink Revolution** - Onion production / Pharmaceutical (India)/Prawn production.

**Red Revolution** - Meat & Tomato production.

**Round Revolution** - Potato production.

**Silver Revolution** - Egg/Poultry production.

**Silver Fibre Revolution** – Cotton production.

**Almond Revolution** – Spice production

**Evergreen Revolution** - Overall development of Agriculture.

**Ambrosia Revolution** – For Connecting Rivers.

### **National Commission on Farmers (NCF)**

- It is an Indian commission constituted on November 18, 2004 under the chairmanship of Professor M.S. Swaminathan.
- The NCF submitted four reports in December 2004, August 2005, December 2005 and April 2006 respectively.
- The fifth and final report was submitted on October 4, 2006. The reports contain suggestions to achieve the goal of "faster and more inclusive growth" as envisaged in the Approach to 11th Five Year Plan.

### **AGRICULTURE IN TWELFTH FIVE YEAR PLAN**

- In 12th Year Plan, It aims at growth rate of 4% per annum in agriculture sector, with foodgrains growing at about 2% per year and non-foodgrains growing at 5.6%.
- It has emphasised on technology as the main vehicle for improving productivity in agriculture as natural resources are fixed. Severely indicting the public sector research in agriculture the Twelfth Plan encourages Public Private Partnership (PPP) in agriculture so as to bridge the gap in dry land areas and rapidly diversify agriculture.
- It emphasises on greater road connectivity, development of horticulture, dairying and other animal husbandry to further improve the market access to the farmers.

### Indian Fisheries

- Fish production in India has increased more than tenfold since its independence in 1947. According to the Food and Agriculture Organization (FAO) of the United Nations, fish output in India doubled between 1990 and 2010.
- India has 7517 kilometers of marine coastline, 3,827 fishing villages, and 1,914 traditional fish landing centers. India's fresh water resources consist of 195,210 kilometers of rivers and canals, 2.9 million hectares of minor and major reservoirs, 2.4 million hectares of ponds and lakes, and about 0.8 million hectares of flood plain wetlands and water bodies.
- India is the third largest supplier of fish in the world.
- Contribution of Fisheries to GDP : 1.07(%)
- Contribution to Agril. GDP : 5.15(%)

### Food Security in India

- According to the Food and Agriculture Organization (FAO), food security "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".
- The National Food Security Mission (NFSM) during the 12th Five Year Plan will have five components (i) NFSM-Rice; (ii) NFSM-Wheat; (iii) NFSM-Pulses, (iv) NFSM-Coarse cereals and (v) NFSM-Commercial Crops.

### Role of Government in Food Security:

- (i) Promoting domestic production to meet the demands of the growing population.
- (ii) Providing minimum support prices for procurement and storage of food grains.
- (iii) Operating a Public Distribution System, and

- (iv) Maintaining buffer stocks to counteract any pushing up of prices of food grains during periods of shortages.

### Public Distribution System (PDS)

- It is an Indian food security system, established by the Government of India under Ministry of Consumer Affairs, Food, and Public Distribution and managed jointly with state governments in India.
- It distributes subsidized food and non-food items to India's poor. This scheme was launched in India on June 1997.

### Targeted Public Distribution System (TPDS)

- It was introduced with effect from June 1997.
- Its focus on "poor in all areas" and TPDS involves issue of 10 Kg of food grains per family per month for the population Below Poverty Line (BPL) at specially subsidized prices.
- The TPDS requires the states to Formulate and implement foolproof arrangements for identification of poor, Effective delivery of food grains to Fair Price Shops (FPSs).
- Its distribution in a transparent and accountable manner at the FPS level.

### Agricultural Price Policy (APP)

- It seeks to ensure remunerative prices to the producers so as to encourage higher interest and production on the one hand, on the other.
- It also safeguards the consumers interest by making food available at reasonable prices.

**Commission for Agricultural Costs and Prices (CACPs)** was set-up in 1965 with the name Agricultural Price Commission and was renamed as CACP in 1985.



**Market Intervention Scheme (MIS)** is implemented for horticultural and agricultural commodities. It generally perishable in nature and not covered under the Price Support Scheme (PSS).

**Economic cost** is composed of three components; viz, MSP, procurement incidentals and cost of distributing foodgrains.

#### **Agriculture Credit**

- The sources of Agriculture Credit available to farmers are institutional and private.
- **Institutional credit** covers cooperative societies and banks, commercial banks, RRB and NABARD.
- **Non-institutional/Private** sources of credit are moneylenders, traders and commission agents, relatives and landlords.
- In 1969 on the recommendation of Dr Gadgil Committee and Narasimham Committee, Lead Bank Scheme based on area approach was launched.

#### **Regional Rural Banks (RRBs)**

- It came into existence on Gandhi Jayanti in 1975 with the formation of a Prathama Grameen Bank.
- The rural banks had the legislative backing of the Regional Rural Banks Act 1976 . This act allowed the government to set up banks from time to time wherever it considered necessary.
- The RRBs were owned by three entities with their respective shares as follows: Central Government 50%, State government 15%, Sponsor bank 35%.
- Its objective to provide sufficient banking and credit facility for agriculture and other rural sectors.

#### **Agriculture Insurance Company of India Limited (AIC)**

AIC was incorporated on 20 December 2002 with an authorized capital of ₹ 1500 crore. The initial paid-up capital was ₹ 200 crores, which was subscribed by the promoting companies, General Insurance Corporation of India GIC (35%), NABARD (30%) and the four public-sector general insurance companies (8.75%) each, viz., National Insurance Co. Ltd., Oriental Insurance Co. Ltd., New India Assurance Co. Ltd., and United India Insurance Co. Ltd.

#### **National Bank for Agriculture and Rural Development (NABARD)**

- It was established on the recommendations of Shivaraman Committee, on 12 July 1982 to implement the National Bank for Agriculture and Rural Development Act 1981.
- It is the apex institution in the country which looks after the development of the cottage industry, small industry and village industry, and other rural industries.
- It also reaches out to allied economies and supports and promotes integrated development.
- Rural Infrastructure Development Fund (RIDF) was set-up in 1995-96 under NABARD for holistic rural development.

#### **National Agricultural Co-operative Marketing Federation (NAFED)**

It is the Apex Co-operative Organisation at the national level. It deals in procurement, distribution, export and import of selected agricultural commodities.

### **National Co-operative Development Corporation (NCDC)**

It was set-up in 1963, under an Act of Parliament. The object of NCDC is planning and promoting programmes for the production, processing, storage and marketing of agricultural produce and notified commodities through co-operative societies.

### **Commodity Markets in India**

- Commodity Exchange. **Mumbai**
- National Commodity and Derivatives Exchange. **Mumbai**
- Multi Commodity Exchange. **Mumbai**
- ACE Derivatives and Commodity Exchange Limited. **Ahmedabad**

### **Food Processing Industry**

- India is the third largest producer of food in the world after China and the US.
- Food processing industry is the fifth largest industry in India in terms of production, consumption, exports and expected growth.

### **Mega Food Parks Scheme (MFPS)**

It was launched in 2008, the Government provides Financial Assistance up to ₹ 50 Crore to set up modern infrastructure facilities for food processing called Mega Food Parks. The key objectives of the scheme are to reduce wastage of perishables; raise processing of

food items from 6% to 20% and raise India's share in Food Processing Industry from 1.5% to 3%.

### **Vision 2015 of Ministry of Food Processing Industries**

It aims to raise the processing of perishables in the country from existing 6% to 20%, value addition from 20% to 35% and the share in global food trade from 1.5% to 3% by year 2015.

### **Land Reforms in India**

- The Land Reforms Policy adopted since Independence aims at restructuring agrarian relations to achieve an egalitarian social structure; elimination of exploitation in land relations; realizing the age-old goal of land to the tiller; increasing agricultural productivity and production and infusing equality in local institutions.
- After independence, focus was given on land reforms to fulfill promises made during the freedom struggle (i.e. land to the tiller and growth with equity).
- The most successful land reforms initiative was **Operation Banga** in Paschim Banga in 1977.
- **Acharya Vinoba Bhave** launched **Bhoodan Andolan** in the country in order to improve the conditions of landless farmers.

## **INDUSTRY**

### **Major Industrial Policy (IP)**

IP 1948	First IP. It declared India to be a mixed economy
IP 1956	Schedule A : industries were meant for Central monopoly Schedule B : industries were meant for state government initiatives Schedule C : industries (that were not included in Schedule A and B) were meant for private sectors
IP 1973	The concept of 'joint sector' was developed which allowed partnership between the centre and states and the private sector while allowing setting up of industries. To regulate foreign exchange the Foreign Exchange Regulation Act (FERA)
IP 1977	District Industries Centres (DICs) were set up to promote the expansion of small and cottage industries at a mass scale.
IP 1980	Foreign investment via the technology transfer route was allowed again

### **New Industrial Policy 1991**

GOI announced its new industrial policy on July 24, 1991, with an aim to correct the distortion and weakness of the Industrial Structure of the country that had developed in 4 decades; raise industrial efficiency to the international level; and accelerate industrial growth.

The main objectives to launch new economic policy (NEP) in 1991 are as follows:

1. to plunge Indian economy in to the field of 'Globalization and to give it a new drive on market orientation.
2. to reduce the rate of inflation and to remove imbalances in payment.
3. to move towards higher economic growth rate and to build sufficient foreign exchange reserves.
4. to remove restrictions on FDI and to abolish MRTP Act, 1969; and

### **Compulsory Licensing in**

1. All type of Industrial explosives.
2. Electrical, electronic, aerospace and defence equipment and etc.
3. Specific hazardous chemicals
4. Distillation and brewing of alcoholic drinks.
5. Cigars and cigarettes of tobacco and manufactured tobacco substitutes.

### **Disinvestment in India**

- The GOI in July 1991 initiated the disinvestment process in India, while launching the New Economic Policy (NEP). The Government had appointed the Krishnamurthy Committee in 1991 and Rangarajan Committee in 1992.
- Both the Committees, have recommended disinvestments to fulfill objectives of modernisation of the public sector through strengthening R & D, initiating diversification/ expansion programmes, retraining and re-employment of employees, funding genuine needs of expansion, widening the capital market basis and mitigating fiscal deficit of the government.

### **Companies Act 2013**

- It is an Act of the Parliament of India which regulates incorporation of a company, responsibilities of a company, directors, dissolution of a company.
- The 2013 Act is divided into 29 chapters containing 470 sections as against 658 Sections in the Companies Act, 1956 and has 7 schedules.
- The Act has replaced The Companies Act, 1956 (in a partial manner) after receiving the assent of the President of India on 29 August 2013.
- The Act came into force on 12 September 2013 with few changes like earlier private companies maximum number of member was 50 and now it will be 200. A new term of "one person company" is included in this act that will be a private company and with only 98 provisions of the Act notified.

## PUBLIC SECTOR ENTERPRISES

*The status of Maharatna, Navratna, Miniratna to CPSEs is conferred by the Department of Public Enterprises to various Public Sector Undertakings. These prestigious titles provide them greater autonomy to compete in the global market.*

	Maharatna	Navratna	Miniratna Category-I	Miniratna Category-II
Eligibility	Three years with an average annual net profit of over ₹ 2500 crore (earlier was ₹ 5,000 Cr), OR Average annual Net worth of ₹ 10,000 crore for 3 years (earlier was ₹ 15,000 Cr), OR Average annual Turnover of ₹. 20,000 crore for 3 years (earlier was ₹ 25,000 Cr)	A score of 60 (out of 100), based on six parameters which include net profit, net worth, total manpower cost, total cost of production, cost of services, PBDIT (Profit Before Depreciation, Interest and Taxes), capital employed, etc., AND A company must first be a Miniratna and have 4 independent directors on its board before it can be made a Navratna.	Have made profits continuously for the last three years or earned a net profit of ₹ 30 crore or more in one of the three years	Have made profits continuously for the last three years and should have a positive net worth.
Benefits for investment	₹ 1,000 crore - ₹ 5,000 crore, or free to decide on investments up to 15% of their net worth in a project	up to ₹1,000 crore or 15% of their net worth on a single project or 30% of their net worth in the whole year (not exceeding ₹1,000 crores).	up to ₹ 500 crore or equal to their net worth, whichever is lower.	up to ₹ 300 crore or up to 50% of their net worth, whichever is lower.

### List of Maharatnas

1. Bharat Heavy Electricals
2. Coal India Ltd.
3. GAIL (India) Ltd.
4. Indian Oil Corporation
5. NTPC Ltd.
6. Oil and Natural Gas Corporation
7. Steel Authority of India Ltd.

### List of Navratna

1. Bharat Electronics Ltd.
2. Bharat Petroleum Corporation
3. Container Corporation of India
4. Engineers India Ltd.
5. Hindustan Aeronautics
6. Hindustan Petroleum Corporation
7. Mahanagar Telephone Nigam Ltd.
8. National Aluminium Company Ltd.
9. National Buildings Construction Corporation
10. National Mineral Development Corporation
11. Neyveli Lignite Corporation
12. Oil India
13. Power Finance Corporation
14. Power Grid Corporation of India
15. Rashtriya Ispat Nigam Ltd.
16. Rural Electrification Corporation
17. Shipping Corporation of India

## SMALL SCALE INDUSTRIES

- Ministry of Micro, Small and Medium Enterprises (MSME) is often recognised as the growth engine of an economy across the world.
- In India, before the enactment of Micro, Small and Medium Enterprise Development (MSMED) Act, 2006, the non-agriculture MSME segment was heterogeneous in nature mainly consisting of traditional industries like coir, khadi and silk, Small Scale Service and Business Enterprises (SSSBEs), Small Scale Industries (SSIs), Cottage and Village Industries.
- The Act assimilated all varied industries and also expanded the coverage to include the service sector and medium enterprises. Currently, the MSME sector in India is broadly classified into manufacturing and those engaged in rendering services.
- According to the Fourth Census (2009) of the MSME sector, 67% are manufacturing and 33% services enterprises.
- MSME sector contributes 8% to the GDP, 45% to the manufactured output, 40% to the exports and provides employment to 42 million people.
- SIDBI (Small Industries Development Bank of India) is an independent financial institution to finance the growth of MSME's.
- Abid Hussain Co'mmittee was set-up to look into the problems of small-scale industries.

### MSME Policy, 2012

Enterprise	Manufacturing Sector	Service Sector
Micro Enterprise	Does not exceed ₹ 25 lakh	Does not exceed ₹ 10 lakh
Small Enterprise	More than ₹ 25 lakh, but does not exceed ₹ 5 crore	More than ₹ 10 lakh, but does not exceed ₹ 2 crore
Medium Enterprise	More than ₹ 5 crore, but does not exceed ₹ 10 crore	More than ₹ 2 crore, but does not exceed ₹ 5 crore

## LARGE SCALE INDUSTRY

- India has many large metallurgical industries. Shipbuilding, automobile industry and other large-scale engineering industries are directions in which India's capital and enterprise will have a large scope for operation.
- The following are the principal lines in which India's industrial development has been in a large scale:

### Iron and Steel Industry

- In 2009, India was ranked third. India is the fourth largest producer of crude steel in the world after China, Japan and the USA in 2010.
- India is the largest producer of sponge iron since 2002.
- Steel Authority of India Limited (SAIL) was established in 1974 for the development of the steel industry.
- Bengal Iron Works Company is the first steel industry at Kulti (in Paschim Banga) was established in 1870.
- Tata Iron and Steel Co. Ltd. (TISCO) is the first large scale steel plant-at Jamshedpur (1907), followed by IISCO at Burnpur (1919).

- Rourkela Integrated Steel Plant is the first public-owned steel plant, set-up in 1954 with the help of German Kmp-Demag.

#### **Iron and Steel Plants in India**

<b>Location</b>	<b>Assistance</b>
Rourkela (Odisha)	Germany
Bhilai (Chhatisgarh)	Russia
Durgapur (Paschim Banga)	Britain
Bokaro (Jharkhand)	Russia
Vishakhapatnam (Andhra Pradesh)	Russia

#### **Textile Industry**

- The textile industry continues to be the second largest employment generating sector in India. It offers direct employment to over 35 million in the country.
- The share of textiles in total exports was 11.04% during April–July 2010, as per the Ministry of Textiles.
- India is 2nd in global textile manufacturing and also 2nd in silk and cotton production.
- Other fibres produced in India include silk, jute, wool, and man-made fibers. 60% of the Indian textile industry is cotton based.
- The first Indian modernised cotton cloth mill was established in 1818 at fort Gloster near Kolkata, but this was unsuccessful.
- The second mill was established in 1854 at Bombay by KGN Daber.
- India is first in global jute production and shares 63% of global textile and garment market.
- Jute Technology Mission was launched 2nd June, 2006.
- Government has enacted Jute Packing Materials (compulsory use in packing commodities) Act, 1997 to broaden the usage of jute.

#### **Gems and Jewellery Industry**

- It plays a significant role in the Indian economy, contributing around 6-7 per cent of the country's GDP.
- According to the data released by the World Gold Council (WGC), India is the largest consumer of gold.
- Apart from India, cutting and polishing of diamonds take place in South Africa, Belgium, China, Israel, Russia and the United States.

#### **Paper Industry**

- India is the 15<sup>th</sup> largest paper industry in the world.
- The estimated turnover of the industry is ₹ 25,000 crore (USD 5.95 billion).
- The first paper mill in India was set up at Sreerampur, Paschim Banga, in the year of 1862.

#### **Silk Industry**

- India is the second largest (after China) silk manufacturer contributing to 18% of the total raw silk production.

- In India, about 97% of the raw silk is produced in the five Indian states of Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal and Jammu and Kashmir.
- The majority of silk is produced mainly in Bhoodan Pochampally (also known as silk city), Kanchipuram, Dharamvaram and Mysore.
- The Indian Silk Promotion Council (ISEPC) has initiated programmes for growth and development of the silk industry.

### **Sugar Industry**

- India is the world's largest producer of sugarcane and second largest producer of sugar after Cuba. But India becomes the largest producer if gur and khandsari are also included.
- This industry involves a total capital investment of ₹ 1,250 crore and provides employment to 2.86 lakh workers.
- The Sugar Development Fund was set-up in 1982, under the Sugar Cess Act.
- BB Mahajan Committee was set-up to study the sugar industry.

### **Cement Industry**

- India is the second largest producer of cement in the world. Cement production increased at a compound annual growth rate (CAGR) of 9.7 per cent in the period 2006– 2013, producing 272 million tonnes (MT). The production capacity is projected to reach 550 MT by FY 2020.
- The foundation of stable Indian cement industry was laid in 1914, when the Indian Cement Company Limited manufactured cement at Porbandar in Gujarat.

### **Petrochemical Industry**

- Indian Petrochemicals Corporation Limited (IPCL) was a petrochemicals company in India. It was established on March 22, 1969, with a view to promote and encourage the use of plastics in India.
- Its business consists of polymers, synthetic fibre, fibre intermediaries, solvents, surfactants, industrial chemicals, catalysts, adsorbents, and polyesters.
- The main source of feedstock and fuel to this industry are natural gas and naphtha.

### **Fertilizer Industry**

- The first manufacturing unit was started by the Indian Fertilizer Industry was of Single Super Phosphate (SSP) in Ranipet near Chennai in 1906.
- India meets 85% of its urea requirement through indigenous production, but is largely import dependent for meeting the demand for phosphorus (90%) and potassium fertilizer (20%).
- India is the third largest producer of fertilizer after China and USA and second largest consumer after China.

### **Automotive Industry**

- The automotive industry in India is one of the largest in the world with an annual production of 23.37 million vehicles in FY 2014-15, following a growth of 8.68 per cent over the last year.
- India is the second largest manufacturer of motorcycle and fifth largest manufacturer of commercial vehicles in the world. In 2009, India was the fourth largest exporter of passenger cars after Japan, South Korea and Thailand.

- India is the largest manufacturer of tractors in the world. India is the ninth largest car manufacturer in the world.

### **MAKE IN INDIA : National Manufacturing Policy (NMP)**

- The National Manufacturing Policy is by far the most comprehensive and significant policy initiative taken by the Government. The policy is the first of its kind for the manufacturing sector as it addresses areas of regulation, infrastructure, skill development, technology, availability of finance, exit mechanism and other pertinent factors related to the growth of the sector.
- India has already marked its presence as one of the fastest growing economies of the world.
- The country is expected to rank amongst the world's top three growth economies and amongst the top three manufacturing destinations by 2020.

### **Vision of NMP**

- An increase in manufacturing sector growth to 12-14% per annum over the medium term.
- An increase in the share of manufacturing in the country's Gross Domestic Product from 16% to 25% by 2022.
- To create 100 million additional jobs by 2022 in manufacturing sector.
- Creation of appropriate skill sets among rural migrants and the urban poor for inclusive growth.
- An increase in domestic value addition and technological depth in manufacturing.
- Enhancing the global competitiveness of the Indian manufacturing sector.
- Ensuring sustainability of growth, particularly with regard to environment.

### **National e-Governance Plan (NeGP)**

- It has been formulated by the Department of Electronics and Information Technology (DEITY) and Department of Administrative Reforms and Public Grievances (DARPG). The Union Government approved the NeGP, comprising of 27 Mission Mode Projects (MMPs) and 10 components on May 18, 2006.
- It aims at improving delivery of Government services to citizens and businesses with the following vision:
- *"Make all Government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency & reliability of such services at affordable costs to realise the basic needs of the common man."*

### **National Policy on Electronics, 2012**

- Government of India has launched the National Policy on Electronics 2012 (NPE 12) with the vision to make India a globally competitive destination for Electronics System Design and Manufacturing (ESDM). Besides, India has large young talent, low wage costs and Government of India.
- India is one of the fastest growing markets for electronics. The demand is projected to reach USD 400 Billion by 2020.
- *The National Telecom Policy 2012 (NTP, 2012) works in conjunction with NPE, 2012 and provides for creating a design and manufacturing ecosystem for telecom equipment.*



## FOREIGN TRADE

*It is exchange of capital, goods, and services across international borders or territories.*

### Foreign trade in India

- It includes all imports and exports to and from India.
- At the level of Central Government it is administered by the Ministry of Commerce and Industry. As of 2014.
- India's largest trading partners in descending order of value of total trade are the United Arab Emirates, China, the United States, Saudi Arabia, Switzerland, Singapore, Germany, Hong Kong, Indonesia, Iraq and Japan.

### Types of Foreign Trade

1. **Import** : inflow of goods in a country
2. **Export** : outflow of goods from a country
3. **Entrepot** : Many times goods are imported for the purpose of re-export after some processing operations.

### Balance of Payments (BOP)

- Most of exports and imports involve finance i.e. receipts and payments in money. An account of all receipts and payments is termed as Balance of Payments (BOP).
- The BOP is divided into three main categories: the current account, the capital account and the financial account.

### Foreign Exchange Reserves in India (Forex Reserve)

Forex Reserve is reported by Reserve Bank of India.

Foreign Exchange Reserves in India are:

1. Foreign Currency Assets (FCAs)
2. Gold Stock of RBI
3. Special Drawing Rights (SDRs)
4. Reserve Tranche Position (RTP) in the IMF

### FERA and FEMA

- The Foreign Exchange Regulation Act (FERA) is legislation that was passed by the Indian Parliament in 1973 and came into effect as of January 1, 1974.
- FERA was repealed by the government in 1999 and replaced by the Foreign Exchange Management Act (FEMA), which liberalized foreign exchange controls and removed many restrictions on foreign investment.
- The intentions of the Foreign Exchange Management Act are to perhaps, revise and unite laws that relate to transactions of foreign exchange and encourage an orderly maintenance and development, of the foreign exchange markets in India.

### Special Economic Zone (SEZ)

- It is a geographical region that has economic laws that are more liberal than a country's domestic economic laws.
- It covers a broad range of more specific zone types, including Free Trade Zones (FTZ), Export processing zones (EPZ), Free Zones (FZ), Industrial Estates (IE), Free ports, Urban Enterprise Zones and others.
- India was one of the first in Asia to recognize the effectiveness of the Export Processing Zone (EPZ) model in promoting exports, with Asia's first EPZ set up in Kandla in 1965.

### Special Economic Zones (SEZs) Policy in India

It came into inception on April 1, 2000. The prime objective was to enhance foreign investment and provide an internationally competitive and hassle free environment for exports.

### **SEZ Act, 2005**

- The SEZ Act was passed by the Government of India in May 2005, it received Presidential assent on the 23rd of June, 2005. While introducing the act, then Prime Minister of India, Dr. Manmohan Singh, said: "SEZs are here to stay".
- An Act to provide for the establishment, development and management of the Special Economic Zones for the promotion of exports and for matters connected therewith or incidental thereto."
- The main objective as per the preamble is to promote exports.

### **Export Processing Zones**

- Export Processing Zones in India was set up by the government of India with the aim to initiate infrastructural development and tax holidays in various industrial sectors in the country.
- The export processing zones in India came into existence soon after the political independence, when India proclaimed the first Industrial Policy Revolution in the year 1948.
- The Kandla Free Trade Zone - India's first Export Processing Zone - was set up in 1965. Subsequently, six more EPZs were set up at Santa Cruz (Mumbai), Falta (West Bengal), Chennai (Tamil Nadu), Noida (UP), Cochin (Kerala), and Visakhapatnam (Andhra Pradesh).

### **Foreign Trade Policy (2015-2020)**

- PM Narendra Modi's pet projects, 'Make in India' and 'Digital India' will be integrated with the new Foreign Trade Policy.
- India to be made a significant participant in world trade by 2020.
- Merchandize exports from India (MEIS) to promote specific services for specific Markets Foreign Trade Policy

- FTP would reduce export obligations by 25% and give boost to domestic manufacturing
- FTP benefits from both MEIS & SEIS will be extended to units located in SEZs
- FTP 2015-20 introduces two new schemes, namely "Merchandise Exports from India Scheme (MEIS)" and "Services Exports from India Scheme (SEIS)".
- Agricultural and village industry products to be supported across the globe at rates of 3% and 5% under MEIS.
- Industrial products to be supported in major markets at rates ranging from 2% to 3%.
- The criteria for export performance for recognition of status holder have been changed from Rupees to US dollar earnings.
- Reduced Export Obligation (EO) (75%) for domestic procurement under EPCG scheme.
- Online procedure to upload digitally signed document by Chartered Accountant/Company Secretary/Cost Accountant to be developed.
- No need to repeatedly submit physical copies of documents available on Exporter Importer Profile.

### **Foreign Direct Investment (FDI) in India**

- Foreign companies invest in India to take benefits of cheaper wages and changing business environment of India.
- Economic liberalisation started in India in wake of the 1991 economic crisis and since then FDI has steadily increased in India.
- According to the Financial Times, in 2015 India overtook China and the US as the top destination for the Foreign Direct Investment. In first half of the 2015, India attracted investment of \$31 billion compared to \$28 billion and \$27 billion of China and the US respectively.

- Government eases FDI norms in 15 major sectors.
- Townships, shopping complexes & business centres – all allow up to 100% FDI under the auto route.
- India's defence sector now allows consolidated FDI up to 49% under the automatic route.
- Private sector banks now allow consolidated FDI up to 74%.
- Up to 100% FDI is now allowed in coffee/rubber/cardamom/palm oil & olive oil plantations via the automatic route.
- 100% FDI is now allowed via the auto route in duty free shops located and operated in the customs bonded areas.
- 100% FDI allowed in medical devices
- FDI cap increased in insurance & sub-activities from 26% to 49%
- FDI up to 49% has been permitted in the Pension Sector.

## INDIAN CURRENCY SYSTEM

- The Indian currency is called the Indian Rupee (INR) and the coins are called paise. One Rupee consists of 100 paise.
- At present, Paper Currency Notes in India are issued in the denomination of Rs.5, Rs.10, Rs.20, Rs.50, Rs.100, Rs. 200, Rs.500 and Rs.2000. These notes are called bank notes as they are issued by the Reserve Bank of India (Reserve Bank).
- The distribution of Coins is undertaken by RBI as an agent of the Government, (coins are minted by the Government and not by RBI). Coins up to 50 paise are called “small coins” and coins of Rupee one and above are called “Rupee coins”.
- The amount of a banknote is written on it in 17 languages out of 22 official languages of India. The languages are Assamese, Bengali, Gujarati, Kannada, Kashmiri, Konkani, Malayalam, Marathi, Nepali, Odia, Punjabi, Sanskrit, Tamil, Telugu and Urdu.

### Role of Government of India in Currency System

In terms of Section 25 of RBI Act, 1934 the design of banknotes is required to be approved by the Central Government on the recommendations of the Central Board of the Reserve Bank of India. The responsibility for coinage vests with the Government of India on the basis of the Coinage Act, 1906 as amended from time to time. The Government of India also attends to the designing and minting of coins in various denominations.

### Clean Note Policy

Reserve Bank of India has been continuously making efforts to make good quality banknotes available to the members of public. To help RBI and banking system, the members of public are requested to ensure the following:

1. Not to staple the banknotes

2. Not to write / put rubber stamp or any other mark on the banknotes
3. Store the banknotes safely to prevent any damage

### Indian Rupee Sign (₹)

- It is the currency sign for the Indian rupee, the official currency of India. Designed by D. Udaya Kumar, it was presented to the public by the Government of India on 15 July 2010.
- The design resembles both the Devanagari letter "र" (ra) and the Latin capital letter "R", with a double horizontal line at the top.
- On 26 August 2010 Ministry of Finance and Department of Economic Affairs of the Government of India had finally approved the sign. The approval was given by Sushil Kumar, Under Secretary of the Government of India.

### Printing of Securities and Minting in India

Security Press	Station	Related to
India Security Press (1922)	Nashik	Postal material, Postal stamps etc.
Security Printing Press (1982)	Hyderabad	Union excise duty stamps
Currency Notes Press (1928)	Nashik	Bank notes from ₹ 1 to ₹ 100
Bank Notes Press (1974)	Dewas	Bank note of ₹20, ₹50, ₹100, ₹500
Modernised Currency Notes Press (1995)	Mysore and Salbani	Indian Currency Notes
Security Paper (Estd 1967-68)	Hoshangabad	Banks and currency notes paper

**Minting of Coins :** *Mumbai, Kolkata, Hyderabad, Noida*

## DEMONETIZATION

- “*Demonetization of currency means discontinuity of the said currency from circulation and replacing it with a new currency.*”
- On Nov. 8, Prime Minister **Narendra Modi** announced that 500- and 1,000-rupee notes were no longer legal tender; people were given 50 days to deposit them in bank accounts or exchange them for new notes at banks and post offices — when only half of Indian adults have bank accounts.
- The incidence of fake Indian currency notes in higher denomination has increased. For ordinary persons, the fake notes look similar to genuine notes, even though no security feature has been copied.
- The legal tender character of the notes in Old High Denominations (OHD) of ₹ 500 and ₹ 1,000 have been withdrawn. In consequence thereof withdrawn OHD notes cannot be used for transacting business and/or store of value for future usage.
- The old notes can be exchanged for value at any of the 19 offices of the Reserve Bank of India or at any of the bank branches or at any Head Post Office or Sub-Post Office.

### Impacts of Demonetization

**Inflation :** It will cause deflation in the market as people who have earned money through illegal ways would be afraid to declare the money as they may be prosecuted by the Income tax department on the legitimacy of their income.

**Reduction in Monetary Circulation:** This will lead to reduction of money circulation in the economy leading to deflation. Value of money will be increasing which we have because the total money supply will be going down but the commodities and things available in the market have not gone down. It will lead to inflation slowly but not overnight.

**Cash Deposits in Banks:** A lot of cash which are legally earned will be deposited in the

banks and now the banks with more deposits will be able to do more lending.

**Easy Loans:** Loans will become easier and interest rates may come down. As banks will have more money so more loans will be given out which will increase the money supply in the market and it will create inflation.

### Advantages

- The major decision which is made by the government will help us to eradicate black money, corruption to some extent.
- Due to lack of funding there will be no arms smuggling and all the terrorist activities will also be choked.
- The government has proposed the new limits on ATM withdrawals being restricted to Rs.2000 per day, withdrawal from bank account is Rs.10000 a day and

Rs.20000 a week. It indicates that card transactions will slowly replace the cash transactions in our daily prone activities.

- Exchange of money in banks can only be done producing a valid identity cards like PAN, aadhar card and electoral card from 10 to 24 November with a daily limit of Rs.4000. By doing so it will be easy for the government to track the money which is being exchanged in banks. There is no limit if the amount which we are exchanging is legal amount.
- Financial Intelligence Unit will track all details of the transactions from the banks. So now it is really difficult to get rid of the black money.
- Real estate industry is totally corrupted and now by this stringent decision the real estate sector will bring in more transparency. By doing it in this way we will have more credibility, making it more attractive to the foreign investors as well as domestic investors.

#### **Disadvantages**

- It will cause great inconvenience to common man who will start running to bank to exchange Rs.500 and Rs.1000 notes.
- By replacing all the Rs.500 and Rs.1000 denomination notes, as ordered by the government, could cost the RBI at least Rs.12000 crore.
- It will be very difficult for half of the population who are not well versed with the card transactions.
- The major problem is that big fishes will be left out whose black money is in the form of foreign currency, gold and property and stashed in tax havens.

#### **NEW FEATURES of 500 and 2000 banknotes**

*There are 17 new features that can be seen in new Rs 500 note and Rs 2000 note.*

1. The denominational numeral 2000 can be seen when held against the light.

2. Latent image of Denominational numeral 2000 can be seen which it is held at 45 degree from eye level.
3. Denominational numeral 2000 can be seen in Devanagari.
4. The portrait of Mahatma Gandhi has been changed and it is shifted to centre.
5. It has small micro letter of RBI and 2000 on Rs 2000 note. When the notes are tilted, the colour changes of both the note from green to blue.
6. Both the notes has guarantee clause along with Governor's sign. Towards the right of the note there is an RBI emblem.
7. Both the notes has electrotype watermarks along with Gandhi portrait.
8. Numerals on number panels are seen growing from small to big which can be seen from top left side and bottom right side of the notes.
9. On the right side of the notes Ashoka Pillar emblem can be seen.

#### **Some special features for visually impaired.**

10. The portrait of Mahatma Gandhi has been raised along with Ashoka Pillar emblem and also the identification mark on the note.
11. Raised horizontal rectangle for Rs 2000 note and raised circle on the right side of Rs 500 note.
12. On the left and right side on the Rs 2000 note we can see a raised print seven angular bleed lines and on RS 500 we can see five bleed lines.

#### **Some features on the reverse side**

13. The printing year has been done on the left side.
14. We can see slogan of Swachh Bharat along with logo.
15. In the centre we can see the language panel.
16. Indian heritage Red fort with flag can be seen.
17. Motif of Mangalyan which is reflecting the country's 1st venture can be seen in the interplanetary space of the notes.

## Black Money tracking

This move will help the government to track unaccounted black money or cash on which income tax has not been paid.

Individuals who are sitting on a pile of cash usually do not deposit the amount in the bank or invest anywhere as they would be required to show income or submit PAN for any valid financial transactions. They would hide it somewhere and use it as and when necessary.

Banning high-value currency will impact people who will have no option, but, to declare income and pay tax on the same or destroy the cash somehow.

## Reduction in illegal activity

Banning high-value currency will halt illegal activity as the cash provided for such activities has no value now. Black money is usually used to fund the illegal activity, terrorism, and money laundering.

Fake currency circulation will come to a halt in a single shot. Corrupt officers, money launderers are under threat as Income tax department is taking all the measures to track such people.

## Tax payment

Most of the businessmen who have been hiding some income are ready to pay advance tax as current year's income. Tax payers who have been hiding some income can come forward to declare income and pay tax on the same.

Individuals are required to submit PAN for any deposit above Rs 50,000 in cash, which will help tax department to track individuals with high denominations. Also, deposit up to Rs 2.5 lakh will not come under Income tax scrutiny.



Rupees Five Hundred

Rupees Two Thousand

Rupees Fifty

Rupees Two Hundred

## INFLATION

*It refers to a general increase in the price of goods and services. This occurs when demand for these items grows faster than the supply. The result is more money chasing fewer goods, and therefore prices increase.*

### Causes of Inflation

- Printing too much money.
- Increase in production cost.
- Tax rises. Decline in exchange rates.
- War or other events causing instability.
- Increase in money supply in the economy.

### Controlling the Economy

**Fiscal Policy:** Fiscal policy is the means by which a government adjusts its spending levels and tax rates to monitor and influence a nation's economy. The tax and expenditure programs levied and undertaken by the government are the drivers of the fiscal policy.

**Monetary Policy:** The Monetary Policy is governed by the nation's central bank (in this instance, the RBI) to control the money supply in the economy to maintain price stability and attain high economic growth. The central bank achieves this by controlling the interest rates.

### Consumer Price Index (CPI)

It expresses the current price of a basket of goods and services (say July 2014) in terms of prices during the same period in the previous year (July 2013). Most countries, including India, use the CPI as their measure of

inflation, which is measured from the consumer's perspective.

### Wholesale Price Index (WPI)

It shows the rise (or fall) of prices of manufactured goods as they leave the factory. Until recently, the Reserve Bank of India (RBI) used the WPI as their measure of inflation.

### Deflation

It is the opposite of inflation. Deflation refers to a situation where there is a decline in general price levels. Thus, deflation occurs when the inflation rate falls below 0% (or it is a negative inflation rate).

### Stagflation

It refers to an economic condition where economic growth is very slow or stagnant and prices are rising.

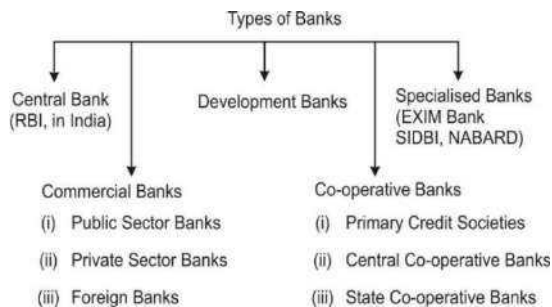
### Hyperinflation

It is a situation where the price increases are too sharp. Hyperinflation often occurs when there is a large increase in the money supply, which is not supported by growth in Gross Domestic Product (GDP).

## BANKING IN INDIA

- The first banks were the Bank of Hindustan, which was established in 1770 and liquidated in 1829-32; and the General Bank of India, established in 1786 but failed in 1791.
- The largest bank, and the oldest still in existence, is the State Bank of India (S.B.I). It originated as the Bank of Calcutta in June 1806. In 1809, it was renamed as the Bank of Bengal.
- The first Indian commercial bank which was wholly owned and managed by Indians was Central Bank of India which was established in 1911. So, Central Bank of India is called India's First Truly Swadeshi bank.

### Types of Banks



### Central Bank

It is also called the banker's bank in any country. The Reserve Bank of India is the central bank of the India.

### Commercial Banks

Commercial banks are established with an objective to help businessmen. These banks collect money from general public and give short-term loans to businessmen by way of cash credits, overdrafts, etc. Commercial banks provide various services like collecting cheques, bill of exchange, remittance money from one place to another place.

### Development Bank

It collect cash by issuing shares & debentures and providing long-term loans to industries. The main objective of these banks is to provide long-term loans for expansion and modernisation of industries.

IFCI (Industrial Finance Corporation of India) was the first of these institutions (1948). It was followed by SFCs (State Financial Institutions), ICICI (1955), IDBI (1964) and

UTI (1964) followed soon after. LIC was set up in 1956 to mobilise individual savings and to invest part of the savings in the capital market.

### Cooperative Banks

In India, Co-operative banks are registered under the Co-operative Societies Act, 1912. They generally give credit facilities to small farmers, salaried employees, small-scale industries, etc. Co-operative Banks are available in rural as well as in urban areas.

### Specialized Banks

In India, there are some specialized banks, which cater to the requirements and provide overall support for setting up business in specific areas of activity. They engage themselves in some specific area or activity and thus, are called specialized banks.

### Types of Specialized Banks in India

1. **Export Import Bank of India (EXIM Bank)** was set up in 1982. It is the principal financial institution in India for coordinating the working of institutions engaged in financing export and import trade.
2. **Small Industries Development Bank of India (SIDBI)** grants loan to those who want to establish a small-scale business unit or industry. It was established in October 1989 and commenced its operation from April 2, 1990 with its Head Office at Lucknow as a development bank, exclusively for the small scale industries.



3. **National Bank for Agricultural and Rural Development (NABARD)** was established on 12 July 1982 by a special act by the parliament. This specialized bank is a central or apex institution for financing agricultural and rural sectors.

#### **Reserve Bank of India (RBI)**

- It is India's central banking institution, which controls the monetary policy of the Indian rupee.
- It commenced its operations on 1 April 1935 during the British Rule in accordance with the provisions of the Reserve Bank of India Act, 1934.
- The original share capital was divided into shares of 100 each fully paid, which were initially owned entirely by private shareholders. Following India's independence on 15 August 1947, the RBI was nationalised on 1 January 1949.
- It has four zonal offices and 19 regional offices at most state capitals and at a few major cities in India.
- The bank is headed by the Governor and the post is currently held by economist Raghuram Rajan. There are 4 Deputy Governors H R Khan, Dr Urjit Patel, R Gandhi and S S Mundra.

#### **Functions of RBI**

- Issue of Currency Notes
- Banker to other Banks
- Banker to Government
- Exchange Rate Management
- Credit Control Function
- Supervisory Function
- Development of the Financial System
- Promotion of Banking Habits
- Bank Inspection

#### **State Bank of India (SBI)**

- It is the largest and the oldest Commercial Bank in India.
- According to the parliamentary act, State Bank of India Act (1955), Imperial Bank of India (IBI) was acquired by the Reserve Bank of India.
- On 30 April 1955 RBI renamed Imperial Bank of India as State bank of India.
- SBI act passed in 1959.
- SBI has 14 regional hubs and 57 Zonal Offices that are located at important cities throughout India.
- It is a regional banking behemoth and has 20% market share in deposits and loans among Indian commercial banks.
- SBI now has five associate banks, down from the eight that it originally acquired in 1959. All use the State Bank of India logo, which is a blue circle, and all use the "State Bank of" name, followed by the regional headquarters' name:
  1. State Bank of Mysore (founded 1913)
  2. State Bank of Patiala (founded 1917)
  3. State Bank of Hyderabad (founded 1941)
  4. State Bank of Travancore (founded 1945)
  5. State Bank of Bikaner & Jaipur (founded 1963)

#### **BHARATIYA MAHILA BANK (BMB)**

- It is an Indian financial services banking company based in New Delhi, India. It was set-up on 19 November 2013 on the occasion of the 96th birth anniversary of former Indian Prime Minister Indira Gandhi. Although initially reported as a bank exclusively for women, the bank allows deposits to flow from everyone, but lending will be predominantly for women.
- India is the third country in the world to have a bank especially for women, after Pakistan and Tanzania.

## FACTS ABOUT BANKING IN INDIA

- First bank established in India: **Bank of Hindustan** in 1770
- Second bank: **General Bank of India**, 1786
- Oldest bank in India originated in the **Bank of Calcutta** in June 1806 which was still in existence – State Bank of India
- First Indian bank got ISO: **Canara Bank**
- First India bank started solely with Indian capital investment is **PNB** (Punjab National Bank)
- Founder of Punjab National Bank is **Lala Lajpat Rai**
- Reserve bank of India (RBI) was instituted in 1935
- First governor of RBI: **Mr. Osborne Smith**
- First Indian Governor of RBI: **Mr. C D Deshmukh**
- First bank to introduce savings account in India: **Presidency Bank** in 1833
- First bank to introduce cheque system in India: **Bengal Bank** in 1833
- First bank to introduce internet banking: **ICICI bank**
- First bank to introduce mutual fund: **State Bank of India**
- First bank to introduce credit card in India: **Central Bank of India**
- Which cards are known as plastic money – **Credit Cards.**
- Open market operations are carried out by – **RBI**
- Capital market regulator is – **SEBI**
- Largest Commercial bank in India – **State Bank of India**
- The International Bank for Reconstruction and Development (IBRD) is known as – **World Bank**
- India's First Financial Archive has been set up at – **Kolkata**
- CRR, SLR, Repo Rate, Reverse Repo rate are decide by **RBI**
- **NABARD** was established in – July, 1982
- Largest Public sector bank in India – **SBI**
- Largest Private sector bank in India – **ICICI Bank**
- Largest Foreign bank in India – **Standard Chartered Bank**
- First Indian bank to open branch outside India i.e. London in 1946: **Bank of India**
- First RRB named Prathama Grameen Bank was started by: **Syndicate Bank**
- First Bank to introduce ATM in India: **HSBC** in 1987, Mumbai
- **Bank of Baroda** has the maximum number of overseas branches
- **SBI** holds the second position with maximum number of overseas branches
- Premium credit cards exclusively for women launched recently by – **HDFC bank**
- The bank which approved loan of \$500mn to help India improve Rail services – **Asian Development Bank**

## INSURANCE SECTOR IN INDIA

- *The insurance industry of India consists of 53 insurance companies of which 24 are in life insurance business and 29 are non-life insurers.*
- *Among the life insurers, Life Insurance Corporation (LIC) is the sole public sector company.*
- *Apart from that, among the non-life insurers there are six public sector insurers. In addition to these, there is sole national re-insurer, namely, General Insurance Corporation of India (GIC Re).*

### **The Insurance Regulatory Development Authority of India (IRDA)**

- It is an autonomous apex statutory body which regulates and develops the insurance industry in India.
- It was constituted by a Parliament of India act called Insurance Regulatory and Development Authority Act, 1999 and duly passed by the Government of India.
- The agency operates from its headquarters at Hyderabad, Telangana where it shifted from Delhi in 2001.
- The FDI limit in insurance sector was raised to 49% in July 2014.

### **Life Insurance Corporation of India (LIC)**

- It is an Indian state-owned insurance group and investment company headquartered in Mumbai.
- It was founded in 1956 when the Parliament of India passed the Life Insurance of India Act that nationalised the private insurance industry in India.
- Over 245 insurance companies and provident societies were merged to create the state owned Life Insurance Corporation.

### **General Insurance Corporation of India (GIC Re)**

- It was incorporated on 22 November 1972 under the Companies Act, 1956 as a private company limited by shares.
- It was formed to control and operate the business of general insurance in India.
- It is the sole reinsurance company in the Indian insurance market with over four decades of experience.
- It has its registered office and headquarters in Mumbai.
- GIC became the sole Re-Insurer in India, and is now called GIC Re.

## INDIAN FINANCIAL SYSTEM

*It refers to the borrowing and lending of funds or to the demand for and supply of funds consists of two parts, for example, the Indian Money Market and Indian Capital Market.*

### Indian Money Market

- It is the market in which short-term funds are borrowed and lent.
- It is one part of financial market where instruments like securities, bonds having short term maturities usually less than one year are traded.
- Indian Money Market is regulated by RBI and instrument having maturity less than one year usually traded in money markets.

### Major Players in Indian Money Market

1. RBI
2. Central Government
3. State Governments
4. Banks
5. Financial Institutions
6. Micro Finance Institutions
7. Foreign Institutional Investors (FII)
8. Mutual Funds

### Indian Money Market Instruments

- **Treasury Bills** are also known as T-Bills. This is one of safest instrument to invest .T-bills are issued by RBI backed by government security.
- **Commercial Papers** are issue by private organizations or financial institutions having strong credit rating to meet short term liquidity requirements. These are unsecured instruments as these are not backed by any security.
- **Certificate of Deposit (CD)** can be issued by scheduled commercial banks and select All-India Financial Institutions (FIs) that have been permitted by RBI to raise short-term resources.
- **Bankers Acceptance** provides bank guarantee to seller to pay amount of good purchased at agreed future date. In case buyer failed to pay on agreed date, seller

can invoke bank guarantee. It is usually used to finance export and import.

- **Repurchase Agreement** is also known as Repo .It is money market instrument .In this one party sell his asset usually government securities to other party and agreed to buy this asset on future agreed date. The seller pays an interest rate, called the repo rate, when buying back the securities.

### Indian Capital Market

- It is the market in which medium and long term funds are borrowed and lent.
- S.E.B.I. regulate the capital market in India .It set the transparent mechanism rules and regulations for investors and borrowers.
- It task is to protect the interest of investors and promote the growth of capital market.

### Major Players in Indian Capital Market

1. S.E.B.I
2. Central and State Government
3. Financial Institutions like L.I.C.
4. Financial intermediaries like stock brokers
5. Individuals
6. Corporate houses
7. Insurance companies

### Indian Capital Market Instruments

- **Equities market** generally known as stock market. In this company want to raise money issue shares in share market like BSE or NSE to individual or financial institutions who want to invest their surplus money.
- **Bond market** is also known as Debt market. A debt instrument is used by government or organization to generate funds for longer duration. The relation between the people who invest in debt instrument is of lender and borrower.

## STOCK EXCHANGE IN INDIA

- *It deals in shares, debentures and financial securities.*
- *There are 23 stock exchanges in India. Among them two are national level stock exchange namely Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). The rest 21 are Regional Stock Exchanges (RSE).*

### Bombay Stock Exchange (BSE)

- It was established in 1875.
- It is located at Dalal Street, Kala Ghoda, Mumbai, Maharashtra.
- BSE is Asia's first stock exchange and the world's fastest stock exchange with a median trade speed of 6 microseconds.
- The BSE is the world's 11th largest stock exchange with an overall market capitalization of \$1.7 trillion as of January 23, 2015.
- More than 5500 companies are publicly listed on the BSE.
- **Sensex** is the index of Bombay Share Market

### National Stock Exchange of India Limited (NSE)

- It was established in 1992 (located in Mumbai) as the first demutualized electronic exchange in the country.
- It has a market capitalization of more than US\$1.65 trillion, making it the world's 12th-largest stock exchange as of 23 January 2015.
- NSE was also instrumental in creating the National Securities Depository Limited (NSDL) which allows investors to securely hold and transfer their shares and bonds electronically. It also allows investors to hold and trade in as few as one share or bond.

- More than 1500 companies are publicly listed on the BSE.
- **Nifty** is the index of National Stock Exchange.

### Metropolitan Stock Exchange of India Ltd. (MSEI)

- It was formerly known as MCX Stock Exchange Ltd. (MCX-SX). It was founded in 2008.
- It is India's youngest and one of the three stock exchanges recognized by country's securities market regulator - Securities and Exchange Board of India (SEBI).
- It offers an electronic, transparent and hi-tech platform for trading in Capital Market, Futures & Options, Currency Derivatives, Interest Rate Futures (IRF) and Debt Market segments.

### Major Global Indices

Index	Country
NASDAQ Composite Index	US
Dow Jones	US
FTSE 100	UK
SSE Composite Index	China
Nikkei 225	Japan
STOXX	Europe
Hang Seng	Hong Kong
JCI	Indonesia
Kospi	South Korea
Kualalumpur Composite	Malaysia
TSEC Weighted Index	Tawan
SET	Thailand

## CREDIT RATING AGENCIES IN INDIA

- *It is a company that assigns credit ratings for issuers of certain type of debt obligation as well as the debt instrument, example of issuers are companies, State and Central Government etc.*
- *Indian credit rating industry mainly comprises of CRISIL, ICRA, CARE, ONICRA, FITCH & SMERA.*

### CRISIL

- It is the largest credit rating agency in India, with a market share of greater than 60%.
- CRISIL (Credit Rating Information Services of India Limited) is the largest credit rating agency in India. It was established in 1987.
- The world's largest rating agency Standard & Poor's now holds majority stake in CRISIL.

### SMERA

- Small and Medium Enterprises Rating Agency is a joint initiative by SIDBI, Dun & Bradstreet Information Services India Private Limited (D&B) and several leading banks in the country.
- It is the country's first Rating agency that focuses primarily on the Indian MSME segment.

### CARE

Credit Analysis and Research Limited is incorporated in 1993, is a credit rating, research and advisory committee promoted by Industrial Development Bank of India (IDBI), Canara Bank, Unit Trust of India (UTI) and other financial and lending institutions.

### ICRA

Information and Credit Rating Agency was established in 1991 by leading Indian financial institutions and commercial banks.

### ONICRA

Onida Individual Credit Rating Agency was established in 1993. It analyzes data and provides rating solutions for Individuals and Small and Medium Enterprises (SMEs).

## INDIAN FISCAL SYSTEM

*It refers to the management of revenue and capital expenditure finances of the state.*

### Fiscal Policy

- It refers to the use of taxation, public expenditure and the management of the public debt in order to achieve certain specified objectives.
- These uses can affect the following macroeconomic variables in an economy
- Aggregate demand and the level of economic activity.
- The distribution of income

- The patten of resource allocation within the government sector and relative to the private sector.

### Sources of Revenue

Main sources of revenue are customs duties, excise duties, service tax, taxes on property, corporate, income taxes.

### Sources of Expenditure

- **Plan expenditure** includes agriculture, rural development, irrigation and flood control, energy, industry, minerals, transport and communications etc.
- **Non-Plan Expenditure** consists of interest payments, defense, subsidies, and general services.

### Public Debt

- **Internal Debt** comprises loans raised from the open market treasury bills issued to the RBI, Commercial Banks etc.
- **External Debt** consists of loans taken from World Bank, IMF, ADB and Individual Countries.

### Deficits

In a budget statement, four types of deficits are mentioned. Those are, Revenue, Capital, Fiscal, Primary.

#### Revenue Deficit

There are various ways to represent and interpret a Government's deficit. The simplest is the revenue deficit which is just the difference between revenue receipts and revenue expenditures.

Revenue Deficit = Revenue Expenditure - Revenue Receipts

#### Capital Deficit

An imbalance in a nation's balance of payments capital account, in which payments

made by the country for purchasing foreign assets exceed payments received by the country for selling domestic assets. In other words, investment by the domestic economy in foreign assets is less than foreign investment in domestic assets. This is generally not a desirable situation for a domestic economy.

Capital Deficit = Capital Receipts - Disbursement on Capital Account

#### Fiscal Deficit

This is the sum of revenue and capital expenditure less all revenue and capital receipts other than loan taken. This gives a more holistic view of the Government's funding situation since it gives the difference between all receipts and expenditures other than loans taken to meet such expenditures.

Fiscal Deficit = Difference between country expenditure and earnings

Fiscal Deficit = Revenue receipts (Net Tax Revenue + Non Tax Revenue) + Capital

Receipts (only recoveries of loans and other receipts) - Total expenditure (Plan and non-plan)

#### Primary Deficit

Amount by which a Government's total expenditure exceeds its total revenue, excluding interest payments on its debt.

Primary deficit = Fiscal Deficit - Interest Payments

## UNION BUDGET

- *Union Budget keeps the account of the government's finances for the fiscal year that runs from 1st April to 31st March.*
- *According to Article 112 of the Indian Constitution, the Union Budget of a year, also referred to as the annual financial statement, is a statement of the estimated receipts and expenditure of the government for that particular year.*
- *Union Budget keeps the account of the government's finances for the fiscal year that runs from 1st April to 31st March. Union Budget is classified into Revenue Budget and Capital Budget.*

### Revenue budget

It includes the government's revenue receipts and expenditure. There are two kinds of revenue receipts - tax and non-tax revenue. Revenue expenditure is the expenditure incurred on day to day functioning of the government and on various services offered to citizens. If revenue expenditure exceeds revenue receipts, the government incurs a revenue deficit.

### Capital Budget

It includes capital receipts and payments of the government. Loans from public, foreign governments and RBI form a major part of the government's capital receipts. Capital expenditure is the expenditure on development of machinery, equipment, building, health facilities, education etc. Fiscal deficit is incurred when the government's total expenditure exceeds its total revenue.

### Vote on Account

It deals only with the expenditure side of the government's budget

### Interim Budget

It is a complete set of accounts, including both expenditure and receipts. It gives the complete

financial statement, very similar to a full Budget.

### Facts about Union Budget of India

- The first Union budget of independent India was presented by R. K. Shanmukham Chetty on November 26, 1947.
- The first budget of Republic of India was proposed by John Mathai in 1950 and also the creation of Planning Commission.
- CD Deshmukh was the first Indian Governor of RBI to have presented the Interim Budget for the year 1951-52.
- Indira Gandhi is the only woman to hold the post of the Finance Minister and to have presented the budget in her capacity as the Prime Minister of India in 1978.
- Finance Minister Morarji Desai has given budget for the maximum number of times (10) followed by P Chidambaram, who has given 8 budgets.
- The first such mini-budget was presented by TT Krishnamachari on 30th November, 1956, in form of fresh taxation proposals through Finance Bills, demanded by the prevailing domestic and international economic situation.
- Dr. Manmohan Singh became the Finance Minister but presented the interim budget for 1991-92 as elections were forced.



## INDIAN TAXATION SYSTEM (BEFORE GST)

- India has a well-developed tax structure with clearly demarcated authority between Central and State Governments and local bodies.
- Central Government levies taxes on income (except tax on agricultural income, which the State Governments can levy), customs duties, central excise and service tax.
- Value Added Tax (VAT), stamp duty, state excise, land revenue and profession tax are levied by the State Governments.
- Local bodies are empowered to levy tax on properties, authorize and for utilities like water supply, drainage etc.
- Indian taxation system has undergone tremendous reforms during the last decade. The tax rates have been rationalized and tax laws have been simplified resulting in better compliance, ease of tax payment and better enforcement. The process of rationalization of tax administration is ongoing in India.

### Direct Tax

- It is referred to as the tax, levied on person's income and wealth and is paid directly to the government.
- The person on whom it is levied bears its burden.
- It helps in reducing the inflation.
- Types of Direct Taxes are Wealth Tax, Income Tax, Property Tax, Corporate Tax, Import and Export Duties.

### Indirect Tax

- It is referred to as the tax, levied on a person who consumes the goods and services and is paid indirectly to the government.
- The burden of tax can be shifted to another person.
- It taxes promotes the inflation.
- Types of Indirect Taxes are Central Sales tax, VAT (Value Added Tax), Service Tax, STT (Security Transaction Tax), Excise Duty, Custom Duty.

### Central Government levies taxes on the following

- **Income Tax:** Tax on income of a person
- **Customs duties:** Duties on import and export of goods
- **Central excise:** Taxes on Manufacturing of dutiable goods
- **Service tax:** Taxes on provision of services

### State Governments can levy the following taxes

- **Value Added Tax (VAT):** This is tax on sale of goods. While intra-state sale of goods are covered by the VAT Law of that state, inter-state sale of goods is covered by the Central Sales Tax Act. Even the revenue collected under Central Sales Tax Act is done so by the State Governments themselves and actually the Central Government has no role to play so.
- **Stamp duties and Land Revenue:** Since land is a matter on which only State Governments can govern, thus the Stamp duties on transfer of immovable properties are levied by State Governments.
- **State Excise** on Liquor and certain agricultural goods.

## INDIAN TAXATION SYSTEM (AFTER GST)

### GST LAUNCH HIGHLIGHTS

*President Pranab Mukherjee, PM Modi Launch India's Biggest Tax Reform*

Goods and Services Tax (GST), India's biggest tax reform, was launched at midnight at Parliament's historic Central Hall, by President Pranab Mukherjee and Prime Minister Narendra Modi. With the stroke of the gong, current tax rates are replaced by GST rates. It is the fourth time since Independence that an event was held there at midnight. The last three celebrated India's Independence and that is among the reasons that the Congress had listed for boycotting the GST launch. Several other opposition parties too stayed away. GST, which replaces a slew of indirect taxes with a unified tax, is set to dramatically reshape the country's 2 trillion dollar economy.

<b>GST</b> (Goods & Services tax)					
<b>COSTLIER ▲</b>			<b>CHEAPER ▼</b>		
	Pre-GST	After-GST		Pre-GST	After-GST
Shoes > ₹ 500	14.4%	18%	Fertiliser	12%	5%
Cornflakes	10%	18%	Tractor Parts	28%	18%
Jam	5%	18%	Shoes < ₹ 500	14.4%	5%
Leather Bags	6%	22%	Garments > ₹ 1000	18.5%	12%
Mobile Bills/Salon Visits	15%	18%	Cellphones	13-24%	12%
Credit Card/NEFT	15%	18%	Soap, Hair Oil	24-28%	18%
Telephone Bills	15%	18%	Pressure Cooker	19.5%	12%
Business Air Tickets	9%	12%	Economy Air Tickets	6%	5%
Small Cars < 1500cc	25-27%	28+1%	Large Cars > 1500cc	41.5-44.5%	28+15%
Watch	20%	28%	Plastic Kitchenware	17.5-27%	18%
Life Insurance	15%	18%	Biscuits	12-18%	18%
Hotels > ₹ 7500	18-25%	28%			
DSLR Camera	25%	28%			
Shampoo	26%	28%			
Perfume	26%	28%			
TVs & ACs	26%	28%			
<b>UNCHANGED ◀▶</b>					
	Pre-GST	After-GST		Pre-GST	After-GST
Garments < ₹ 1000	5-6%	5%			
Movie Tickets > ₹ 1000	25-30%	28%			
Gold	2-5%	3%			

## GST IMPACT IN 10 POINTS

The historic GST or goods and services tax has become a reality. The new tax system was launched at a function in Central Hall of Parliament on Friday midnight. GST, which embodies the principle of "one nation, one tax, one market" is aimed at unifying the country's \$2 trillion economy and 1.3 billion people into a common market. Under GST, goods and services fall under five tax categories: 0 per cent, 5 per cent, 12 per cent, 18 per cent and 28 per cent. For corporates, the elimination of multiple taxes will improve the ease of doing business. And for consumers, the biggest advantage would be in terms of a reduction in the overall tax burden on goods.

***"Inflation will come down, tax avoidance will be difficult, India's GDP will be benefitted and extra resources will be used for welfare of poor and weaker section,"*** Finance Minister Arun Jaitley said at GST launch event in Parliament.

### Here is a 10-point cheat-sheet

1. The biggest game changer in GST is input tax credit, where credits of input taxes paid at each stage of production or service delivery can be availed in the succeeding stages of value addition. This means that the end consumer will thus only bear the GST charged by the last point in supply chain, with set-off benefits at all the earlier stages.
2. To ensure that manufacturers and service providers pass on the benefit to the final customer, the government has included an anti-profiteering clause in GST. Under this, it becomes mandatory to pass on the benefit of tax reduction due to input tax credit to the final customer.
3. Petroleum products such as petrol, diesel and aviation turbine fuel have been kept out of GST as of now. The GST Council will take a decision on it at a later date. Alcohol has also been kept out of GST.
4. The implementation of the GST is not expected to have a material impact on overall inflation, the Reserve Bank of India said in its latest monetary policy statement. Economists also predict a benign inflation regime with global crude prices remaining soft and forecast of normal monsoon. Though the tax rates in some select services categories like banking and financial services go up, overall inflation may not be impacted significantly, according to economists at DBS Bank, who say the overall tax burden will get lowered over time.
5. "The impact of GST on service sector in the short term could be inflationary as the tax rate would immediately shoot up to 18 per cent. However, going forward, it is expected that due to reduced cost because of availability of GST credit on items hitherto not available, the price of services will come down which will benefit the consumers," said Sandeep Sehgal, director-tax and regulatory at Ashok Maheshwary & Associates LLP.
6. Manufacturers may wait for a few weeks to gauge the net impact of GST on them as well as on wholesalers and distributors and may revise the prices accordingly later, says Mr Sehgal.
7. Domestic stock markets have come off recent highs in the run-up to the GST amid some cautiousness over its implementation. In the near term, the markets are looking at the implementation of GST, says Dhiraj Relli of HDFC Securities, which sees Nifty hitting new highs of 10,300-10,400 this fiscal year. Analysts say that markets will need some time to adjust to the GST implementation process, which could partially hurt corporate earnings in the short term but will boost earnings over the long term.
8. For India Inc, the biggest benefit would be the ease of doing business. GST replaces multiple taxes, multiple interfaces, multiple compliances regime into one, says Ansh Bhargava, head for growth & alliance at Taxmann. "India is moving towards tax-compliant society where filing of returns will not just be easy but transparent too. This tax compliance will lead to higher revenue for both the central and state governments and enable them to fulfil their social objectives," he said.
9. Small traders with annual turnover less than Rs. 20 lakh are exempt from GST registration. In further relief to small businesses, under the composition scheme, they will benefit from not

having to meet with detailed compliances under GST. However, they will not get the benefit of input tax credit. If businesses opt for the composition scheme, traders with turnover below Rs. 75 lakh will have to pay 1 per cent tax on turnover. Manufacturers will have to pay 2 per cent while restaurant businesses will have to pay 5 per cent.

10. Commenting on the benefits of GST, Chanda Kochhar, MD & CEO of ICICI Bank said, "The GST is a transformational structural reform which will have multiple benefits - the creation of a national market; enhanced ease of doing business; greater productivity and efficiency; and improved tax compliance. This reform will result in benefits for all participants in the Indian economy, including both businesses and consumers."

## A QUICK GUIDE TO INDIA GST RATES IN 2017

The Goods and Services Tax (GST) has been one of the key things that has caught the attention of the market given its implications on earnings of companies. The government has kept a large number of items under 18% tax slab. The government categorised 1211 items under various tax slabs. Here is a low-down on the tax slab these items would attract:

Here is the complete updated list:

*Gold and rough diamonds do not fall under the current rate slab ambit and will be taxed at 3% and 0.25% respectively.*

### No tax (0%)

- **Goods :** No tax will be imposed on items like Jute, fresh meat, fish chicken, eggs, milk, butter milk, curd, natural honey, fresh fruits and vegetables, flour, besan, bread, prasad, salt, bindi. Sindoor, stamps, judicial papers, printed books, newspapers, bangles, handloom, Bones and horn cores, bone grist, bone meal, etc.; hoof meal, horn meal, Cereal grains hulled, Palmyra jaggery, Salt - all types, Kajal, Children's' picture, drawing or colouring books, Human hair
- **Services :** Hotels and lodges with tariff below Rs 1,000, Grandfathering service has been exempted under GST. Rough precious and semi-precious stones will attract GST rate of 0.25 per cent.

### 5% Tax

- **Goods :** Items such as fish fillet, Apparel below Rs 1000, packaged food items, footwear below Rs 500, cream, skimmed milk powder, branded paneer, frozen vegetables, coffee, tea, spices, pizza bread, rusk, sabudana, kerosene, coal, medicines, stent, lifeboats, Cashew nut, Cashew nut in shell, Raisin, Ice and snow, Bio gas, Insulin, Agarbatti, Kites, Postage or revenue stamps, stamp-post marks, first-day covers
- **Services :** Transport services (Railways, air transport), small restaurants will be under the 5% category because their main input is petroleum, which is outside GST ambit.

### 12% Tax

- **Goods :** Apparel above Rs 1000, frozen meat products, butter, cheese, ghee, dry fruits in packaged form, animal fat, sausage, fruit juices, Bhutia, namkeen, Ayurvedic medicines, tooth powder, agarbatti, colouring books, picture books, umbrella, sewing machine, cellphones, Ketchup & Sauces, All diagnostic kits and reagents, Exercise books and note books, Spoons, forks, ladles, skimmers, cake servers, fish knives, tongs, Spectacles, corrective, Playing cards, chess board, carom board and other board games, like ludo,
- **Services :** State-run lotteries, Non-AC hotels, business class air ticket, fertilisers, Work Contracts will fall under 12 per cent GST tax slab

### 18% Tax

- **Goods :** Most items are under this tax slab which include footwear costing more than Rs 500, Trademarks, goodwill, software, Bidi Patta, Biscuits (All categories), flavoured refined sugar, pasta, cornflakes, pastries and cakes, preserved vegetables, jams, sauces, soups, ice cream, instant food mixes, mineral water, tissues, envelopes, tampons, note books, steel products, printed circuits, camera, speakers and monitors, Kajal pencil sticks, Headgear and parts thereof, Aluminium foil, Weighing Machinery [other than electric or electronic weighing machinery], Printers [other than multifunction printers], Electrical Transformer, CCTV, Optical Fiber, Bamboo furniture, Swimming pools and padding pools, Curry paste; mayonnaise and salad dressings; mixed condiments and mixed seasonings
- **Services :** AC hotels that serve liquor, telecom services, IT services, branded garments and financial services will attract 18 per cent tax under GST, Room tariffs between Rs 2,500 and Rs 7,500, Restaurants inside five-star hotels

### 28% Tax

- **Goods :** Bidis, chewing gum, molasses, chocolate not containing cocoa, waffles and wafers coated with chocolate, pan masala, aerated water, paint, deodorants, shaving creams, after shave, hair shampoo, dye, sunscreen, wallpaper, ceramic tiles, water heater, dishwasher, weighing machine, washing machine, ATM, vending machines, vacuum cleaner, shavers, hair clippers, automobiles, motorcycles, aircraft for personal use, will attract 28 % tax - the highest under GST system.
- **Services :** Private-run lotteries authorised by the states, hotels with room tariffs above Rs 7,500, 5-star hotels, race club betting, cinema will attract tax 28 per cent tax slab under GST.

## FINANCE COMMISSIONS IN INDIA

- Article 280 of the Constitution of India provides for a Finance Commission as a quasi-judicial body.
- It is constituted by the President of India every fifth year or at such earlier time as he considers necessary.

Finance Commission	Year of Estb.	Chairman	Operational Duration
First	1951	K. C. Neogy	1952-57
Second	1956	K. Santhanam	1957-62
Third	1960	A. K. Chanda	1962-66
Fourth	1964	P. V. Rajamannar	1966-69
Fifth	1968	Mahaveer Tyagi	1969-74
Sixth	1972	K. Brahmananda Reddy	1974-79
Seventh	1977	J. M. Shelat	1979-84
Eighth	1983	Y. B. Chavan	1984-89
Ninth	1987	N. K. P. Salve	1989-95
Tenth	1992	K. C. Pant	1995-2000
Eleventh	1998	A. M. Khusro	2000-2005
Twelfth	2002	C. Rangarajan	2005-2010
Thirteenth	2007	Dr. Vijay L. Kelkar	2010-2015
Fourteenth	2013	Dr. Y. V Reddy	2015-2020

### Fourteenth Finance Commission

- It has recommended an increase in the share of states in the centre's tax revenue from the current 32 per cent to 42 per cent. This is indeed the single largest increase ever recommended by a Finance Commission.
- As against a total devolution of ₹ 3.48 lakh crore approximately in 2014-15, the total devolution to the States in 2015-16 will be ₹ 5.26 lakh crore approximately, a year-on-year increase of ₹ 1.78 lakh crore approximately.
- "The higher tax devolution will allow States greater autonomy in financing and designing schemes as per their needs and requirements," says the report. Practically, it will give more power to states in determining how they spend this money.

### Panel of Fourteenth Finance Commission

- Former Governor of the Reserve Bank of India, **Mr. Y.V. Reddy**, is the Chairman.
- The Commission comprise **Abhijit Sen**, Member, Planning Commission; **Sushama Nath**, Former Union Finance Secretary; **M Govinda Rao**, former Director of National Institute of Public Finance and Policy; **Sudipto Mundle**, former Acting Chairman, National Statistical Commission; and **AN Jha**, Secretary to the Commission.

## INTERNATIONAL FINANCIAL ORGANIZATION

### World Bank (WB)

- It is an international financial organization that provides loans to developing countries for capital programs.
- It was formed in July 1944. It is located in Washington, D.C., U.S. It's official goal is the reduction of poverty.
- It comprises two institutions: the International Bank for Reconstruction and Development (IBRD), and the International Development Association (IDA).
- The World Bank is a component of the **World Bank Group**, which is part of the United Nations system.

The **World Bank Group** consists of five organizations:

1. International Bank for Reconstruction and Development (IBRD)
2. International Development Association (IDA)
3. International Finance Corporation (IFC)

4. Multilateral Investment Guarantee Agency (MIGA)
5. International Centre for Settlement of Investment Disputes (ICSID)

### International Monetary Fund (IMF)

- It is an international organization headquartered in Washington, D.C.
- It is a financial organization of 188 countries working to foster global monetary cooperation, secure financial stability, facilitate international trade, promote high employment and sustainable economic growth, and reduce poverty around the world.
- The IMF came into formal existence in December 1945. It began operations on March 1, 1947.

### World Trade Organization (WTO)

- It is an organization that intends to supervise and liberalize international trade.

- It is officially commenced on 1 January 1995 under the Marrakech Agreement, replacing the General Agreement on Tariffs and Trade (GATT), which commenced in 1948.
- It has 159 members and 25 observer governments. Its headquarters is in Centre William Rappard, Geneva, Switzerland.
- It is the only global international organization dealing with the rules of trade between nations.

### WTO Conferences

Sl. No.	Date	Host City
1st	9 – 13 Dec 1996	Singapore
2nd	18 – 20 May 1998	Geneva, Switzerland
3rd	30 Nov – 3 Dec 1999	Seattle, United States
4th	9 – 14 Nov 2001	Doha, Qatar
5th	10 – 14 Sept 2003	Cancún, Mexico
6th	13 – 18 Dec 2005	Hong Kong
7th	30 Nov – 2 Dec 2009	Geneva, Switzerland
8th	15 – 17 Dec 2011	Geneva, Switzerland
9th	3 – 6 Dec 2013	Bali, Indonesia
10th	15 – 18 Dec 2015	Nairobi, Kenya
11th	11 – 14 Dec 2017	Buenos Aires, Argentina

### Asian Development Bank (ADB)

- It was established in December, 1966, with the aim to accelerate economic and social development in Asia and Pacific region, it is headquartered at Manila, Philippines.
- The main devices for assistance of ADB are loans, grants, policy dialogue, technical assistance and equity

investments. ADB has 67 members of which 48 are from within Asia and the Pacific and 19 outside.

- For OCR, members subscribe capital, including paid-in and callable elements, a 50 % paid-in ratio for the initial subscription, 5 % for the Third General capital increase (GCI) in 1983 and 2 % for the Fourth General Capital Increase in 1994.

### BIMSTEC

- Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC) is an international organisation involving a group of countries in South Asia and South East Asia. These are: Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan and Nepal.
- On 6 June 1997, a new sub-regional grouping was formed in Bangkok and given the name BIST-EC (Bangladesh, India, Sri Lanka, and Thailand Economic Cooperation).
- Myanmar attended the inaugural June Meeting as an observer and joined the organisation as a full member at a Special Ministerial Meeting held in Bangkok on 22 December 1997, upon which the name of the grouping was changed to BIMST-EC.
- Nepal was granted observer status by the second Ministerial Meeting in Dhaka in December 1998.
- Full membership has been granted to Nepal and Bhutan in 2003.

**LIST OF COMMITTEES IN INDIA DURING 2017-18**

<b>Name of the Committees</b>	<b>Chairpersons</b>	<b>Committees working for</b>
Sports Code committee	Injeti Srinivas	To suggest improvements in the National Sports Development Code functioning of sports federations.
Special Task Force	Anil Bajjal	To review the decisions taken by the Delhi Police and other departments regarding women's safety
Negotiation Committee on Mahanadi & its Tributaries	Water Planning and Projects Wing (WP&P) and Central Water Commission (CWC).	To determine the availability and utilization of waters of the river Mahanadi and its tributaries.
N.K. Singh Committee	N.K. Singh	To review the Fiscal Responsibility and Budget Management (FRBM) Act.
Defence Procurement Organisation (DPO)	Dr. Pritam Singh	To integrate and streamline the long and complex process of defence acquisitions
Krishna River Management Board (KRMB)	AK Bajaj	To look into te Water sharing between Andhra Pradesh and Telangana
DB Shekatkar Committee	DB Shekatkar	To reform the military financial management
Inter-Ministerial Monitoring-cum-coordination Committee	-	To monitor the regional air connectivity scheme UDAN
Girdhar Malviya committee	Justice Shri Girdhar Malviya	To prepare draft Ganga Act submitted its report to the Union Minister of Water Resources, River Development and Ganga Rejuvenation to Uma Bharti
Kewal Kumar Sharma committee	Kewal Kumar Sharma	To review UGC recommendations on 7th Pay commission in educational institutes
High-level task force	Arvind Panagariya	To compute timely data on employment situation in the country.
Chitale Committee	Madhav Chitale	To recommends measures for desiltation of river Ganga
Panel on National Education Policy	Krishnaswamy Kasturirangan	To draft the National Education Policy
GST Council panel	Pradeep Kumar Sinha	To select National Anti-profiteering Authority
RBI panel	Tarun Ramadorai	Rights- based privacy framework in household finance
Parliamentary Panel	B C Khanduri	100% pension to widow of deceased soldiers
Task Force on Artificial Intelligence	Dr. V. Kamakoti	Artificial Intelligence (AI) for India's Economic Transformation.
SEBI committee	T K Viswanathan	The committee will suggest short term and medium term measures for improved surveillance of the markets
Cabinet Committee on Security (CCS)	Shekatkar Committee	To enhance combat capability and rebalancing Defence Expenditure of the Armed Forces
Empowered Steering Committee (ESC)	Based on the recommendations of the interim report of the 8-member Task Force headed by AbinavBindra	The committee will review the core probable list of each High Priority and Priority disciplines for Commonwealth Games, Asian Games and Olympic Games
NITI Aayog Expert Task Force on Employment & Exports	Dr.Rajiv Kumar	To provide a major thrust to job creation by enhancing India's exports.
Group of Ministers on the implementation of GST	Sushil Kumar Modi	To monitor and resolve IT challenges faced in implementation of Goods and Services Tax (GST)
Group of Ministers on the implementation of GST	Hasmukh Adhia	To look at the issues of export sector and to recommend to the GST Council
Joint Parliamentary Committee	Bhupender Yadav	To examine and present a report on the Financial Resolution and Deposit Insurance Bill, 2017
Appointments Committee of the Cabinet	Narendra Modi	It is responsible for all appointments of higher ranks in the Central Secretariat, Public Enterprises, Public Enterprises and Financial Institutions
Cabinet Committee on Economic Affairs (CCEA)	Narendra Modi	It deals with the activities pertaining to the economics of the country
Cabinet Committee on Political Affairs (CCPA)	Narendra Modi	It is responsible for all issues related to domestic and foreign affairs. It is most powerful cabinet committee. It is often referred as 'super cabinet'
Cabinet Committee on Security (CCS)	Narendra Modi	It is one of the most important committees in India, it looks into the matters of defence expenditures and National security
Cabinet Committee on Accommodation (CCA)	Rajnath Singh	It is responsible for the allotment of accommodation for various top positions in the Government of India.



# GENERAL SCIENCE



# PHYSICS

## Introduction

- PHYSICS is originated from a Greek word **Physis** or **fusis**, meaning nature or natural things.
- It is the study of nature and its laws. In other words, it is the study of matter and energy.
- Physics explains natural phenomena in the universe, it's often considered to be the most fundamental science.
- It provides a basis for all other sciences - without physics, you couldn't have biology, chemistry, or anything else!
- Emphasis within physics is centered on energy and force and defining the laws of nature which govern how our universe behaves.

## Major Branches of Physics

- **Acoustics** is the study of production and properties of sound.
- **Astronomy** is the study of celestial objects.
- **Atomic Physics** is the study of structure and properties of an atom.
- **Biophysics** applies the approaches and methods of physics to study biological systems.
- **Cryogenics** is the study of matters in very low-temperature.
- **Electromagnetism** is the study of the electromagnetic force.
- **Electrodynamics** is the study of rapidly changing electric and magnetic fields.
- **Fluid Dynamics** deals with movement of liquid and gases.
- **Mechanics** deals with behaviour of object and system to various forces.
- **Meteorology** is the study of the atmosphere.
- **Nuclear/ Modern Physics** is concerned with structure and properties of atomic nucleus and their reactions.
- **Optical sciences** is the study of the properties and behavior of light along with the interactions of light, matter and energy.
- **Thermodynamics** is the study of how heat relates to work and energy.

## UNIT OF MEASUREMENT

### Unit

Unit is the standardised quantity of a physical property, used as a factor to express occurring quantities of that property.

### Types of Units

- The units of fundamental physical quantities are called fundamental units. They are length, mass and time. They are independent of one another.
- Units of physical quantities can be expressed in terms of fundamental units and such units are called derived units, like area, velocity, etc.

## SI System

BASIC UNITS			
Dimension	Unit	Unit symbol	Symbol
Length	meter	m	<i>l</i>
Mass	kilogram	kg	<i>m</i>
Time	second	s	<i>t</i>
Electric Current	ampere	A	<i>I</i>
Temperature	kelvin	K	<i>T</i>
Luminous Intensity	candela	cd	<i>J</i>
Amount of Substance	mole	mol	<i>N</i>
SUPPLEMENTARY UNITS			
angle	radian	m·m <sup>-1</sup>	<i>rad</i>
solid angle	steradian	m <sup>2</sup> ·m <sup>-2</sup>	<i>sr</i>

## Important Derived Units

Derived quantity	Definition	SI Unit
Area	Length square	m <sup>2</sup>
Speed / Velocity	Displacement per unit time	m/s
Force	Mass x Acceleration	Kgms <sup>-2</sup>

## Some Practical Units of Length

- 1 light-year (ly) =  $9.46 \times 10^{15}$  m
- 1 AU or ua =  $1.5 \times 10^{11}$  m
- 1 parsec =  $3.084 \times 10^{16}$  m  $\approx$  3.26 ly
- 1 nautical mile = 1.85200 km
- 1 micrometer or micron =  $1 \times 10^{-6}$  m
- 1 angstrom (Å) =  $10^{-10}$  m

## Some Practical Units of Mass

- 1 quintal =  $10^2$  kg
- 1 metric ton =  $10^3$  kg
- 1 atomic mass unit (amu) or dalton =  $1.66 \times 10^{-27}$  kg
- 1 pound = 0.453592 kg
- 1 Chandrasekhar limit = 1.44 mass of the sun =  $2.864 \times 10^{30}$  kg

# MOTION

## Motion

- Motion is a change in position of an object with respect to time.
- It is typically described in terms of displacement, direction, velocity, acceleration, and time.

## Scalar quantity

It is a physical quantity which has only magnitude. e.g., mass, length, time, work, etc.

## Vector quantity

It is a physical quantity which has magnitude as well as direction. e.g., velocity, displacement, acceleration, etc.

## Kinematics

It is a branch of mechanics, which deals with the motion of object.

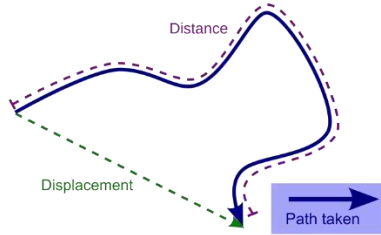
## Distance (S)

- It is the length of actual path followed by an object in a particular time interval during a motion.
- It is a scalar quantity and its unit is meter.
- Its dimensional formula is  $[M^0L^1T^0]$ .

## Displacement ( $\vec{S}$ )

- It is a vector that is the shortest distance from the initial to the final position of an object during a time interval.
- It is a vector quantity and its unit is meter.

- Its dimensional formula is also  $[M^0L^1T^0]$ .
- The magnitude of displacement is less than or equal to the magnitude of distance.
- $|\text{Displacement}| \leq |\text{Distance}|$



### Speed (v)

- It is the rate of change of distance with respect to time.
  - It is a scalar quantity and its unit is meter/second (m/s).
  - Dimension of speed is  $[M^0L^1T^{-1}]$ .
  - Average speed is
- $$v_a = \frac{\Delta s}{\Delta t} = \frac{\text{Total distance travelled}}{\text{Total time taken}}$$
- Speed of Light =  $3 \times 10^8$  m/s
  - Speed of Sound = 343 m/s
  - The first scientist to measure speed as distance over time was Galileo.

### Velocity ( $\vec{v}$ )

- It is the rate of change of displacement with respect to time.
  - It is a vector quantity and its unit is meter/second (m/s).
  - Dimension of speed is  $[M^0L^1T^{-1}]$
  - Average velocity is
- $$\vec{v}_a = \frac{\Delta \vec{s}}{\Delta t} = \frac{\text{Displacement}}{\text{Total time taken}}$$

### Uniform Velocity

If an object undergoes equal displacements in equal intervals of time, then it is said to be moving with a uniform velocity.

### Non-Uniform Velocity

If an object undergoes unequal displacements in equal intervals of time, then it is said to be moving with a non-uniform or variable velocity.

### Relative velocity

- Relative velocity of an object with respect to another object is the time rate of change of relative position of one object with respect to another object.
- Relative velocity of object A with respect to object B
- $\vec{V}_{AB} = \vec{V}_A - \vec{V}_B$

### Acceleration (a)

- The time rate of change of velocity is called acceleration.
- Its unit is  $m/s^2$
- Its dimensional formula is  $[M^0LT^{-2}]$
- It is a vector quantity.
- Average acceleration over a period of time is the change in velocity ( $\Delta v$ ) divided by the duration of the period ( $\Delta t$ )
- $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{v_2 - v_1}{\Delta t}$
- Acceleration of an object is zero, if it is at rest or moving with uniform velocity.

## EQUATIONS OF MOTION

- The equations of motion are used to describe various components of a moving object.
- Displacement, velocity, time and acceleration are the kinematic variables that can be derived from these equations.
- There are three equations, which are also referred to as the laws of constant acceleration, and therefore can only be applied when acceleration is constant and motion is constrained to a straight line. The three equations are

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

Where

$u$  = initial velocity (m/s)

$v$  = final velocity (m/s)

$a$  = acceleration (m/s<sup>2</sup>)

$t$  = time (s)

$s$  = displacement (m)

### Equation of motion under gravity

#### Downward direction:

$$v = u + gt$$

$$v^2 = u^2 + 2gs$$

$$h = ut + \frac{1}{2}gt^2$$

Where  $g$  (gravitational acceleration) = 9.8 m/s<sup>2</sup>

#### Upward direction:

$$v = u - gt$$

$$v^2 = u^2 - 2gs$$

$$h = ut - \frac{1}{2}gt^2$$

Where  $g$  (gravitational acceleration) = -9.8 m/s<sup>2</sup>

### Distance travelled by a body in $n$ th second

$$S_{nth} = u + (2n-1) a/2$$

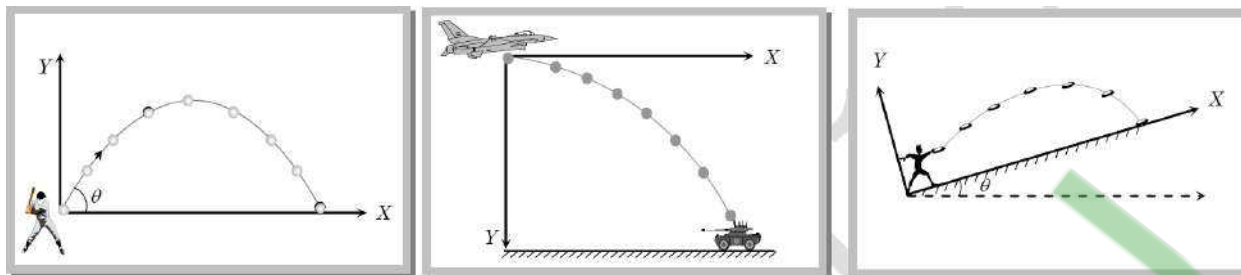
$h$  = height,  $n$ th = time interval

### Motion in Two Dimension

- The motion of an object is called two dimensional, if two of the three co-ordinates are required to specify the position of the object in space changes w.r.t time.
- In such a motion, the object moves in a plane. For example, a billiard ball moving over the billiard table, an insect crawling over the floor of a room, earth revolving around the sun etc.
- Two special cases of motion in two dimension are Projectile motion and Circular motion.

### Projectile Motion

- Projectile motion is a form of motion in which an object or particle (called a projectile) is thrown near the earth's surface, and it moves along a curved path under the action of gravity only. The only force of significance that acts on the object is gravity, which acts downward to cause a downward acceleration.
- Velocity of the projectile changes by acceleration vector in unit time.
- The motion of a projectile is a two-dimensional motion. So, it can be discussed in two parts, Horizontal motion and vertical motion. These two motions take place independent of each other.
- The velocity of the particle can be resolved into two mutually perpendicular components. Horizontal component and vertical component.
- The horizontal component remains unchanged throughout the flight. The force of gravity continuously affects the vertical component.
- The horizontal motion is a uniform motion and the vertical motion is a uniformly accelerated retarded motion.



Oblique projectile motion (Left), Horizontal projectile motion (Middle), Projectile motion on an inclined plane (Right)

### Kinematic quantities of projectile motion

Where,

X axis is horizontal and Y axis is vertical.

$\sin \theta$  is the component along y-axis

$\cos \theta$  is the component along x-axis

$V_0$  is the initial Velocity,

$V_x$  is the velocity along x-axis

$V_y$  is the velocity along y-axis

$g$  is the acceleration due to gravity and

$t$  is the time taken.

### Acceleration

$$a_x = 0$$

$$a_y = -g$$

### Velocity

$$v_x = v_0 \cos(\theta)$$

$$v_y = v_0 \sin(\theta) - gt$$

The magnitude of the velocity

$$v = \sqrt{v_x^2 + v_y^2}$$

### Displacement

At any time  $t$ , the projectile's horizontal and vertical displacement:

$$x = v_0 t \cos(\theta)$$

$$y = v_0 t \sin(\theta) - \frac{1}{2}gt^2$$

The magnitude of the displacement:

$$\Delta r = \sqrt{x^2 + y^2}$$

### The maximum height of projectile

$$h = \frac{v_0^2 \sin^2(\theta)}{2g}$$

### Circular Motion

- It is a movement of an object along the circumference of a circle or rotation along a circular path.
- It can be uniform, with constant angular rate of rotation and constant speed, or non-uniform with a changing rate of rotation.
- Examples of circular motion include: an artificial satellite orbiting the Earth at constant height, a stone which is tied to a rope and is being swung in circles.

### Velocity in Circular Motion:

$$v = r \frac{d\theta}{dt} = r\omega$$

### Acceleration in Circular Motion:

$$a = v \frac{d\theta}{dt} = v\omega = \frac{v^2}{r}$$

Where the angular rate of rotation is  $\omega$ . (By rearrangement,  $\omega = v/r$ .) Thus,  $v$  is a constant, and the velocity vector  $v$  also rotates with constant magnitude  $b$ , at the same angular rate  $\omega$ .

## Force ( $\vec{F}$ )

- A force is a push or pull upon an object resulting from the object's interaction with another object.
- It is a product of mass and acceleration.
- Its unit is newton and represented by the symbol  $F$ .
- Force = mass x acceleration
- or  $\vec{F} = m\vec{a}$
- $1\text{N} = 1\text{ kg} \times 1\text{m/s}^2$ .

## Centrifugal Force (Christiaan Hygens in 1659)

It is the tendency of an object following a curved path to fly outwards, away from the center of the curve. It is the inertia of motion. e.g. Mud flying off a tire; children pushed out on a roundabout.

## Centripetal Force (Isaac Newton in 1684)

The force that keeps an object moving with a uniform speed along a circular path. e.g. Satellite orbiting a planet.

# NEWTON'S LAWS OF MOTION



*Isaac Newton (1643-1727), the physicist who formulated the laws of motion*

## Newton's First Law of Motion

- It states that every object will remain at rest or in uniform motion in a straight line unless compelled to change its state by the action of an external force.
- This is normally taken as the definition of inertia. (Galileo's concept "Law of Inertia")
- The key point here is that if there is no net force acting on an object (if all the external forces cancel each other out) then the object will maintain a constant velocity. If that velocity is zero, then the object remains at rest. If an external force is applied, the velocity will change because of the force.
- The first law can be stated mathematically as
- $\sum F = 0 \Rightarrow \frac{dv}{dt} = 0$

## Newton's Second Law of Motion

- It explains how the velocity of an object changes when it is subjected to an external force.
- It defines a force to be equal to change in momentum (mass times velocity) per change in time.
- Newton also developed the calculus of mathematics, and the "changes" expressed in the second law are most accurately defined in differential forms. For an object with a constant mass  $m$ , the second law states that the force ( $F$ ) is the product of an object's mass ( $m$ ) and its acceleration ( $a$ ):
- $F = m \frac{dv}{dt} = ma$

### Newton's Third Law of Motion

- Every action have equal and opposite reaction.
- The third law states that all forces exist in pairs: if one object **A** exerts a force  $\mathbf{F}_A$  on a second object **B**, then **B** simultaneously exerts a force  $\mathbf{F}_B$  on **A**, and the two forces are equal and opposite:  $\mathbf{F}_A = -\mathbf{F}_B$
- The third law can be used to explain the generation of lift by a wing and the production of thrust by a jet engine.

### Momentum (p)

- It refers to the quantity of motion that an object has. It can be also defined as "mass in motion."
- Linear momentum or translational momentum is the product of the mass and velocity of an object.
- It is a vector quantity.
- $p = mv$
- Where  $p$  = linear momentum,  $m$  = mass,  $v$  = velocity

### Impulse (I) or (J)

- It is defined as the integral of a force with respect to time, which gives you the change in the momentum of the body being acted on by the force.
- Its unit is newton second (Ns)
- The quantity of impulse is **force**  $\times$  **time interval**.

### Inertia

- It is the resistance of any physical object to any change in its state of motion (this includes changes to its speed, direction or state of rest).
- It is the tendency of objects to keep moving in a straight line at constant velocity.

### Equilibrium

- It is the condition of a system when neither its state of motion nor its internal energy state tends to change with time.

- If the dynamics of a system is described by a differential equation (or a system of differential equations), then equilibria can be estimated by setting a derivative (all derivatives) to zero.

There are three states of equilibrium:

1. **Neutral equilibrium** means that, with a small deviation, the body remains in equilibrium. An example is a wheel rolling on a horizontal surface. If you stop it at any point, the wheel will be in a state of equilibrium. A ball lying on a flat horizontal surface is in a state of neutral equilibrium.
2. **Unstable equilibrium** means that, with a small deviation of the body from the equilibrium state, forces emerge which tend to increase this deviation. A ball located at the top of a spherical projection is an example of unstable equilibrium.
3. **Stable equilibrium** means that, with small deviations of the body from this state, forces or moments of forces emerge which tend to return the body to the state of equilibrium. A ball located at the bottom of a spherical deepening is in a state of stable equilibrium.

### Friction ( $\mu$ )

- It is the force between surfaces in contact that resists their relative tangential motion (slipping).
- The force of friction is a force that resists motion when two objects are in contact.
- Friction is high for dry and rough surfaces and low for smooth and wet surfaces.
- **Rolling Friction** occurs when an object rolls over another (something with wheels or that is circular like a ball). e.g. riding a motorcycle
- **Fluid Friction** occurs when an object moves through a fluid, meaning either a liquid or gas. e.g. skydiving, swimming
- **Sliding Friction** occurs when solid surfaces slide over each other. e.g. falling on the pavement
- **Lubricated friction** is a case of fluid friction where a fluid separates two solid surfaces.



- **Skin friction** is a component of drag, the force resisting the motion of a solid body through a fluid.
- **Internal friction** is the force resisting motion between the elements making up a solid material while it undergoes deformation.

### Static friction

- The Force of Static Friction keeps a stationary object at rest!
- The coefficient of kinetic friction is typically denoted as  $\mu_s$

- The friction that exists between two surfaces those are not moving relative to each other.

### Kinetic friction

- Once the Force of Static Friction is overcome, the Force of Kinetic Friction is what slows down a moving object!
- The coefficient of kinetic friction is typically denoted as  $\mu_k$ , and is usually less than the coefficient of static friction for the same materials.
- The friction that exists between two surfaces those are moving relative to each other.

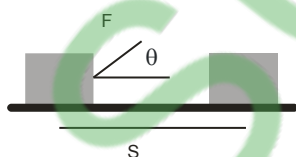
## WORK, ENERGY AND POWER

### Work (W)

- When a force acts on an object and the object actually moves in the direction of force, then the work is said to be done by the force.
- Work done by the force is equal to the product of the force and the displacement of the object in the direction of force.
- The **SI** unit of work is the **newton-metre (N m)** or joule (**J**) and CGS unit is erg.
- Its dimensional formula is  $[ML^2T^{-2}]$ .

If under a constant force **F** the object displaced through a distance **S**, then work done by the Force

$$(W) = FS \cos \theta$$



Where **W** = Work, **F** = Force, **S** = Displacement,  $\theta$  = angle between force and displacement.

Work done by a force is **zero**, if

(a) body is not displaced actually, i.e.,  $S = 0$

(b) body is displaced perpendicular to the direction of force, i.e.,  $\theta = 90^\circ$

Work done by a force is **positive** if angle between **F** and **S** is acute angle.

Work done by a force is **negative** if angle between **F** and **S** is obtuse angle.

Work done by a constant force depends only on the initial and final Positions and not on the actual path followed between initial and final positions.

### Energy (E)

- Energy of a body is its capacity of doing work.
- It is a scalar quantity.
- Its SI unit is **newton-metre (N m)** or **joule** and CGS unit is **erg**.
- Its dimensional formula is  $[ML^2T^{-2}]$ .
- There are several types of energies, such as mechanical energy (kinetic energy and potential energy), chemical energy, light energy, heat energy, sound energy, nuclear energy, electric energy etc.

**Relativity** - When calculating kinetic energy (work to accelerate a mass from zero speed to some finite speed) relativistically - using

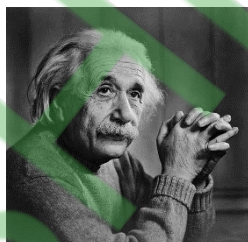
Lorentz transformations instead of Newtonian mechanics, Einstein discovered an unexpected by-product of these calculations to be an energy term which does not vanish at zero speed. He called it rest mass energy - energy which every mass must possess even when being at rest. The amount of energy is directly proportional to the mass of body:

$$E = mc^2$$

Where **E** is energy, **m** is mass, and **c** is the speed of light. The speed of light = 299 792 458 m/s =  $2.9 \times 10^8$  m/s

<b>Kinetic Energy (<math>E_k</math>)</b>	<b>Potential Energy (<math>E_p</math>)</b>
The energy of a body or a system with respect to the motion of the body or of the particles in the system.	Potential Energy is the stored energy in an object or system because of its position or configuration.
Kinetic energy can be transferred from one moving object to another.	Potential energy cannot be transferred.
Flowing water, such as when falling from a waterfall.	Water at the top of a waterfall, before the precipice.
Kinetic energy (KE) or $E_k = \frac{1}{2} mv^2$ (m= mass, v= velocity)	Potential energy (PE) or $E_p = mgh$ (m=mass, g= gravity, h= height)

### LAW OF CONSERVATION OF ENERGY



***“Energy cannot be created or destroyed; it can only be changed from one form to another.” - Albert Einstein***

It states that the total energy of an isolated system cannot change. It is said to be conserved over time. Energy cannot be created or destroyed, but can change form; for instance, chemical energy can be converted to kinetic energy.

#### Energy Transformation

- Energy can change from one type to another. This is called an energy conversion or energy transformation.
- In energy transformations, some energy is always lost to the environment as thermal energy.

Examples :

A television changes electrical energy into sound and light energy.

A toaster changes electrical energy into thermal energy and light.

A car changes chemical energy from fuel into thermal energy and mechanical energy.

**Thermal energy** is the total kinetic energy of a substance's atoms and molecules. Atoms and molecules are constantly in motion. When thermal energy causes particles to move faster and farther apart, the result is a phase change (or change of state).

## Power (P)

- Rate of doing work by a body is called **power (P)**.
- $\text{Power}(P) = \frac{\text{Work Done}(W)}{\text{Time Taken}(t)}$
- The unit of power is the joule per second (**J/s**), known as the **watt** (in honor of **James Watt**, the eighteenth-century developer of the *Steam Engine*).

- 1 W = 1 J/s
- 1 kW =  $10^3$  W
- 1 MW =  $10^6$  W
- 1 Horse Power = 746 W
- 1 watt second (W-s) = 1 J
- 1 watt hour (W-h) = 3600 J
- 1 kilowatt hour (kW-h) =  $3.6 \times 10^6$  J

## GRAVITATION

### Newton's Law of Universal Gravitation: Gravitational Force

Isaac Newton discovered in the 17th century that the same interaction that makes an apple fall from a tree also keeps planets in orbit around the sun. Along with his three laws of motion, Newton published the law of gravitation in 1687. It can be stated as follows:

*“Every particle of matter in the universe attracts every other particle with a force that is directly proportional to the product of the masses of the particles and inversely proportional to the square of the distance between them.”*

In mathematical terms, the law of universal gravitation may be given by

$$F = G \frac{m_1 m_2}{r^2}$$

Where:

**F** is the magnitude of the gravitational force between the two point masses,

**G** is the gravitational constant or  $G = (6.67428 \pm 0.00067) \times 10^{-11} \text{m}^3 \text{kg}^{-1} \text{s}^{-2}$

**m<sub>1</sub>** is the mass of the first point mass,

**m<sub>2</sub>** is the mass of the second point mass,

**r** is the distance between the two point masses.

### Gravity (g)

- It is the force that attracts a body toward the center of the earth, or toward any other physical body having mass.
- The gravity of Earth, denoted **g**, refers to the acceleration that the Earth imparts to objects on or near its surface.
- Its unit is **meters per second squared** (in symbols, **m/s<sup>2</sup>** or **m·s<sup>-2</sup>**) or equivalently in newtons per kilogram (**N/kg** or **N·kg<sup>-1</sup>**).
- It has an approximate value of **9.8 m/s<sup>2</sup>**, which means that, ignoring the effects of air resistance, the speed of an object falling freely near the Earth's surface will increase by about **9.8 meters** (about **32.2 ft**) per second every second.

So, to find the acceleration due to gravity at sea level, substitute the values of the gravitational constant, **G**, the Earth's mass (in kilograms), **m<sub>1</sub>**, and the Earth's radius (in metres), **r**, to obtain the value of **g**:

$$g = G \frac{m_1}{r^2} = (6.6742 \times 10^{-11}) \frac{5.9736 \times 10^{24}}{(6.37101 \times 10^6)^2} = 9.822 \text{m} \cdot \text{s}^{-2}$$

### Variation in gravity (g)

- Acceleration due to gravity decreases with increase in height/altitude.
- **g** is maximum at poles.
- **g** is minimum at equator.
- **g** decreases due to rotation of earth.
- **g** decreases if angular speed of earth increases and increases in angular speed of earth decreases.

## Center of Gravity

It is the point in a body around which the resultant torque due to gravity forces vanish. Near the surface of the earth, where the gravity acts downward as a parallel force field, the center of gravity and the center of mass are the same.

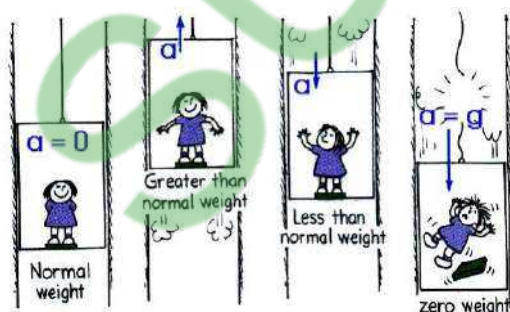
## Mass (m)

- It is the quantity of matter in a body regardless of its volume or of any forces acting on it.
- It should not be confused with weight, which is the measure of the force of gravity acting on a body.
- Its unit is the **kilogram (kg)**.
- mass = **Force / acceleration** [  $m = F/a$  ]
- mass = **momentum / velocity** [  $m = p/v$  ]
- mass = **weight / acceleration of gravity** [  $m = W/g$  ]

## Weight (W)

- It is the force exerted on a body by gravity and calculated as the mass times the acceleration of gravity,  $w = mg$ .
- Its unit is the **newton (N)**.
- For an object in free fall, so that gravity is the only force acting on it, then the expression for weight follows from Newton's second law.
- $W = mg$
- Weight of object = mass of object x acceleration of gravity

## Weight of a PERSON inside the Lift



## Satellite

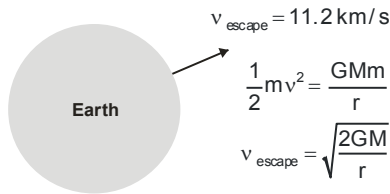
- A satellite is a moon, planet or machine that orbits a planet or star. For example, Earth is a satellite because it orbits the sun. Likewise, the moon is a satellite because it orbits Earth.
- Usually, the word "satellite" refers to a machine that is launched into space and moves around Earth or another body in space.
- The world's first artificial satellite, the Sputnik 1, was launched by the Soviet Union in Oct. 4, 1957.
- The path a satellite follows is an orbit. In the orbit, the farthest point from Earth is the apogee, and the nearest point is the perigee.

## Important types of Satellite

- **Anti-Satellite weapons/"Killer Satellites"** : to destroy enemy warheads, satellites, and other space assets.
- **Astronomical satellites** : observation of distant planets, galaxies, and other outer space objects.
- **Biosatellites** : to carry living organisms, generally for scientific experimentation.
- **Communications satellites** : telecommunications
- **Navigational satellites** : use radio time signals transmitted to enable mobile receivers on the ground to determine their exact location.
- **Reconnaissance satellites** : Earth observation satellite or communications satellite deployed for military or intelligence applications.
- **Earth observation satellites** : non-military uses such as environmental monitoring, meteorology, map making etc.
- **Weather satellites** : used to monitor Earth's weather and climate.
- **Manned spacecraft (spaceships)** : large satellites able to put humans into (and beyond) an orbit, and return them to Earth.
- **Space stations** : man-made orbital structures that are designed for human beings to live on in outer space.

### Escape Velocity

- It is the speed at which the kinetic energy plus the gravitational potential energy of an object is zero.
- For a spherically symmetric body, the escape velocity at a given distance is calculated by the formula
- $v_e = \sqrt{\frac{2GM}{r}}$
- Where G is the universal gravitational constant ( $G = 6.67 \times 10^{-11} \text{ m}^3 \text{ kg}^{-1} \text{ s}^{-2}$ ), M the mass of the planet, star or other body, and r the distance from the center of gravity.



- The Escape velocity on the earth's surface is 11.2 km/s and on the moon's surface 2.4 km/s.

- The escape velocity at a given height is  $\sqrt{2}$  times the speed in a circular orbit at the same height.

### Kepler's Laws

Johannes Kepler developed three laws which described the motion of the planets across the sky.

1. **Law of Orbits:** It states that all planets move in elliptical orbits, with the sun at one focus.
2. **Law of Areas:** It states that a line that connects a planet to the sun sweeps out equal areas in equal times.
3. **Law of Periods:** It states that the square of the period of any planet is proportional to the cube of the semi major axis of its orbit.  $P^2 \propto a^3$

*Kepler's laws were derived for orbits around the sun, but they apply to satellite orbits as well.*

## GENERAL PROPERTIES OF MATTER

*Matter is a substance that has inertia and occupies physical space.*

### Elasticity

- It is the property of a material whose dimensions can be changed by applying a force to it (for example, pushing, pulling, twisting, or compressing), but subsequently returns to its original shape.
- The deforming force is called a **stress**, and the deformation is called the **strain**.

### Plasticity

- It is the deformation of a (solid) material undergoing non-reversible changes of shape in response to applied forces.
- Plastic deformation is observed in most materials including metals, soils, rocks, concrete, foams, bone and skin.

### Stress ( $\sigma$ )

- The stress applied to a material is the force per unit area applied to the material.

$$\text{Stress } (\sigma) = \frac{\text{Force}}{\text{Area}} = \frac{F}{A}$$

- Where, **Stress** = stress measured in  $\text{Nm}^{-2}$  or pascals (Pa)
- **F** = force in newtons (N)
- **A** = cross-sectional area in  $\text{m}^2$

### Strain ( $\epsilon$ )

- It is the relative change in the shape or size of an object due to externally-applied forces.

$$\text{Strain } (\epsilon) = \frac{\text{Extension}}{\text{Length}} = \frac{\Delta L}{L}$$

- Where, **Strain** = strain it has no units
- $\Delta L$  = extension measured in metres
- $L$  = original length measured in metres
- Hooke's law states that the force needed to extend or compress a spring by some distance is proportional to that distance.
- Young's modulus states that a measure of elasticity, equal to the ratio of the stress acting on a substance to the strain produced.

### Pressure ( $P$ )

- It is defined as force per unit area and it is a scalar quantity.
- Its unit is **Pascal (pa)**, which is a **Newton per square meter ( $N/m^2$ )**.
- **Pressure of an ideal gas:** In an ideal gas, molecules have no volume and do not interact. Pressure varies linearly with temperature, volume, and quantity according to the ideal gas law
- $P = \frac{nRT}{V}$
- Where, **P** is the absolute pressure of the gas, **n** is the amount of substance, **T** is the absolute temperature, **V** is the volume, **R** is the universal gas constant = 8.3145 J/mol K

**Liquid pressure:** Pressure in liquid is due to the weight of the liquid acting on the surface of any objects in the liquid.

$$P = \rho gh$$

Where, **P** = Pressure, **h** = depth,  **$\rho$**  = density of liquid, **g** = Gravitational Field Strength

**Atmospheric pressure** is the force per unit area exerted on a surface by the weight of air above that surface in the atmosphere of Earth (or that of another planet).

**1 atmosphere = 760 torr = 101.3 KPa**

The mercury barometer is the standard instrument for atmospheric pressure measurement in weather reporting.

### Pascal's Law

- It states that the pressure applied anywhere to a body of fluid causes a force to be transmitted equally in all directions; the force acts at right angles to any surface in contact with the fluid
- Attractive forces between molecules of the same type are called **cohesive forces**.
- Attractive forces between molecules of different types are called **adhesive forces**.

### Surface Tension ( $T$ )

It is the elastic tendency of a fluid surface which makes it acquire the least surface area possible. Its unit is  $Nm^{-1}$ .

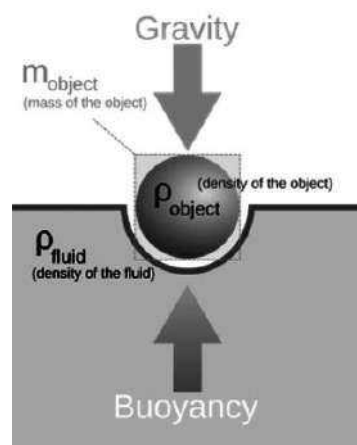
$$\text{Surface Tension} = \frac{\text{Force}}{\text{Length}} = \frac{F}{L}$$

### Capillary Action or Capillarity

It is the ability of a liquid to flow in narrow spaces without the assistance of, or even in opposition to, external forces like gravity.

### Buoyancy

- It is the ability or tendency to float in water or other fluid.
- It is also the power of a liquid to keep something afloat is called Buoyancy.



### Archimedes' Principle

It states that the upward buoyant force that is exerted on a body immersed in a fluid, whether fully or partially submerged, is equal to the weight of the fluid that the body displaces.

## Law of Flotation

- It states that a floating object displaces its own weight of the fluid in which it floats. i.e.
- **Weight of floating object = weight of fluid displaced**
- **Mass of floating object = mass of fluid displaced**
- Any changes in the density of the surrounding liquid affects the level in which an object floats.

## Density ( $\rho$ )

- It is its mass per unit volume. The symbol used for density is  $\rho$ .
- $\rho = \frac{m}{V}$
- Where  $\rho$  is the density,  $m$  is the mass, and  $V$  is the volume.
- Its unit is kilograms per cubic meter ( $\text{kg/m}^3$ ).
- If we take a cubic centimeter of some commonly known substances, we can see that they weigh different amounts:



So from the above examples it is easy to see that some of the cubes weigh more than others, even though they all take up the same amount of space.

Entity	$\rho$ ( $\text{kg/m}^3$ )
Interstellar medium * Assuming 90% H, 10% He; variable T	$1 \times 10^{-19}$
The Earth (Mean density)	5,515
The Inner Core of the Earth	13,000
The core of the Sun	33,000–160,000
Super-massive Black hole	$9 \times 10^5$
White dwarf star	$2.1 \times 10^9$
Atomic nuclei	$2.3 \times 10^{17}$
Neutron star	$1 \times 10^{18}$
Stellar-Mass Black hole	$1 \times 10^{18}$

## Relative density or Specific Gravity

- It is the ratio of the density (mass of a unit volume) of a substance to the density of a given reference material.
- It is a dimensionless quantity, as it is the ratio of either densities or weights.
- $RD = \frac{\rho_{\text{substance}}}{\rho_{\text{reference}}}$
- In SI units, the density of water is (approximately)  $1000 \text{ kg/m}^3$  or  $1 \text{ g/cm}^3$ , which makes relative density calculations particularly convenient: the density of the object only needs to be divided by 1000 or 1, depending on the units.

## Viscosity ( $\eta$ )

- It is a fluid's resistance to flow.
- Fluids become less viscous as the liquid's temperature increases, becoming more viscous as the fluid gets cooler.
- A viscous fluid is sticky, thick and syrupy to a greater or lesser extent.
- Its unit is the pascal second (Pa s)
- 1 pascal second = 10 poise = 1,000 millipascal second
- 1 centipoise = 1 millipascal second
- e.g. Treacle is quite viscous, but water is not. Hot engine oil is less viscous ('thinner') and runs more quickly and smoothly than cold engine oil.

## Bernoulli's Principle

- It states that a rise (fall) in pressure in a flowing fluid must always be accompanied by a decrease (increase) in the speed, and conversely, if an increase (decrease) in the speed of the fluid results in a decrease (increase) in the pressure.
- It states that Pressure energy + Kinetic energy + Datum or Potential energy = Constant
- $\frac{v^2}{2} + gz + \frac{p}{\rho} = \text{constant}$ , where:
- $v$  is the fluid flow speed at a point on a streamline,
- $g$  is the acceleration due to gravity,
- $z$  is the elevation of the point above a reference plane, with the positive  $z$ -direction pointing upward – so in the

direction opposite to the gravitational acceleration,

- $p$  is the pressure at the chosen point, and
- $\rho$  is the density of the fluid at all points in the fluid.

### Periodic Motion

- It is the motion repeated in equal intervals of time.
- It is performed, for example, by a rocking chair, a bouncing ball, and a vibrating tuning fork, a swing in motion, the Earth in its orbit around the Sun, and a water wave.

### Simple harmonic motion

- It is the back and forth motion that is caused by a force that is directly proportional to the displacement. The displacement centers on an equilibrium position.
- $F_s \propto x$
- $F_s = kx$  or  $-kx$
- $k$  = Constant of Proportionality
- $k$  = Spring Constant (Unit : N/m)
- One of the simplest type of simple harmonic motion is called Hooke's Law. This is primarily in reference to springs.
- The negative sign only tells us that "F" is what is called a restoring force, in that it works in the opposite direction of the displacement.

### Oscillatory Motion

- It is a motion that repeats itself in a regular cycle for example a sine wave or pendulum.
- The time taken for an oscillation to occur is often referred to as the oscillatory period.

### Simple Pendulum

- The period of swing of a simple gravity pendulum depends on its length, the local strength of gravity, and to a small extent on the maximum angle that the pendulum swings away from vertical,  $\theta_0$ , called the amplitude.
- It is independent of the mass of the body. If the amplitude is limited to small swings, the period  $T$  of a simple pendulum, the time taken for a complete cycle, is:

$$T \approx 2\pi \sqrt{\frac{L}{g}} \quad \theta_0 \ll 1 \quad (1)$$

Where,

$T$  is the period in seconds (s)

$L$  is the length of the rod or wire in meters or feet

$g$  is the acceleration due to gravity (9.8 m/s<sup>2</sup>)

**For small swings** the period of swing is approximately the same for different size swings: that is, the period is independent of amplitude. This property, called isochronism, is the reason pendulums are so useful for timekeeping. Successive swings of the pendulum, even if changing in amplitude, take the same amount of time.

**For larger amplitudes**, the period increases gradually with amplitude so it is longer than given by equation (1). For example, at an amplitude of  $\theta_0 = 23^\circ$  it is 1% larger than given by (1). The period increases asymptotically (to infinity) as  $\theta_0$  approaches  $180^\circ$ , because the value  $\theta_0 = 180^\circ$  is an unstable equilibrium point for the pendulum.



## WAVE AND WAVE MOTION

### Waves

- It is a vibration or disturbance in space.
- A medium is the substance that all sound waves travel through and need to have in order to move.

### Types of Waves

1. **Longitudinal Wave** - A fixed point will move parallel with the wave motion. [Compression- an area of high molecular density and pressure; Rarefaction - an area of low molecular density and pressure]. It can pass through liquids and gasses.
2. **Transverse Wave** - A fixed point will move perpendicular with the wave motion. Wave parts (recall demo for simple harmonic motion)- crest, trough, wavelength, amplitude, frequency, period. It requires a material to be solid to propagate.
3. **Surface waves** - particles travel in a circular motion. These waves occur at interfaces. Examples include waves in the ocean and ripples in a cup of water.
4. **Electromagnetic waves** (including light) can move through a vacuum.
5. **Physical waves** require matter through which to propagate. Physical waves are further distinguished by the phases of matter through which they can move.

### Wave Motion

It transfers energy from one point to another, often with no permanent displacement of the particles of the medium - that is, with little or no associated mass transport.

**Displacement (y):** Position of an oscillating particle from its equilibrium position.

**Amplitude ( $y_0$  or A):** The maximum magnitude of the displacement of an oscillating particle from its equilibrium position.

**Period (T):** Time taken for a particle to undergo one complete cycle of oscillation.

**Frequency (f):** Number of oscillations performed by a particle per unit time.

**Wavelength ( $\lambda$ ):** For a progressive wave, it is the distance between any two successive particles that are in phase, e.g. it is the distance between 2 consecutive crests or 2 troughs.

**Wave speed (v):** The speed at which the waveform travels in the direction of the propagation of the wave.

**Wave front:** A line or surface joining points which are at the same state of oscillation, i.e. in phase, e.g. a line joining crest to crest in a wave.

**Ray:** The path taken by the wave. This is used to indicate the direction of wave propagation. Rays are always at right angles to the wave fronts (i.e. wave fronts are always perpendicular to the direction of propagation).

### Sound Wave

- Sound waves exist as variations of pressure in a medium such as air.
- They are created by the vibration of an object, which causes the air surrounding it to vibrate.
- The vibrating air then causes the human eardrum to vibrate, which the brain interprets as sound.
- The scientific study of sound waves is known as acoustics.

### Facts about Sound

- Dogs can hear sound at a higher frequency than humans, allowing them to hear noises that we can't.
- Sound can't travel through a vacuum (an area empty of matter).
- The speed of sound is around 767 miles per hour (1,230 kilometres per hour).
- When traveling through water, sound moves around four times faster than when it travels through air.
- The sound of thunder is produced by rapidly heated air surrounding lightning which expands faster than the speed of sound.

## Speed of Sound

It depends on the medium the waves pass through, and is a fundamental property of the material.

Material	Speed of Sound
Air at 20 <sup>0</sup> C	343 m/s
Air at 40 <sup>0</sup> C	355 m/s
Water	1493 m/s
Sea Water	1533 m/s
Iron	5130 m/s
Rubber	1600 m/s

## Perception of Sound

- The perception of sound in any organism is limited to a certain range of frequencies.
- It can calculate with hertz (Hz).
- For humans, hearing is normally limited to frequencies between about 20 Hz and 20,000 Hz (20 kHz).
- Dogs can perceive vibrations higher than 20 kHz, but are deaf to anything below 40 Hz.

## Intensity (*I*)

- It is the power transferred per unit area.
- Its units is watt per metre squared (W/m<sup>2</sup>).
- It is used most frequently with waves (e.g. sound or light), in which case the average power transfer over one period of the wave is used.
- The intensity is the product of the sound pressure and the particle velocity,  $\vec{I} = p\vec{v}$  (Notice that both *v* and *I* are vectors, which means that both have a direction as well as a magnitude.)
- The decibel (dB) is the unit used to measure the intensity of a sound.
- Near total silence - 0 dB
- A whisper - 15 dB
- Normal conversation - 60 dB
- A lawnmower - 90 dB
- A car horn - 110 dB
- A rock concert or a jet engine - 120 dB
- A gunshot or firecracker - 140 dB

## Pitch

- It is the sensation of a frequency of a sound wave.
- A high pitch sound corresponds to a high frequency sound wave and a low pitch sound corresponds to a low frequency sound wave.

## Shock Wave

- It is a thin transitive area propagating with supersonic speed in which there is a sharp increase of density, pressure and speeds of substance.
- It arises at explosions, detonation, supersonic movements of bodies, powerful electric discharges etc. (1 Hertz = 1 vibration/second)

## Echo

- It is the sound you hear when you make a noise and the sound wave reflects off a distant object.
- In other words it is the reflection sound.
- Sound travels 34 m in 0.1 seconds, so you only hear echoes from surfaces that are at least 17 m away.
- A person can typically hear his or her own echo where a hard surface, such as the side of cliff, reflects sound waves directly back to the person. The use of echoes to locate objects is called echolocation.
- **Reverberation** is the collection of reflected sounds from the surfaces in an enclosure like an auditorium.

## SONAR

Sonar (**S**ound **N**avigation **A**nd **R**anging) is a technique that uses sound propagation (usually underwater, as in submarine navigation) to navigate, communicate with or detect objects on or under the surface of the water, such as other vessels.

## Doppler Effect

- It is named after the Austrian physicist Christian Doppler, who proposed it in 1842 in Prague.
- You may have noticed that when an ambulance or police car goes past, its siren is high-pitched as it comes towards you, then becomes low-pitched as it goes away.

This effect, where there is a change in frequency and wavelength, is called the Doppler Effect.

- When a source moves towards an observer, the observed wavelength decreases and the frequency increases.
- When a source moves away from an observer, the observed wavelength increases and the frequency decreases.

## HEAT & TEMPERATURE

### Heat

- It is a form of energy and measures the total energy of all molecules in the substance.
- It is a total kinetic energy of all molecules in a substance.
- Its units are Calorie (cal), Kilocalorie (kcal) or Joule (J). Its CGS unit is the erg =  $10^{-7}$  joule.
- 1 cal = 4.18 joule
- 1 kcal = 1000 cal

### Temperature

- It is a measure of degree of hotness or coldness of a body.
- The unit of degree Celsius or Kelvin or degree Fahrenheit.
- Two bodies cannot be in thermal equilibrium if they are at different Temperature.
- It is a measure of average kinetic energy of molecules in a substance.
- The formula relating all temperature scales is

$$\frac{C}{5} = \frac{F - 32}{9} = \frac{R}{4} = \frac{K}{5}$$

### Facts about Heat and Temperature

- The highest temperature ever recorded on Earth was 136 Fahrenheit (58 Celsius) in the Libyan desert. The coldest temperature ever measured was -126 Fahrenheit (-88 Celsius) at Vostok Station in Antarctica.

- Body temperature can rise to 105 degrees if working outside in a heat wave. Death occurs usually when a body temperature reaches 107.6.
- You'll lose weight in the heat.
- The average temperature on Mars is -63C.
- **Good heat conductors:** Gold, Copper, Silver, Iron, Aluminum, Nickel, Zinc & most other metals
- **Bad heat conductors:** Plastic, Bakelite, Styrofoam, Air, Water, Rubber, Cotton, Silk, Marble, Wood, Mica
- When lightning strikes it can reach up to 30,000 degrees Celsius (54,000 degrees Fahrenheit)
- Room temperature is defined as between 20° to 25°C (68° to 77°F)
- When water freezes it expands by 9%
- Hot water freezes quicker than cold water
- Normal body temperature is 37°C (99°F)
- The center of the Sun is approximately 15 million°C

### Pyrometer

- It is an instrument for measuring temperature.
- **Optical pyrometer :** It determines the temperature of a very hot object by the color of the visible light it gives off.
- **Radiation pyrometer :** It determines the temperature of an object from the radiation (infrared and, if present, visible light) given off by the object.

### Specific Heat Capacity

- It is the amount of heat per unit mass required to raise the temperature by one degree Celsius.
- The units for the specific heat capacity are

$$[c] = \frac{J}{kg.K}$$

Substance	C (J/g °C)
Air	1.01
Aluminum	0.902
Gold	0.129
Iron	0.450
NaCl	0.864
Ice	2.03
Water	4.18

### Thermodynamics

It deals with heat and temperature and their relation to energy and work.

*The four laws of thermodynamics are:*

- **Zeroth law of thermodynamics** – If two thermodynamic systems are each in thermal equilibrium with a third, then they are in thermal equilibrium with each other.
- **First law of thermodynamics** – Energy can neither be created nor destroyed. It can only change forms. In any process, the total energy of the universe remains the same. For a thermodynamic cycle the net heat supplied to the system equals the net work done by the system.
- **Second law of thermodynamics** – The entropy of an isolated system not in equilibrium will tend to increase over time, approaching a maximum value at equilibrium.
- **Third law of thermodynamics** – As the temperature of a system approaches absolute zero ( $-273.15^{\circ}C$ , 0 K), then the value of the entropy approaches a minimum.

### Latent Heat or Phase Transition

- It is the heat energy per mass unit required for a phase change (i.e. solid, liquid, or gas) to occur.
- Its SI units is J/kg.
- The formula for latent heat is:
- $Q = m * L$
- This equation relates the heat Q that must be added or removed for an object of mass m to change phases. The object's individual latent heat is noted by L.
- The values of latent heat are variable depending on the nature of the phase change taking place:
- The latent heat of **fusion** is the change from liquid to solid.
- The latent heat of **vaporization** is from liquid to gas.
- The latent heat of **sublimation** is the change from solid to gas.

### Thermal Expansion

- It occurs when an object expands and becomes larger due to a change in the object's temperature.
- When a substance is heated, the particle within it start to move about causing them to increase in motion, thus resulting in the particle creating more space between them hence the substance increases in size.

### Humidity

- It is the quantity representing the amount of water vapour in the atmosphere or in a gas.
- Water vapor is the gaseous state of water and is invisible.
- Humidity is measured by **hygrometer**.
- **Absolute humidity** : It is the mass of water vapor divided by the mass of dry air in a volume of air at a given temperature. The hotter the air is, the more water it can contain.
- **Relative humidity** : It is the ratio of the current absolute humidity to the highest possible absolute humidity (which depends on the current air temperature).

## Heat Transfer

- It is the exchange of thermal energy between physical systems.
- The rate of heat transfer is dependent on the temperatures of the systems and the properties of the intervening medium through which the heat is transferred.
- The three fundamental modes of heat transfer are **conduction**, **convection** and **radiation**.

### Conduction

- An energy transfer across a system boundary due to a temperature difference by the mechanism of intermolecular interactions.
- It needs matter and does not require any bulk motion of matter.
- Snow is a poor conductor and so keeps the earth warm.
- e.g. Using a heating blanket to get warm.

### Convection

- An energy transfer across a system boundary due to a temperature difference by the combined mechanisms of intermolecular interactions and bulk transport.
- It needs fluid matter.
- e.g. Putting your wet shoes on a floor vent to dry them faster.

### Radiation

- It involves the transfer of heat by electromagnetic radiation that arises due to the temperature of the body. It does not need matter.
- e.g. A person placing their cold hands over a warm fire.
- **Advection** – *It is the transfer of energy from one location to another as a side effect of physically moving an object containing that energy.*

## Perfect Blackbody

- It absorbs all light/radiation in its reach. According to basic laws of physics, the more energy a body absorbs the more it can emit. Therefore, a black body absorbs all energy directed at it and also emits all energy that's been absorbed.
- However, if heated to a high temperature, a blackbody will begin to glow with thermal radiation.
- The energy emitted by a blackbody is called blackbody radiation.

### Newton's Law of Cooling

- It states that the rate of change of the temperature of an object is proportional to the difference between its own temperature and the ambient temperature (i.e. the temperature of its surroundings).
- $T(t) = T_s + (T_0 - T_s) e^{-kt}$
- $T(t)$  = temperature of an object at a certain time (Kelvin, K)
- $t$  = time (s)
- $T_s$  = temperature of the surroundings (Kelvin, K)
- $T_0$  = starting temperature of the object (Kelvin, K)
- $k$  = a cooling constant, specific to the object (1/s)

### Kirchhoff's Law of Thermal Radiation

- It states that wavelength-specific radiative emission and absorption by a material body in thermodynamic equilibrium, including radiative exchange equilibrium.
- It signifies that good absorbers are good emitter.
- If a shining metal ball with some black spot on its surface is heated to a high temperature the shining ball becomes dull but the black spots shines brightly because black spot absorbs radiation during heating and emit in dark.

### Stefan-Boltzmann Law

- It states that the total radiant heat energy emitted from a surface is proportional to the fourth power of its absolute temperature.
- If  $E$  is the radiant heat energy emitted from a unit area in one second and  $T$  is the

absolute temperature (in degrees Kelvin), then  $E = \sigma T^4$

- The constant of proportionality  $\sigma$ , called the Stefan–Boltzmann constant or Stefan's constant. The value of the constant is  $5.735 \times 10^{-8} \text{ Wm}^{-2}\text{K}^4$

## LIGHT

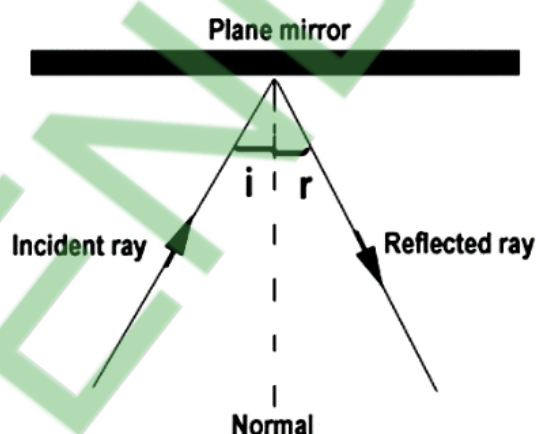
### Light

- It is the natural agent that stimulates sight and makes things visible.
- The speed of light in a vacuum is  $3 \times 10^8 \text{ m/s}$
- **Sunlight** is a portion of the electromagnetic radiation given off by the Sun, particularly infrared, visible, and ultraviolet light. Sunlight on the skin is an effective source of vitamin D. It takes about **8.3** minutes to reach the Earth. The Sunlight reflected from moon takes 1.28 s to reach earth.

### Reflection

- Reflection is when light bounces off an object.
- The incident ray, the reflected ray and the normal to the reflection surface at the point of the incidence lie in the same plane.
- The angle which the incident ray makes with the normal is equal to the angle which the reflected ray makes to the same normal:  $\angle i = \angle r$
- The reflected ray and the incident ray are on the opposite sides of the normal.

### Plane Mirror and Its Reflection



- It is simply a mirror with a flat surface; all of us use plane mirrors every day, so we've got plenty of experience with them.
- The image is the same distance from the mirror as the object appears to be (i.e., the image distance = the object distance)
- The image produced is upright.
- The image is the same size as the object

### Spherical Mirror and Its Reflection

- It is a mirror which has the shape of a piece cut out of a spherical surface.
- There are two types of spherical mirrors:
- **Concave Mirror** : Its inner side of the surface of a spherical mirror is polished to reflect light. It converge parallel beam of light.
- **Convex Mirror** : Its outer side of the surface of a spherical mirror is polished to reflect light. It diverge parallel beam light.

Positions of Object and Image in Concave Mirror			
Position of Object	Position of Image	Size of Image	Nature of Image
At infinity	At focus	Highly diminished	Real and inverted
Between infinity and C	Between F and C	Diminished	Real and inverted
At C	At C	Same size	Real and inverted
Between C and F	Beyond C	Enlarged	Real and inverted
At F	At infinity	Highly enlarged	Real and inverted
Between F and P	Behind mirror	Enlarged	Virtual and erect

Positions and Nature of Image in Convex Mirror			
Position of Object	Position of Image	Size of Image	Nature of Image
At infinity	At F, behind mirror	Highly diminished	Virtual and erect
Between infinity and P	Between F and P, behind mirror	Diminished	Virtual and erect

Where **F** is focus, **P** is pole and **C** is the centre of curvature.

### Uses of Mirrors

- **Plane mirror** : looking glass, constructing periscope, solar cookers, kaleidoscope, measuring instruments
- **Concave Mirror** : headlights of cars, dentist's mirror, solar devices, reflecting telescopes, satellite dishes, flash-lights, electron microscopes, etc.
- **Convex mirror** : street lamps, real view mirror, etc.

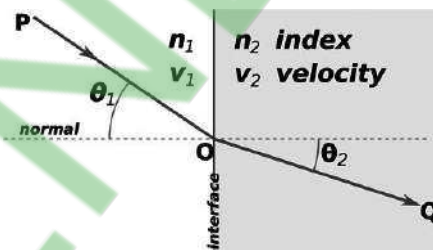
### Refraction

- It is the bending of a wave when it enters a medium where its speed is different.
- The refraction of light when it passes from a fast medium to a slow medium bends the light ray toward the normal to the boundary between the two media.

### Snell's law or Laws of Refraction

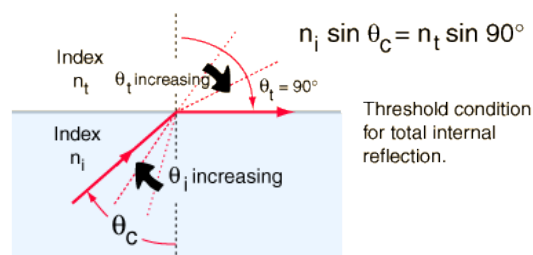
It states that for a given pair of media and a wave with a single frequency, the ratio of the sines of the angle of incidence  $\theta_1$  and angle of refraction  $\theta_2$  is equivalent to the ratio of phase velocities ( $v_1 / v_2$ ) in the two media, or equivalently, to the opposite ratio of the indices of refraction ( $n_2 / n_1$ ):

$$\frac{\sin \theta_1}{\sin \theta_2} = \frac{v_1}{v_2} = \frac{n_2}{n_1}$$



### Total Internal Reflection

It occurs when light attempts to move from a medium having a given refractive index to a medium having a lower refractive index.



When light is incident upon a medium of lesser index of refraction, the ray is bent away from the normal, so the exit angle is greater than the incident angle. Such reflection is commonly called "**internal reflection**". The exit angle will then approach  $90^\circ$  for some critical incident angle  $\theta_c$ , and for incident angles greater than the critical angle there will be **total internal reflection**.

e.g. air bubbles in glass paper weight appears silvery white, Sparkling of diamond, etc.

## Scattering of Light

- When light passes through a substance or gas, a part of it is absorbed and the rest scattered away.
- The strength of scattering can be measured by the loss of energy in the light beam as it passes through the medium.
- A clear cloudless day-time sky is **blue** because molecules in the air scatter blue light from the sun more than they scatter **red** light.
- When we look towards the sun at sunset, we see red and orange colours because the blue light has been scattered out and away from the line of sight.
- When sunlight is intercepted by a drop of water in the atmosphere, some of the light refracts into the drop, reflects from the drop's inner surface, and then refracts out of the drop. The first refraction separates the sunlight into its component colours, and the second refraction increases the separation. The result is a **rainbow**.

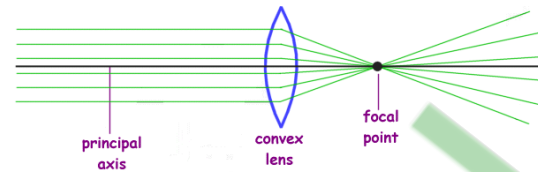
## Optical Fiber

- It is a thin glass fibre through which light can be transmitted.
- A fiber optic cable consists of a bundle of glass threads, each of which is capable of transmitting messages modulated onto light waves. It can function as a waveguide, or "light pipe", to transmit light between the two ends of the fiber.

## Lens

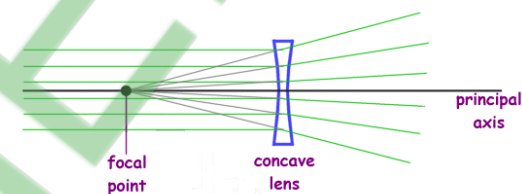
- It is an optical device which transmits and refracts light, converging or diverging the beam.
- A simple lens consists of a single optical element.
- A compound lens is an array of simple lenses with a common axis.
- Lenses are two types: Convex and Concave

## Convex or Convergent Lens



- It is a positive lens.
- Convex lenses are thicker at the middle. Rays of light that pass through the lens are brought closer together (they converge).
- When parallel rays of light pass through a convex lens the refracted rays converge at one point called the principal focus.
- The distance between the principal focus and the center of the lens is called the focal length.

## Concave or Divergent lens



- It is a negative lens.
- Concave lenses are thinner at the middle. Rays of light that pass through the lens are spread out (they diverge).
- When parallel rays of light pass through a concave lens the refracted rays diverge so that they appear to come from one point called the principal focus.
- The distance between the principal focus and the center of the lens is called the focal length.
- The image formed is virtual and diminished (smaller).

## Focal Point

It is generally noted by the capital letter "F." This is the point in space where the light rays will converge to after passing through a converging lens.



### Focal Length

It is the distance from the center of the lens to the focal point.

### Principal Axis

It is a horizontal imaginary line drawn through the center of the lens.

### Power of a Lens or Optical Power

- It is the degree to which a lens, mirror, or other optical system converges or diverges light.
- The power of a lens is defined as the reciprocal of its focal length in meters.

$$\text{Power of Lens} = \frac{1}{\text{Focal length in meters}}$$

- The unit of power is diopter (D).

- $1 \text{ dioptre (D)} = \frac{1}{\text{meter}} = 1 \text{ m}^{-1}$

### Prism

A transparent object with smooth and polished surfaces which refract the light is known as prism.

### Dispersion of Light by Prisms

When a narrow beam of white light is passed through a prism, it splits into seven colours known as spectrum. The colours of the spectrum are violet, indigo, blue, green, yellow, orange and red (VIBGYOR).

### Wave-Lengths of Different Color Lights

The colours of the spectrum of white light are violet, indigo, blue, green, yellow, orange and red (VIBGYOR). The white light is a mixture of different colours.

Colour	Wavelength
Violet	400 – 440 nm
Indigo	440 - 460 nm
Blue	460 - 500 nm
Green	500 – 570 nm
Yellow	570 - 590 nm
Orange	590 - 620 nm
Red	620 - 720 nm

### Colour Mixing

#### RGB Colour Combination: Additive Mixing

1. Red + Green + Blue = White
2. Red + Blue = Magenta
3. Blue + Green = Cyan
4. Red + Green = Yellow

#### CMYK Colour Combination: Subtractive Mixing

1. Cyan + Magenta + Yellow = Black
2. Magenta + Cyan = Blue
3. Yellow + Magenta = Red
4. Yellow + Cyan = Green

## HUMAN EYE

- The human eye is an optical instrument just like a photographic camera.
- It forms the real image of the object on retina of the eye.
- The human eye has a 200-degree viewing angle and can see 10 million colors and shades.
- For the normal eye, the range of vision is from 25 cm to infinity.

### Defects of Vision

1. **Myopia** : A person cannot see the distant object. Image is formed before the retina. Concave lens is used for correcting this defect.
2. **Hypermetropia (Hyperopia)**: A person cannot see near object. Image is formed behind the retina. Convex lens is used for correcting this defect.

3. **Astigmatism** : The curvature of cornea becomes irregular and image is not clear. Cylindrical lens is used for correcting this defect.
4. **Presbyopia** : The power of accommodation of the eye lens decrease in the old age. Therefore neither near nor distant objects are clearly seen. Presbyopia can be removed by using bifocal lenses.
5. **Cataract** : An opaque, white membrane is developed on cornea due to which a person loses power of vision partially or completely. This defect can be removed by removing this membrane through surgery.
6. **Glaucoma** : The eye produces a clear fluid (aqueous humor) that fills the space between the cornea and the iris. This fluid filters out through a complex drainage system.

### Simple Microscope

- It (magnifying glass) is simply a single biconvex lens of a short focal length.
- It is used to see the magnified images of very small objects.
- Magnifying power =  $1 + (D/f)$

### Compound Microscope

It consists of two convex lenses.

It is used to view smaller specimens such as cell structures which cannot be seen at lower levels of magnification.

$$\text{Magnifying Power} = \frac{v_0}{u_0} \left( 1 + \frac{D}{f_e} \right)$$

Where,

$v_0$  = distance of image from the Objective

$u_0$  = distance of object from the objective

### Telescope

- It is used to see the magnified images of the very distance objects.
- Generally, there are two types of telescopes
- **Astronomical telescope** : the objective lens is a convex lens of large focal length, but eye-piece is a convex lens of short focal length.
- **Galilean telescope** : the objective lens is a convex lens of large focal length, but the eye-piece is a concave lens of short focal length.
- The first recognized practical telescopes were invented in the Netherlands at the start of the 17th century, using glass lenses. They found use in terrestrial applications and astronomy.
- There are a wide range of telescopes that work in different ways based on what you need to use them for. Different types of telescopes include optical telescopes, refracting telescopes, reflecting telescopes, radio telescopes, x-ray telescopes, gamma-ray telescopes and high energy particle telescopes.

### Facts about Telescope

- The famous astronomer Galileo Galilei used a refracting telescope.
- Isaac Newton invented the reflecting telescope which was much more powerful than the refracting telescope that Galileo used.
- The Hubble telescope sends 120 gigabytes of data to Earth each week and is powered by energy from the Sun using solar panels.
- The James Webb Space Telescope is the successor to the Hubble telescope and is due to be launched in 2013.

## ELECTRICITY

### Electricity

- It is the set of physical phenomena associated with the presence and flow of electric charge.
- It is a form of energy. Also, it is the flow of electrons.
- It gives a wide variety of well-known effects, such as lightning, static electricity, electromagnetic induction and electric current.

### Electric Charge (Q)

- It is a property of some subatomic particles, which determines their electromagnetic interactions.
- Electric charge generates electric field. The electric charge influence other electric charges with electric force and influenced by the other charges with the same force in the opposite direction.
- The SI unit of electric charge is the coulomb (C). One coulomb has the charge of  $6.242 \times 10^{18}$  electrons:  $1\text{C} = 6.242 \times 10^{18} e$

$$Q = I \cdot t$$

**Q** is the electric charge, measured in coulombs [C].

**I** is the current, measured in amperes [A].

**t** is the time period, measured in seconds [s].

There are 2 types of electric charge:

### Positive charge (+)

- It has more protons than electrons ( $N_p > N_e$ ).
- The positive charge attracts other negative charges and repels other positive charges.
- The positive charge is attracted by other negative charges and repelled by other positive charges.

### Negative charge (-)

- It has more electrons than protons ( $N_e > N_p$ ).
- Negative charge attracts other positive charges and repels other negative charges.
- The negative charge is attracted by other positive charges and repelled by other negative charges.

Charge of elementary particles		
Particle	Charge (C)	Charge (e)
Electron	$1.602 \times 10^{-19} \text{ C}$	-e
Proton	$1.602 \times 10^{-19} \text{ C}$	+e
Neutron	0 C	0

### Coulomb's Law

- It describes force interacting between static electrically charged particles.
- It states that the force between two charges is proportional to the amount of charge on both charges and inversely proportional to the square of the distance between them.

$$F = \frac{k \cdot q_1 \cdot q_2}{r^2}$$

Where, **F** = Force

**k** = a constant,  $8.988 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$

**q<sub>1</sub>** = charge one

**q<sub>2</sub>** = charge two

**r** = distance between the two charges

### Electric Current (I)

- An electric current is a flow of electric charge.
- In electric circuits this charge is often carried by moving electrons in a wire.
- It can also be carried by ions in an electrolyte, or by both ions and electrons such as in a plasma.
- It measured in amperes.

## Ohm's Law

- It deals with the relationship between voltage and current in an ideal conductor.
- This relationship states that, the potential difference (voltage) across an ideal conductor is proportional to the current through it.
- Ohm's Law is given by:  
 $V = I R$ , where  $V$  is the potential difference between two points which include a resistance  $R$ .  $I$  is the current flowing through the resistance. The constant of proportionality is called the "resistance",  $R$ .
- For biological work, it is often preferable to use the conductance,  $g = 1/R$ ; in this form Ohm's Law is:  $I = g V$

## Electric Field

- Electric field is defined as the electric force per unit charge ( $E = F/q$ )
- The direction of the field is taken to be the direction of the force it would exert on a positive test charge.
- The electric field is radially outward from a positive charge and radially inward toward a negative point charge.
- Electric field intensity inside a charged hollow conductor, hollow conductor & spherical surface is zero.

## Electric Potential

- It is the capacity of an electric field to do work on an electric charge, typically measured in volts.
- It is the 'push' of electricity through a circuit.
- The electric potential at infinity is assumed to be zero.
- Force and potential energy are directly related.

## Electromagnets

- An electromagnet is a type of magnet in which the magnetic field is produced by an electric current. The magnetic field disappears when the current is turned off.
- Electromagnets usually consist of a large number of closely spaced turns of wire that create the magnetic field.

## Electronics

It deals with electrical circuits that involve active electrical components such as vacuum tubes, transistors, diodes and integrated circuits, and associated passive interconnection technologies.

## Electrical resistance and conductance

- **Conductance (G)** is a measure of how well an artefact (such as an electrical component, not a material, such as iron) carries an electric current. It is measured in **Siemens (S)**.
- **Resistance (R)** is a measure of how well an artefact resists an electric current. It is measured in **Ohms ( $\Omega$ )**.
- The resistance ( $R$ ) of an object is defined as the ratio of voltage across it ( $V$ ) to current through it ( $I$ ), while the conductance ( $G$ ) is the inverse:

$$R = \frac{V}{I}, \quad G = \frac{1}{V}, \quad G = \frac{1}{R}$$

$$1 \text{ S} = 1 \text{ ohm}^{-1}$$

## Measuring instrument

1. **Ammeter** : It is a measuring instrument used to measure the electric current in a circuit.
2. **Voltmeter** : It is an instrument used for measuring electrical potential difference between two points in an electric circuit.
3. **Galvanometer** : It is an instrument used to indicate the presence, direction, or strength of a small electric current.

4. **Shunt** : It is a device which allows electric current to pass around another point in the circuit by creating a low resistance path.

### Electrical Conductivity

Electrical conductivity, a measure of a material's ability to conduct an electric current.

1. **Conductors** allow electric current to flow with little resistance. **Ex:** Gold ,silver, copper, mercury, etc.
2. **Superconductors** allow current to flow with no resistance. **Ex:** Sn (Tin), Hg (Mercury), Pb (Lead), Al (Aluminum), etc.
3. **Semiconductors** allow some electric current to flow but with significant resistance. **Ex:** Silicon, Germanium, aluminum phosphide, etc.
4. **Insulators** do not allow electric current to flow. **Ex:** Wood, Glass, Plastic, Rubber, Plants, Diamond, Silicon, Paper, etc.

### Electric Power

- Electric power is the rate of energy consumption in an electrical circuit.
- Its unit of power is the watt, one joule per second.

$$P = \text{work done per unit time} = \frac{QV}{t} = IV$$

- Where, **Q** is electric charge in coulombs, **t** is time in seconds, **I** is electric current in amperes, **V** is electric potential or voltage in volts.

### Kilowatt Hour (kWh)

It is a derived unit of energy equal to 3.6 mega-joules. If the energy is being transmitted or used at a constant rate (power) over a period of time, the total energy in kilowatt-hours is the product of the power in kilowatts and the time in hours.

### Electric Fuse

- It is used to protect circuits from over current, overload and make sure the protection of the circuit.
- All electric appliances like bulbs, fans etc. are connected in parallel across the live wires and the neutral wires
- Fuse consists of a low resistance metallic wire enclosed in a non-combustible material.

### Electric Cell

Electrical cell is a device which converts chemical energy into electrical energy.

Electrical Cells are basically of two

1. **Primary Cell** : In this cell electrical energy is obtained from the irreversible chemical reaction taking place inside the cell. After completing discharge, primary cell becomes unserviceable. Examples Voltaic cell, Leclanche Cell, Daniel Cell, Dry Cell etc.
2. **Secondary cells** : It can be charged again and again. Acid and alkali accumulators are the types of secondary cells.

## MAGNETIC FIELD

- *A magnetic field is the magnetic effect of electric currents and magnetic materials.*
- *The magnetic field at any given point is specified by both a direction and a magnitude (or strength); as such it is a vector field.*
- *The SI unit for magnetic field is the Tesla. A smaller magnetic field unit is the Gauss (1 Tesla = 10,000 Gauss).*

### Diamagnetic Material

- It has a weak, negative susceptibility to magnetic fields.
- It repelled by a strong magnet.
- The magnetic susceptibility is independent of temperature.
- Most elements in the periodic table, including copper, silver, and gold, are diamagnetic.

### Paramagnetic Material

- It has a small, positive susceptibility to magnetic fields.
- It attracted by a strong magnet.
- The magnetic susceptibility decreases with rise of temperature.
- It includes magnesium, molybdenum, lithium, and tantalum.

### Ferromagnetic Material

- It has a large, positive susceptibility to an external magnetic field.
- The magnetic susceptibility decreases with rise of temperature.
- It includes Iron cobalt, nickel, ferric chloride etc.

### Curie Temperature ( $T_c$ )

- It is the temperature at which certain materials lose their permanent magnetic properties, to be replaced by induced magnetism.
- The Curie temperature is named after Pierre Curie, who showed that magnetism was lost at a critical temperature.
- As the temperature increases to  $T_c$  and above however, fluctuations due to the increase in thermal energy destroy that alignment.
- $T_c$  for nickel is 631K, while that for iron is 1043K.

### Transformer

- A transformer is a static machine used for transforming power from one circuit to another without changing frequency.
- **Electrical power transformer** is a static device which transforms electrical energy from one circuit to another without any direct electrical connection and with the help of mutual induction between two windings. It transforms power from one circuit to another without changing its frequency but may be in different voltage level.
- The basic principle behind working of a transformer is the phenomenon of mutual induction between two windings linked by common magnetic flux.
- **Power transformers** are used in transmission network of higher voltages for step-up and step down application (400 kV, 200 kV, 110 kV, 66 kV, 33kV) and are generally rated above 200MVA.
- **Distribution transformers** are used for lower voltage distribution networks as a means to end user connectivity. (11kV, 6.6 kV, 3.3 kV, 440V, 230V) and are generally rated less than 200 MVA.

### Facts about electricity

- Electricity travels at the speed of light - more than 186,000 miles per second!
- A bolt of lightning can measure up to three million (3,000,000) volts.
- A 600 megawatt natural gas plant can power 220,000 homes.
- The first power plant - owned by Thomas Edison - opened in New York City in 1882.
- Benjamin Franklin demonstrated that lightning is electricity.
- In 1826 Georg Ohm defined the relationship between power, voltage, current and resistance in Ohms Law.
- The world's first nuclear power plant in Russia started generating electricity in 1954.

## ELECTRONICS

It is the branch of physics that deals with the emission and effects of electrons and the operation of electronic devices.

### Semiconductors

It is a substance, usually a solid chemical element or compound, that can conduct electricity under some conditions but not others, making it a good medium for the control of electrical current.

A pure semiconductor is called intrinsic semiconductor. It has equal numbers of negative carriers (electrons) and positive carriers (holes).

An impure semiconductor is called extrinsic semiconductor. There are two types of extrinsic semiconductor.

1. n-type
2. p-type

### n-type Semi-Conductor

- It is an extrinsic semi-conductor which is obtained by doping the impurity atoms of Vth group of the periodic table to the pure Ge and Si semi-conductor.
- The impurity atoms added, provide extra electrons in the structure and are called donor atoms.
- The majority carriers are electrons that move in the conduction band.

- The majority carriers move against the direction of conventional current.

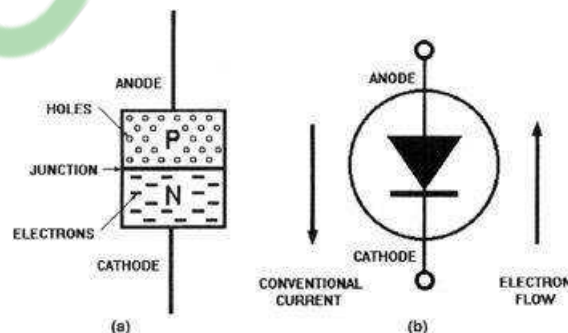
### p-type Semi-Conductor

- It is an extrinsic semi-conductor which is obtained by doping the impurity atoms of III group of the periodic table to the pure Ge and Si semi-conductor.
- The impurity atoms added, create vacancies of electrons (i.e. holes) in the structure and are called acceptor atoms.
- The majority carriers are holes which move in the valence band.
- The majority carriers move in the direction of conventional current

### p-n Junction

It is an arrangement consisting a p-type semiconductor brought into a close contact with n-type semiconductor.

*The Noble prize in physics 2014 was awarded jointly to Isamu Akasaki, Hiroshi Amano and Shiji Nakamura, for inventing a new energy efficient and environment friendly light source the blue Light Emitting Diode (LED).*



PN diode (a) functional diagram, and (b) schematic diagram

## NANOTECHNOLOGY (NANOTECH)

- It is manipulation of matter on an atomic, molecular, and super-molecular scale.
- It uses a basic unit of measure called a nanometer (nm).
- The nanometer scale is conventionally defined as 1 to 100 nm. One nanometer is one billionth of a meter ( $10^{-9}$  m).
- The concepts of nanotechnology were first discussed in 1959 by renowned physicist Richard Feynman and the term "nano-technology" was first used by Norio Taniguchi in 1974.

### Different way to visualize a nanometer

- our fingernails grow at the rate of 1 nm per second;
- the head of a pin is about 1 000 000 nm in diameter;
- a human hair is about 80 000 nm in diameter;
- a DNA molecule is 1–2 nm wide;
- the transistor of a latest-generation Pentium Core Duo processor is 45 nm.

### Applications of nanotechnology

It has a wide range of applications, and nanoparticles are incorporated in the production of many different materials and processes.

- Nanomedicine
- Nanobiotechnology
- Green nanotechnology
- Energy applications of nanotechnology
- Industrial applications of nanotechnology
- Potential applications of carbon nanotubes
- Nanoart

## ATOMIC AND NUCLEAR PHYSICS

### Atomic Physics

- It is the studies atoms as an isolated system of electrons and an atomic nucleus.
- It is primarily concerned with the arrangement of electrons around the nucleus and the processes by which these arrangements change.
- The term atomic physics is often related with nuclear power and nuclear bombs.

### Nuclear Physics

- It is the studies the constituents and interactions of atomic nuclei.
- The most commonly known applications of nuclear physics are nuclear power generation and nuclear weapons technology.

### Cathode Ray

- It consists of negatively charged material particles called electrons.
- It deflects towards the positive plate of an electric field.
- The charge to mass ratio ( $e / m$ ) for the particles in the nature of the gas taken in the discharge tube.
- It travels in straight lines.
- It can ionise the gases.
- It can produce X-rays.
- It can produce fluorescence.
- It can penetrate through thin metal foils.

### Anode rays

- It consists of positively charged material particles.
- It deflects towards the negative plate of an electric field.



- The charge to mass ( $e / m$ ) ratio of the particles in anode rays depends upon the nature of the gas taken in the discharge tube.
- It travels in straight line.
- It consists of fast moving positively charged particle.
- It deflected in magnetic field and electric field.
- It penetrates through the thin aluminum foil.
- It rays can produce fluorescence and phosphorescence.

### **X-Rays (X-radiation)**

- X-rays are electromagnetic waves and part of the electromagnetic spectrum.
- Roentgen discovered the X-rays.
- Its wavelength shorter than that of ultraviolet radiation, which is less than about  $1 \times 10^{-8}$  meters.

### **Properties of X-rays**

*These properties make X-rays very useful for medical diagnosis and treatment.*

- they have a very short wavelength (about the same size as the diameter of an atom)
- they cause ionisation (adding or removing electrons in atoms and molecules)
- they affect photographic film in the same way as visible light (turning it black)
- they are absorbed (stopped) by metal and bone
- they are transmitted by (pass through) healthy body tissue

### **Photoelectric Cell**

- Photoelectric cell or photocell, device whose electrical characteristics (e.g., current, voltage, or resistance) vary when light is incident upon it.
- The most common type consists of two electrodes separated by a light-sensitive semiconductor material.
- A battery or other voltage source connected to the electrodes sets up a current even in the absence of light; when light strikes the semiconductor section of the photocell, the current in the circuit increases by an amount proportional to the intensity of the light.

### **Photoelectric Effect**

It occurs when matter emits electrons upon exposure to electromagnetic radiation, such as photons of light. It is the ejection of electrons from a metal plate when light falls on it.

### **Uses of Photoelectric Cell**

*A photocell can be used in any situation where beam of light falling on it is interrupted or broken by any mean.*

- To count vehicles passing a road.
- To count items running on a conveyer belt.
- To open doors automatically in a building such as banks or other commercial buildings or offices.
- To operate burglar alarms.
- To produce sound in movies.

## RADIOACTIVITY

- In 1896, Becquerel, a French physicist discovered that crystals of Uranium salts emitted penetrating rays similar to X-rays which could fog photographic plates. Two years after this Pierre and Marie Currie discovered other elements: Polonium and Radium which had this property. The emission was known as Radioactivity.
- Protons and Neutrons are held together in the nucleus of an atom by the strong-force. This force acts over a very short distance of about  $\sim 1$  fm, ( $10^{-15}\text{m}$ ) and over this short distance it can overcome the electromagnetic repulsion between the positively charged protons.
- The elements with atomic number greater than 82 are radioactive element.

### Radioactive Decay

- It is the process by which the nucleus of an unstable atom loses energy by emitting radiation, including alpha particles, beta particles, gamma rays and conversion electrons.
- Its unit is the becquerel (Bq), named in honour of the scientist Henri Becquerel. One **Bq** is defined as one transformation (or decay or disintegration) per second.

### Einstein's Mass-Energy Relation

It states that the universal proportionality factor between equivalent amounts of energy and mass is equal to the speed of light squared.

It is the relationship between mass ( $m$ ) and energy ( $E$ ) in the special theory of relativity of Albert Einstein.

$$E = mc^2$$

Where **E** is energy, **m** is mass, and **c** is the speed of light ( $3 \times 10^8 \text{ ms}^{-1}$ ).

### Fluorescence & Phosphorescence

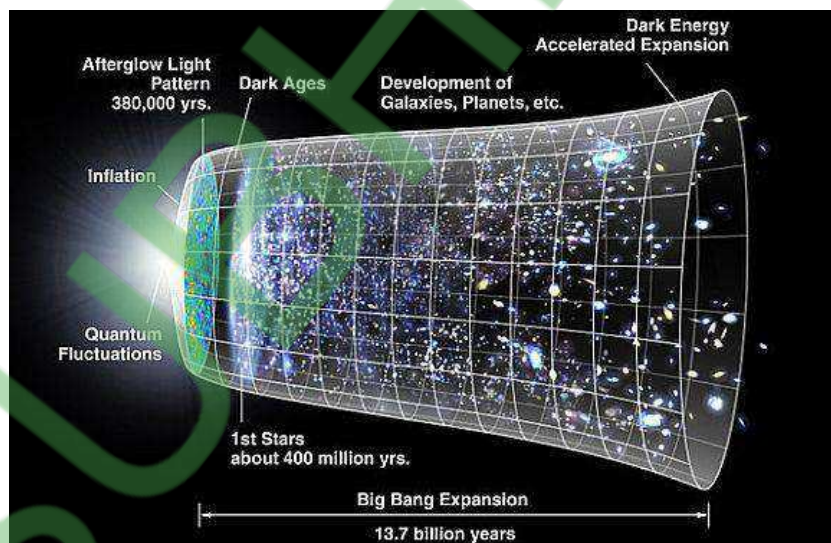
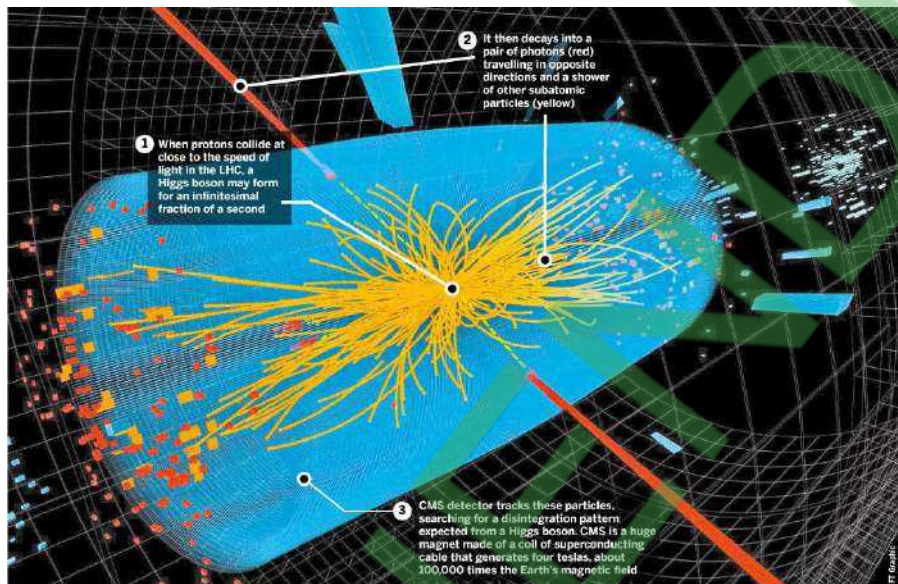
Fluorescence is the emission of light by a substance that has absorbed light or other electromagnetic radiation. It is a form of photoluminescence. In most cases, the emitted light has a longer wavelength, and therefore lower energy, than the absorbed radiation. The emitted radiation may also be of the same wavelength as the absorbed radiation, termed "resonance fluorescence".

Phosphorescence is a specific type of photoluminescence related to fluorescence. Unlike fluorescence, a phosphorescent material does not immediately re-emit the radiation it absorbs. Excitation of electrons to a higher state is accompanied with the change of a spin state. Once in a different spin state, electrons cannot relax into the ground state quickly because the re-emission involves quantum mechanically forbidden energy state transitions.

## GOD PARTICLE ( $H^0$ )

*Higgs boson or Higgs particle or God Particle*

- It is an elementary particle in the Standard Model of particle physics.
- It is the quantum excitation of the Higgs field - a fundamental field of crucial importance to particle physics theory, first suspected to exist in the 1960s, which, unlike other known fields such as the electromagnetic field, takes a non-zero constant value almost everywhere.



- The Higgs boson or Higgs particle is an elementary particle initially theorised in **1964**, and tentatively confirmed to exist on **14 March 2013**.
- It is named after **Peter Higgs**.
- It was Theorized by R. Brout, F. Englert, P. Higgs, G. S. Guralnik, C. R. Hagen, and T. W. B. Kibble (1964)
- In 2013 Peter Higgs and François Englert were awarded the Nobel Prize in Physics for their discovery.

## IMPORTANT LAWS / THEORIES AND THEIR SCIENTIST

Year	Law / Theory / Discovery	Scientist
250 BCE	Archimedes principle	Archimedes
1514	Heliocentrism	Nicholas Copernicus
1613	Inertia	Galileo Galilei
1660	Pascal's Principle	Blaise Pascal
1660	Hooke's law	Robert Hooke
1687	Laws of Motion	Sir Isaac Newton
1687	Laws of motion and law of gravity	Sir Isaac Newton
1803	Atomic theory of matter	John Dalton
1806	Kinetic energy	Thomas Young
1808	Atom	John Dalton
1831	Electromagnetic Induction	Michael Faraday
1834	Law of electrolytic	Michael Faraday
1842	Doppler effect	Kelvin
1861	Black body	Kirchhoff
1864	Dynamical theory of the electromagnetic field	Maxwell
1867	Dynamite	Alfred Nobel
1871 – 89	Statistical mechanics	Boltzmann, Gibbs
1880	Thermionic emission	Edition
1888	Periodic table	Mandeleev
1891	Invention of the Tesla Coil	Nikola Tesla
1895	X-Rays	Roentgen
1896	Radioactivity	Henry Becquerel
1897	Electron	J.J.Thomson
1898	Radium	Madam Curie
1905	Photo electric effect	Albert Einstein
1913	Atomic Structure	Neil Bohr & Rutherford
1919	Proton	Rutherford
1927	Big Bang	Lemaitre
1928	Raman Effect	C.V. Raman
1928	Antimatter predicted	Dirac
1932	Neutron	James Dalton
1944	Theory of magnetism in 2D	Ising model
1948	Invention of the Maser and Laser	Charles Townes
1995	Bose-Einstein condensate found	Wolfgang Ketterle
1999	Slow light experimentally demonstrated	Lene Vestergaard Hau
2012	Higgs Boson found	-

## SOME IMPORTANT SCIENTIFIC INSTRUMENTS

**Air Cooler:** An apparatus for cooling the air. Here air is blown through water and atmosphere cooled.

**Altimeter:** An instrument used in aircrafts for measuring altitudes

**Ammeter:** An instrument used for measuring electric current.

**Anemometer:** An instrument to measure the speed and pressure of the wind.

**Beaufort scale:** It is used to measure wind force.

**Barograph:** An instrument which registers automatically the altitude reached by an aeroplane.

**Barometer:** An instrument to measure atmospheric conditions and changes.

**Callipers :** A compass with legs for measuring the inside or outside diameter of bodies.

**Calorimeter:** An instrument used for measuring quantities of heat.

**Carburettor:** An apparatus for charging air with petrol vapours in an internal combustion engine.

**Cinematograph:** An apparatus for projecting pictures on the screen in so rapid a succession that picture seems to be in motion.

**Crescograph:** An instrument for recording electrically the response of living matter to various kinds of stimuli.

**Cardiograph:** It is a medical instrument for tracing heart movements.

**Chronometer:** It is a clock to determine longitude of a vessel at sea.

**Cyclotron:** It is an apparatus for smashing atoms.

**Computers:** These are data-processing machines, which provide the information according to the requirements.

**Dictaphone:** A trade name for a tape recorder.

**Dynamo:** A machine used for transforming mechanical energy into electrical energy.

**Electric Motor:** Machine for using electricity as a motive power.

**Electrometer:** An instrument for measuring electrical potential differences.

**Epidiascope:** For projecting films as well as images of opaque articles on a screen.

**Eudiometer:** It is a glass tube for measuring volumes changes in the chemical reactions between gases.

**Fathometer:** Is an instrument used for measuring depth of the ocean-

**Gramophone:** A machine for reproducing recorded sound.

**Hydrophone:** An instrument for measuring the density of liquids with that of water,

**Hygrometer:** An apparatus for measuring the humidity of air.

**Internal Combustion Engine:** An engine in which heat energy added the air within the working cylinder and converted into mechanical work through the medium of a piston or by a turbine rotator.

**Lactometer:** A typical hygrometer for testing pure milk.

**Laser:** A device to throw a thin beam of light that is carried over great distances.

**Water Meter:** For measuring gallons of water consumed.

**Magneto:** A part of the motor car that converts mechanical energy into electrical energy.

**Manometer:** For determining the pressure of a gas.

**Micrometer:** An instrument for measuring distance of angles.

**Microphone:** An instrument which intensifies and renders audibly the faintest possible sound.

**Microscope:** An optical instrument for producing greatly magnified images of very small objects.

**Periscope:** Optical instrument used in trench warfare and in submarines for enabling an observer to see surrounding objects from a lower level.

**Phonograph:** Is an instrument used for reproducing sound.

**Photometer:** Is an apparatus used to compare the illuminating power of two sources of light.

**Pipette:** It is a glass tube with the aid of which a definite volume of liquid may be transferred.

**Pyrometer:** Is an instrument for measuring high temperatures.

**Radar:** An instrument to detect the presence of enemy aircraft, submarine, etc., and also to determine its direction, distance and speed.

**Radiogram:** A combined radio and gramophone.

**Refract meter:** It is an instrument to measure refractive indices.

**Radiometer:** An instrument for measuring the radiant energy of light and heat.

**Samaphore:** System of signalling between two places generally ships.

**Seismometer:** It is an apparatus for measuring the origin of earthquakes.

**Sextant:** An instrument for measuring angle.

**Spark Plug:** Device for producing an electric spark to set off combustion in the cylinder of a petrol engine.

**Stethoscope:** A doctor's tool to listen to the beat of the heart.

**Stereoscope:** A binocular optical instrument through which a double Photograph taken from two slightly different angles by two lensed cameras is viewed.

**Speedometer:** An instrument which registers the speed of the vehicle

**Telephone:** A device by virtue of which two persons at two different places can communicate. It consists of two main parts (i) a microphone and (ii) a receiver.

**Telstar:** It is a space communication satellite developed by Bell for overseas communications. It was launched on July 10, 1962 from Cape Kennedy (U.S.A.). Telstar, in addition to telephone calls, enables television microwave transmissions to be made from and to any country with a receiving and transmitting station.

**Telemeter:** Is an apparatus for recording physical events happening at a distance.

**Theodolite:** An instrument for use in land surveying for measuring vertical and horizontal angles.

**Thermometer:** It is an instrument to measure the temperature.

**Thermionic valve:** Used in wireless telegraphy and radio broadcasting.

**Thermostat:** It is an instrument which controls temperature automatically. It is used in refrigerators, air-conditioners, geysers etc.

**Transformer:** It is an electric apparatus which is used to convert high voltage to low and vice versa.

**Tachometer:** An instrument for measuring the speed of aeroplanes, motors, etc.

**Television:** It is the transmission of images of moving objects by radio waves.

**Telescope:** An instrument designed to view the distant object easily.

**Teleprinter:** An instrument which prints automatically messages sent from one place to another on telegraph lines.

**Viscometer:** Is an instrument to measure viscosity.

**Voltmeter:** It is an instrument to measure the potential difference across two points of an electrical circuit.

**Voltmeter:** It is an apparatus for producing electrolysis in liquids

**Wattmeter:** It is an instrument for the direct measurement of power in watt of an electrical circuit.

**Wavemeter:** It is an instrument for measure the wavelength of a radiowave.

## INVENTIONS AND DISCOVERIES

<b>Invention</b>	<b>Year</b>	<b>Inventor</b>	<b>Country</b>
Acetylene Gas	1862	Berthelot	France
Adding Machine	1642	Pascal	France
Adhesive Tape, Scotch	1930	Richard Drew	USA
Aeroplane	1903	Orville & Wilbur Wright	USA
Air Conditioning	1902	Carrier	USA
Aeroplane, Jet Engine	1939	Ohain	Germany
Airship(Non-Rigid)	1852	Henri Giffard	France
Aerosol Spray	1926	Erik Rotheim	Norway
Artificial Heart	1957	William Kolff	Netherlands
Atomic Bomb	1945	J Robert Oppenheimer	USA
Atomic Numbers	1913	Moseley	Britain
Atomic Theory	1803	Dalton	Britain
Automatic Rifle	1918	John Browning	USA
Bakelite	1907	Leo H Baekeland	Belgium
Ballistic Missile	1944	Wernher von Braun	Germany
Balloon	1783	Jacques & Joseph Montgolfier	France
Ballpoint Pen	1888	John J loud	USA
Barometer	1644	Evangelista Torricelli	Italy
Battery(Electric)	1800	Alessandro Volta	Italy
Bicycle	1839-40	Kirkpatrick Macmillan	Britain
Bicycle Tyres(Pneumatic)	1888	John Boyd Duniop	Britain
Bifocal Lens	1780	Benjamin Franklin	USA
Bleaching Powder	1798	Tennant	Britain
Bunsen Burner	1855	R. Willhelm von Bunsen	Germany
Burglar Alarms	1858	Edwin T. Holmes	USA
Calculus	1670	Newton	Britain
Camera, Kodak	1888	Walker Eastman	USA
Canned Food	1804	Appert	France
Car(Steam)	1769	Nicolas Cugnot	France
Car(Petrol)	1888	Karl Benz	Germany
Carburettor	1876	Gottlieb Daimler	Germany
Cassette, Audio	1963	Philips co.	Holland
Cassette Videotape	1969	Sony	Japan
Celluloid	1861	Alexander Parkes	Britain
Cement (Portland)	1824	Joseph Aspdin	Britain
Chemotherapy	1909	Ehrlich	Germany
Chronometer	1735	John Harrison	Britain
Cinema	1895	Nicolas and Jean Lumiere	France
Clock (Mechanical)	1725	I Hsing & Liang Ling Tsan	China
Cloning, DNA	1973	Boyer, Cohen	USA
Cloning, Mammal	1996	Wilmur, et al	UK
Compact Disc	1972	RCA	USA
Compact Disc Player	1979	Sony, Philips co	Japan, Netherlands
Computer, Laptop	1987	Sinclair	Britain
Computer,Mini	1960	Digital corp	USA
Crossword Puzzle	1913	Arthur Wynne	USA
Ct Scan	1973	Hounsfield	Britain
Diesel Engine	1895	Rudolf Diesel	Germany



Disc Brakes	1902	Dr. F Lanchester	Britain
Disc, Video	1972	Phillips co	Holland
DNA, Structure	1951	Crick-UK, Watson-US, Wilkins-UK	--
Dynamo	1832	Hypolite Pixii	France
Electric Flat Iron	1882	H.W. Seeley	USA
Electric Lamp	1879	Thomas alva Edison	USA
Electric Motor (DC)	1873	Zenobe Gramme	Belgium
Electric Motor (AC)	1888	Nikola Tesla	USA
Electric Iron	1882	Henry W. Seely	USA
Electric Washing Machine	1906	Alva J Fisher	USA
Electromagnet	1824	William Sturgeon	Britain
Electron	1897	Thomson J	Britain
Electroplating	1805	Luigi Brugnatelli	Italy
Electronic Computer	1824	Dr Alan M turning	Britain
Facsimile Machine	1843	Alexander Bain	Britain
Fibre-Optics	1955	Kepany	Britain
Film (Moving Outlines)	1885	Louise Prince	France
Film (Talking)	1922	J. Engl, J. Mussolle & H Vogt	Germany
Film (Musical Sound)	1923	Dr Le de forest	USA
Floppy Disk	1970	IBM	USA
Frequency Modulation	1933	EH Armstrong	USA
Frisbee	1948	Fred Morrisson	USA
Fountain Pen	1884	Lewis E. Waterman	USA
Galvanometer	1834	Andre-Marie Ampere	France
Glider	1853	Sir George Cayley	Britain
Gramophone	1878	Thomas Alva Edison	USA
Helicopter	1924	Etinne Oehmichen	France
Hiv	1984	Martagnier	France
Holography	1947	Denis Gason	Britain
Hydrogen Bomb	1952	Edward Teller	USA
Intelligence Testing	1905	Simon Binet	France
Jet Engine	1937	Sir Frank Whittle	Britain
Laser	1960	Theodore Maiman	USA
Launderette	1934	J.F. Cantrell	USA
Lift (Mechanical)	1852	Elisha G Otis	USA
Lightning Conductor	1752	Benjamin Franklin	USA
Locomotive	1804	Richard Trevithick	Britain
Logarithms	1614	Napier	Britain
Loom, Power	1785	E cartwright	Britain
Loudspeaker	1900	Horace Short	Britain
Machine Gun	1718	Richard Gatling	Britain
Magnetic Recording Tape	1928	Fritz Pfleumer	Germany
Match, Safety	1826	John Walker	Britain
Microphone	1876	Alexander Graham Bell	USA
Microprocessor	1971	Robert Noyce & Gordon Moore	USA
Microscope, Comp	1590	Z.Janssen	Netherlands
Microscopes, Elect	1931	Ruska Knoll	Germany
Microwave Oven	1947	Percy LeBaron Spencer	USA
Motorcycle	1885	G. Daimler	Germany
Movie Projector	1593	Thomas Edison	USA

Mri	1971	Damadian	USA
Neon Lamp	1910	George Claude	France
Neutron	1932	Chadwick	Britain
Neutron Bomb	1958	Samuel Cohan	USA
Nylon	1937	Dr Wallace H Carothers	USA
Optical Fibre	1955	Narinder Kapany	Germany
Paper	AD 105	-	China
Pacemaker	1952	Zoll	USA is
Pasteurization	1867	Lewis Pasteur	France
Pencil	1792	Lacques Nicolas Conte	France
Periodic Table	1869	Mendeleyev	Russia
Photocopier	1938	Carlson	USA
Photoelectric Cell	1893	Julius Elster, Hans F Geitel	Germany
Photo Film, Celluloid	1893	Reichenbach	USA
Photo Film, Transparent	1884	Goodwin Eastman	USA
Photography (On Metal)	1826	J.N. Niepce	France
Photography (On Paper)	1835	W.H. Fox Talbot	Britain
Photography (On Film)	1888	John Carbutt	USA
Piano	1709	Cristofori	Italy
Pistol, Revolver	1836	Colt	USA
Plutonium Fission	1940	Kennedy, whal, Seaborg, Segre	USA
Pop-Up Toaster	1927	Charles Strite	USA
Printing Press	1455	Johann Gutenberg	Germany
Printing (Rotatory)	1846	Richard Hoe	USA
Printing (Web)	1865	William Bullock	USA
Proton	1919	Rutherford	New Zealand
Quantum Theory	1900	Plank	Germany
Radar	1922	AH Taylor and Leo C Young	USA
Radiocarbon Dating	1947	Libby	USA
Radio Telegrapy	1864	Dr Mohlon Loomis	USA
Radio Telegrapy (Trans-Atlantic)	1901	G Marconi	Italy
Rayon	1883	Sir Joseph Swan	Britain
Razor (Electric)	1931	Col Jacob Schick	USA
Razor (Safety)	1895	King C Gillette	USA
Refrigerator	1850	James Harrison, Alexandre catlin	USA
Relativity Theory	1905	Einstein	Germany
Rubber (Latex Foam)	1928	Dunlop Rubber Co.	Britain
Rubber (Tyres)	1846	Thomas Hancock	Britain
Rubber (Vulcanised)	1841	Charles Goodyear	USA
Rubber (Waterproof)	1823	Charles Macintosh	Britain
Safety Pin	1849	Walter Hunt	USA
Safety Razor	1903	King camp Gillette	USA
Seatbelt	1959	Volvo	Sweden
Self-Starter	1911	Charles F Kettering	USA
Ship (Steam)	1775	IC Perier	France
Ship (Turbine)	1894	Hon Sir C Parson	Britain
Silk Manufacture	50 BC	-	China
Skyscraper	1882	W Le Baron Jenny	USA
Slide Rule	1621	William Oughtred	Britain
Spinning Frame	1769	Sir Richard Arkwright	Britain

Spinning Jenny	1764	James Hargreaves	Britain
Spinning Mule	1779	Samuel Crompton	Britain
Steam Engine	1698	Thomas Savery	Britain
Steam Engine(Piston)	1712	Thomas Newcomen	Britain
Steam Engine(Condenser)	1765	James Watt	Britain
Steel(Stainless)	1913	Harry Brealey	Britain
Stethoscope	1819	Laennec	French
Submarine	1776	David Bushnell	USA
Super Computer	1976	J.H Van Tassel	USA
Synthesiser	1964	Moog	USA
Tank	1914	Sir Ernest D Swington	Britain
Tape Recorder	1899	Fessenden Poulsen	Denmark
Telegraph	1787	M Lammond	France
Telegraph Code	1837	Samuel FB Morse	USA
Telephone, Cellular	1947	Bell Labs	USA
Telephone (Imperfect)	1849	Antonio Meucci	Italy
Telephone (Perfected)	1876	Alexander Graham Bell	USA
Telescope	1608	Hans Lippershey	Netherlands
Television (Mechanical)	1926	John Logie Baird	Britain
Television (Electronic)	1927	P.T Farnsworth	USA
Television, Colour	1928	John Logie Baird	Britain
Transformer	1831	Michael Faraday	Britain
Transistor	1948	Bardeen, Shockley & Brattain	USA
Transistor Radio	1955	Sony	Japan
Uranium Fission, Atomic Reactor	1942	Szilard Fermi	USA
Vacuum Cleaner	1907	Spangler	USA
Videotape	1956	Charles Ginsberg	USA
Velcro(Hook-And-Loop-Fastner)	1948	Georges de Mestral	Switzerland
Washing Machine(Elec)	1907	Hurley Machine co	USA
Watch	1462	Bartholomew Manfredi	Italy
Welder (Electric)	1877	Elisha Thomson	USA
Windmill	600	Persian corn grinding	-
Wireless (Telegraph The)	1896	G Marconi	Italy
X-Ray	1895	W.K Roentgen	Germany
Zip Fastener	1891	W.L Judson	USA

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## CHEMISTRY

*It is a branch of physical science that studies the composition, structure, properties and change of matter.*

### MATTER AND ITS STATES

#### Matter

- **Matter** is anything that has mass and occupies space. When a substance goes from one state of matter to another, the process is called a change of state, or phase change.
- Two major categories of classification of matter are physical classification and chemical classification.
- Physical Classification: Solid, Liquid, Gas and Plasma
- Chemical Classification : Pure Substances and Mixture

#### Physical Classification of Matter

##### Solid

- Solids are matter having fixed shape, fixed volume and are almost impossible to compress.
- Solids are composed of particles which are very near to each other.
- It can only change their shape by force, as when broken or cut.
- *e.g.* Iron, cobalt, zinc, nickel, gold, silver, radium etc.

##### Liquid

- Liquids are matter having a fixed volume but no fixed shape – they take the shape of the container. Liquids are very difficult to compress.
- Liquids are composed of higher energy particles which overcome their mutual forces of attraction and move independently.
- The volume is definite if the temperature and pressure are constant.

- The inter-molecular force of attraction for liquid matter is weaker than solid matter.
- *e.g.* mercury, bromine, water, milk

##### Gas

- Gases are matter having neither a fixed shape nor a fixed volume. They are very easy to compress.
- Not only will a gas conform to the shape of its container but it will also expand to fill the container.
- The inter-molecular force of attraction for gaseous matter is negligible.
- *e.g.* oxygen, nitrogen, hydrogen, helium etc.

##### Plasma

- A plasma is an ionized gas, a gas into which sufficient energy is provided to free electrons from atoms or molecules and to allow both species, ions and electrons, to coexist.
- Plasmas are electrically conductive, produce magnetic fields and electric currents, and respond strongly to electromagnetic forces.

##### Bose–Einstein condensate

- It is a state of matter of a dilute gas of bosons cooled to temperatures very close to absolute zero (that is, very near 0 K or  $-273.16\text{ }^{\circ}\text{C}$ ). Under such conditions, a large fraction of bosons occupy the lowest quantum state, at which point macroscopic quantum phenomena become apparent.
- This form of matter was predicted in 1924 by Albert Einstein on the basis of the quantum formulations of the Indian physicist Satyendra Nath Bose.

### Melting (Melting Point)

- It is the change of state from solid to liquid.
- Melting Point : It is the temperature at which a solid melts. It decreases in the presence of impurity. The melting point of ice is 0°C or 32°F.

### Evaporation (Boiling Point)

- It is the change of state from liquid to gas.
- Boiling Point : It is the temperature at which a liquid evaporates. Boiling point of water at normal condition is 100°C or 212°F.

### Freezing Point

It is the change of state from liquid to solid. Water freezes at 0°C or 32°F.

### Chemical Classification of Matter

#### Pure Substance

- A material that is composed of only one type of particle; examples of a pure substance include gold, oxygen and water.
- It can be either an element or a compound, but the composition of a pure substance doesn't vary.
- **Atom** is the smallest amount of an element. It is composed of a dense core called the nucleus and a series of outer shells occupied by orbiting electrons. The nucleus, composed of protons and neutrons, is at the center of an atom. Protons have a positive electric charge while neutrons are neutral.
- **Molecule** is two or more atoms that are chemically joined together. The diatomic molecules are (H<sub>2</sub>) Hydrogen, (N<sub>2</sub>) Nitrogen, (O<sub>2</sub>) Oxygen, (F<sub>2</sub>) Fluorine, (Cl<sub>2</sub>) Chlorine, (I<sub>2</sub>) Iodine and (Br<sub>2</sub>) Bromine.

### Element

- An element is a substance consisting of atoms which all have the same number of protons - i.e. the same atomic number.
- It can only be changed into other elements using nuclear methods.
- In the earth's crust, oxygen (47 %) is the most abundant element, followed by silicon (28 %) and aluminum (8 %).
- There are 118 elements that have been identified, of which the first 94 occur naturally on Earth with the remaining 24 being synthetic elements.
- On the Periodic Table, there are three major types of elements known as Metals, Non-Metals, and Metalloids.
- **Metals** are generally shiny, malleable, and hard. Metals are also good conductors of electricity. **e.g.** Gold, Silver, Iron, etc.
- **Non-metals** do not conduct heat or electricity very well. Non-metals are typically brittle and are not easily molded into shapes. **e.g.** Hydrogen, Carbon, etc.
- **Metalloids** share characteristics of both metals and non-metals and are also called semimetals. Metalloids are typically semi-conductors, which mean that they both insulate and conduct electricity. **e.g.** Silicon, Boron, etc.

*Elements with Atomic Numbers 113, 115, 117 and 118 were discovered in 2016. Named as Ununtrium (Uut), Ununpentium (Uup), Ununseptium (Uus) and Ununoctium (Uuo) respectively. These elements were discovered by Russian-American team of scientists at the Joint Institute for Nuclear Research in Dubna and Lawrence Livermore National Laboratory in California.*

## Compounds

- It composed of two or more different atoms chemically bonded to one another.
- It can be destroyed by chemical means.
- It might be broken down into simpler compounds, into its elements or a combination of the two.
- For example, water ( $H_2O$ ) is a compound made up of two elements, hydrogen (H) and oxygen (O).
- Compounds are divided into two main categories: **Organic compounds** and **Inorganic compounds**.

## Mixtures or Impure Substances

- It is a material system made up of two or more different substances which are mixed but are not combined chemically.
- **Homogeneous mixture** : It is relatively uniform in composition; every portion of the mixture is like every other portion.
- **Heterogeneous mixture** : It is a mixture whose composition varies from position to position within the sample.

## VARIOUS SEPARATION PROCESSES OF MIXTURES

**Sedimentation** is the process of separating an insoluble solid from a liquid in which it is suspended by allowing it to settle to the bottom of the container. If this also involves pouring off of the liquid leaving the solid behind, it is called decantation.

**Filtration** is used for separating insoluble solids from a liquid.

**Evaporation** is used for recovering dissolved solid substances from solutions by evaporating the solvent. The solute “dissolves out” and is left behind.

**Crystallisation** is a sophisticated form of evaporation technique in which crystals of the solute are encouraged to develop during the

process of “dissolving out” from the solution as the solvent evaporates.

**Distillation** is the process of heating a solution containing soluble solids to form vapours of the liquid and then cooling the vapours to get the liquid back.

**Sublimation** is a process in which some solids, on heating, are transformed directly to vapour without passing through the liquid phase, and vice versa. This technique can be used to separate a mixture of solids, one of which can undergo sublimation. The vapours are then cooled separately to get the sublimed solid back.

**Extraction** is the process of dissolving out the soluble component from a mixture, and subsequently treating the solution to get the solid.

**Magnetic separation** is exemplified by the separation of iron filings.

**Chromatography** is an advanced technique of separation in which individual components of a mixture are separated from each other using the property of differential migration (different rates of flow).

**Fractional distillation** is the process of separating two or more miscible liquids by a modified distillation process, in which the distillates are collected as fractions having different boiling points. The separation of the liquids by this method is based on the difference in their boiling points.

**Reverse Osmosis (RO)** is the process of forcing a solvent from a region of high solute concentration through a semipermeable membrane to a region of low solute concentration by applying a pressure in excess of the osmotic pressure.

### Chemical Changes

- These affect the composition as well as chemical properties of matter and result in the formation of a new substance.
- *e.g.* of chemical changes include combustion (burning), cooking an egg, rusting of an iron pan, and mixing hydrochloric acid and sodium hydroxide to make salt and water.

### Physical Changes

- It is the change which only affect the physical properties like colour: hardness, density, melting point etc. of matter.
- It does not affect the composition and chemical properties of matter.
- *e.g.* of physical changes include crushing a can, melting an ice cube, and breaking a bottle.

### Mole Concept

- It is defined as the quantity of a substance that has the same number of particles as are found in 12 grams of carbon-12.
- The number of atoms present in 12 grams of carbon 12 (C-12) which is equal to  $6.023 \times 10^{23}$ . This is also known as **Avogadro's constant**.
- $1 \text{ mol} = 6.023 \times 10^{23} = \text{Avogadro's Number or Constant}$
- **Atomic mass** : It is the mass of one atom of that element in atomic mass units (**u**).
- **Molar mass** : It is equal to the numerical value of the atomic mass. Its unit is **g**. The molar mass of an atom is also known as **gram atomic mass**.
- **Molecular mass** : It is the sum of the atomic masses of all the atoms in a molecule of a substance.
- **Formula unit mass** : It is the sum of the atomic masses of all atoms in a formula unit of a compound. It is used for substances made up of ions.

## THE GAS LAWS

### PRESSURE VOLUME TEMPERATURE RELATIONSHIPS

Where **P** is the pressure, **V** is the volume of a gas, **T** is the absolute temperature, **n** is the number of moles of the gas, **k** is the constant and **R** is the universal gas constant.

#### Boyle's Law: The Pressure-Volume Law

It states that, at constant temperature, the pressure of a fixed amount of gas (number of moles) is inversely proportional to its volume.

$$P \propto \frac{1}{V} \text{ or } PV = k$$
$$\text{or } P_1V_1 = P_2V_2$$

When pressure goes up, volume goes down.  
When volume goes up, pressure goes down.

#### Charles' Law: The Temperature-Volume Law

It states that, at constant pressure volume of a fixed mass of a gas is directly proportional to its absolute temperature.

$$V \propto T$$
$$\text{or } \frac{V}{T} = k$$
$$\text{or } \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

As the volume goes up, the temperature also goes up, and vice-versa.

### **Gay-Lussac's Law: The Pressure Temperature Law**

It states that the pressure of a given amount of gas held at constant volume is directly proportional to the Kelvin temperature (absolute temperature).

$$P \propto T$$
$$\text{or } \frac{P}{T} = k$$
$$\text{or } \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

As the pressure goes up, the temperature also goes up, and vice-versa.

### **Avogadro's Law: The Volume Amount Law**

It states that equal volumes of all gases at the same temperature and pressure contain the equal number of molecules.

$$V \propto n$$
$$\text{or } V = kn$$

### **Ideal Gas Equation or Combined gas laws**

It is formed by the combination of the three laws (Charles's, Boyle's and Gay-Lussac's law), and shows the relationship between the pressure, volume, and temperature:

$$PV = nRT$$

### **Dalton's law of partial pressures**

It states that the total pressure exerted by a mixture of gases is the sum of partial pressure

of each individual gas present. Each gas is assumed to be an ideal gas.

$$P_{\text{total}} = \sum_{i=1}^n p_i = p_1 + p_2 + \dots + p_n$$

Where  $p_1, p_2, \dots, p_n$  represent the partial pressure of each component.

### **Graham's Laws of Diffusion and Effusion**

#### **Graham's Law of Diffusion**

It states that, the rate at which gases diffuse is inversely proportional to the square root of their densities. Diffusion is the rate at which two gases mix.

$$\text{Rate}_{\text{diffusion}} \propto \frac{1}{\sqrt{\text{density}}}$$
$$\text{Rate}_{\text{diffusion}} \propto \frac{1}{\sqrt{MM}}$$

#### **Graham's Law of Effusion**

It states that, the rate of effusion of a gas is inversely proportional to the square root of either the density or the molar mass of the gas. Effusion is the rate at which a gas escapes through a pinhole into a vacuum.

$$\text{Rate}_{\text{effusion}} \propto \frac{1}{\sqrt{\text{density}}} \propto \frac{1}{\sqrt{MM}}$$

#### **Ideal and Real Gases**


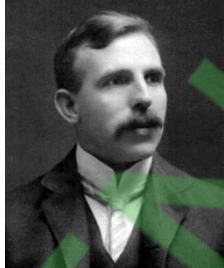

- Ideal gases follow gas laws in all conditions of temperature and pressure.
- Real gases follow gas laws only at high temperature and low pressure.



## ATOMIC STRUCTURE

### Atom

- The word 'atom' has been derived from the Greek word 'a-tomio' which means 'uncuttable' or 'non-divisible'.
- It is the basic unit of an element.
- It is a form of matter which cannot be further broken down using any chemical changes.
- **Nucleus** is the very dense region consisting of protons and neutrons at the center of an atom.
- Atom is made up of three types of sub-atomic particles; these are electrons, protons and neutrons.

Properties	Electron ( $-1e^0$ )	Proton ( $1p^1$ )	Neutron ( $0n^1$ )
<i>Discovered by</i>	 J. J. Thomson in 1897	 Ernest Rutherford in 1920	 James Chadwick in 1932
<i>Symbol</i>	e	p	n
<i>Position or located</i>	Outside the nucleus	Inside the nucleus	Inside the nucleus
<i>Electric Charge</i>	-1 e or $-1.6 \times 10^{-19}$ C	+1 e or $1.6 \times 10^{-19}$ C	0 e or 0 C (No Charge)
<i>Mass</i>	$9.1 \times 10^{-31}$ kg or $5.4 \times 10^{-4}$ u	$1.672 \times 10^{-27}$ kg or 1.00727 u	$1.674 \times 10^{-17}$ kg or 1.00867 u

### Cathode Rays and Anode Rays

*For details about cathode and anode rays, Please Check **ATOMIC AND NUCLEAR PHYSICS** in **Physics**.*

### Rutherford's Atomic Model

- This model describes the structure of atoms proposed (1911) by Ernest Rutherford.
- It described the atom as a tiny, dense, positively charged core called a nucleus, in which nearly all the mass is concentrated, around which the light, negative constituents, called electrons, circulate at some distance, much like planets revolving around the Sun.
- Gold foil experiment : This experiment involved the firing of radioactive particles

through minutely thin gold foils and detecting them using screens coated with zinc sulfide. He found that although the vast majority of particles passed straight through the foil approximately 1 in 8000 were deflected leading him to his theory that most of the atom was made up of 'empty space'.

### Atomic or Chemical Symbol

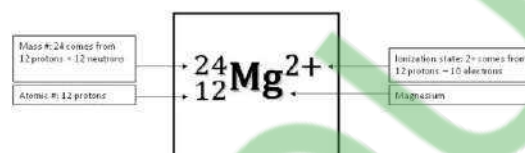
- The names of elements have been chosen for a variety of reasons over the course of human and chemical history. It is represented by a unique chemical symbol, **X**.
- The **atomic symbol** is used to identify the element to which an atom belongs and the number of electrons, protons and neutrons it contains. As noted above, every neutral

atom of an element has the same number of electrons and protons:



- **Number of protons = Number of electrons = atomic number = Z** (placed as a left subscript)
- **Mass number (A)** is equal to the number of protons and neutrons in the isotope (placed as a left superscript).

- As the mass number is equal to the number of protons plus the number of neutrons:
- **Number of neutrons = Mass Number - Number of protons = A - Z**



*This is an example of an atomic symbol.*

Isotopes	Isobars	Isotones	Isomers
The atoms having same atomic number but different atomic mass number.	Nuclides having the same mass number but having the different Proton/Atomic number.	Atoms of different elements having different mass number and different atomic number but same neutron number	The atoms having same atomic numbers and the atomic masses, but their structures are different.
Ex: Hydrogen ${}^1_1\text{H}$ , Deuterium ${}^2_1\text{H}$ , Tritium ${}^3_1\text{H}$	Ex: Argon ${}^{40}_{18}\text{Ar}$ , Potassium ${}^{40}_{19}\text{K}$ , Calcium ${}^{40}_{20}\text{Ca}$	Ex: Tritium ${}^3_1\text{H}$ , Helium ${}^4_2\text{He}$ (both have 2 neutrons)	Ex: Allene $\text{H}_2\text{C}=\text{C}=\text{CH}_2$ , Propyne $\text{H}-\text{C}\equiv\text{C}-\text{CH}_3$

### Niels Bohr Model of the Atom

Niels Bohr model (in 1913) of the atom is very small, positively charged nucleus which contains proton and neutron surrounded by negatively charged electrons. This negatively charged electrons travel in circular orbits around the nucleolus. This atomic model is more similar to the solar system. But in this atomic model, electrostatic force providing attraction force rather than gravity force.

### Planck's Quantum Theory

- Max Planck suggested that the energy of light is proportional to its frequency, also showing that light exists in discrete quanta of energy.
- The energy **E** of the quantum is related to the frequency **v** by **E = hv**.

- The quantity **h** is known as the **Planck's constant**, **h = 6.626 X 10<sup>-34</sup> Js**.

### Louis de Broglie's Concept of Matter Waves

Louis de-Broglie (in 1924) proposed that matter waves, the matter has dual nature.

When the matter is moving it shows the wave properties (like interference, diffraction etc.) are associated with it and when it is in the state of rest then it shows particle properties.

It states that wavelength ( $\lambda$ ) of electron is inversely proportional to its momentum (p).

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

Where,  $\lambda$  = wavelength,  $h$  = Planck's constant ( $6.626 \times 10^{-34}$  Js),  $p$  = momentum,  $m$  = mass,  $v$  = speed

### Heisenberg's Uncertainty Principle

It states that the more precisely the position of a particle is determined, the less precisely the momentum is known, and vice versa. In mathematically,  $\Delta x \cdot \Delta p \geq h/4\pi$

Where,  $\Delta x$  = the uncertainty in position,  $\Delta p$  = the uncertainty in momentum,  $h$  = Planck's constant ( $6.626 \times 10^{-34}$  Js),  
So,  $h/4\pi = 0.527 \times 10^{-34}$  Js

### Quantum Numbers

- A total of four quantum numbers are used to describe completely the movement and trajectories of each electron within an atom.
- It can be used to determine the electron configuration of an atom and the probable location of the atom's electrons.
- It also used to determine other characteristics of atoms, such as ionization energy and the atomic radius.

These rules are summarized as follows:

Quantum Number	Symbol	Orbital meaning	Range of values	Value examples
principal	$n$	shell	$1 \leq n$	$n = 1, 2, 3, \dots$
azimuthal or angular	$\ell$	subshell (s orbital is listed as 0, p orbital as 1 etc.)	$0 \leq \ell \leq n - 1$	for $n = 3$ : $\ell = 0, 1, 2$ (s, p, d)
magnetic or projection of angular momentum	$m_\ell$	energy shift (orientation of the subshell's shape)	$-\ell \leq m_\ell \leq \ell$	for $\ell = 2$ : $m_\ell = -2, -1, 0, 1, 2$
spin projection	$m_s$	spin of the electron ( $-\frac{1}{2}$ = "spin down", $\frac{1}{2}$ = "spin up")	$-s \leq m_s \leq s$	for an electron $s = \frac{1}{2}$ , so $m_s = -\frac{1}{2}, \frac{1}{2}$

e.g. The quantum numbers used to refer to the outermost valence electrons of the Carbon (C) atom, which are located in the 2p atomic orbital, are;  $n = 2$  (2nd electron shell),  $\ell = 1$  (p orbital subshell),  $m_\ell = 1, 0$  or  $-1$ ,  $m_s = \frac{1}{2}$  (parallel spins).

### Electron Configuration

- It is the distribution of electrons of an atom or molecule in atomic or molecular orbitals.
- It is written as  $n\ell^x$ . Where,  $n$  = the principal quantum number,  $\ell$  = subshell or azimuthal quantum number,  $x$  = the number of electrons
- Number of electrons in  $n$  shell =  $2n^2$  e.g., in 2<sup>nd</sup> shell the number of electrons =  $2 \times 2^2 = 8$ .
- It is also written as 2, 8, 8, 18, 18, 32.

Element	Configuration	
	2, 8, 8 type	$n\ell^x$ type
Hydrogen ( ${}_1\text{H}$ )	1	$1s^1$
Oxygen ( ${}_8\text{O}$ )	2, 6	$1s^2, 2s^2, 2p^4$
Magnesium ( ${}_{12}\text{Mg}$ )	2, 8, 2	$1s^2, 2s^2, 2p^6, 3s^2$
Calcium ( ${}_{20}\text{Ca}$ )	2, 8, 8, 2	$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$

### Pauli Exclusion Principle

It states that, in an atom or molecule, no two electrons can have the same four electronic quantum numbers. As an orbital can contain a maximum of only two electrons, the two electrons must have opposing spins. This means if one is assigned an up-spin (+1/2), the other must be down-spin (-1/2).

Electrons in the same orbital have the same first three quantum numbers, *e.g.*,  $n = 1, l = 0, m_l = 0$  for the 1s subshell. Only two electrons can have these numbers, so that their spin moments must be either  $m_s = -1/2$  or  $m_s = +1/2$ .

### Hund's Rule

It states that, (1) Every orbital in a sublevel is singly occupied before any orbital is doubly occupied. (2) All of the electrons in singly occupied orbitals have the same spin (to maximize total spin).

### Aufbau Principle : "to build" principle

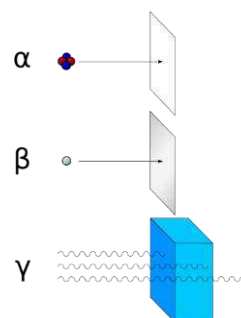
It states that no two fermions (e.g., electrons) in an atom can have the same set of quantum numbers, hence they have to "pile up" or "build up" into higher energy levels. It means electrons are added to orbitals as protons are added to an atom.

## NUCLEAR CHEMISTRY

### Radioactivity

- Atoms become unstable due to large neutron to proton ratio. Such unstable nucleus emitted some radiations and convert in to some other stable nucleus and known as radioactive elements. These radiations are termed as radioactive rays.
- The property of emission of radioactive rays from radioactive elements is termed as radioactivity. It was discovered by Henry Becquerel in 1896.
- Generally, elements with atomic number more than 82 show radioactivity and disintegrated to small nuclei with the emission of alpha, beta, proton, neutron particles or gamma rays. This nuclei with decomposed is called as parent nuclei and the product nuclei is termed as daughter nuclei.

- The atomic number and mass depends upon the type of radioactive rays emitted during nuclear reaction. The decay of radioactive parent nuclei to stable nuclei is known as radioactive decay or nuclear decay.
- The type of decay depends on the type of radioactive particles emitted in decay. For example, **Alpha** decay, **Beta** decay and **Gamma** decay.



### Nuclear Radiation

Name	Charge	Symbol	Shield	Distance traveled
alpha	positive	$({}_2\text{He}^4)^{2+}$ or $\alpha$	paper or clothing	2-4 cm
beta	negative	${}_{-1}\text{e}^0$ or $\beta$	aluminum	2-3 m
gamma	neutral	$\gamma$	lead or concrete	500 m

### Nuclear fission & Nuclear Fusion

Nuclear fission	Nuclear Fusion
Splitting of a heavy nucleus into two or more light nuclei.	Combination of two light nuclei to form a heavy nucleus.
Takes place at room temperature.	Requires a very high temperature equal to $4 \times 10^6$ °C.
Comparatively less amount of energy is released.	Enormous amount of energy is released.
Fission reaction can be controlled and the energy released can be used to generate electricity.	Fusion reaction cannot be controlled and hence the energy released cannot be used to generate electricity.
It is a chain reaction.	It is not a chain reaction.
It leaves behind radioactive wastes.	It does not leave behind any radio active wastes.
One class of nuclear weapon is a fission bomb, also known as an atomic bomb or atom bomb.	One class of nuclear weapon is the hydrogen bomb, which uses a fission reaction to "trigger" a fusion reaction.

#### Nuclear Reactor

- It is a system that contains and controls sustained nuclear chain reactions.
- It is used for generating electricity, moving aircraft carriers and submarines, producing medical isotopes for imaging and cancer treatment, and for conducting research.
- The most common nuclear fuels are Uranium 235 and Plutonium 239. Moderators such as heavy water (D<sub>2</sub>O) are used to slow down neutrons and control rods to absorb neutrons. It also contains liquid sodium as coolant.

#### Radioactive Half-Life

The radioactive half-life for a given radioisotope is the time for half the radioactive nuclei in any sample to undergo radioactive decay. After two half-lives, there will be one fourth the original sample, after three half-lives one eighth the original sample, and so forth.

**Half Life Period** is defined as the time taken for half of the reaction to be completed.

**Atom Bomb or A-bomb or fission bomb**

- It is a weapon that infers its disparaging and explosive power with nuclear fission.
- The atomic bomb worked in the way that radioactive element which includes plutonium (<sup>239</sup>Pu) or uranium (<sup>235</sup>U), is joined into supercritical mass, the quantity of material expected to start a chain reaction.
- The destructive material exists in bomb, when exploded, will start a chain reaction that leads to the blast.

#### Hydrogen Bomb or H-bomb or thermonuclear weapon

- It is a weapon that infers its hazardous and ruinous power with nuclear fusion reaction.
- It worked in a way that a fission bomb is set within a radiation-reflecting holder alongside fusion fuel, like deuterium and tritium.
- It took its name from the way that deuterium and tritium are isotopes of hydrogen.
- The disparaging material, fission bomb, blasts, which is called as primary reaction. After that it compresses and warms fusion fuel, which then brings about additional chain reaction, called as the secondary reaction.

## Radioactive Isotope

It is natural or artificially created isotope of a chemical element having an unstable nucleus that decays, emitting alpha, beta, or gamma rays until stability is reached.

### Major Uses of Radioisotopes

Radioactive Isotope	Uses
Cobalt-60	Gamma ray irradiation of tumors
Chromium-51	Used in research in RBC survival studies
Cobalt-57	Used as a tracer to diagnose pernicious anemia.
Cadmium-109	Used to analyze metal alloys for checking stock, scrap sorting
Calcium-47	Important aid to biomedical researchers studying the cellular functions and bone formation in mammals.
Carbon-14	Helps in research to ensure that potential new drugs are metabolized without forming harmful byproducts.
Iodine-123	Used to diagnose thyroid disorders and other metabolic disorders including brain function.
Phosphorus-32	Cancer detection and treatment, especially in eyes and skin
Xenon-133	Used in nuclear medicine for lung ventilation and blood flow studies.

## Radiocarbon Dating or Carbon Dating or Carbon-14 Dating

It is a method for determining the age of an object containing organic material by using the properties of radiocarbon or Carbon-14, a radioactive isotope of carbon.

### Uranium Dating

- It is used to determine the age of earth, minerals and rocks.
- It is based on the radioactive isotopes of uranium, usually  $^{238}\text{U}$  or  $^{235}\text{U}$ .

### Facts about Atomic Structure

- The word "atom" comes from the Greek word for "uncuttable" or "undivided".
- Nearly one hundred percent of the mass of an atom (99.94%) is contained in the nucleus.
- Hydrogen (H) is highly flammable and is the most common element found in our universe.
- The most abundant type of atom in the universe is the hydrogen atom. Nearly 74% of the atoms in the Milky Way galaxy are hydrogen atoms.
- The isotopes undergo radioactive decay due to their unstable nuclei.
- In 1661, Robert Boyle first published the theory that all matter was composed of atoms.

## CHEMICAL BONDING and CHEMICAL REACTION

### Chemical Bond

- It is the attraction between two atoms or ions that holds them together.
- It is caused by the electrostatic force of attraction between opposite charges, either between electrons and nuclei, or as the result of a dipole attraction.
- Covalent or Ionic bonds are **strong bonds** and Dipole–Dipole bond and Hydrogen bond are **weak bonds**.

### Valence

- The valence or valency of an element is a measure of its combining power with other atoms when it forms chemical compounds or molecules.
- It is denoted using a positive or negative integer used to represent this binding capacity. It is also known as valency or valence number.

### Table of Element Valences

No.	Element	Valence
1	Hydrogen	(-1), +1
2	Helium	0
3	Lithium	+1
4	Beryllium	+2
5	Boron	-3, +3
6	Carbon	(+2), +4
7	Nitrogen	-3, -2, -1, (+1), +2, +3, +4, +5
8	Oxygen	-2
9	Fluorine	-1, (+1)
10	Neon	0

### Ions

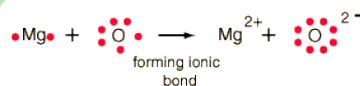
- It is a charged atom or molecule. It is charged because the number of electrons do not equal the number of protons in the atom or molecule.
- An atom can acquire a positive charge or a negative charge depending on whether the number of electrons in an atom is greater or less than the number of protons in the atom.
- When an atom is attracted to another atom because it has an unequal number of

electrons and protons, the atom is called an **Ion**.

- If the atom has more electrons than protons, it is a negative ion, or **Anion**. *e.g.* Hydroxide anion (OH<sup>-</sup>), Oxide anion (O<sup>2-</sup>)
- If it has more protons than electrons, it is a positive ion, or **Cation**. *e.g.* Silver (Ag<sup>+</sup>), Hydronium (H<sub>3</sub>O<sup>+</sup>)
- **Ionic Compound** is a compound composed of cations and anions held together by electrostatic forces.

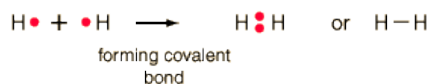
### Ionic Bond

- It formed by the electrostatic force of attraction between two oppositely charged ions.
- It is formed due to transfer of electrons from one atom to another.
- Generally, it is formed between a metal atom and a nonmetal atom.
- Its properties are Crystalline, stronger force of attraction, thermally stable, low volatility, high density, high melting point and boiling point.
- *e.g.* NaCl, MgO<sub>2</sub>, CaCl<sub>2</sub>, etc.



### Covalent Bond

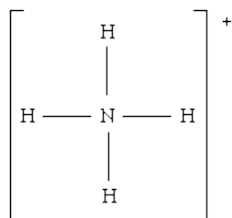
- It formed between two atoms due to the sharing of electron pairs.
- Generally, it formed by two nonmetal atoms.
- Its properties are low melting point and boiling point, non-conductor, and soluble in non-polar solvent, rigid and directional bond.
- *e.g.* H<sub>2</sub>, Cl<sub>2</sub>, HCl, etc.



### Coordinate Covalent Bond

- It is formed when one atom donates both of the electrons to form a single covalent bond. These electrons originate from the donor atom as an unshared pair.

- Its properties are Sparingly soluble in water, not forming ions, largely soluble in non-polar solvents, High Melting and boiling points, Stable, Non conductor, rigid and directional bond.
- *e.g.* Ammonium Ion (NH<sub>4</sub><sup>+</sup>)



### Hydrogen Bond

- It is the electrostatic attraction between polar groups that occurs when a hydrogen (H) atom bound to a highly electronegative atom such as nitrogen (N), oxygen (O) or fluorine (F) experiences attraction to some other nearby highly electronegative atom.
- It tends to be stronger than **van der Waals forces**, but weaker than covalent bonds or ionic bonds.
- It is two types; inter-molecular (between two molecules) and intra-molecular (within a molecule).

### Van Der Waals' Force / Interaction

- It is the attraction of intermolecular forces between molecules.
- It is the weakest of all intermolecular attractions between molecules.
- With a lot of Van der Waals forces interacting between two objects, the interaction can be very strong.

### Metallic Bond

- It is the force of attraction between valence electrons and the metal ions.
- It is the sharing of many detached electrons between many positive ions, where the electrons act as a "glue" giving the substance a definite structure.
- It is formed between electropositive metal atoms of same or different elements.
- It is also considered as highly delocalized covalent bond.
- **E.g.** The metal atoms Na, Cu, Ag, Fe etc. are bound to each other in their crystals by metallic bond.

## Types of Chemical Reactions

Reaction	Definition	Formula & Example
Synthesis <i>or</i> Combination	Two or more simple substances combine to form a more complex substance.	$A + B \rightarrow AB$ $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
Decomposition <i>or</i> Analysis	A compound is broken into smaller chemical species.	$AB \rightarrow A + B$ $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
Single replacement <i>or</i> Substitution	A single uncombined element replaces another in a compound.	$A + BC \rightarrow AC + B$ $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
Double replacement <i>or</i> Metathesis	The anions and cations of two compounds switch places and form two entirely different compounds.	$AB + CD \rightarrow AD + CB$ $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$
Acid-Base Reaction	double displacement reaction that occurs between an acid and a base.	The H <sup>+</sup> ion in the acid reacts with the OH <sup>-</sup> ion in the base, causing the formation of water. $\text{HA} + \text{BOH} \rightarrow \text{H}_2\text{O} + \text{BA}$
Combustion	A hydrocarbon combines with oxygen. The products of combustion are always carbon dioxide and water.	This kind of reaction is the burning of naphthalene. $\text{C}_{10}\text{H}_8 + 12\text{O}_2 \rightarrow 10\text{CO}_2 + 4\text{H}_2\text{O}$
Oxidation-Reduction <i>or</i> Redox Reaction	The oxidation numbers of atoms are changed. It may involve the transfer of electrons between chemical species.	$2\text{S}_2\text{O}_3^{2-} + \text{I}_2 \rightarrow \text{S}_4\text{O}_6^{2-} + 2\text{I}^-$



### Catalysts and Catalysis

- **Catalysis** is the process by which some substance is added to a reaction in order to make the reaction occur more quickly.
- **Catalyst** is the substance that is added to produce the result.

### Homogeneous catalysis

- It is a reaction involving a catalyst where the catalyst is in the same phase as the reactants.
- **E.g.** Oxidation of Sulphur dioxide to Sulphur trioxide in presence of Nitric oxide as catalyst.  
 $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) + \text{NO}(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$

### Heterogeneous catalysis

- It is a catalyst where the phase of the catalyst is different from the phase of the reactants.

- **E.g.** Manufacture of ammonia from  $\text{N}_2$  and  $\text{H}_2$  in presence of Iron (Fe) as catalyst.  
 $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) + \text{Fe}(\text{s}) \rightarrow 2\text{NH}_3(\text{g})$

### Some Important Reaction Process and the Catalyst Used

Process	Catalyst
Making ammonia	Iron
Manufacturing ghee from vegetable oil	Nickel
Conversion of milk into curd	Lactose
Making synthesis gas (carbon monoxide and hydrogen)	Nickel
Catalytic cracking of gas oil	Zeolite
Making Phenol and propanone	Sulfuric acid
Reforming of naphtha	Platinum and rhenium on zeolite

## ACID, BASE and SALT

### Acid

- The word acid, comes from a latin word 'acere' which means 'sour'.
- Acidic substances contain acids and hence have a sour taste. **e.g.** orange juice, curd, lemon juice, etc.
- It turns blue litmus paper red.
- The most common acids are: Hydrochloric acid (HCl), Sulphuric Acid ( $\text{H}_2\text{SO}_4$ ), etc.

### Properties of Acid

1. corrosive in nature.
2. good conductors of electricity.
3. It has pH less than 7.
4. It yields hydrogen ion ( $\text{H}^+$ ), when dissolved in water.

### Types of Acid

**Natural acid** or **organic acid** are the acids which are basically present in food. **e.g.** acetic acid, tartaric acid, lactic acid, etc.

**Mineral acid** or **inorganic acid** are the acids prepared from mineral and used in various laboratory processes. **e.g.** hydrochloric acid, sulphuric acid, nitric acid, etc.

### Organic Acids & Source

Name of Acid	Source
Acetic acid	Vinegar
Ascorbic acid	Guava, amla
Citric acid	Lemon, Orange & other citrus food
Lactic acid	Sour milk, Curd
Methanoic acid	Ant sting, Nettle sting
Oxalic acid	Tomato
Tartaric acid	Tamarind

### Strength of Acids

Strong Acids	Weak Acids
pH value: 0, 1, 2, 3	pH value: 4, 5, 6
Fully Ionized	Partially Ionized
When dissolved in water, they give large amounts of H <sup>+</sup> ions	When dissolved in water, they give small amounts of H <sup>+</sup> ions
HCl (hydrochloric acid), H <sub>2</sub> SO <sub>4</sub> (sulfuric acid), etc.	CH <sub>3</sub> COOH (acetic acid), HF (hydrofluoric acid), etc.

### Base

- It is bitter in taste and feels soapy on touch. e.g baking soda
- It turns red litmus paper blue.
- Bases are substances made of hydroxide OH<sup>-</sup> ions and a metal.
- Common base are : Sodium hydroxide (caustic soda), calcium hydroxide, sodium carbonate (washing soda), lime (Calcium oxide), potassium hydroxide (caustic potash)

### Properties of Base

1. When used in aqueous state they are good conductors of electricity.
2. Its pH value greater than 7.
3. Strong bases are corrosive

### Types of Base

Base can be divided in two types Water soluble and water insoluble.

### Strength of Bases

Strong Bases	Weak Bases
pH value: 11, 12, 13, 14	pH value: 8, 9, 10
Completely ionized in water to produce hydroxide ions	Partially ionize and equilibrium lies mostly towards reactants side
e.g. sodium hydroxide	e.g. ammonia in water

### pH Scale (Power of Hydrogen ion Scale)

- The strength of acid or base depends upon the hydrogen ion concentration.
- pH is a scale which quantifies the concentration of hydrogen ion in a solution. The range of pH scale is between 0 to 14.
- Substances with a pH value below 7 are acidic.
- Substances with pH value above 7 are basic.
- Substances with a pH value is 7 are neutral.

Substance	pH
<b>Acids</b>	
Hydrochloric Acid (HCl)	0
Sulfuric acid or Battery acid	1.0
Lemon Juice	2.0
Vinegar	2.2
Apples	3.0
Wine and Beer	4.0
Tomatoes	4.5
Milk	6.6
<b>Neutral</b>	
Pure Water	7.0
<b>Bases</b>	
Human Blood	7.4
Baking Soda (Sodium Bicarbonate)	8.3
Ammonia	11.0

### Acid-Base Indicators

Acid - Base indicators (also known as pH indicators) are substances which change colour with pH. They are usually weak acids or bases, which when dissolved in water dissociate slightly and form ions.

This range is termed the color change interval. It is expressed as a pH range.

### Common Acid-Base Indicators

Indicator	pH range	Acid	Base
Thymol Blue	1.2-2.8	red	yellow
Methyl yellow	2.9-4.0	red	yellow
Methyl orange	3.1-4.4	red	orange
Bromphenol blue	3.0-4.6	yellow	blue-violet
Methyl red	4.4-6.2	red	yellow
Phenol red	6.4-8.0	yellow	red
Neutral red	6.8-8.0	red	yellow
Phenolphthalein	8.0-10.0	colorless	red
Nile blue	10.1-11.1	blue	red
Nitramine	11.0-13.0	colorless	orange red

### Litmus Paper or Solution

- This indicator is present in two colors: red and blue.
- Blue litmus paper or solution is used to test a substance for acidity.
- Red litmus paper or solution is used to test a substance for alkalinity.

Indicates	Litmus Paper turns	Litmus Solution turns
In Acid	red	red
In Base	blue	blue
In Neutral	Color does not change	purple

### Salts

Salts are the ionic compounds which are produced after the neutralization reaction between acid and base.

Salts are electrically neutral.

Sodium chloride (NaCl) is also known as table salt or common salt.

### Family of Salt

- Salts having common acidic or basic radicals are said to belong to same family.
- Sodium chloride (NaCl) and Calcium chloride (CaCl<sub>2</sub>) belong to chloride family.
- Calcium chloride (CaCl<sub>2</sub>) and calcium sulphate (CaSO<sub>4</sub>) belong to calcium family.
- Zinc chloride (ZnCl<sub>2</sub>) and Zinc sulphate (ZnSO<sub>4</sub>) belong to zinc family.

### Characteristics of salt

1. Most of the salts are crystalline solid
2. Salts may be transparent or opaque
3. Most of the salts are soluble in water
4. Solution of salts conducts electricity. Salts conduct electricity in their molten state also
5. The salt may be salty, sour, sweet, bitter and umami (savory)
6. Neutral salts are odourless

### Acidic, Basic and Neutral Salts

**Acidic salt:** Salts which are formed after the reaction between a strong acid and weak base are called acidic salt. The pH value of acidic salt is lower than 7. **e.g.** ammonium sulphate, ammonium chloride, etc.

**Basic Salt:** Salts which are formed after the reaction between weak acid and strong base are called basic salt. The pH value of a basic salt is more than 7. **e.g.** sodium carbonate, sodium acetate, etc.

**Neutral Salt:** Salts produced because of reaction between strong acid and strong base are neutral in nature. The pH of value of such salts is equal to 7, i.e. neutral. **e.g.** Sodium chloride, sodium sulphate, potassium chloride, etc.

## SOME COMMON SALTS AND THEIR USES

Salt Name	Chemical name and formula	Used to
<b>Bleaching powder</b>	Calcium hypochlorite (CaOCl <sub>2</sub> )	bleaching cotton and linen, bleaching wood pulp in paper factories, oxidising agent in many chemical industries; and for disinfecting drinking water to make it free of germs.
<b>Washing soda</b>	Sodium Carbonate (Na <sub>2</sub> CO <sub>3</sub> )	manufacture of glass, chemicals such as sodium silicates and sodium phosphates, manufacture of detergents and as an alkaline agent in many chemical industries.
<b>Baking soda</b>	Sodium bicarbonate (NaHCO <sub>3</sub> )	ingredient in antacids, fire extinguishers, cake-making.
<b>Plaster of Paris</b>	Calcium sulfate (CaSO <sub>4</sub> .1/2 H <sub>2</sub> O)	plaster fractures bones, for making toys, for making smooth surface and various materials for decoration. It was named plaster of Paris because a large deposit of gypsum was found in Montmartre in Paris.
<b>Copper sulfate</b>	CuSO <sub>4</sub> .5H <sub>2</sub> O	combines sulfur with copper, kill bacteria, algae, roots, plants, snails, and fungi.
<b>Quick lime</b>	Calcium Oxide (CaO)	making porcelain and glass; purifying sugar; preparing bleaching powder, calcium carbide, and calcium cyanamide; in water softeners; and in mortars and cements.
<b>Potassium Nitrate</b>	KNO <sub>3</sub>	fertilizer in vegetable. food preservatives, explosive (gun powder), etc.

## CLASSIFICATION OF ELEMENTS

### Periodic Table

- It is a tabular arrangement of the chemical elements, ordered by their atomic number (number of protons), electron configurations, and recurring chemical properties.
- The horizontal rows of the table are called **periods**; the vertical columns are called **groups**.
- **Dmitri Mendeleev** is generally credited with the invention of the periodic table.

### Mendeleev's Periodic Table



- Dmitri Ivanovich Mendeleev, a Russian scientist arranged the elements in increasing order of their relative atomic masses.
- Mendeleev's Periodic Law states that the properties of elements are the periodic function of their relative atomic masses.
- Mendeleev arranged all 63 elements in a tabular form. It is known as Mendeleev's Periodic Table.
- It contains eight vertical columns of elements called 'groups' and seven horizontal rows called 'periods', Each group has two sub-groups A and B.

- The properties of elements of a sub-group resemble each other more markedly than the properties of those between the elements of the two sub-groups.

### Modern Periodic Table



- In 1913 Sir Henry Moseley discovered that elements positions in the periodic

table are better predicted by their atomic numbers than their atomic weights.

- Law of Modern Periodic Table states that properties of elements are the periodic function of their atomic numbers. In the modern periodic table, elements are arranged in order of their increasing atomic numbers.
- The vertical columns are known as **Groups** and horizontal columns are known as **Periods**; in the **Modern Periodic Table**.
- There are **18 groups** and **7 periods** in the modern periodic table.

### Long Form of Periodic Table

Period	s - block												p - block					
	IA (1)	IIA (2)	d - block or transition elements										IIIA (13)	IVA (14)	VA (15)	VIA (16)	VIIA (17)	0 (18)
1	H 1																	He 2
2	Li 3	Be 4											B 5	C 6	N 7	O 8	F 9	Ne 10
3	Na 11	Mg 12	(3) IIIB	(4) IVB	(5) VB	(6) VIB	(7) VIIB	(8)	(9) VIII B	(10)	(11) IB	(12) IIB	Al 13	Si 14	P 15	S 16	Cl 17	Ar 18
4	K 19	Ca 20	Sc 21	Ti 22	V 23	Cr 24	Mn 25	Fe 26	Co 27	Ni 28	Cu 29	Zn 30	Ga 31	Ge 32	As 33	Se 34	Br 35	Kr 36
5	Rb 37	Sr 38	Y 39	Zr 40	Nb 41	Mo 42	Tc 43	Ru 44	Rh 45	Pd 46	Ag 47	Cd 48	In 49	Sn 50	Sb 51	Te 52	I 53	Xe 54
6	Cs 55	Ba 56	La 57	Hf 58	Ta 59	W 60	Re 61	Os 62	Ir 63	Pt 64	Au 65	Hg 66	Tl 67	Pb 68	Bi 69	Po 70	At 71	Rn 72
7	Fr 87	Ra 88	Ac 89	Rf 104	Db 105	Sg 106	Bh 107	Hs 108	Mt 109	Ds 110	Rg 111	Uub 112	Uut 113	Uuq 114	Uup 115	Uuh 116	Uus 117	Uuo 118
			Ce 58	Pr 59	Nd 60	Pm 61	Sm 62	Eu 63	Gd 64	Tb 65	Dy 66	Ho 67	Er 68	Tm 69	Yb 70	Lu 71		
			Th 90	Pa 91	U 92	Np 93	Pu 94	Am 95	Cm 96	Bk 97	Cf 98	Es 99	Fm 100	Md 101	No 102	Lr 103		

→ f - block or inner-transition elements

- This periodic table is based on the **electronic configuration** of elements.
- There are **118** elements have been identified.
- A block of the periodic table of elements is a set of adjacent groups.
- The respective highest-energy electrons in each element in a block belong to the same atomic orbital type. Each block is named after its characteristic orbital; thus, the blocks are: **s-block**, **p-block**, **d-block** and **f-block**

### s-block

- It contains 1 & 2 group.
- Its General Electronic Configuration is  $ns^{0-2}$
- Element Properties are Soft Metal, Electropositive, basic oxides, reactive metals with low ionization, good reducing agents

### p-block

- It contains 13 to 18 groups.
- Its General Electronic Configuration is  $ns^2 np^{1-6}$
- It includes metals, non-metals and metalloids.

### d-block

- It contains 3 to 12 groups.
- Its General Electronic Configuration is  $(n-1)d^{1-10} ns^{1-2}$
- It has high melting and boiling points and form coloured salts.
- These elements are transition elements.

### f-block

- It contains the rest of the periodic table, has no group numbers and comprises lanthanides and actinides (the last two rows).
- Its General Electronic Configuration is  $(n-2)f^{1-14} (n-1)d^{0-1} ns^2$
- Actinides (5f series) are radioactive elements.
- It has high melting and boiling points and form coloured salts.

## PERIODIC PROPERTIES

1. **Atomic Radius** is the total distance from an atom's nucleus to the outermost orbital of electron. Smallest atom is **hydrogen** and largest is **cesium**.
2. **Ionization Energy** is the energy required to remove an electron from the atom in the gas phase.
3. **Electron Affinity** reflects the ability of an atom to accept an electron.
4. **Electronegativity** is a measure of the attraction of an atom for the electrons in a chemical bond.
5. **Metallic Character** is the chemical properties of elements that are metals. The strongest natural metal is Tungsten.

### Moving Left → Right

- Atomic Radius Decreases
- Ionization Energy Increases
- Electron Affinity Generally Increases (except **Noble Gas** Electron Affinity Near Zero)
- Electronegativity Increases
- Metallic Character Decreases

### Moving Top → Bottom

- Atomic Radius Increases
- Ionization Energy Decreases
- Electron Affinity Generally Decreases Moving Down a Group
- Electronegativity Decreases
- Metallic Character Increases

## METALS, NONMETALS, METALLOIDS and METALLURGY

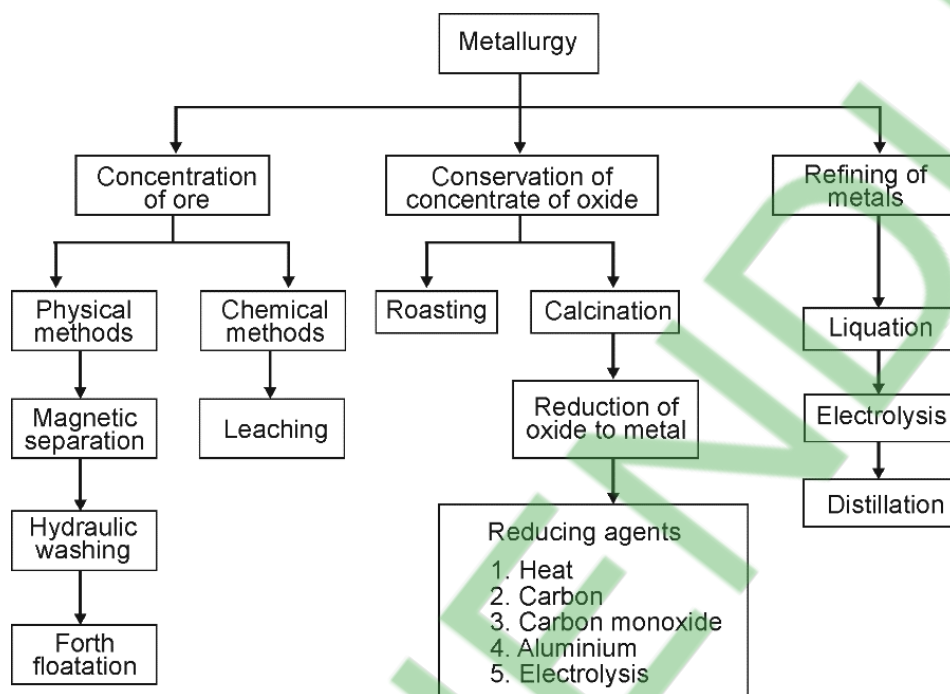
Group→	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
↓Period																		
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo
				* 57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
				** 89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

- All elements are classified into metals, non-metals and metalloids.
- Majority of the elements are **Metals** (metallic properties).
- **Nonmetals** have properties opposite those of the metals.
- **Metalloids** have properties similar to both metals and non-metals.

Metallic Elements	Nonmetallic elements	Metalloids
Distinguishing luster (shine)	Non-lustrous, various colors	Can be shiny or dull
Malleable and ductile (flexible) as solids	Brittle, hard or soft	Solids
Conduct heat and electricity	Poor conductors	Conduct heat and electricity better than nonmetals but not as well as metals
Metallic oxides are basic, ionic	Nonmetallic oxides are acidic, compounds	They can form alloys with other metals.
Cations in aqueous solution	Anions, oxyanions in aqueous solution	gains electrons in reactions
Used as		
<b>Zinc</b> : galvanizing iron, in anti-corrosion material, in medicinal fields and in alloys. <b>Iron</b> : construction material in bridges, houses, ships etc. <b>Lead</b> : making water pipes, in pigments, batteries, in alloys etc. <b>Mercury</b> : thermometer	<b>Boron</b> : making skin ointments. <b>Phosphorus</b> : making crackers. <b>Chlorine</b> : in the form of bleaching powder, is used for purification of water. <b>Oxygen, hydrogen and nitrogen</b> : used by all living things, they are the 'building blocks' of life.	<b>Boron</b> : borosilicate glass. <b>Silicon</b> : computers, transistors, solar cells, LCD screens, to control the flow of electricity. <b>Germanium</b> : wide-angle camera lenses, microscope lenses, etc. <b>Antimony</b> : making of flame retardants.

## Metallurgy : *Extraction of Metals*

The compounds of various metals found in nature as ores are mixed with impurities like sand and rock. The various processes involved in the extraction of metals from their ores and their subsequent refining are known as metallurgy.



## Rock, Mineral and Ore

### Rocks

A rock is made up of 2 or more minerals. You need minerals to make rocks, but you don't need rocks to make minerals. All rocks are made of minerals.

### Minerals

A mineral is composed of the same substance throughout. There are about 3000 different minerals in the world. Minerals are made of chemicals - either a single chemical or a combination of chemicals.

***Difference between rock and mineral-*** A rock is made up of 2 or more minerals, whereas a mineral is composed of the same substance throughout.

### Ore

A mineral occurring in sufficient quantity and containing enough metal to permit its recovery and extraction at a profit. Or, a mineral or an aggregate of minerals from which a valuable constituent, especially a metal, can be profitably mined or extracted is an ore. **Simple ores** are ores that yield a single metal. **Complex ores** are ores that yield more than one metal.



### Some Important Ores of Metals

Metal	Ores
Aluminum (Al)	Bauxite: $Al_2O_3 \cdot 2H_2O$ Corundum: $Al_2O_3$ Kryolite: $Na_3AlF_6$
Iron (Fe)	Hematite: $Fe_2O_3$ Magnetite: $Fe_3O_4$ IronPyrite: $FeS_2$ Siderite: $FeCO_3$
Copper (Cu)	Copper Pyrite: $CuFeS_2$ Copper Glance: $Cu_2S$ Malachite: $2CuCO_3 \cdot Cu(OH)_2$
Zinc (Zn)	Zinc Blende: $ZnS$ Calamine: $ZnCO_3$
Sodium (Na)	Rock Salt: $NaCl$ Sodium Carbonate: $Na_2CO_3$
Potassium (K)	Karnalite: $KClMgCl_6 \cdot 6H_2O$ Salt Petre: $KNO_3$

Metal	Ores
Lead (Pb)	Galena: $PbS$ Anglesite: $PbCl_2$
Tin (Sn)	Tin Pyrites: $Cu_2FeSnS_4$ Classiterite: $SnO_2$
Silver (Ag)	Silver Glance: $Ag_2S$
Gold (Au)	Calve rite: $AuTe_2$ Sybarite: $AgAuTe_2$
Mercury (Hg)	Cinnabar: $HgS$ Calomel: $Hg_2Cl_2$
Magnesium (Mg)	Dolomite: $MgCO_3 \cdot CaCO_3$ Karnalite: $KClMgCl_6 \cdot 6H_2O$
Calcium (Ca)	Lime Stone: $CaCO_3$ Dolomite: $MgCO_3 \cdot CaCO_3$
Phosphorous (P)	Phosphorite: $Ca_3(PO_4)CaFe_2$ Florepetite: $3Ca_3(PO_4)CaFe_2$

### Alloys

- It is a material containing a mixture of two or more metals.
- It can be used to provide increased strength or a lighter weight material.
- It constituents are usually measured by mass.

### Alloys and their uses

Name	Composition	Use
Amalgam	Mercury (45–55%), plus silver, tin, copper, and zinc.	Dental fillings.
Babbitt metal	Tin (90%), antimony (7–15%), copper (4–10%).	Friction-reducing coating in machine bearings.
Bell metals	Cu (80%), Sn (20%)	For making bells
Brass	Cu (60% to 80%), Zn (40 to 20%)	For making household utencils
Bronze	Cu (75 to 90%), Sn (25 to 10%)	For making coins, idols, utencils
Cast iron	Iron (96–98%), carbon (2–4%), plus silicon.	Metal structures such as bridges and heavy-duty cookware.
Duralium	Al (95%), Cu (4%), Mg (0.5%), Mn (0.5%)	In aircraft manufacturing
Gun metal	Cu (85%), Zn (10%), Sn(5%)	Used for engineering purpose
Magnelium	Mg (5%), Al (95%)	For making aircraft frame
Magnox	Magnesium, aluminum.	Nuclear reactors.
Rolled Gold	Cu (90%), Ni (10%)	For making cheap ornaments
Solder	Sn (50-75%), Pb (50-25%)	Soldering of metals
Steel	Fe (98%), C (2%)	For making nails, screws, bridges
Stainless Steel	Fe (82%) Cr, Ni (18%)	for making cooking utencils, knives
Sterling silver	Silver (92.5%), copper (7.5%).	Cutlery, jewelry, medical tools, musical instruments.
White gold (18 carat)	Gold (75%), palladium (17%), silver (4%), copper (4%)	Jewelry or ornaments

## Aqua Regia

- It is a mixture of hydrochloric acid (**HCl**) and nitric acid (**HNO<sub>3</sub>**) at a ratio of either **3:1** or **4:1**.
- It is a **reddish-orange** or **yellowish-orange** fuming liquid.
- The term is a Latin phrase, meaning "**king's water**".
- It dissolves the noble metals gold, platinum, and palladium. It will not dissolve all noble metals. *e.g.* iridium and tantalum are not dissolved.
- It is also known as **Royal Water**, **Nitro-Muriatic Acid** (1789 name by Antoine Lavoisier).

## COAL, PETROLEUM and FLAMES

### Natural Resources

It is anything that people can use which comes from nature.

There are two types of natural resources:

**Inexhaustible Natural Resources:** Resources which do not exhaust and which are available in plenty in nature are known as inexhaustible natural resources. For example – air, sunlight, etc.

**Exhaustible Natural Resources:** Resources which get exhausted and are not available in nature in plenty and are known as exhaustible natural resources. They take longer to get replenished. For example – coal, petroleum, forest, minerals, etc.

### Coal

- It is a black coloured stone-like material.
- It is a combustible, sedimentary, organic rock, which is composed mainly of carbon, hydrogen and oxygen.
- It is used to produce electricity in thermal power stations.
- It gives carbon dioxide when burnt in air.

### Types of Coal

Type	% of C	Used as
Anthracite	90	space heating
Bituminous	80	fuel in steam-electric power generation
Lignite	70	fuel for electric power generation
Peat	60	domestic fuel

### Charcoal

- It is a light, black residue, consisting of carbon and any remaining ash, obtained by removing water and other volatile constituents from animal and vegetation substances.
- It is usually produced by slow pyrolysis, the heating of wood or other substances in the absence of oxygen.

**Lamp Black** is a velvety black powder and used in ink, printer's ink, black paint, carbon papers, etc.

**Carbon Black** is black, finely divided pellet or powder. It is used in tires, rubber and plastic products, and coatings.

### Petroleum or Rock oil or Crude oil

It is naturally occurring flammable liquid consisting of a complex mixture of hydrocarbons. Various usable substances are obtained from petroleum.

### Some of the petroleum products and their uses

Petroleum products	Uses
Petrol	Fuel in motor car, aviation, solvent for dry cleaning
Diesel	Fuel for heavy vehicle, such as trucks, rail engine, small vehicle, such as jeep car, for jet air crafts, small generators, etc.
Liquid Petroleum Gas	Fuel in households, and in vehicles.
Kerosene	Fuel for stoves, jet aircrafts, lamps, etc.
Lubricating oil	Used as lubricants mainly in engines.
Paraffin wax	Used in manufacturing of ointment, candles, cosmetics, etc.
Bitumen	Used in making of paints, road, etc.
Asphalt	Roads, railway beds or airport runways, etc.

### NATURAL GAS

- It is naturally occurring hydrocarbon gas.
- It is a mixture of methane, higher alkanes, carbon dioxide, etc.
- It is found in deep underground rock formation as fossil fuel.
- Compressed natural gas (CNG) is used for running vehicle.

#### CNG : Compressed Natural Gas

- Its constituent is methane.
- It obtained from natural gas-and-condensate wells, oil wells, coal bed methane wells.
- It is the substitute for gasoline in automobiles.
- It releases lesser greenhouse gas.
- It is lighter than air and hence disperses quickly in the event of spillage.

#### LPG : Liquefied Petroleum Gas

- Its constituents are Propane and Butane
- It is automatically generated from gas fields when natural gas is extracted from

the reservoir. It is the by-product of cracking process during crude-oil refining.

- It is used as fuel in households, and in vehicles.
- It releases CO<sub>2</sub> which is a greenhouse gas but is cleaner when compared to gasoline.
- It is highly inflammable.

**Ethanethiol** or **Ethyl Mercaptan** is a colorless gas or clear liquid with a distinct scent. It added to liquefied petroleum gas (LPG) to help warn of gas leaks.

**Octane Number** or **Octane Rating** is a standard measure of the ignition quality of gas (gasoline or petrol).

**Antiknock Agent** is a gasoline additive used to reduce engine knocking and increase the fuel's octane rating by raising the temperature and pressure at which ignition occurs.

**Cetane Number** or **Cetane Rating** is an indicator of the combustion speed of diesel fuel. It is an inverse of the similar octane rating for gasoline (petrol).

### FLAME

It is the hot glowing body of ignited gas that is generated by something on fire.

#### Zones of Candle Flame

**Dark zone:** It is the area around the wick of the candle flame that consists of unburnt wax vapour. When you ignite the candle, the molten wax moves up (due to a phenomena called the capillary action) and vaporizes around the wick creating a dark zone. This part is 'dark black' because of the decomposed carbon particles formed due to vaporization. Also, it is the least hottest of all the four zones.

**Luminous zone:** It is the region where incomplete combustion takes place and a lot of heat is generated. In this zone, the molten wax particles further vaporize in the presence of wax and vapor particles. It is present near the base of the flame. It is typified by a yellowish flame.

**Non-Luminous zone:** It is the region of complete combustion. This is the zone of complete combustion (as there is plenty of oxygen present around the candle).

**Blue zone:** Just at the base of the flame you will observe a 'bluish hue'. This is due to the incomplete burning of carbon dioxide resulting in the formation of carbon monoxide.

#### Flame colorants

Color	Chemical
Carmine (Dark Red)	Lithium chloride
Red	Strontium chloride or Strontium nitrate
Orange	Calcium chloride
Yellow	Sodium chloride (table salt) or Sodium carbonate
Apple Green	Borax (Sodium Borate)
Green	Copper(II) sulfate, Boric Acid
Blue	Copper(I) chloride, Butane
Violet	3 parts Potassium sulfate, 1 part Potassium nitrate (saltpeter)
Purple	Potassium chloride

#### Fire Extinguisher

- It is a portable device that discharges a jet of water, foam, gas, or other material to extinguish a fire.
- Different types of Fire Extinguishers are Water and Foam, Carbon Dioxide, Dry Chemical, Wet Chemical, Halogenated, Dry Powder, Water Mist and Cartridge Operated Dry Chemical.

#### Match

- It is a tool for starting a fire.
- Modern matches are made of small wooden sticks or stiff paper.
- **Safety Matches** can be struck only against a specially prepared surface.
- **Strike-Anywhere Matches** can be used on any suitably frictional surface.
- **Electric matches** are ignited fire electrically and do not make use of heat from friction.

## ELECTROCHEMISTRY

*It is the study of systems in which electricity plays a role in the changes that occur during a reaction.*

#### Oxidation-Reduction Reaction (Redox Reaction)

- It is a type of chemical reaction that involves a transfer of electrons between two species.
- **Redox reactions** are common and vital to some of the basic functions of life, including photosynthesis, respiration, combustion, and corrosion or rusting.
- **Oxidation** is the process in which electrons are donated by a reactant.
- The electron acceptor reactant is called as oxidizing agent,
- **Reduction** is the process in which electrons are gained by a reactant
- The electron donor reactant is called as reducing agent.

#### ELECTROLYSIS

- It is a process by which electric current is passed through a substance to effect a chemical change.
- It is used extensively in metallurgical processes, such as in extraction (electrowinning) or purification (electrorefining) of metals from ores or compounds and in deposition of metals from solution (electroplating).
- **An electrolyte** is a substance containing free ions which are the carriers of electric current in the electrolyte.
- **A direct current (DC) supply** provides the energy necessary to create or discharge the ions in the electrolyte.

- **Electrode** is an electrical conductor which provides the physical interface between the electrical circuit providing the energy and the electrolyte.

### ELECTROCHEMICAL CELL

- In electrochemical cells **Redox reactions** take place.
- It consists of two electrodes: an **anode** (the electrode at which the oxidation reaction occurs) and a **cathode** (the electrode at which the reduction reaction occurs).
- There are two types of electrochemical cells: **Galvanic Cell** (ones that spontaneously produce electrical energy) and **Electrolytic Cell** (ones that consume electrical energy).

#### Galvanic Cell or Daniel cell or Voltaic cell

It induces a spontaneous redox reaction to create a flow of electrical charges, or electricity.

It turns chemical energy into electrical energy

Non-rechargeable batteries are examples of Galvanic cells.

**Oxidation:**  $\text{Zn}_{(s)} \rightarrow \text{Zn}^{2+}_{(aq)} + 2e^-$  (Anode)

**Reduction:**  $2e^- + \text{Cu}^{2+}_{(aq)} \rightarrow \text{Cu}_{(s)}$  (Cathode)

#### Electrolytic Cell

- An Electrolytic cell is one kind of battery that requires an outside electrical source to drive the non-spontaneous redox reaction.
- It turns electrical energy into chemical energy
- Rechargeable batteries act as Electrolytic cells when they are being recharged.
- **Oxidation:**  $\text{Cu}_{(s)} \rightarrow \text{Cu}^{2+}_{(aq)} + 2e^-$  (anode)
- **Reduction:**  $\text{Zn}^{2+}_{(aq)} + 2e^- \rightarrow \text{Zn}_{(s)}$  (cathode)

**Volt meter** : It measures the electric current. In Galvanic cells, this shows how much current is produced; in Electrolytic cells, this shows how much current is charging the system.

#### Faraday's Laws of Electrolysis

**First law of electrolysis** states that *the weights of substances formed at an electrode during electrolysis are directly proportional to the quantity of electricity that passes through the electrolyte.*

$$W \propto Q$$
$$\text{or } W = ZQ = Z \cdot It$$

Charge = Current x time

**Z** = electrochemical constant for a given substance.

**Second law of electrolysis** states that *the weights of different substances formed by the passage of the same quantity of electricity are proportional to the equivalent weight of each substance.*

$$W \propto E$$
$$\text{or } \frac{W_1}{W_2} = \frac{E_1}{E_2}$$

#### Battery

- It is a source of electrical energy, which is provided by one or more electrochemical cells of the battery after conversion of stored chemical energy.
- **Primary batteries** irreversibly transform chemical energy to electrical energy. When the supply of reactants is exhausted, energy cannot be readily restored to the battery.
- **Secondary batteries** can be recharged; that is, they can have their chemical reactions reversed by supplying electrical energy to the cell, approximately restoring their original composition.

## AIR, WATER, SOIL and THEIR POLLUTION

### Air

- The air in our atmosphere is composed of molecules of different gases.
- It consists of 78 % nitrogen gas, 21 % oxygen, 0.9 % argon, and 0.03 % carbon dioxide, water vapor-floating molecules of water and trace gases.
- Earth's atmosphere is divided into five main layers.

Layers	Ranges in km
Troposphere	0 to 12
Stratosphere	12 to 50
Mesosphere	50 to 80
Thermosphere	80 to 700
Exosphere	700 to 10000

### Some Important Gases

Gases	Symbol & Atomic No.	Discovered by	Fact
Oxygen (O <sub>2</sub> )	O & 8	Carl Wilhelm Scheele and <b>named by</b> Antoine Lavoisier (1777).	Approximately 2/3 of the mass of the human body is oxygen. It is the gas we inhale.
Ozone (O <sub>3</sub> )	It is a form of elemental oxygen.	Christian Friedrich Schönbein	It is blue in color and has a strong odor. It is very reactive gas and toxic.
Nitrogen (N <sub>2</sub> )	N & 7	Daniel Rutherford (1772) and <b>named by</b> Jean-Antoine Chaptal (1790).	It is estimated at about seventh in total abundance in our galaxy and the Solar System.
Carbon dioxide (CO <sub>2</sub> )	It is a compound.	Joseph Black in 1750	It is the gas we exhale. CO <sub>2</sub> as a gas is heavier than air and therefore can be layered as blanket of inert gas.

### Water (H<sub>2</sub>O)

- It can occur in three states: solid (ice), liquid, or gas (vapor).
- It is a good polar solvent and is often referred to as the universal solvent.
- It covers 71% of the Earth's surface, and is vital for all known forms of life.
- Its boiling point is 100°C and freezing point is 0°C.
- It is tasteless and odorless.
- The intrinsic colour of water and ice is a very slight blue hue, although both appear colorless in small quantities.

Types of water	Description	pH value	hardness
Soft water	It is a pure form of water in which the only ion is Na <sup>+</sup> , and a natural source is rain water.	5.5 to 7.7	0-60 gm/L
Hard water	It is an impure form of water having high mineral contents, like Ca, Mg, sulphides, chlorides, bicarbonates etc.	7.8 as 8	> 120 gm/L
Heavy water D <sub>2</sub> O	It contains either one or both the hydrogen atoms in water replaced by deuterium (D).	7.43 at 25 °C	-

## Soil

It is the mixture of minerals, organic matter, gases, liquids, and the countless organisms that together support life on Earth.

In terms of soil texture, soil type usually refers to the different sizes of mineral particles in a particular sample. Soil is made up in part of finely ground rock particles, grouped according to size as sand and silt in addition to clay, organic material such as decomposed plant matter.

## POLLUTION

It is the introduction of contaminants into the natural environment that cause adverse change.

### Pollutants

It is the substance or agent of pollution. It is harmful to nature.

**Primary Pollutants** are injected into the atmosphere directly. *e.g.* smoke, carbon monoxide, nitric oxide, sulphur dioxide, dust, ash, salt particles, etc.

**Secondary pollutants** are formed by chemical reaction between the primary pollutants and constituents of the environment (i.e. those which are already present in the environment). *e.g.* smog, ozone, sulphur trioxide, nitrogen dioxide, etc.

### Air pollution

- When some foreign particles enter the air and deteriorate its quality is known as air pollution. These particles can be produced naturally or man made. Dust storms, Bacteria and gases of volcanic eruptions are examples of natural's sources of pollutants. Gases released from the automobile and the chimneys are the example of man made pollutants.
- **Major Air pollutants:** Carbon monoxide (CO), Ozone (O<sub>3</sub>), Nitrogen dioxide (NO<sub>2</sub>), Sulphur dioxide (SO<sub>2</sub>), etc.

- **Cause :** Vehicle or manufacturing exhaust, Forest fires, volcanic eruptions, dry soil erosion, and other natural sources, Building construction or demolition

### Water pollution

- When some foreign particle, organic, inorganic or biological impurities are added to the water so that it becomes unfit for use is known as water pollution.
- **Major Water pollutants:** *Point Sources:* Sewerage system and industrial effluents etc. *Diffused sources:* Agriculture. Mining and construction etc.
- **Cause :** Increased sediment from soil erosion, Improper waste disposal and littering, Leaching of soil pollution into water supplies, Organic material decay in water supplies

### Soil pollution

- When the productivity of the soil reduces due to the presence of pollutants in it is known as soil pollution. Man has polluted the soil by the excess use of pesticides.
- **Major soil pollutants:** Pesticides, fungicides and herbicides
- **Cause :** Hazardous waste and sewage spills, Non-sustainable farming practices, such as the heavy use of inorganic pesticides, Strip mining, deforestation, and other destructive practices, Household dumping and littering

### Greenhouse Effect

- It is the exchange of incoming and outgoing radiation of greenhouse gases that warms the Earth.
- Carbon dioxide, ozone, water vapor, methane, nitrous oxide, chlorofluorocarbons, and a few other gases are greenhouse gases.

### Global Warming

It is the increase of Earth's average surface temperature due to effect of greenhouse gases, such as carbon dioxide emissions from burning fossil fuels or from deforestation, which trap heat that would otherwise escape from Earth. This is a type of greenhouse effect.

It is the gradual increase in the average temperature of the Earth's atmosphere and its oceans, a change that is believed to be permanently changing the Earth's climate.

#### *Effects of global warming*

- Increase of temperature on the earth by about 3° to 5° C (5.4° to 9° Fahrenheit) by the year 2100.
- Rise of sea levels by at least 25 meters (82 feet) by the year 2100.

### Acid Rain

- It refers to a mixture of wet and dry deposition (deposited material such as snow) from the atmosphere containing higher than normal amounts of nitric and sulfuric acids.
- It has pH less than 5 due to oxides of nitrogen and sulphur. The pH value of normal rain water is 5.6.

### Particulate matter

It is the sum of all solid and liquid particles suspended in air, many of which are hazardous. This complex mixture contains for instance dust, pollen, soot, smoke, and liquid droplets.

### Smog

- Smog is air pollution that reduces visibility.
- It is the mixture of smoke and fog caused a major air pollution problem.
- It occurs when emissions from industry, motor vehicles, incinerators, open burning and other sources accumulate under certain climatic conditions.

## CARBON and ITS COMPOUND

### CARBON

- It is a chemical element of group 14 on the periodic table, with symbol C and atomic number 6.
- Its electron configuration is 2, 4.
- It is nonmetallic and tetravalent - making four electrons available to form covalent chemical bonds.
- It is the fourth most abundant element in the universe (hydrogen, helium, and oxygen are found in higher amounts, by mass).

- **Catenation** : Due to small size of carbon, it has a unique ability to combine with other carbon atoms to form long chains.
- Carbon occurs in two forms in nature.

**Free State (allotropes)** : graphite, diamond, Fullerene

**Combined State** : Carbon Combines with other elements to form compounds such as carbon monoxide, carbon dioxide, etc.



Allotropes	Conductance	Crystal system	Melting point	Used in
Graphite	Good	Hexagonal	4026.85 °C	Pencils, making electrode, lubricant
Diamond	Low	Cubic	3926.85 °C	protective windows for space probes, making cutting and grinding tools
Fullerene	Superconductivity	Hexagonal cubic	600 °C	Artificial photosynthesis, cosmetics, surface coating, drug delivery system

**Amorphous Carbon or diamond-like carbon** is free, reactive carbon that does not have any crystalline structure. It is often abbreviated to aC for general amorphous carbon, aC:H or HAC for hydrogenated amorphous carbon.

**Graphene** is a thin layer of pure carbon; it is a single, tightly packed layer of carbon atoms that are bonded together in a hexagonal honeycomb lattice. It is the best electrical conductivity of any material. It can be used to make very small devices.

### Organic Compounds

These are made up of carbon (C), hydrogen (H) and oxygen (O) generally. Organic compounds contains at least one C – H bond. *e.g.* Methane (CH<sub>4</sub>), Methanol (CH<sub>3</sub>OH), Glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>)

### Hydrocarbons

Compounds made up of carbon and hydrogen only, are known as Hydrocarbons. It can be classified in two types, which are Saturated and Unsaturated Hydrocarbons.

#### Saturated Hydrocarbons

Hydrocarbons which contain only single bonds between the carbon atoms are called **alkanes**. Their general formula is  $C_nH_{2n+2}$ .

#### Unsaturated Hydrocarbons

- Hydrocarbons which contain one or more double bonds between the carbon atoms are called **alkenes**. Their general formula is  $C_nH_{2n}$ .
- Hydrocarbons which contain one or more triple bonds between the carbon atoms are called **alkynes**. Their general formula is  $C_nH_{2n-2}$ .

No. of carbon atom(s)	Prefix
1	Meth
2	Eth
3	Prop
4	But
5	Pent
6	Hex
7	Hept
8	Oct
9	Non
10	Dec

Suffix for alkane : **ane**

Suffix for alkene : **ene**

Suffix for alkyne : **yne**

#### Inorganic Compounds

These do not have any C – H bond. *e.g.* carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>)

**Carbon Monoxide (CO)** is a colorless, odorless, and tasteless gas that is slightly less dense than air. It is toxic in nature. Carbon monoxide consists of one carbon atom and one oxygen atom, connected by a triple bond that consists of two covalent bonds as well as one dative covalent bond.

## LIST OF COMMON INORGANIC & ORGANIC REAGENTS

*Reagents are substances or compounds that are added to a system in order to bring about a chemical reaction or are added to see if a reaction occurs.*

Name	General Description
Acetic acid	an organic acid; is one of the simplest carboxylic acids
Acetone	an organic compound; simplest example of the ketones
Acetylene	a hydrocarbon and the simplest alkyne; widely used as a fuel and chemical building block
Ammonia	inorganic; the precursor to most nitrogen-containing compounds; used to make fertilizer
Butanone (methyl ethyl ketone)	organic compound; similar solvent properties to acetone but has a significantly slower evaporation rate
Carbon disulfide	a non-polar solvent; used frequently as a building block in organic chemistry
Chloroform	organic compound; a precursor to teflon
Chromic acid	a strong and corrosive oxidising agent; an intermediate in chromium plating
Collins reagent	used to selectively oxidize primary alcohols to an aldehyde
Copper(I) iodide	useful in a variety of applications ranging from organic synthesis to cloud seeding
Diethyl ether	organic compound; a common laboratory solvent
Dimethyl ether	the simplest ether; a useful precursor to other organic compounds and an aerosol propellant
Dioxane	a heterocyclic organic compound; classified as an ether
Ethanol	a powerful psychoactive drug; used in alcoholic beverages, in thermometers, as a solvent, and as a fuel
Fehling's reagent	used to differentiate between water-soluble aldehyde and ketone functional groups
Fenton's reagent	a solution of hydrogen peroxide and an iron catalyst that is used to oxidize contaminants or waste waters
Formaldehyde	the simplest aldehyde; an important precursor to many other chemical compounds, such as polymers and polyfunctional alcohols
Formic acid	the simplest carboxylic acid; often used as a source of the hydride ion
Grignard reagents	the most common application is for alkylation of aldehydes and ketones:
Hydrochloric acid	a highly corrosive, strong mineral acid with many industrial uses
Hydrofluoric acid	valued source of fluorine, precursor to numerous pharmaceuticals; highly corrosive
Hydrogen peroxide	an oxidizer commonly used as a bleach
Lime	used in Flue Gas Desulphurisation in Power Plants
Limestone	used in Flue Gas Desulphurisation in Power Plants
Manganese dioxide	used as a pigment and as a precursor to other manganese compounds; used as a reagent in organic synthesis for the oxidation of allylic alcohols
Millon's reagent	an analytical reagent used to detect the presence of soluble proteins
Nitric acid	highly corrosive and toxic strong acid; used for the production of fertilizers, production of explosives, and as a component of aqua regia
Phosphoric acid	a mineral acid with many industrial uses; commonly used in the laboratory preparation of hydrogen halides
Phosphoryl chloride	used to make phosphate esters such as tricresyl phosphate
Potassium hydroxide	a strong base; precursor to most soft and liquid soaps as well as numerous potassium-containing chemicals
Silver oxide	used to prepare other silver compounds; in organic chemistry, used as a mild oxidizing agent
Silver nitrate	precursor to many other silver compounds; commonly used in

	inorganic chemistry to abstract halides
Sodium chlorite	in organic synthesis, used for the oxidation of aldehydes to carboxylic acids
Sodium hydride	a strong base used in organic synthesis
Sodium hydroxide	strong base with many industrial uses; in the laboratory, used with acids to produce the corresponding salt, also used as an electrolyte
Sodium nitrite	used to convert amines into diazo compounds
Sulfuric acid	strong mineral acid; major industrial use is the production of phosphoric acid
Tollens' reagent	a chemical test most commonly used to determine whether a known carbonyl-containing compound is an aldehyde or a ketone

## HUMAN MADE MATERIALS

*Any material that is manufactured by human effort or human made through industrial process. e.g. Soaps, detergents, fertilizers, Glass, medicine, cement, plastics, fibers, etc.*

### Soap

- Soap is water-soluble sodium or potassium salts of fatty acids. Soaps are made from fats and oils, or their fatty acids, by treating them chemically with a strong alkali.
- Used as surfactants for washing, bathing, and cleaning, but they are also used in textile spinning and are important components of lubricants.

- Fertilizers are commonly used for growing all crops, with application rates depending on the soil fertility, usually as measured by a soil test and according to the particular crop.
- Organic fertilizers use decaying plants, fish, bone or other animal waste.
- Commercial and homemade fertilizers contain nitrogen, phosphorus and potassium (N-P-K) mixed in proportion to function.

### Detergent

- It is a surfactant or a mixture of surfactants with cleaning properties in dilute solutions.
- Higher end detergents contain enzymes and optical brighteners. Some liquid detergents contain nonionic surfactants. Sodium tripolyphosphate was an excellent builder used in laundry detergent powders.

### Glass

- It is a mixture having no definite boiling or freezing points.
- It is also called a super cooled liquid.
- Most glasses are silicates.
- It is transparent and not affected by chemicals.
- It can be moulded into any shape.
- The ingredients for making glass are Limestone ( $\text{CaCO}_3$ ), Soda ash ( $\text{Na}_2\text{CO}_3$ ) and Sand ( $\text{SiO}_2$ ).

### Fertilizer

- It is any material of natural or synthetic origin (other than liming materials) that is applied to soils or to plant tissues (usually leaves) to supply one or more plant nutrients essential to the growth of plants.

### Metals Used to Impart Colour to Glass

Substance Added	Colour
Antimony Oxides	White
Cadmium Sulfide	Yellow
Carbon Oxides	Amber Brown
Chromic Oxide	Emerald Green
Cobalt Oxide	Blue-Violet
Copper Compounds	Blue, Green, Red
Gold Chloride	Red
Iron Oxide	Greens and Browns
Lead Compounds	Yellow
Manganese Dioxide	Purple
Nickel Oxide	Violet
Sulfur	Yellow-Amber
Tin Compounds	White
Uranium Oxide	Fluorescent Yellow, Green

#### Types of glass

**Soda glass or soda-lime glass** is prepared by heating sodium carbonate and silica. *Uses:* making windowpanes, tableware, bottles and bulbs.

**Colored structural glass** is a heavy plate glass, available in many colors. It is used in buildings as an exterior facing, and for interior walls, partitions, and tabletops.

**Plate glass** It is made by floating a layer of molten glass over a layer of molten tin. So, it is thicker than ordinary glass. *Uses:* shop windows, doors, etc.

**Bullet-resisting glass** is thick, multilayer laminated glass. This glass can stop even heavy-caliber bullets at close range. Bullet-resisting glass is heavy enough to absorb the energy of the bullet, and the several plastic layers hold the shattered fragments together. Such glass is used in bank teller windows and in windshields for military tanks, aircraft, and special automobiles.

**Laminated safety glass** is a “sandwich” made by combining alternate layers of flat glass and plastics. The outside layer of glass may break when struck by an object, but the plastic layer is elastic and so it stretches. The plastic holds the broken pieces of glass together and keeps

them from flying in all directions. It is used where broken glass might cause serious injuries, as in automobile windshields.

**Optical glass** is used in eyeglasses, microscopes, telescopes, camera lenses, and many instruments for factories and laboratories. The raw materials must be pure so that the glass can be made almost flawless. The care required for producing optical glass makes it expensive compared with other kinds of glass.

**Pyrex glass or borosilicate glass** is highly heat resistant. Uses in Laboratory equipment, ovenware, etc.

**Photochromic glass** darkens when exposed to ultraviolet rays and clears up when the rays are removed. It is used for windows, sunglasses, and instrument controls.

**Chalcogenide glass** is made up of elements from the chalcogen group, including selenium, sulfur, and tellurium. The glass is transparent to infrared light and is useful as a semiconductor in some electronic devices. Chalcogenide glass fibers are a component of devices used to perform laser surgery.

## Cement

- A cement is a binder, a substance that sets and hardens and can bind other materials together.
- **Concrete** = Cement + water + sand + gravel
- **Plaster** = Cement + water + sand
- **Mortar** = Cement + lime + sand

## Composition of cement

Lime (CaO) 60-65%, Silica (SiO<sub>2</sub>) 20-25%, Alumina (Al<sub>2</sub>O<sub>3</sub>) 4-8%, Iron Oxide (Fe<sub>2</sub>O<sub>3</sub>) 2-4%, Magnesium Oxide (MgO) 1-3%, Sodium

oxide (Na<sub>2</sub>O) 0.1-0.5%, Sulphur Trioxide (SO<sub>3</sub>) 1-2%

**Portland cement** consists essentially of compounds of lime (calcium oxide, CaO) mixed with silica (silicon dioxide, SiO<sub>2</sub>) and alumina (aluminum oxide, Al<sub>2</sub>O<sub>3</sub>). The lime is obtained from a calcareous (lime-containing) raw material, and the other oxides are derived from an argillaceous (clayey) material.

## Medicine

It is the chemical substances used for diagnosis, treatment, and prevention of disease

## Classes of Medicine

Class	Cure/treatment/prevent	Medicine(s)
Antipyretics (pyrexia/pyresis)	fever	aspirin, paracetamol, analgin, novalgin, phenacetain, etc.
Analgesics painkillers	pain	aspirin, paracetamol, morphine, etc.
Antimalarial drugs	Malaria	chloroquin
Antibiotics	inhibiting germ growth	penicillin, ampicillin, amoxicillin, tetracycline, etc.
Antiseptics	Prevent germ growth near burns, cuts and wounds	Dettol, Savlon, Boric acid, hydrogen peroxide, etc.
Mood stabilizers	moderate the manic highs and bipolar disorder	lithium, valpromide, etc.
Hormone replacements	-	Premarin, Angeliq, etc.
Oral contraceptives	-	
Stimulants	-	methylphenidate (Ritalin)
Tranquilizers	-	meprobamate, chlorpromazine, reserpine, chlordiazepoxide, diazepam, etc.
Statins	-	lovastatin, pravastatin, and simvastatin, etc.

## Polymers

These are substances whose molecules have high molar masses and are composed of a large number of repeating units. There are both naturally occurring and synthetic polymers. Among naturally occurring polymers are proteins, starches, cellulose, and latex.

## Plastic

- It is a synthetic material made from a wide range of organic polymers such as polyethylene, PVC, nylon, etc. Types of Plastic : Thermoplastics and Thermosets
- **Thermoplastics** which are softened by heat and can be moulded. (Injection moulded, blow moulded or vacuum formed). *e.g.* acrylic, polypropylene, polystyrene, polythene and PVC.

- **Thermosets** which are formed by heat process but are then set (like concrete) and cannot change shape by reheating. *e.g.* melamine (kitchen worktops), Bakelite (black saucepan handles), polyester and epoxy resins.

### Some Common Polymers and their monomers

Name(s)	Monomer
Polyethylene	ethylene
Polyethylene	ethylene
Polypropylene	propylene
Poly(vinyl chloride)	vinyl chloride
Poly(vinylidene chloride)	vinylidene chloride
Polystyrene	styrene
Polyacrylonitrile	acrylonitrile
Polytetrafluoroethylene	tetrafluoroethylene
Poly(methyl methacrylate)	methyl methacrylate
Poly(vinyl acetate)	vinyl acetate
Polychloroprene	chloroprene

### Fiber

- It is a natural or synthetic substance that is significantly longer than it is wide.
- The strongest engineering materials often incorporate fibers, for example **carbon fiber** and **ultra-high-molecular-weight polyethylene**.
- **Synthetic fibers** can often be produced very cheaply and in large amounts compared to natural fibers, but for clothing natural fibers can give some benefits, such as comfort, over their synthetic counterparts.

### Natural Rubber

- It is a high molecular weight polymeric substance with viscoelastic properties.
- It is obtained from the milky secretion (latex) of various plants, but the only

important commercial source of natural rubber (sometimes called Pará rubber) is the tree *Hevea brasiliensis*. The only other plant under cultivation as a commercial rubber source is guayule.

- The main use of natural rubber is in automobiles.

### Explosives

It is a reactive substance that contains a great amount of potential energy that can produce an explosion if released suddenly, usually accompanied by the production of light, heat, sound, and pressure. An explosive charge is a measured quantity of explosive material. *e.g.* TNT- trinitrotoluene, RDX- cyclonite, PETN- pentaerythritol tetranitrate, nitrocellulose, nitroglycerin, etc.

**Chemical explosive** is a compound or mixture that releases chemical energy violently and rapidly, creating heat and a shock wave generated by a release of gases.

**Dynamite** is an explosive made by soaking an inert (inactive or stable), absorbent substance with a mixture of (1) nitroglycerin or ammonium nitrate, (2) a combustible substance (a substance with the ability to burn), such as wood pulp, and (3) an antacid.

**Gunpowder** is an explosive mixture of charcoal, potassium nitrate, and sulfur often used to propel bullets from guns and shells from cannons.

**Nitroglycerine** is an explosive liquid used to make dynamite. Also used as a medicine to dilate blood vessels.

**Nuclear explosive** is a device that obtains its explosive force from the release of nuclear energy.

**Trinitrotoluene (TNT)** is a high explosive.

## INDUSTRIAL NAMES OF SOME IMPORTANT COMPOUNDS

Industrial name	Chemical name and Formula
Alum	Potassium aluminium sulphate ( $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24 H_2O$ )
Alcohol	Ethyl alcohol ( $C_2H_5OH$ )
Baking Power	Sodium bicarbonate ( $NaHCO_3$ )
Blue vitriol	Copper sulphate ( $CuSO_4 \cdot 5H_2O$ )
Bleaching Powder	Calcium chlorohypochloride ( $CaOCl_2$ )
Borax	Sodium tetraborate decahydrate ( $Na_2B_4O_7 \cdot 10H_2O$ )
Brine or Salt	Sodium chloride ( $NaCl$ )
Calomel	Mercurous chloride ( $Hg_2Cl_2$ or $HgCl$ )
Caustic potash	Pottasium hydroxide ( $KOH$ )
Chili salt petre	Sodium nitrate ( $NaOH$ )
Chloroform	Trichloromethane ( $CHCl_3$ )
Dry ice	Solid carbon dioxide ( $CO_2$ )
Epsom	Magnesium sulphate ( $MgSO_4 \cdot 7H_2O$ )
Glauber's salt	Sodium sulphate decahydrate ( $Na_2SO_4 \cdot 10H_2O$ )
Green vitriol	Ferrous sulphate ( $FeSO_4 \cdot 7H_2O$ )
Gypsum	Calcium sulphate ( $CaSO_4 \cdot 2H_2O$ )
Hypo	Sodium thiosulphate pentahydrate ( $Na_2S_2O_3 \cdot 5H_2O$ )
Laughing gas	Nitrous oxide ( $N_2O$ )
Litharge	Lead oxide ( $PbO$ )
Lunar castic	Silver nitrate ( $AgNO_3$ )
Magnesia	Magnesium oxide ( $MgO$ )
Marble or chalk or pearl	Calcium carbonate ( $CaCO_3$ )
Marsh gas	Methane ( $CH_4$ )
Mohr's salt	Ferrous ammonium sulphate, ( $(NH_4)_2SO_4 \cdot FeSO_4 \cdot 6H_2O$ )
Mosaic gold	Sulphide ( $SnS_2$ )
Muratic acid	Hydrogen chloride ( $HCl$ )
Pearl ash	Pottasium carbonate ( $K_2CO_3$ )
Plaster of Paris	Calcium Sulphate hemi hydrate ( $CaSO_4 \cdot \frac{1}{2} H_2O$ )
Quick lime	Calcium oxide ( $CaO$ )
Red lead	Lead peroxide ( $Pb_3O_4$ )
Rock salt	Sodium chloride ( $NaCl$ )
Ruby or sapphire	Aluminium oxide, $Al_2O_3$
Sand	Silicon dioxide ( $SiO_2$ )
Sal ammonic	Ammonium chloride ( $NH_4Cl$ )
Slaked lime	Calcium hydroxide $Ca(OH)_2$
Spirit	Methyl alcohol ( $CH_3OH$ )
Soda ash	Sodium carbonate ( $Na_2CO_3$ )
Vinegar	Acetic acid ( $CH_3COOH$ )
Vermelion	Mercuric sulphide ( $HgS$ )
Washing soda	Sodium carbonatedecahydrate ( $Na_2CO_3 \cdot 10H_2O$ )
White vitriol	Zinc sulphate ( $ZnSO_4 \cdot 7H_2O$ )

## BIOLOGY

The word biology means, "the science of life", from the Greek bios, life, and logos, word or knowledge. Therefore, Biology is the science of Living Things. That is why Biology is sometimes known as Life Science.

Generally, biology is classified into 2 categories. Those are: **Botany** (Study of Plants) and **Zoology** (Study of Animals).

Category	Botany	Zoology
<i>They are</i>	Study of plants	Study of animals
<i>The person who studies is called as</i>	botanist or a plant scientist	zoologists or a animal scientist
<i>Main Persons</i>	Father of Botany-Theophrastus	Father of Zoology-Aristotle
<i>Nomenclature</i>	International Code of Nomenclature for algae, fungi, and plants (ICN),replaced by International Code of Botanical Nomenclature (ICBN).	International Code of Zoological Nomenclature (ICZN or ICZN Code).
<i>Researches and Studies includes</i>	Deals with the studies of plant structure, growth and differentiation, reproduction, biochemistry and primary metabolism, chemical products, development, diseases, evolutionary relationships, systematic, and plant taxonomy.	Vast studies related to animal structure, formation, physiological, evolutionary and systematic and ethology.

### Fathers of Different Fields in Biology

#### *Father of,*

Biology and Zoology - **Aristotle**

Botany and Ecology - **Theophrastus**

Anatomy - **Andreas Vesalius**

Taxonomy and Nomenclature – **Carolus**

**Linnaeus**

Plant Physiology - **Stephen Hales**

Plant Pathology - **de Bary**

Palaeontology - **Leonard da Vinci**

Genetics - **Gregor Johann Mendel**

Medicine - **Hippocrates**

Cytology - **Robert Hooke**

Modern Embryology - **Von Baer**

Immunology - **Edward Jenner**

Madern Palaeonlogy - **Cuvier**

Antibiotic - **Alexander Fleming**

Blood Circulation - **William Harvey**

Blood Groups - **Landsteiner**

Green Revolution - **Norman E. Borlaug**

Indian Green Revolution - **M. S.**

**Swaminathan**

Indian Palaeobotany - **Birbal Sahni**

Experimental Genetics - **T. H. Morgan**

*\*Birdman of India - Salim Ali*

*\*Founder of Embryology - C. F. Wolff*

### Characteristics of life

- Living things are composed of matter structured in an orderly way where simple molecules are ordered together into much larger macromolecules.
- An easy way to remember this is “**GRIMNERD C**” All organisms; - **Grow**, **Respire**, **Interact**, **Move**, **Need Nutrients**, **Excrete** (Waste), **Reproduce**, **Death**, **Cells** (Made of)
- Living things are **sensitive**, meaning they are able to **respond to stimuli**.
- Living things are able to **grow**, **develop**, and **reproduce**.
- Living things are able to **adapt** over time by the process of **natural selection**.
- All known living things use the **hereditary molecule, DNA**.



## BIOLOGICAL EVOLUTION

- *It is the process through which the characteristics of organisms change over successive generations, by means of genetic variation and natural selection.*
- **Microevolution** is defined as changes in gene frequency in a population from one generation to the next. A population is a group of organisms who interbreed with each other.
- **Macroevolution** is evolution on a big scale, the descent of many species from one common ancestor over billions of years.

### Origin of Life

- It is generally agreed that all life today evolved by common descent from a single primitive lifeform.
- All known organisms share certain general properties, and to a large degree these properties define what we mean by life.
- **Scientists Disagree about Where Life Started** : The atmosphere of the early earth was rich in hydrogen, providing a ready supply of energetic electrons with which to build organic molecules.
- **The Miller-Urey Experiment** : Experiments attempting to duplicate the conditions of early earth produce many of the key molecules of living organisms.
- **Theories about the Origin of Cells** : The first cells are thought to have arisen spontaneously, but there is little agreement as to the mechanism.
- **The Earliest Cells** : The earliest fossils are of bacteria too small to see with the unaided eye.
- In 1924 when **Alexander Oparin** reasoned that atmospheric oxygen prevented the synthesis of the organic molecules. Organic molecules are the necessary building blocks for the evolution of life. In his *The Origin of Life*, Oparin argued that a "primeval soup" of organic molecules could be created in an oxygen-less atmosphere through the action of sunlight.
- Around the same time **J.B.S. Haldane** also suggested that the Earth's pre-biotic oceans, which were very different from what oceans are now, would have formed

a "hot dilute soup". In this soup, organic compounds, the building blocks of life, could have formed. This idea was called **biopoiesis**

### Fundamental Properties of Life

- **Cellular organization** : All organisms consist of one or more cells—complex, organized assemblages of molecules enclosed within membranes.
- **Sensitivity** : All organisms respond to stimuli— though not always to the same stimuli in the same ways.
- **Growth** : All living things assimilate energy and use it to grow, a process called metabolism. Plants, algae, and some bacteria use sunlight to create covalent carbon-carbon bonds from CO<sub>2</sub> and H<sub>2</sub>O through photosynthesis. This transfer of the energy in covalent bonds is essential to all life on earth.
- **Development** : Multicellular organisms undergo systematic gene-directed changes as they grow and mature.
- **Reproduction** : All living things reproduce, passing on traits from one generation to the next. Although some organisms live for a very long time, no organism lives forever, as far as we know. Because all organisms die, ongoing life is impossible without reproduction.
- **Regulation** : All organisms have regulatory mechanisms that coordinate internal processes.
- **Homeostasis** : All living things maintain relatively constant internal conditions, different from their environment.

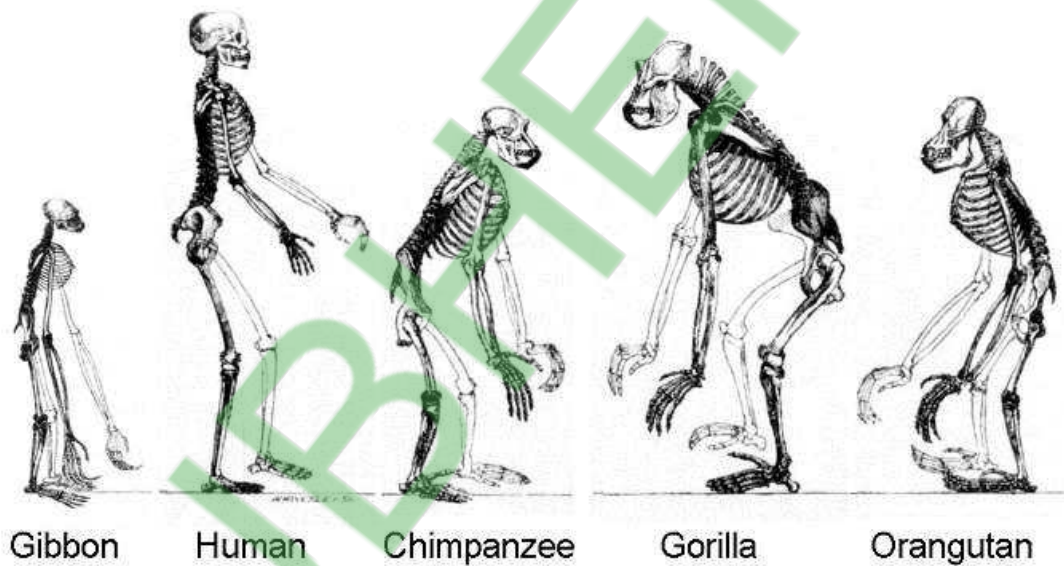
## Heredity

All organisms on earth possess a genetic system that is based on the replication of a long, complex molecule called DNA. This mechanism allows for adaptation and evolution over time, also distinguishing characteristics of living things.

## Evidence from Connecting Links

Connecting Links	Between groups
Virus	living and non-living organism
Euglena (Protozoa)	plants and animals
Balanoglossus (Chordata)	invertebrates and chordates
Peripatus (Anthropoda)	arthropods and annelids
Neopilina (Mollusca)	annelids and molluscans
Protopterus (Lung fish)	fishes and amphibians
Chimaera	cartilaginous and bony fishes

## THEORIES OF EVOLUTION



## Lamarckism (Lamarckian inheritance)

Jean-Baptiste Lamarck was a French scientist who developed an alternative theory of evolution in 1801 and 1809. His theory involved two ideas:



1. A characteristic which is used more and more by an organism becomes bigger and stronger, and one that is not used eventually disappears
2. Any feature of an organism that is improved through use is passed to its offspring.

## Darwinism

The theory of evolution by natural selection, first formulated in Darwin's book "On the Origin of Species" in 1859, is the process by which organisms change over time as a result of changes in heritable physical or behavioral traits.



*As "Darwinism" became widely accepted in the 1870s, caricatures of Charles Darwin with an ape or monkey body symbolized evolution.*

## Mendelian inheritance

It is inheritance of biological features that follows the laws proposed by Gregor Johann Mendel in 1865 and 1866 and re-discovered in 1900.

## Genetic drift

It (also known as allelic drift or the Sewall Wright effect after biologist Sewall Wright) is the change in the frequency of a gene variant (allele) in a population due to random sampling of organisms.

## Modern Evolutionary Synthesis

It is a synthesis of ideas from several fields of biology that provides an account of evolution which is widely accepted as the current paradigm in evolutionary biology, and reflects the consensus about how evolution works.

The 19th Century ideas of natural selection by Charles Darwin and Mendelian genetics by Gregor Mendel were united by Ronald Fisher, one of the three founders of population genetics, along with J. B. S. Haldane and Sewall Wright, between 1918 and 1932.

# THE CELL and ITS STRUCTURE

## Discovery of Cells

- 1665 : Robert Hooke looks at cork under a microscope. Calls the chambers he see "cells"
- 1665 - 75 : Anton van Leeuwenhoek, the person incorrectly given credit for the invention of the microscope (actually, he was just damn good at making and using them, and his scopes soon became the standard, and history has just given him credit as the inventor of the microscope), studies organisms living in pond water (like you did in lab). He calls them "Animalcules."
- 1830 : German scientists Schleiden and Schwann summarize the findings of

many scientists and conclude that all living organisms are made of cells. This forms the basis of the Cell Theory of Biology

## *All organisms are composed of cells*

- The cell is the structural unit of life - units smaller than cells are not alive
- Cells arise by division of preexisting cells - spontaneous generation does not exist
- Cells can be cultured to produce more cells  
*in vitro* = outside organism or cell  
*in vivo* = inside organism or cell

## Anatomy of a Cell

Cells are of two types, **eukaryotic**, which contain a nucleus, and **prokaryotic**, which do not.

Prokaryotes are single-celled organisms, while eukaryotes can be either single-celled or multicellular.

Cell types	Prokaryotes	Eukaryotes
Typical organisms	bacteria, archaea	protists, fungi, plants, animals
Typical size	~ 1–5 $\mu\text{m}$	~ 10–100 $\mu\text{m}$
Type of nucleus	nucleoid region; no true nucleus	true nucleus with double membrane
DNA	circular (usually)	linear molecules (chromosomes) with histone proteins
RNA/protein synthesis	coupled in the cytoplasm	RNA synthesis in the nucleus protein synthesis in the cytoplasm
Ribosomes	50S and 30S	60S and 40S
Cytoplasmic structure	very few structures	highly structured by endomembranes and a cytoskeleton
Mitochondria	none	one to several thousand
Chloroplasts	none	in algae and plants
Organization	usually single cells	single cells, colonies, higher multicellular organisms with specialized cells
Cell division	binary fission	mitosis and meiosis
Chromosomes	single chromosome	more than one chromosome
Membranes	cell membrane	Cell membrane and membrane-bound organelles

### Animal and Plant cells

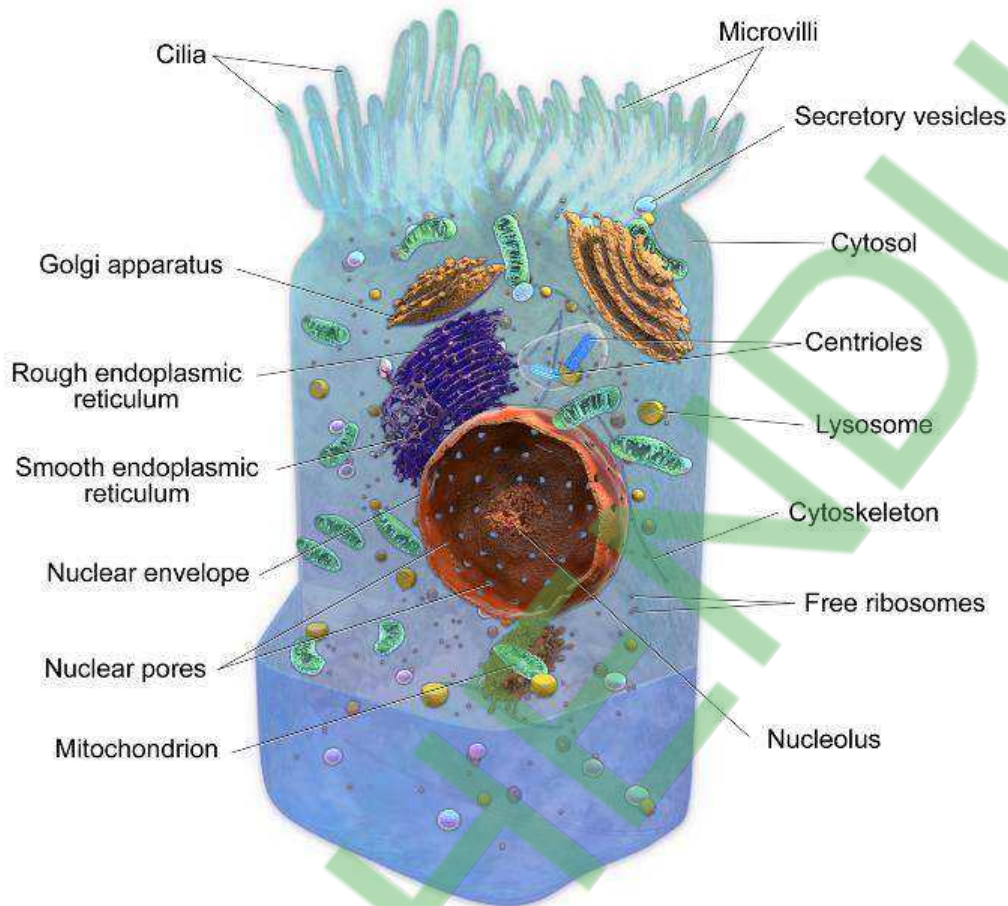
#### Animal cell

- All animals are multicellular. Human body contains trillions of cells.
- All animal cells are eukaryotic, they are surrounded by cell membrane and do not have a cell wall.
- The components of animal cells are centrioles, cilia and flagella, endoplasmic reticulum, Golgi apparatus, lysosomes, microfilaments, microtubules, mitochondria, nucleus, peroxisomes, plasma membrane and ribosomes.
- There are many different cell types, approximately 210 distinct cell types in adult human body.

#### Plant cell

- Plant cells are eukaryotic cells, they are membrane bound organelles. They are surrounded by a rigid cell wall.
- Plant cells are similar to animal cells in being eukaryotic and they have similar cell organelles.
- Generally, plant cells are larger than animal cells and are mostly similar in size and are rectangular or cube shaped.
- Plant cell contains a few distinctive features like a cell wall, large vacuole and plastids.

## Structure and Functions of a cell



### Cell membrane

It is the outer lining of the cell which encloses all other cell organelles. The cell membrane also known as the plasma membrane is semipermeable. It allows only specific molecules to pass through and blocking others.

### Cell wall

The cell wall is a rigid layer that surrounds the plant cells. Plant cell walls are primarily made up of cellulose. It is located outside the cell membrane whose main function is to provide rigidity, strength, protection against mechanical stress and infection.

### Cytoplasm

It is the fluid substance that fills the cell. All the cell organelles are suspended in the cytoplasm. The cytoplasm maintains the osmotic concentration of the cells and prevents them from bursting or shrinking.

### Nucleus

It is a membrane bound organelle, spherical in shape. Most of the activities of the cell is directed by the nucleus. All the cells in an animal has one complete set of genes in its nucleus. The genetic material DNA help in protein formation.

### Nucleolus

It is darkly stained are in the nucleus, it aids in protein formation and RNA synthesis.

## DNA and RNA

	DNA	RNA
Structural Name	Deoxyribonucleic Acid	Ribonucleic Acid
Function	Medium of long-term storage and transmission of genetic information.	Transfer the genetic code needed for the creation of proteins from the nucleus to the ribosome. This process prevents the DNA from having to leave the nucleus, so it stays safe. Without RNA, proteins could never be made.
Structure	Typically a double- stranded molecule with a long chain of nucleotides.	A single-stranded molecule in most of its biological roles and has a shorter chain of nucleotides.
Bases/ Sugars	Long polymer with a deoxyribose and phosphate backbone and four different bases: adenine, guanine, cytosine and thymine.	Shorter polymer with a ribose and phosphate backbone and four different bases: adenine, guanine, cytosine, and uracil.
Base Pairing	A-T (Adenine-Thymine), G-C (Guanine-Cytosine)	A-U (Adenine-Uracil), G-C (Guanine-Cytosine)
Stability	Deoxyribose sugar in DNA is less reactive because of C-H bonds. Stable in alkaline conditions. DNA has smaller grooves where the damaging enzyme can attach which makes it harder for the enzyme to attack DNA.	Ribose sugar is more reactive because of C-OH (hydroxyl) bonds. Not stable in alkaline conditions. RNA on the other hand has larger grooves which makes it easier to be attacked by enzymes.
Unique Traits	The helix geometry of DNA is of B-Form. DNA is completely protected by the body i.e. the body destroys enzymes that cleave DNA. DNA can be damaged by exposure to Ultra-violet rays.	The helix geometry of RNA is of A-Form. RNA strands are continually made, broken down and reused. RNA is more resistant to damage by Ultra-violet rays.

### Nuclear membrane

It is the porous double membrane layer surrounding the nucleus. It allows passage of substances and is a distinctive characteristic of the eukaryotic cell.

### Nucleoplasm

It is the semi-fluid substance inside the nucleus, contains the genetic material and the nucleolus.

### Mitochondria

Mitochondria is one of the largest organ of the cell and is known as the 'power house of the cell'. It is a spherical or rod shaped organelles and is enveloped by a double membrane. The mitochondria aids in conversion of glucose to high energy molecules (ATP) for the cell.

### Ribosomes

Ribosomes are found on the endoplasmic reticulum. Together they help in manufacturing proteins for the cell following instructions of the nucleus.

### Lysosomes

Lysosomes are membrane bound organelles, they contain digestive enzymes. They break down the waste products and detoxify the cell.

### Centrosome

It is a small body located near the nucleus. Centrioles are made in the centrosomes. During cell division the centromere organizes the assembly of the micro-tubules.

### Endoplasmic reticulum

It is a large network of interconnecting membrane tunnels. It is composed of both

rough endoplasmic reticulum and smooth endoplasmic reticulum. The rough endoplasmic reticulum is covered with ribosomes hence appears rough. They follow the instructions from the nucleus and make proteins the cell needs. The smooth endoplasmic reticulum is continuous with the outer nuclear membrane. It transports material through the cell and produces and digests lipids and membrane proteins.

### **Golgi apparatus**

They are flattened stacks of membrane bound sacs. They function as the packaging unit, the proteins formed by the endoplasmic reticulum are packed into small membrane sacs called vesicles.

### **Vacuoles**

They are organelles for storage. Small membrane bound vacuoles filled with fluids and water are present in animals. In plant cells the vacuoles perform functions of secretion, excretion and storage.

### **Chloroplasts**

It is an elongated or disc-shaped organelle containing chlorophyll. It is the site for photosynthesis in a plant cell. The green pigment chlorophyll absorbs energy from sunlight.

### **Cytoskeleton**

It is a network of fibers made up of micro-tubule and micro-filament. They maintain the shape and gives support to the cell.

### **Plasmodesmata**

They are microscopic channels which traverse the cell walls of plant cells and enables transport and communication between them.

### **Plastids**

Plastids are storage organelles. They store products like starch for synthesis of fatty acids and terpenes.

### **History of research in Cell**

- **1632–1723:** Antonie van Leeuwenhoek teaches himself to make lenses, constructs basic optical microscopes and draws protozoa, such as Vorticella from rain water, and bacteria from his own mouth.
- **1665:** Robert Hooke discovers cells in cork, then in living plant tissue using an early compound microscope. He coins the term cell (from Latin cella, meaning "small room") in his book Micrographia (1665).
- **1839:** Theodor Schwann and Matthias Jakob Schleiden elucidate the principle that plants and animals are made of cells, concluding that cells are a common unit of structure and development, and thus founding the cell theory.
- **1855:** Rudolf Virchow states that new cells come from pre-existing cells by cell division (omnis cellula ex cellula).
- **1859:** The belief that life forms can occur spontaneously (generatio spontanea) is contradicted by Louis Pasteur (1822–1895) (although Francesco Redi had performed an experiment in 1668 that suggested the same conclusion).
- **1931:** Ernst Ruska builds the first transmission electron microscope (TEM) at the University of Berlin. By 1935, he has built an EM with twice the resolution of a light microscope, revealing previously unresolvable organelles.
- **1953:** Watson and Crick made their first announcement on the double helix structure of DNA on February 28.
- **1981:** Lynn Margulis published Symbiosis in Cell Evolution detailing the endosymbiotic theory.

## BIOMOLECULE

*It is an organic compound normally present as an essential component of living organism.*

### Characteristics of Biomolecules

- Most of them are organic compounds.
- They have specific shapes and dimensions.
- Functional group determines their chemical properties.
- Many of them are asymmetric.
- Macromolecules are large molecules and are constructed from small building block molecules.
- Building block molecules have simple structure.
- Biomolecules first arose by chemical evolution.

### Types of biomolecules

A diverse range of biomolecules exist, including:

Small molecules (*Lipids, fatty acids, glycolipids, sterols, glycerolipids, Vitamins, Hormones, neurotransmitters, Metabolites*)  
Monomers, oligomers and polymers.

### Carbohydrates

- Carbohydrates (polysaccharides) are long chains of sugars.
- A carbohydrate is a biological molecule consisting of carbon (C), hydrogen (H) and oxygen (O) atoms, usually with a hydrogen–oxygen atom ratio of 2:1 (as in water); in other words, with the empirical formula  $C_m(H_2O)_n$  (where **m** could be different from **n**).
- The primary function of carbohydrates is for short-term energy storage (sugars are for Energy).
- A secondary function is intermediate-term energy storage (as in starch for plants and glycogen for animals).

Carbohydrates are 3 types:

**Monosaccharides** are the simplest form of carbohydrates with only one simple sugar. They essentially contain an aldehyde or ketone group in their structure. *e.g.* Glucose - Fructose - Galactose

**Disaccharides** are formed when two monosaccharides, or two single simple sugars, form a bond with removal of water. They can be hydrolyzed to yield their saccharin building blocks by boiling with dilute acid or reacting them with appropriate enzymes. *e.g.* Lactose-Sucrose-Maltose

**Polysaccharides** are polymerized monosaccharides, or complex carbohydrates. They have multiple simple sugars. *e.g.* Starch-Glycogen-Cellulose

### Proteins

- It contains the elements Carbon, Hydrogen, Oxygen, Nitrogen and sometimes Phosphorus or Sulfur.
- Proteins are **heteropolymers** of strings of **amino acids**. Amino acids are joined together by the peptide bond which is formed in between the carboxyl group and amino group of successive amino acids.
- Proteins are formed from 20 different amino acids, depending on the number of amino acids and the sequence of amino acids.
- **Animal Protein** contains the most biological value because it contains all essential amino acids (Meat, Milk, Fish, Eggs, etc.)
- **Plant Protein** contains a lower biological value to humans because it contains fewer essential amino acids (Cereals, Peas, Beans, etc.)



## Lipids (fats)

Lipids are composed of long hydrocarbon chains. Lipid molecules hold a large amount of energy and are energy storage molecules. Lipids are generally esters of fatty acids and are building blocks of biological membranes. Most of the lipids have a polar head and non-polar tail. Fatty acids can be unsaturated and saturated fatty acids. *e.g.* oils, fats, phospholipids, glycolipids, etc.

*Lipids present in biological membranes are of three classes based on the type of hydrophilic head present:*

- Glycolipids are lipids whose head contains oligosaccharides with 1-15 saccharide residues.
- Phospholipids contain a positively charged head which are linked to the negatively charged phosphate groups.
- Sterols, whose head contain a steroid ring. Example steroid.

## Roughage or Dietary Fiber or Bulk

- It includes the parts of plant foods your body can't digest or absorb.
- It passes relatively intact through your stomach, small intestine and colon and out of your body.
- Fiber is commonly classified as soluble, which dissolves in water, or insoluble, which doesn't dissolve.
- **Soluble fiber** dissolves in water to form a gel-like material. It can help lower blood cholesterol and glucose levels. It is found

in oats, peas, beans, apples, citrus fruits, carrots, barley and psyllium.

- **Insoluble fiber** promotes the movement of material through your digestive system and increases stool bulk, so it can be of benefit to those who struggle with constipation or irregular stools. Whole-wheat flour, wheat bran, nuts, beans and vegetables, such as cauliflower, green beans and potatoes, are good sources of insoluble fiber.

## Vitamin

- A vitamin is defined as an organic compound and a vital nutrient that an organism requires in limited amounts.
- A compound is called a vitamin when it cannot be synthesized in sufficient quantities by an organism, and must be obtained from the diet.
- Thus, each "vitamin" refers to a number of vitamer compounds that all show the biological activity associated with a particular vitamin.
- There are two types of vitamins: fat-soluble and water-soluble.
- **Fat-soluble** (Vitamins **A, D, E, and K**) vitamins are stored in your fat cells, consequently requiring fat in order to be absorbed.
- **Water-soluble vitamins** (Vitamin **B & C**) are not stored in your body; therefore, they need to be replenished daily.

### Vitamin Sources and Deficiency & Sufficiency Diseases Chart

Vitamin	Chemical Name	Deficiency disease	Sufficiency disease	Food sources
Vitamin A	Retinol, retinal, and carotenoids	Nightblindness, Hyperkeratosis, and Keratomalacia	Hypervitaminosis A	Orange, ripe yellow fruits, leafy vegetables, carrots, pumpkin, squash, spinach, liver, soy milk, milk
Vitamin B <sub>1</sub>	Thiamine	Beriberi, Wernicke-Korsakoff syndrome	Drowsiness or muscle relaxation with large doses	Pork, oatmeal, brown rice, vegetables, potatoes, liver, eggs
Vitamin B <sub>2</sub>	Riboflavin	Ariboflavinosis		Dairy products, bananas, popcorn, green beans, asparagus
Vitamin B <sub>3</sub>	Niacin, niacinamide	Pellagra	Liver damage and other problems	Meat, fish, eggs, many vegetables, mushrooms, tree nuts
Vitamin B <sub>5</sub>	Pantothenic acid	Paresthesia	Diarrhea; possibly nausea and heartburn.	Meat, broccoli, avocados
Vitamin B <sub>6</sub>	Pyridoxine, pyridoxamine, pyridoxal	Anemia peripheral neuropathy	Impairment of proprioception, nerve damage	Meat, vegetables, tree nuts, bananas
Vitamin B <sub>7</sub>	Biotin	Dermatitis, enteritis		Raw egg yolk, liver, peanuts, certain vegetables
Vitamin B <sub>9</sub>	Folic acid, folinic acid	Megaloblastic anemia and Deficiency during pregnancy is associated with birth defects, such as neural tube defects	May mask symptoms of vitamin B <sub>12</sub> deficiency; Other effects.	Leafy vegetables, pasta, bread, cereal, liver
Vitamin B <sub>12</sub>	Cyanocobalamin, methylcobalamin	Megaloblastic anemia	Acne-like rash	Meat and other animal products
Vitamin C	Ascorbic acid	Scurvy	Vitamin C megadosage	Many fruits and vegetables, liver
Vitamin D	Cholecalciferol, Ergocalciferol	Rickets and Osteomalacia	Hypervitaminosis D	Fish, eggs, liver, mushrooms
Vitamin E	Tocopherols, tocotrienols	Deficiency is very rare; mild hemolytic anemia in newborn infants.	Increased congestive heart failure seen in one large randomized study.	Many fruits and vegetables, nuts and seeds
Vitamin K	phylloquinone, menaquinones	Bleeding diathesis	Increases coagulation in patients taking warfarin.	Leafy green vegetables such as spinach, egg yolks, liver

### Mineral Nutrients or Dietary Mineral

These are the naturally occurring inorganic nutrients in the food and soil essential for the proper functioning of the plant and animal body.

Minerals are among the essential elements required by the body including carbohydrates, proteins, fats, vitamins and water.

These are two types, such as **Macronutrients** and **Micronutrients**.

### Macronutrients

Elements which are present in large amounts in plant tissues are called macronutrients. They are in excess of 10 mmole per kg of dry matter. *e.g.* Carbon, hydrogen, oxygen, nitrogen, phosphorous, sulphur, potassium, calcium and magnesium.

### Micronutrients or Trace Elements

Elements which are present in small amounts, i.e. less than 10 mmole per kg of dry matter are called micronutrients. *e.g.* Iron, manganese, copper, molybdenum, zinc, copper, boron, chlorine and nickel.

### Minerals and their Function in the Human body

Mineral	Major Food Source	Functions	Deficiency Diseases
<b>Macronutrients</b>			
Calcium Ca	milk, dairy products, green leafy vegetables, fish	Muscle contraction, nerve action, blood clotting and the formation of bone.	Tetany & rickets
Chlorine Cl	Salted food and seafood.	Anion/cation balance and gastric acid formation.	Loss of appetite muscle cramps.
Magnesium Mg	meat, whole grains, nuts, legumes, apricots, bananas, chocolate and green vegetable	Formation of bone, formation of coenzymes in cell respiration.	Irregularity of metabolism, Fatigue, poor memory, muscle twitching and rapid heartbeat.
Phosphorus P	Cheese, eggs, pea nuts and most foods.	Bone and tooth formation, energy transfer from foods, DNA, RNA and ATP formation.	Tetany & rickets
Potassium K	meat, chocolate, oranges, bananas, peanuts, beans, potatoes, spinach	Muscle contraction, nerve action, active transport.	Nervous disorder, poor muscles leading to paralysis.
Selenium Se	nuts, fish, tuna, meat, chicken, mustard, mushrooms, barley, cheese, garlic, tofu, seeds.	Helps to prevent damage to cells and aids in the functioning of the thyroid gland. It is an antioxidant for the body.	Poor heart function, mental retardation
Sodium Na	Any salted food, meat, eggs and milk.	Muscle contraction, nerve action and active transport.	Fatigue, Nervous, depression, muscular cramps, PH dis-balance
<b>Micronutrients (Trace Elements)</b>			
Iron Fe	Liver, kidney, red meat, cocoa powder and water-cress, green leaf	Helps the blood and muscles carry oxygen to the body.	Anemia and low immunity.
Fluorine F	salt water fish (salmon), tea, sea food, meat, liver, beans, fluoridated water	Helps to make bones and teeth stronger. Improves resistance to cavities.	Weak teeth and bones.

Zinc Zn	Meat, liver and beans.	Enzyme activation and carbon dioxide transport.	Anemia, weak immunity and fertility.
Copper Cu	beans, raisins, chocolate, nuts, meat, shellfish	Enzyme, melanin and hemoglobin formation.	Anemia, weak blood vessels and connective tissues.
Iodine I	Seafood, iodized salt and fish.	Thyroxin production	Goitre - enlargement of the thyroid gland.
Manganese Mn	Tea, nuts, spices and cereals.	Bone development and enzyme activation.	Irregular growth of bones and connective tissues.
Molybdenum Mo	legumes, grains; leafy green vegetables, tomatoes, onions, carrots.	Helps cells and nerves to function.	Rapid heart and respiratory rates, headache, night blindness
Chromium Cr	beans, cheese, whole grain food , peas, meat	Uptake of glucose.	Irregular metabolism.
Cobalt Co	Meat and yeast.	Synthesis of Vitamin B12 formation of red blood cells	Anemia

## WATER

- Water is defined as an essential nutrient because it is required in amounts that exceed the body's ability to produce it.
- All biochemical reactions occur in water. It fills the spaces in and between cells and helps form structures of large molecules such as protein and glycogen.
- About 70% of the human body consists of water.
- As a general rule, adult males need 3.7 liters of water per day, while adult women need 2.7 liters per day.
- However, pregnant women should aim for 3 liters per day, and lactating women need 3.8 liters per day.
- The daily adequate intake of water is lower before the age of 18.

## FOOD ADULTERATION

- It is an addition of another substance to a food item in order to increase the quantity of the food item in raw form or prepared form, which may result in the loss of actual quality of food item.

- The substance, which lowers or degrades the quality of food material, is called an adulterant.
- It can lead to slow poisoning and various kinds of diseases, which can even result in death.

### Some Common Adulterants in Food

Food Items	Adulterant
Milk, curd and cheese	Water and urea
Sweets	Saccharin, harmful colour
Ghee	Vanaspati and animal fats
Cereals	Stones, sand and grit
Dhania Powder	Powdered horse dung
Haldi Powder	Lead chromate
Pulses	Metanil yellow
Edible oils	Argemone oil
Black pepper	Papaya seed
Sugar	Chalk powder, Washing soda
Honey	Sugar solution
Besan	Khesari flour
Vinegar	Mineral acid

## CLASSIFICATION OF ORGANISM

- Classifying organisms is called Taxonomy (**Taxis** means arrangement and **nomos** means method)
- The modern taxonomic system was developed by the Swedish botanist Carolus (Carl) Linnaeus (1707-1788). He used simple physical characteristics of organisms to identify and differentiate between different species, and is based around genetics.
- He developed a hierarchy of groups for taxonomy.
- These groups are known as **taxa** (singular: **taxon**).

It is in hierarchical order:

1. Kingdom
2. Phylum
3. Class
4. Order
5. Family
6. Genus
7. Species

### FIVE KINGDOMS

All organisms are divided into five Kingdoms:

1. Animal Kingdom (Animalia)
2. Plant Kingdom (Plantae)
3. Fungi Kingdom (Fungi)
4. Protist Kingdom (Protista)
5. Moneran Kingdom (Monera)

#### Animal Kingdom (Animalia or Metazoa)

- The word 'animal' is derived from the Latin word animalis which means 'having breath'.
- Animals are eukaryotic, multicellular and heterotrophic organisms.
- They have multiple cells with mitochondria and they depend on other organisms for food.

- Habitat - Most of the animals inhabit seas, fewer are seen in fresh water and even fewer on land.
- There are around 9 to 10 million animal species that inhabit the earth. Only 800,000 species are identified.

*Some important groups are listed below.*

**Phylum Porifera** - They are primitive organisms, most of them are salt-water sponges. They do not have organs or nerve cells or muscle cells. Approximately, 8,000 species exist today. *e.g.* Sycon, Euspongia, Spongilla.

**Phylum Coelentrata (Cnidaria)** - This group is composed of jelly-fish and other lower aquatic animals. Approximately, 15,000 species exist today. *e.g.* Aurelia, Adamsia.

**Phylum Platyhelminthes** - This group consists of flat worms. They inhabit both marine and fresh water habitats and they are mostly endoparasites found in animals. *e.g.* Taenia, Fascicola.

**Phylum Aschelmeintes** - It is a group of round worms, most of them are parasites. This phylum consists of about 80,000 parasitic worms.

**Phylum Annelida** - They are present in aquatic, terrestrial and are free-living or parasitic in nature. This phylum comprises of segmented worms. *e.g.* Earthworm, Leech etc.

**Phylum Arthropoda** - This is the largest phylum which consists of insects. There are over 1 million species of insects existing today. *e.g.* Locusts, Butterfly, Scorpion, Prawn.

**Phylum Mollusca** - It is the second largest phylum. They are terrestrial and aquatic. *e.g.* Pila, Octopus.

**Phylum Echinodermata** - This consists of sea stars and sea urchins. There are about 6,000 species. *e.g.* Asteria, Ophiura.

**Phylum Chordata** - Animals of this phylum have a characteristic feature of presence of notochord, a dorsal hollow nerve cord and paired pharyngeal gill slits. Within this phylum advanced group called vertebrates which include fish, amphibians, reptiles, birds and mammals.

### **Plant Kingdom (Plantae)**

The Kingdom Plantae can be defined as multicellular, autotrophic eukaryotes, which conduct photosynthesis. All member of this family comprises of true nucleus and advanced membrane bound organelles.

*Some important groups are listed below.*

**Phylum Bryophyta** - These are non-vascular land plants, which do not contain any conducting tissues. *e.g.* Mosses, Liverworts, Hornworts, etc.

**Phylum Pteridophytae** – These are seedless vascular plants, which contain vascular tissues but do not produce seeds. *e.g.* horsetails, ferns and club mosses.

**Phylum Angiosperms** – These are flowering plants, which develops the seeds within a protective structure. *e.g.* trees, shrubs, vines and flowers.

**Phylum Gymnosperms** – These are non-flowering plants with undeveloped seeds, which are present in an enclosed structure. *e.g.* palms, carpet lawns, etc.

### **Fungi Kingdom (Fungi)**

- Fungi are eukaryotic organisms.
- They are non-vascular organisms.
- They reproduce by means of spores.
- Depending on the species and conditions both sexual and asexual spores may be produced.

- They are typically non-motile.
- Fungi exhibit the phenomenon of alteration of generation.
- The vegetative body of the fungi may be unicellular or composed of microscopic threads called hyphae.
- The structure of cell wall is similar to plants but chemically the fungi cell wall are composed of chitin.

*Some important groups are listed below.*

**Phylum Ascomycota: Sac Fungi** - The sac-fungi produce spores in small cup-shaped sacs called asci, hence the name ascomycota. *e.g.* Aspergillus, Claviceps, Neurospora.

**Phylum Basidiomycota: Club Fungi** - includes the mushrooms, puff-balls, smuts, rusts and toadstools. The spores are borne on a club-shaped spore case called basidium. *e.g.* Agaricus(mushroom), Ustilago(smut), and Puccinia(rust fungus).

**Phylum Zygomycota: Zygote forming Fungi** - These fungi are usually found on cheese, bread, and other decaying food. They are zygote forming fungi, hence the name zygomycota. The spores are produced in round-shaped case called sporangium. *e.g.* Mucor, Rhizopus (the bread mould) and Albugo.

**Phylum Deuteromycota: Imperfect Fungi** - These organisms are known as imperfect fungi because they lack sexual reproduction. They reproduce by asexual spores known as conidia. Most of the fungi causes diseases to humans like ringworm, athlete's foot. *e.g.* Alternaria, Colletotrichum and Trichoderma.

### **Protist Kingdom (Protista)**

- They are single-celled, eukaryotes and mainly aquatic.
- It includes diatoms, golden algae, euglena and protozoans like amoeba, paramecium Plasmodium, etc.

- In this kingdom, cell walls form two thin overlapping shells.
- Walls are embedded with silica. Cell walls deposit forms a diatomaceous, which is used for polishing, filtration of oils and syrups.
- Mostly marine & photosynthetic.

*Some important groups are listed below.*

**Protozoans** – animal like single-celled organisms. **e.g.** amoeba, foraminifera, paramecium, plasmodium

**Algae** – plant like single or multi-celled organisms. **e.g.** green algae, red algae, brown algae, golden algae, fire algae

#### **Moneran Kingdom (Monera)**

- The kingdom consists of very small and one-celled organisms.
- They are prokaryotes, which includes species such as bacteria, archae bacteria, cyanobacteria and Mycoplasma.
- They are present almost everywhere around us.

- They are unicellular organisms with no specific mode of nutrition.
- They are both aerobic and anaerobic. The presence of cell wall, which are composed of peptidoglycan. They have naked DNA with the absence of membrane bound organelles. Reproduction is through by binary fission.

*Some important groups are listed below.*

**Archaeobacteria** – these are microbes that live in extreme and harsh conditions, they are known as extremophiles. These bacteria lack cell wall, their cell membrane is made up of different lipids, and their ribosomes are similar to that of eukaryotes. These are of three major groups of bacteria based on their habitat i.e., **thermophiles, halophiles** and **methanogens**.

**Eubacteria** – These are true bacteria. The characteristic feature is the presence of rigid cell wall and if present a motile flagellum that aids in locomotion.

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# ZOOLOGY

## Human Body

*The study of the human body involves anatomy and physiology.*

*The human body is the entire structure of a human being and comprises a head, neck, trunk (which includes the thorax and abdomen), arms and hands, legs and feet.*

### Composition of Human Body

- Oxygen = 65%
- Carbon = 18.5%
- Hydrogen = 9.5%
- Nitrogen = 3.2%
- Calcium = 1.5%
- Phosphorus = 1.0%
- Potassium = 0.4%
- Sulfur = 0.3%
- Sodium = 0.2%
- Chlorine = 0.2%
- Magnesium = 0.1%
- Trace elements < 0.1%

### Facts of Human Body

Total number of bones	206
Total number of muscles	640
Longest organ of human body	Skin
Longest bone	Femur - thigh bone
Smallest bone	Stapes - stirrup bone
Largest Endocrine gland	Thyroid
Largest muscle	Gluteus maximus
Average Weight of an adult brain	1.5 kg
Blood volume in an adult human	4.7 to 5 litres
Universal Blood donor	O Rh (-ve)
Universal Blood recipient	AB Rh (+)
Dental formula of Adult	$2123/2123 = 32$
Dental formula of Child	$2120/2120 = 20$ milk teeth
Menopause age	40 to 50 years
Average height of an adult male	5'7" to 5'11"
Average height of an adult female	5'2" to 5'7"
Normal body temperature	37° Celsius or 98° Fahrenheit
Normal blood pressure (BP)	120/80 mmHg
Normal human heart rate	60 to 100 bpm
Normal pulse rate	72 per minute
Minimum distance of proper vision	25 cm



## SYSTEMS OF HUMAN BODY

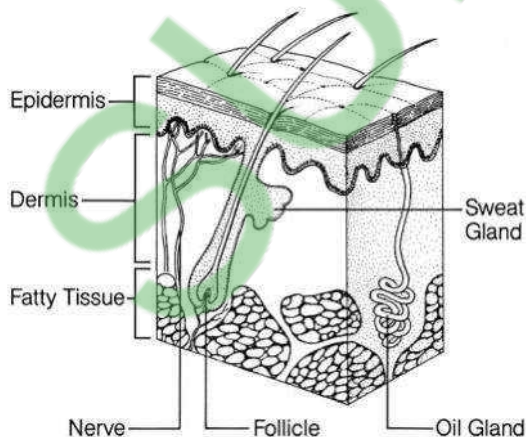
The human body consists of many interacting systems. Each system contributes to the maintenance of homeostasis, of itself, other systems, and the entire body. A system consists of two or more organs, which are functional collections of tissue.

### INTEGUMENTARY SYSTEM or Exocrine system

- The human body's largest organ is the integumentary system, which includes the skin, hair, nails, glands and nerve receptors.
- **Protection:** it protects against UV light, mechanical, thermal and chemical stresses, dehydration and invasion by micro-organisms.
- **Sensation:** skin has receptors that sense touch, pressure, pain and temperature.
- **Thermoregulation:** various features of the skin are involved in regulating temperature of the body. For example sweat glands, hair, and adipose tissue.
- **Metabolic functions:** subcutaneous adipose tissue is involved in production of vitamin D, and triglycerides.

### Skin

It is composed of a layer of epithelial tissue (**epidermis**) that is supported by a layer of connective tissue (**dermis**) and an underlying subcutaneous layer (**hypodermis** or **subcutis**).



### Epidermis

- It is the outermost layer of the skin.
- It contains **squamous cells** or **keratinocytes**, which synthesize a tough protein called **keratin**. **Keratin** is a major component of skin, hair and nails.
- It contains specialized cells called Langerhans cells that signal the immune system of an infection.
- The basal layers of this epithelium are folded to form dermal papillae.

The epidermis is composed of five sub-layers.

1. stratum corneum - top layer of dead, extremely flat cells. Cell nuclei are not visible.
2. stratum lucidum - thin, flattened layer of dead cells. Not visible in thin skin.
3. stratum granulosum - rectangular-shaped cells that become increasingly flattened as they move to the surface of the epidermis.
4. stratum spinosum - polyhedral-shaped cells that flatten as they get closer to the stratum granulosum.
5. stratum basale - innermost layer of elongated columnar (column-shaped) cells. Consists of basal cells that produce new skin cells.

### Dermis

- The layer beneath the epidermis is the dermis.
- It is the thickest layer of skin composing almost 90 percent of its thickness.
- It contains specialized cells that help regulate temperature, fight infection, store water and supply blood and nutrients to the skin.

- It also help in the detection of sensations and give strength and flexibility to the skin.

*Components of the dermis include:*

**Blood vessels** - transport oxygen and nutrients to the skin and remove waste products. These vessels also transport vitamin D from the skin to the body.

**Lymph vessels** - supply lymph (milky fluid containing white blood cells of the immune system) to skin tissue to fight microbes.

**Sweat glands** - regulate body temperature by transporting water to the skin's surface where it can evaporate to cool down the skin.

**Sebaceous (oil) glands** - secret oil that helps to waterproof the skin and protect against microbe build-up. They are attached to hair follicles.

**Hair follicles** - tube-shaped cavities that enclose the hair root and provide nourishment to the hair.

**Sensory receptors** - nerve endings that transmit sensations such as touch, pain, and heat intensity to the brain.

**Collagen** - tough structural protein that holds muscles and organs in place and gives strength and form to body tissues.

**Elastin** - rubbery protein that provides elasticity and makes the skin stretchable. It is also found in ligaments, organs, muscles and artery walls.

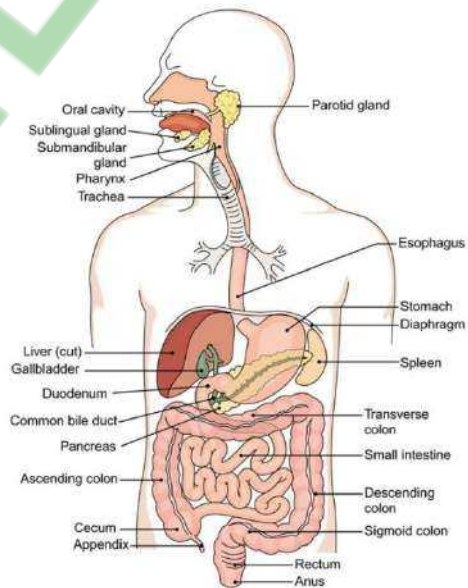
### **Hypodermis (Subcutis)**

- The innermost layer of the skin is the hypodermis.
- This layer is underneath the dermis, and merges with it.
- It mainly contains adipose tissue and sweat glands.

- The adipose tissue has metabolic functions: it is responsible for production of vitamin D, and triglycerides.

### **DIGESTIVE SYSTEM or Excretory system**

- It is a group of organs working together to convert food into energy and basic nutrients to feed the entire body.
- Food passes through a long tube inside the body known as the alimentary canal or the gastrointestinal tract (GI tract).
- The alimentary canal is made up of the oral cavity, pharynx, esophagus, stomach, small intestines, and large intestines.
- The entire system from mouth to anus is about 30 feet (9 meters) long.
- To providing energy and nutrients to the body, six major functions take place in the digestive system: ingestion, secretion, mixing and movement, digestion, absorption, excretion.



### **Digestive system components**

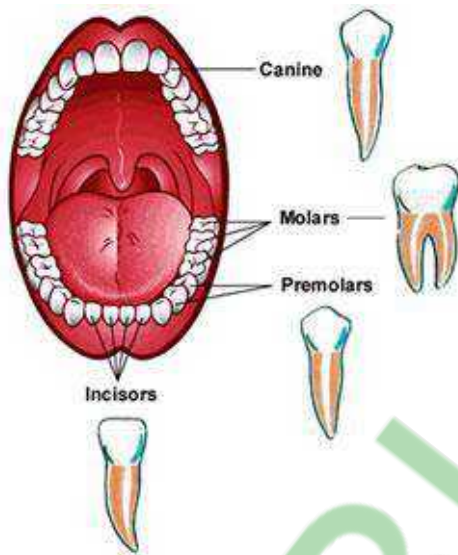
#### **Mouth**

- The mouth is the first part of the gastrointestinal tract and is equipped with several structures that begin the first processes of digestion. These include salivary glands, teeth and the tongue.

- Teeth chop food into small pieces, which are moistened by saliva before the tongue and other muscles push the food into the pharynx.

### Teeth

- Teeth are made of a bone-like material called **dentin**, which is covered by the hardest tissue in the body **enamel**.
- The number of teeth in an adult person is 32.
- It designed for cutting and grinding food into smaller pieces.



**Incisors** are the teeth in the very front. They're the sharpest teeth, built to cut food and shaped to shovel the food inward.

**Canine** teeth are in the corners of your mouth. Because they're meant for grasping and tearing food, they have very long roots.

**Premolars** are located just behind your Canine teeth. Premolars have a more flat chewing surface because they're meant for crushing food.

**Molars** are the last teeth towards the back of your mouth. Molars are much bigger than the Premolars and have bigger, flatter chewing surfaces because their job is to chew and grind the food into smaller pieces.

### Tongue

- It is a fleshy and muscular sensory organ, and the very first sensory information is received via the taste buds on its surface.
- It also helps to push food toward the posterior part of the mouth for swallowing.
- The outside of the tongue contains many rough papillae for gripping food as it is moved by the tongue's muscles.
- The taste buds on the surface of the tongue detect taste molecules in food and connect to nerves in the tongue to send taste information to the brain.

#### Taste Areas on the Human Tongue



### Salivary Glands

- It produces a watery secretion known as **saliva**.
- It helps to moisten food and begins the digestion of carbohydrates.
- The body also uses saliva to lubricate food as it passes through the mouth, pharynx, and esophagus.

### Pharynx (throat)

- It is a funnel shaped tube connected to the posterior end of the mouth.
- It helps in passing chewed food from the mouth to the esophagus.
- Air from the nasal cavity passes through the pharynx on its way to the larynx and eventually the lungs.

## Esophagus

- The esophagus is a long, thin, and muscular tube that connects the pharynx (throat) to the stomach.
- It functions as the conduit for food and liquids that have been swallowed into the pharynx to reach the stomach.
- It is about 9-10 inches (25 centimeters) long and less than an inch (2 centimeters) in diameter when relaxed.
- At the inferior end of the esophagus is a muscular ring called the lower esophageal sphincter or cardiac sphincter. It is used to close off the end of the esophagus and trap food in the stomach.

## Stomach

- It is the main food storage tank of the body, so that the body has time to digest large meals properly.
- It is a muscular sac that is located on the left side of the abdominal cavity, just inferior to the diaphragm.
- It also contains hydrochloric acid (HCL) and digestive enzymes that continue the digestion of food that began in the mouth.
- The inner layer of the stomach is full of wrinkles known as **rugae** (or gastric folds). **Rugae** both allow the stomach to stretch in order to accommodate large meals and help to grip and move food during digestion.

## Small Intestine

- It is a long, thin tube about 1 inch in diameter and about 10 feet long that is part of the lower gastrointestinal tract.
- It is located just inferior to the stomach and takes up most of the space in the abdominal cavity.
- It is coiled like a hose and the inside surface is full of many ridges and folds.
- It absorbs about 90% of the nutrients from the food.

- Duodenum, jejunum and ileum are the three major regions of small intestine.

## Liver

- It is a roughly triangular accessory organ of the digestive system located to the right of the stomach, just inferior to the diaphragm and superior to the small intestine.
- Weighing in at around 3 pounds (1.36 kg), the liver is the body's second largest organ.
- It helps in digestion, metabolism, immunity, and the storage of nutrients within the body.

## Gallbladder

It is a small, pear-shaped organ located just posterior to the liver. It is used to store and recycle excess bile from the small intestine so that it can be reused for the digestion of subsequent meals.

## Pancreas

- It is a glandular organ in the upper abdomen, but really it serves as two glands in one: a digestive exocrine gland and a hormone-producing endocrine gland.
- It is a narrow, 6-inch long gland that lies posterior and inferior to the stomach on the left side of the abdominal cavity.
- The head of the pancreas, which connects to the duodenum, is the widest and most medial region of the organ.
- The tail of the pancreas extends from the body as a narrow, tapered region on the left side of the abdominal cavity near the spleen.
- Glandular tissue that makes up the pancreas gives it a loose, lumpy structure.

## Large Intestine

- It is the final section of the gastrointestinal tract.

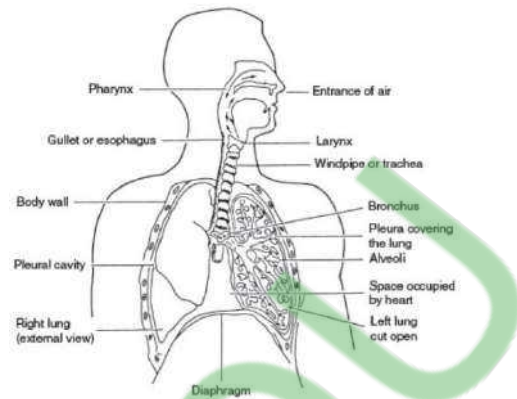
- It is a long, thick tube about 2 ½ inches in diameter and about 5 feet long.
- It is located just inferior to the stomach and wraps around the superior and lateral border of the small intestine.
- It absorbs water and vitamins while converting digested food into Solid waste products and exit the body through the anal canal.

### Digestive Process

1. Ingestion of food
2. Secretion of fluids and digestive enzymes
3. Mixing and movement of food and wastes through the body
4. Digestion of food into smaller pieces
5. Absorption of nutrients
6. Excretion of wastes

### RESPIRATORY SYSTEM

- It allows us to take in vital oxygen and expel carbon dioxide in a process we call breathing.
- It consists mainly of the **trachea**, the **diaphragm** and the **lungs**.
- The nose and nasal cavity form the main external opening for the respiratory system and are the first section of the body's airway—the respiratory tract through which air moves.
- Red blood cells collect the oxygen from the lungs and carry it to the parts of the body where it is needed. The red blood cells collect the carbon dioxide and transport it back to the lungs, where it leaves the body when we exhale.
- A decrease in oxygen is known as **hypoxia** and a complete lack of oxygen is known as **anoxia**.



### Trachea or windpipe

- It is a 5-inch long tube made of C-shaped hyaline cartilage rings lined with pseudo-stratified ciliated columnar epithelium.
- It connects the larynx to the bronchi and allows air to pass through the neck and into the thorax.
- The rings of cartilage making up the trachea allow it to remain open to air at all times.
- It is used to provide a clear airway for air to enter and exit the lungs.

### Diaphragm

- It is the primary muscle used in the process of inspiration, or inhalation.
- It is a dome-shaped sheet of muscle that is inserted into the lower ribs. Lying at the base of the thorax (chest), it separates the abdominal cavity from the thoracic cavity.
- The nerve that controls the diaphragm is the **phrenic** nerve, which originates at vertebral level C3-C5.

### Lungs

- These are a pair of large, spongy organs found in the thorax lateral to the heart and superior to the diaphragm.
- Each lung is surrounded by a pleural membrane that provides the lung with space to expand as well as a negative pressure space relative to the body's exterior.

- The negative pressure allows the lungs to passively fill with air as they relax.
- The left and right lungs are slightly different in size and shape due to the heart pointing to the left side of the body.
- The left lung is therefore slightly smaller than the right lung and is made up of 2 lobes while the right lung has 3 lobes.
- The interior of the lungs is made up of spongy tissues containing many capillaries and around 30 million tiny sacs known as **alveoli**.
- The alveoli are cup-shaped structures found at the end of the terminal bronchioles and surrounded by **capillaries**.

### **CIRCULATORY SYSTEM** or **Cardio-vascular System**

- It is a network of organs and vessels that is responsible for the flow of blood, nutrients, hormones, oxygen and other gases to and from cells.
- It contains the heart, blood and blood vessels.
- It includes the pulmonary circulation, a "loop" through the lungs where blood is oxygenated; and the systemic circulation, a "loop" through the rest of the body to provide oxygenated blood.
- The systemic circulation can also be seen to function in two parts—a macrocirculation and a microcirculation.
- An average adult contains five to six quarts (roughly 4.7 to 5.7 liters) of blood.

#### **Blood**

- It is a constantly circulating fluid providing the body with nutrition, oxygen, and waste removal.
- It is mostly liquid, with numerous cells and proteins suspended in it, making blood "thicker" than pure water.
- It transports nutrients, proteins needed for blood clotting, and waste products.

- It is conducted through blood vessels (arteries and veins).
- It is made up of red blood cells, white blood cells, platelets, and liquid plasma.

#### **Blood types of parents and their children**

Parents' Blood Types	Possible Children
A & A	A, O
A & B	A, B, AB, O
A & AB	A, B, AB
A & O	A, O
B & B	B, O
B & AB	A, B, AB
B & O	B, O
AB & AB	A, B, AB
AB & O	A, B
O & O	O

#### **Red Blood Cells (RBCs) or Erythrocytes**

- These are used to carry oxygen to all parts of the body and to bring carbon dioxide to the lungs.
- RBCs have a lifetime of about 120 days.
- The haemoglobin in the red blood cell is the carrier for oxygen and carbon dioxide.
- One RBC contains about 280 haemoglobin molecule.
- In the process of being formed they go through a unipotent stem cell stage. They have the job alongside the white blood cells of protecting the healthy cells.

#### **White Blood Cells (WBCs) or Leukocytes**

- These are responsible for fighting infection by identifying, engulfing, and destroying foreign organisms.
- They are active in the immune response by producing antibodies to foreign organisms.
- Granulocytes or neutrophils, eosinophils, basophils, monocytes, and lymphocytes are the 5 different types of WBCs.
- Neutrophils are the most abundant of all the WBCs.

### **Platelets or Thrombocytes or Yellow Blood Cells**

- These are small cell fragments responsible for the clotting of blood and the formation of scabs.
- They form in the red bone marrow from large megakaryocyte cells that periodically rupture and release thousands of pieces of membrane that become the platelets.
- They do not contain a nucleus and only survive in the body for up to a week before macrophages capture and digest them.

### **Plasma**

- It is the non-cellular or liquid portion of the blood that makes up about 55% of the blood's volume.
- Approximately, 90% of blood plasma is water and remaining 10% are proteins, inclusions and waste products etc.
- The plasma functions as a transportation medium for these substances as they move throughout the body.

### **Blood Vessels**

These are the tubular structure carrying blood through the tissues and organs

There are three major types of blood vessels: **arteries, capillaries and veins.**

#### **Arteries**

- These are the blood vessels that carry the oxygenated blood away from the heart.
- It contains about 20% of blood at any one time.
- Their walls are thick and elastic.
- They have small lumen (tubular cavities inside).
- They also help to push the rapid flow of blood when the ventricles are relaxed and the heart is refilling.
- Arterioles are known as the small arteries.
- It has a pulse and blood travels in spurts.

#### **Veins**

- These are the blood vessels that carry deoxygenated blood back to the heart.
- It contains about 75% of blood.
- The walls of the veins are thinner than the arteries.
- Venules are known as the smallest of the veins.
- It has no pulse and blood travels smoothly.

#### **Capillary**

- These are the smallest blood vessels in the body.
- It contains about 5% of blood at any time, and no pulse can be felt in one.
- These blood vessels are act as a link between arteries and veins.
- It has a single layer of endothelial cells. Water and other small molecule substances can pass through this wall.

**Atrium** : Either of the two (left and right) upper chambers of the heart. Also called auricles

**Pulmonary** : Used to describe blood vessels that carry blood between the heart and the lungs

**Aorta** : The largest artery which directs blood to every organ but the lungs

**Lumen** : The inner open space of a tubular organ, in this case the blood vessels

**Vena Cava** : Either of two large veins which carry blood into the right side of the heart

**Cardiovascular** : Of or involving the heart and blood vessels

#### **Heart**

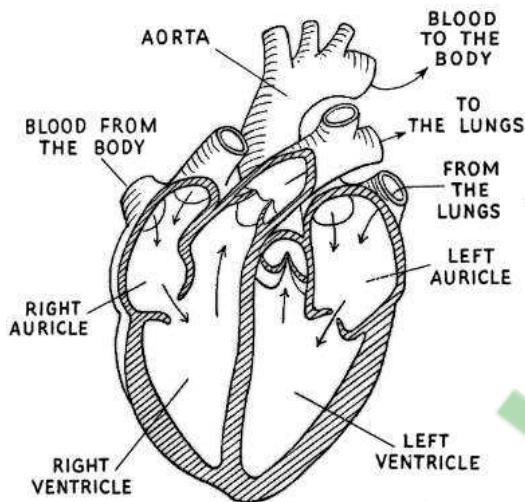
It is a muscular organ about the size of a closed fist that functions as the body's circulatory pump.

It takes in deoxygenated blood through the veins and delivers it to the lungs for oxygenation before pumping it into the various arteries.

It is located in the thoracic cavity medial to the lungs and posterior to the sternum.

The bottom tip of the heart, known as its **apex**, is turned to the left, so that about 2/3 of the heart is located on the body's left side with the other 1/3 on right.

The top of the heart, known as the heart's base, connects to the great blood vessels of the body: the **aorta**, **vena cava**, **pulmonary trunk**, and **pulmonary veins**.



### Circulatory Loops

The pulmonary circulation loop and the systemic circulation loop are 2 primary circulatory loops in the human body.

**Pulmonary circulation** transports deoxygenated blood from the right side of the heart to the lungs, where the blood picks up oxygen and returns to the left side of the heart. The pumping chambers of the heart that support the pulmonary circulation loop are the right atrium and right ventricle.

**Systemic circulation** carries highly oxygenated blood from the left side of the heart to all of the tissues of the body (with the exception of the heart and lungs). Systemic circulation removes wastes from body tissues and returns deoxygenated blood to the right side of the heart. The left atrium and left

ventricle of the heart are the pumping chambers for the systemic circulation loop.

### LYMPHATIC SYSTEM or Immune System

- It is a network of tissues and organs that help rid the body of toxins, waste and other unwanted materials.
- It is our body's defense system against infectious pathogenic viruses, bacteria, and fungi as well as parasitic animals and protists.
- The primary function of the lymphatic system is to transport lymph, a fluid containing infection-fighting white blood cells, throughout the body.
- The lymphatic system primarily consists of lymphatic vessels, which are similar to the circulatory system's veins and capillaries. The vessels are connected to lymph nodes, where the lymph is filtered. The tonsils, adenoids, spleen and thymus are all part of the lymphatic system.

### Red Bone Marrow

- It is a highly vascular tissue found in the spaces between trabeculae of spongy bone.
- It is mostly found in the ends of long bones and in the flat bones of the body.
- It is a hematopoietic tissue containing many stem cells that produce blood cells.

### Lymph Capillaries

As blood passes through the tissues of the body, it enters thin-walled capillaries to facilitate diffusion of nutrients, gases, and wastes. Blood plasma also diffuses through the thin capillary walls and penetrates into the spaces between the cells of the tissues.

### Lymph

- The interstitial fluid picked up by lymphatic capillaries is known as lymph.
- It is very closely resembles the plasma found in the veins: it is a mixture of about



90% water and 10% solutes such as proteins, cellular waste products, dissolved gases, and hormones.

- It may also contain bacterial cells that are picked up from diseased tissues and the white blood cells that fight these pathogens.

### Blood Pressure

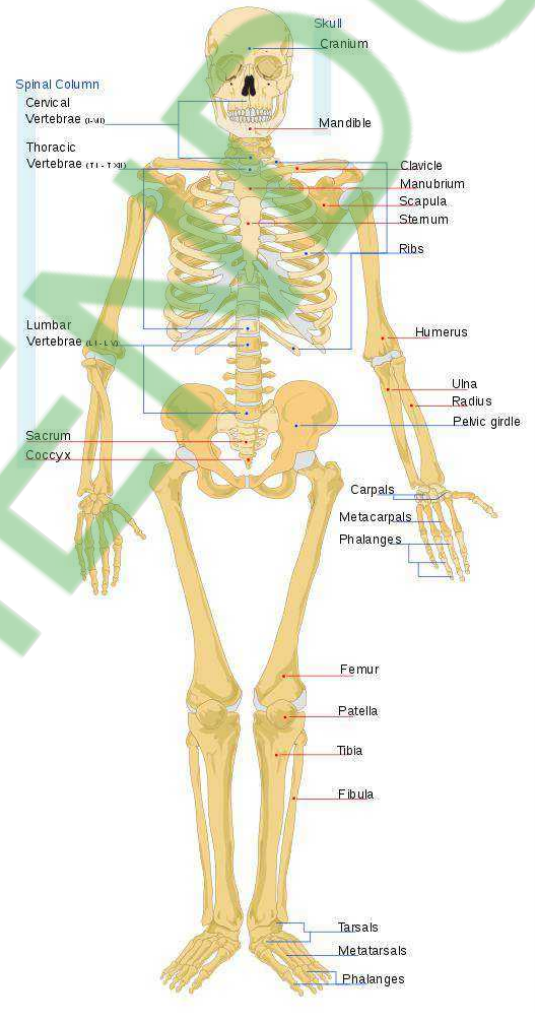
- It is the pressure exerted by circulating blood upon the walls of blood vessels.
- It is also known as arterial blood pressure.
- It is usually expressed in terms of the systolic (maximum) pressure over diastolic (minimum) pressure and is measured in millimeters of mercury (mm Hg).
- **Sphygmomanometer** is the measurement device for Blood pressure.
- Normal resting blood pressure in an adult is approximately 120/80 mm Hg.
- Blood pressure that is low due to a disease state is called **hypotension**, and pressure that is consistently high is **hypertension**.

### SKELTON SYSTEM

- The body is supported and its internal parts protected by a strong yet flexible framework of bones called the skeleton. These bones meet at joints, most of which allow movement between the bones they connect. As well as protection and movement, bones provide a store for the mineral calcium, which is vital to the working of nerves and muscles. They also contain bone marrow, which makes blood cells and stores fat.
- The adult human skeletal system consists of 206 bones, as well as a network of tendons, ligaments and cartilage that connects them. Babies have over 270, but by adulthood many of these have fused together.
- The skeletal system performs vital functions - support, movement, protection, blood cell production, calcium storage and

endocrine regulation - that enable us to survive.

- The human skeleton can be divided into the axial skeleton (80 bones = 28 in skull + 52 in torso) and the appendicular skeleton (126 bones = (32 x 2 in upper extremities including both arms + 31 x 2 in lower extremities including both legs).



### Skull

- It is composed of 22 bones that are fused together except for the mandible.
- The bones of the superior portion of the skull are known as the **cranium** and protect the brain from damage.
- The bones of the inferior and anterior portion of the skull are known as **facial** bones and support the eyes, nose, and mouth.

## Hyoid

- The hyoid is a small, U-shaped bone found just inferior to the mandible.
- It is the only bone in the body that does not form a joint with any other bone - it is a floating bone.
- It helps in holding the trachea open and to form a bony connection for the tongue muscles.

## Auditory Ossicles

The malleus, incus, and stapes - known collectively as the auditory ossicles - are the smallest bones in the body. Found in a small cavity inside of the temporal bone, they serve to transmit and amplify sound from the eardrum to the inner ear.

## Vertebrae

- Twenty-six vertebrae form the vertebral column of the human body. They are named by region: Cervical (neck) - 7 vertebrae, Thoracic (chest) - 12 vertebrae, Lumbar (lower back) - 5 vertebrae, Sacrum - 1 vertebra and Coccyx (tailbone) - 1 vertebra.
- With the exception of the singular sacrum and coccyx, each vertebra is named for the first letter of its region and its position along the superior-inferior axis. For example, the most superior thoracic vertebra is called T1 and the most inferior is called T12.

## Ribs and Sternum

- The **sternum**, or breastbone, is a thin, knife-shaped bone located along the midline of the anterior side of the thoracic region of the skeleton. The sternum connects to the ribs by thin bands of cartilage called the costal cartilage.
- There are 12 pairs of **ribs** that together with the sternum form the ribcage of the thoracic region. The first seven ribs are known as "true ribs" because they connect

the thoracic vertebrae directly to the sternum through their own band of costal cartilage.

## Pectoral Girdle and Upper Limb

- The pectoral girdle connects the upper limb (arm) bones to the axial skeleton and consists of the left and right clavicles and left and right scapulae.
- The humerus is the bone of the upper arm.
- It forms the ball and socket joint of the shoulder with the scapula and forms the elbow joint with the lower arm bones.

## Pelvic Girdle and Lower Limb

- Formed by the left and right hip bones, the pelvic girdle connects the lower limb (leg) bones to the axial skeleton.
- The femur is the largest bone in the body and the only bone of the thigh (femoral) region.
- The femur forms the ball and socket hip joint with the hip bone and forms the knee joint with the tibia and patella. Commonly called the kneecap, the patella is special because it is one of the few bones that are not present at birth.
- The patella forms in early childhood to support the knee for walking and crawling.

## Cartilage

- It is made up of specialized cells called chondrocytes. These chondrocytes produce large amounts of extracellular matrix composed of collagen fibres, proteoglycan, and elastin fibers.
- There are no blood vessels in cartilage to supply the chondrocytes with nutrients.
- It is a firm tissue but is softer and much more flexible than bone.
- It is a connective tissue found in many areas of the body including: Joints between bones e.g. the elbows, knees and ankles, Ends of the ribs, Between the vertebrae in the spine, Ears and nose and Bronchial tubes or airways

### Joint or Articulation

- It is a junction between two or more bones or cartilages.
- It allows to movement (except for skull, sacral, sternal, and pelvic bones) and provide mechanical support, and are classified structurally and functionally.
- An **articulate facet** is generally seen as a small joint, especially used when speaking of the joints of the ribs.

Joint	Body Location
Ball and Socket	Shoulder and hip
Gliding	Vertebra, radio-ulna & carpals
Hinge	Ankle, Knee, Elbow
Immovable	Bone of skull
Pivot	Radius and humerus
Saddle	Metacarpal and carpal
Slightly movable	Public bone of pelvic girdle

### MUSCULAR SYSTEM

- It is an organ system consisting of skeletal, smooth and cardiac muscles.
- It permits movement of the body, maintains posture, and circulates blood throughout the body.
- The muscular system in vertebrates is controlled through the nervous system, although some muscles (such as the cardiac muscle) can be completely autonomous.

#### Skeletal Muscles

- Skeletal muscles form most of the human body weight.
- They are under the control of human will and all body movements occurring by our will are produced by skeletal muscles.
- They are called skeletal muscles because they are almost always found attached to the skeleton and produce movements in different parts of the skeleton.

### Smooth Muscles or Visceral Muscles

- It is found inside of organs like the stomach, intestines, and blood vessels.
- The weakest of all muscle tissues, visceral muscle makes organs contract to move substances through the organ. Because visceral muscle is controlled by the unconscious part of the brain, it is known as **involuntary muscle** - it cannot be directly controlled by the conscious mind.

#### Cardiac Muscles

- Found only in the heart, cardiac muscle is responsible for pumping blood throughout the body.
- Cardiac muscle tissue cannot be controlled consciously, so it is an involuntary muscle.
- While hormones and signals from the brain adjust the rate of contraction, cardiac muscle stimulates itself to contract.
- The natural pacemaker of the heart is made of cardiac muscle tissue that stimulates other cardiac muscle cells to contract.
- Because of its self-stimulation, cardiac muscle is considered to be auto-rhythmic or intrinsically controlled.

### URINARY SYSTEM or Renal System

- It is the system of production, storage and elimination of urine.
- It consists of the kidneys, ureters, urinary bladder, and urethra.
- The kidneys filter the blood to remove wastes and produce urine. The ureters, urinary bladder, and urethra together form the urinary tract, which acts as a plumbing system to drain urine from the kidneys, store it, and then release it during urination.
- Besides filtering and eliminating wastes from the body, the urinary system also maintains the homeostasis of water, ions, pH, blood pressure, calcium and red blood cells.

## Kidneys

- The kidneys are bean-shaped organs that serve several essential regulatory roles in vertebrates and located in the abdominal cavity.
- The left kidney is located at the vertebral level T12 to L3, and the right is slightly below the diaphragm and posterior to the liver.
- The kidneys, unlike the other organs of the abdominal cavity, are located posterior to the peritoneum and touch the muscles of the back.
- The kidneys are surrounded by a layer of adipose that holds them in place and protects them from physical damage.
- The kidneys filter metabolic wastes, excess ions, and chemicals from the blood to form urine.

## Ureters

- These are a pair of tubes that carry urine from the kidneys to the urinary bladder.
- They are about 10 to 12 inches long.
- Gravity and peristalsis of smooth muscle tissue in the walls of the ureters move urine toward the urinary bladder.
- The ends of the ureters extend slightly into the urinary bladder and are sealed at the point of entry to the bladder by the ureterovesical valves.
- These valves prevent urine from flowing back towards the kidneys.

## Urinary bladder

- It is a sac-like hollow elastic organ that functions as the body's urine storage tank.
- It is located along the body's midline at the inferior end of the pelvis.
- The urinary bladder functions as a storage vessel for urine to delay the frequency of urination.
- It is an elastic organs and is able to increase its volume greatly to

accommodate between 600 to 800 ml of urine at maximum capacity.

## Urethra

- It is a tube that conveys urine from the urinary bladder to the outside of the body.
- Its wall is lined with mucous membranes and contains a relatively thick layer of smooth muscle tissue.
- It contains numerous mucous glands, called urethral glands that secrete mucus into the urethral canal.

## Urine

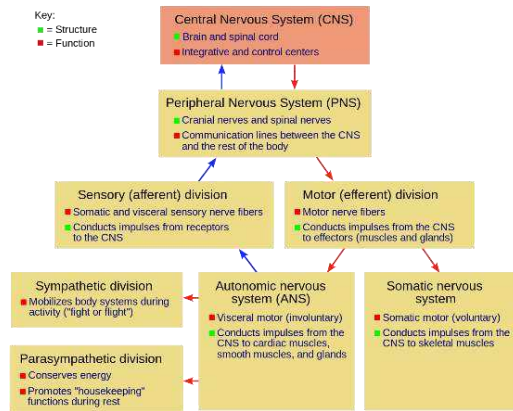
- It is a liquid (an aqueous solution) produced by the kidneys to remove waste products from the bloodstream.
- It is yellowish in color fluid due to presence of **urochrome pigment**.
- It consists primarily of water (91-96%), with organic solutes including urea, creatinine, uric acid, and trace elements.
- The pH of human urine ranges from 5.5 to 7, averaging around 6.2 and it is acidic in nature.
- Average urine production in adult humans is about 1-2 L per day, depending on state of hydration, activity level, environmental factors, weight, and the individual's health.

## NERVOUS SYSTEM

- It consists of the brain, spinal cord, sensory organs, and all of the nerves that connect these organs with the rest of the body.
- Together, these organs are responsible for the control of the body and communication among its parts.
- The **brain** and **spinal cord** form the control center known as the **Central Nervous System (CNS)**, where information is evaluated and decisions made.
- The sensory nerves and sense organs of the peripheral nervous system (PNS) monitor conditions inside and outside of

the body and send this information to the CNS.

- Efferent nerves in the PNS carry signals from the control center to the muscles, glands, and organs to regulate their functions.



## Nervous Tissue

The majority of the nervous system is tissue made up of two classes of cells: **neurons** and **neuroglia**.

**Neurons**, also known as nerve cells, communicate within the body by transmitting electrochemical signals. Neurons look quite different from other cells in the body due to the many long cellular processes that extend from their central cell body. There are 3 basic types of neurons,

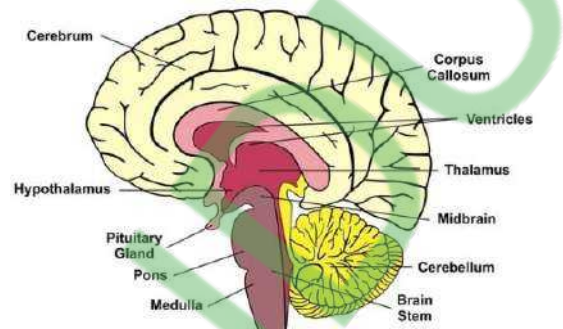
**Afferent neurons.** Also known as sensory neurons, afferent neurons transmit sensory signals to the central nervous system from receptors in the body.

**Efferent neurons.** Also known as motor neurons, efferent neurons transmit signals from the central nervous system to effectors in the body such as muscles and glands.

**Interneurons.** Interneurons form complex networks within the central nervous system to integrate the information received from afferent neurons and to direct the function of the body through efferent neurons.

**Neuroglia**, also known as glial cells, act as the “helper” cells of the nervous system. Each neuron in the body is surrounded by anywhere from 6 to 60 neuroglia that protect, feed, and insulate the neuron.

## Brain



- The brain, a soft, wrinkled organ that weighs about 1.36 kg, is located inside the cranial cavity, where the bones of the skull surround and protect it.
- The approximately 100 billion neurons of the brain form the main control center of the body.
- The brain and spinal cord together form the central nervous system (CNS), where information is processed and responses originate.
- The brain, the seat of higher mental functions such as consciousness, memory, planning, and voluntary actions, also controls lower body functions such as the maintenance of respiration, heart rate, blood pressure, and digestion.

## Spinal Cord

- It is a long, thin mass of bundled neurons that carries information through the vertebral cavity of the spine beginning at the medulla oblongata of the brain on its superior end and continuing inferiorly to the lumbar region of the spine.
- It is around 45 cm (18 in) in men and around 43 cm (17 in) long in women.
- In the lumbar region, the spinal cord separates into a bundle of individual nerves called the cauda equina (due to its

resemblance to a horse's tail) that continues inferiorly to the sacrum and coccyx.

- The white matter of the spinal cord functions as the main conduit of nerve signals to the body from the brain.
- The grey matter of the spinal cord integrates reflexes to stimuli.

### Nerves

- Nerves are bundles of axons in the peripheral nervous system (PNS) that act as information highways to carry signals between the brain and spinal cord and the rest of the body.
- Each axon is wrapped in a connective tissue sheath called the endoneurium. Individual axons of the nerve are bundled into groups of axons called fascicles, wrapped in a sheath of connective tissue called the perineurium.
- Finally, many fascicles are wrapped together in another layer of connective tissue called the epineurium to form a whole nerve.
- The wrapping of nerves with connective tissue helps to protect the axons and to increase the speed of their communication within the body.

### Meninges

The meninges are the protective coverings of the central nervous system (CNS). They consist of three layers: the dura mater, arachnoid mater, and pia mater.

**Dura mater** : The dura mater, which means "tough mother," is the thickest, toughest, and most superficial layer of meninges.

**Arachnoid mater** : The arachnoid mater, which means "spider-like mother," is much thinner and more delicate than the dura mater.

**Pia mater** : The pia mater, which means "tender mother," is a thin and delicate layer of

tissue that rests on the outside of the brain and spinal cord.

### Cerebrospinal Fluid

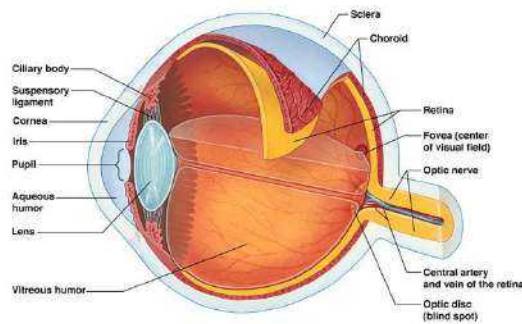
- The space surrounding the organs of the CNS is filled with a clear fluid known as cerebrospinal fluid (CSF).
- CSF is formed from blood plasma by special structures called choroid plexuses.
- The choroid plexuses contain many capillaries lined with epithelial tissue that filters blood plasma and allows the filtered fluid to enter the space around the brain.

### Sense Organs

1. Eye is the sense of sight.
2. Ear is the sense of hearing.
3. Nose is the sense of smell.
4. Tongue is the sense of taste.
5. Skin is the sense of touch.

### Eye

- It allows you not only to view objects, but to see depth, color, size, and detail.
- The eye works by refracting and focusing light onto the retina.
- When light strikes the retina, millions of rhodopsin-containing rods, which are responsible for night vision, convert the light into electrical impulses, which are sent to the brain.
- The brain then translates what it receives from the optic nerves so that we can understand what we see.
- The retina also contains millions of **cones** that contain **iodopsin** and are used for bright light vision and color perception. There are approximately 17 times more rods than cones - about 120 million rods and 7 million cones - in the retina of each eye.
- The human eye is about 2.5 cm in diameter.



## Parts of Human Eye

**Sclerotic:** It is the white outer part of the eye that you can see. It provides protection and structure for the inner parts of the eye.

**Cornea:** It is the clear bulging surface in front of the eye. It is the main refractive surface of the eye.

**Iris:** It controls the size of the pupil and the amount of light that enters the eye. It is the coloured part of your eye.

**Eye Lens:** It focuses light onto the retina. It is a double convex lens with the help of which image is formed at retina by refraction of light.

**Ciliary Muscles:** The eye lens is held by ciliary muscles which helps the eye lens to change its focal length.

**Pupil:** It is the black hole in the center of the colored iris. It contracts when exposed to bright light and expands in darkness to allow more light into the eye.

**Aqueous humour:** It is the transparent fluid between cornea and eye lens.

**Vitreous Humour:** It is the transparent fluid between eye lens and retina.

**Retina:** It is the innermost layer of sensitive tissue that transmits light to the brain. The retina consists of several types of cells, including a layer of rods and cones, which transform light into chemical and electrical energy that is transmitted to the optic nerves. The center of the retina contains the **macula**.

The macula is a highly sensitive part of the retina that is responsible for our detail vision. The center of the macula, which has a major role in detail perception, is called the **fovea**.

**Optic Nerve:** It carries the information from the eye to the brain. It consists of over one million axons, which carry visual information to different parts of the brain.

**Blind Spot :** This is a bit of your retina which is not sensitive to light because there are no rods or cones there. It is the spot where the optic nerve is joined on to the retina.

**Yellow Spot :** It is the central part of retina lying on the optic axis of eye is most sensitive to light.

**Eye Lids :** Its main function is to protect the eyes by blinking. Blinking prevents debris from getting into the eye. The average blink rate is 10 blinks per minute.

## Ear

- It receives sound and helps in balance and body position.
- The human ear can generally hear sounds with frequencies between 20 Hz and 20 kHz.
- The ear has external, middle, and inner portions.
- The outer ear is called the **pinna** and is made of ridged cartilage covered by skin.
- Sound funnels through the pinna into the external **auditory canal**, a short tube that ends at the **eardrum** (tympanic membrane).
- Sound causes the eardrum and its tiny attached bones in the middle portion of the ear to vibrate, and the vibrations are conducted to the nearby **cochlea**.
- The spiral-shaped cochlea is part of the inner ear; it transforms sound into nerve impulses that travel to the brain.
- The fluid-filled **semicircular canals** (labyrinth) attach to the cochlea and nerves in the inner ear. They send

information on balance and head position to the brain.

- The **eustachian** (auditory) tube drains fluid from the middle ear into the **throat** (pharynx) behind the nose.

### Nose

- It is the body's organ of smell and also functions as part of the body's respiratory system.
- The shape of the nose is determined by the nasal bones and the nasal cartilages, including the septal cartilage (which separates the nostrils) and the upper and lower lateral cartilages.
- The nose has two holes called **nostrils**.
- The nostrils and the nasal passages are separated by a wall called the **septum**.
- Deep inside your nose, close to your skull, your septum is made of very thin pieces of bone.
- Closer to the tip of your nose, the septum is made of **cartilage**, which is flexible material that's firmer than skin or muscle. It's not as hard as bone, and if you push on the tip of your nose, you can feel how wiggly it is.
- Behind your nose, in the middle of your face, is a space called the **nasal cavity**. It connects with the back of the throat. The nasal cavity is separated from the inside of your mouth by the palate (roof of your mouth).

### Tongue and Skin

- Tongue is described in **DIGESTIVE SYSTEM**
- Skin is described in **INTEGUMENTARY SYSTEM**

## REPRODUCTIVE SYSTEM

The process by which new individuals are produced from their parents is called reproduction and the organs which are used for this process, collectively constitute the reproductive system.

Reproduction is of two types, i.e., asexual and sexual.

1. **Asexual reproduction** is reproduction without sex. In this form of reproduction, a single organism or cell makes a copy of itself. It produces offspring genetically identical to their parent.

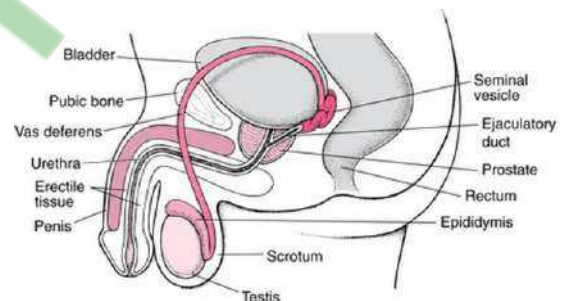
Fission asexual reproduction: Amoeba, bacteria, flatworm etc.

Budding asexual reproduction : Hydra, yeast and sponge

2. **Sexual reproduction** is the creation of a new organism by combining the genetic material of two organisms. It typically requires the involvement of two individuals or gametes, one from each opposite type of sex.

Syngamy sexual reproduction : Cockroach, frog and human being.

### Male Reproductive System



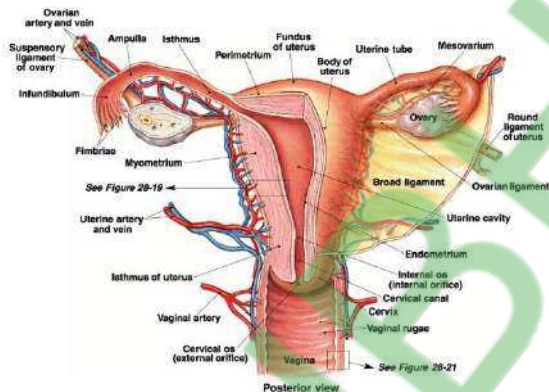
- It includes the scrotum, testes, spermatic ducts, sex glands, and penis. These organs work together to produce sperm, the male gamete, and the other components of semen.
- These organs also work together to deliver semen out of the body and into the vagina where it can fertilize egg cells to produce offspring.
- Male can produce sperm (spermatozoa) through their life from age of 13-14 years.



Male	
Reproductive organs and Numbers	Function
Penis (2)	Pass urine and deposit sperm in female genital tract.
Urethra (1)	Conduct urine and sperms.
Testes (2)	Produce sperm and testosterone
Sperm duct (2)	Conduct the sperm from the testes to urethra
Seminal vesicles (2)	Secrete seminal plasma
Epididymis (2)	Temporarily store sperm and provides mobility
Prostate gland (2)	Secrete an alkaline fluid to neutralise the acidity of urethra and make the sperm more active.
Cowper's gland (2)	Secrete an alkaline white lubricating fluid.

Female	
Reproductive organs with number (s)	Function
Ovaries (2)	To produce ova and hormones.
Oviducts (2)	To move the ovum towards uterus.
Uterus (womb) (1)	To provide space for developing child
Vagina (1)	To receive the sperms.

### Female Reproductive System



- It contains two main parts: the **uterus**, which hosts the developing **fetus**, produces **vaginal** and **uterine** secretions, and can pass sperm through to the **Fallopian tubes**; and the **ovaries**, which produce the female's **egg cells**.
- These parts are **internal**; the vagina meets the external organs at the **vulva**, which includes the **labia**, **clitoris** and **urinary meatus**.
- The **vagina** is attached to the **uterus** through the **cervix**, while the **uterus** is attached to the **ovaries** via the **Fallopian tubes**.

### Menstrual cycle

- The **menstrual cycle** is the preparation of a woman's body for a possible pregnancy.
- It starts during **puberty** (10-14 years) and stops permanently at **menopause** (40-50 years).
- It is also known as “monthly bleeding,” a “period,” and **menses**.
- Each month, one of the **ovaries** releases an **egg** - a process called **ovulation**.
- About **13** mature eggs are released from two ovaries of female in a year.
- **Follicle Stimulating Hormone (FSH)**, **Luteinizing Hormone (LH)**, **Estrogen** and **Progesterone** hormones are involved in the **Menstrual Cycle**.
- On an average **menstrual cycle** is completed in **28** days.
- The entire duration of a **Menstrual cycle** can be divided into four main phases:
  1. **Menstrual phase** (From day 1 to 5)
  2. **Follicular phase** (From day 1 to 13)
  3. **Ovulation phase** (Day 14)
  4. **Luteal phase** (From day 15 to 28)

### Birth Control Methods or Contraception Methods

- **Birth control**, also known as **contraception** and **fertility control**, is a method or device used to prevent pregnancy. The various methods used for it are **diaphragm**, **contraceptive pills**, **tubectomy**, **vesectomy**, **copper-T** etc.

- **Amniocentesis** (Amniotic Fluid Test or AFT) test is technique of finding out sex and disorder of foetus.

### **Length of Pregnancy (Gestation Period) in some mammals**

<b>Mammal</b>	<b>Gestation Period</b>	<b>Mammal</b>	<b>Gestation Period</b>
Buffalo	310 days	Horse	340 days
Cat	62 days	Human	280 days
Cow	280 days	Lion	120 days
Dog	62 days	Tiger	100 days
Elephant	610 days	Rat	21 days

### **ENDOCRINE SYSTEM**

It is the collection of glands that produce hormones that regulate metabolism, growth and development, tissue function, sexual function, reproduction, sleep, and mood, among other things.

*The main glands and organs of the endocrine system include:*

**Pituitary gland** is inside the brain. It oversees the other glands and keeps hormone levels in check. It can bring about a change in hormone production somewhere else in the system by releasing its own 'stimulating' hormones. The pituitary gland is also connected to the nervous system through part of the brain called the hypothalamus. The hormones released by the pituitary gland are gonadotropins (LH and FSH), growth hormone (GH), thyroid stimulating hormone (TSH), adrenocorticotropic hormone (ACTH), prolactin, antidiuretic hormone and oxytocin.

**Thyroid gland** sits in the neck at the front of the windpipe. It releases thyroid hormone (T4 and T3) which is required for metabolism and body homeostasis. It is controlled by TSH which is produced by the pituitary gland through a feed-back loop.

**Parathyroid glands** are usually four parathyroid glands which lie alongside the thyroid gland. The parathyroid gland is involved in calcium, phosphate and vitamin D regulation.

**Adrenal glands** are two adrenal glands which sit on top of each kidney. They make a number of different hormones. The outside part of the gland (adrenal cortex) makes cortisol, aldosterone and sex hormones. The centre of the adrenal gland (adrenal medulla) makes adrenaline. Adrenaline is an example of a hormone that is under the control of the nervous system.

**Pancreas** is an organ of digestion which is inside the abdomen. It makes insulin, which controls the amount of sugar in the bloodstream. It also makes other hormones such as **glucagon** and **somatostatin**.

**Ovaries** are inside the female pelvis. They make female sex hormones like **oestrogen**.

**Testes** they hang in the male scrotal sack. They make male sex hormones like **testosterone**.

*Other lesser known endocrine organs include:*

**Adipose tissue (fat tissue)** is recognised to be metabolically important. It releases hormones such as **leptin**, which affect appetite, and is also a site of oestrogen production. Insulin also acts on adipose tissue.

**Kidneys** produce erythropoietin (EPO) which stimulates red blood cell production, produce renin which is needed for blood pressure regulation and produce the active form of **Vitamin D** (1–25 dihydroxy vitamin D3)

**Gut** is an increasing number of hormones in the gut are being researched and being understood to effect metabolism and appetite. Included are glucagon-like peptide 1 (GLP-1), ghrelin which stimulates appetite, and **somatostatin**.

## HUMAN HEALTH & DISEASES

- Health is the level of functional or metabolic efficiency of a living organism. In humans it is the ability of individuals or communities to adapt and self-manage when facing physical, mental or social challenges.
- The World Health Organization (WHO) defined health in its broader sense in its 1948 constitution as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."
- A disease is a particular abnormal condition, a disorder of a structure or function that affects part or all of an organism.
- The causal study of disease is called pathology.
- Disease is often construed as a medical condition associated with specific symptoms and signs.

### Types of Diseases

The diseases may be broadly classified into two types: **Congenital** and **acquired**.

#### Congenital Diseases

*These are anatomical or physiological abnormalities present from birth. They may be caused by*

- a single gene mutation (alkaptonuria, phenylketonuria, albinism, sickle-cell anaemia, haemophilia, colour blindness);
- chromosomal aberrations (Down's syndrome, Klinefelter's syndrome, Turner's syndrome); or
- environmental factors (cleft palate, harelip). Unlike the gene and chromosome induced congenital defects, environmentally caused abnormalities are not transmitted to the children.

#### Acquired Diseases

These diseases develop after birth. They are further of two types: **communicable** and **non-communicable**.

**Communicable (Infectious)** Diseases are caused by viruses, rickettsias, bacteria, fungi, protozoans and worms.

**Noncommunicable (Noninfectious)** Diseases remain confined to the person who develops them and do not spread to others.

*The non-communicable diseases are of four kinds*

1. **Organic or Degenerative Diseases** are due to malfunctioning of some of the important organs, e.g, heart diseases, epilepsy. Heart diseases result from the abnormal working of some part of this vital organ. Epilepsy may result from abnormal pressure on regions of the brain.
2. **Deficiency Diseases** are produced by deficiency of nutrients, minerals, vitamins, and hormones, e.g., kwashiorkor, beriberi, goitre, diabetes are just a few from a long list.
3. **Allergies** are caused when the body, which has become hypersensitive to certain foreign substance, comes in contact with that substance. Hay fever is an allergic disease.
4. **Cancer** is caused by an uncontrolled growth of certain tissues in the body.

#### The Immune System

1. **Immunity** – The ability of the body to protect against all types of foreign bodies like bacteria, virus, toxic substances etc. which enter the body.

2. The science dealing with the various phenomena of immunity, induced sensitivity and allergy is called **immunology**.
3. **Immune Response** - Third line of defence. Involve production of antibodies and generation of specialized lymphocytes against specific antigens.
4. **Antigens** – Substances which stimulate the production of antibodies, when introduced into the body.
5. **Antibodies** – Immunoglobulins (Igs) which are produced in the body in response to the antigen or foreign bodies.
6. All antibodies are immunoglobulins but all immunoglobulins are not antibodies.
7. There are two major types of immunity: **Innate** or **Natural** or **Non-specific immunity** and **Acquired** or **Adaptive** or **Specific Immunity**.

## Vaccine & Vaccination

**Vaccine:** A product that stimulates a person's immune system to produce immunity to a specific disease, protecting the person from that disease. Vaccines are usually administered through needle injections, but can also be administered by mouth or sprayed into the nose.

**Vaccination:** The act of introducing a vaccine into the body to produce immunity to a specific disease.

World Health Organisation (WHO) in 1974 officially launched a **Global Vaccination Programme** to protect children from six fatal diseases. Diphtheria, pertussis, tetanus, polio, TB (Tuberculosis) and measles. It was launched in India in 1985.

The terms vaccine and vaccination are derived from Variolae vaccinae (smallpox of the cow), the term devised by Edward Jenner to denote cowpox.

In 2014, Polio declared eliminated from India.

Age	Vaccination	Dose
Birth to 12 months	1. OPT (triple vaccine, against diphtheria, whooping cough/pertussis and tetanus) 2. Polio (Sabin's oral, previously Salk's injectible) 3. BCG (Bacillus Calmette Guerin)	1. Three doses (commonly oral) at intervals of 4-6 weeks. 2. Three doses at intervals of 4-6 weeks. 3. Intradermal and one vaccine
9-15 months	Measles vaccine (MMR or Measles, Mumps and Rubella)	One dose
8-24 months	1. OPT 2. Polio (oral) 3. Cholera vaccine (can be repeated every year before summer)	1. Booster dose 2. Booster dose 3. One
5-6 years	1. DT (Bivalent vaccine against diphtheria and tetanus) 2. Typhoid Paratyphoid vaccine	1. Booster dose 2. Two doses at intervals of 1-2 months
10 years	Tetanus, TAB (typhoid)	Booster dose
16 years	Tetanus, TAB	Booster dose

### Major Diseases Caused by Bacteria

Disease	Pathogen	Affected Organs	Symptoms
Anthrax	Bacillus Anthracis	Skin, Lung	Itchiness, loss of appetite, nausea, fever
Botulism	Clostridium Botulinum	Neural System	Difficulty swallowing or speaking, dry mouth
Chlamydial Urethritis	Chlamydia Trachomatis	Cervix, Eye, Urethra	pain or burning during urination. itching, redness, or swelling
Cholera	Vibrio Cholerae	Intestine	Vomiting, acute diarrhoea, muscular cramps, dehydration etc.
Diphtheria	Corynebacterium diphtheriae	Respiratory tract	Difficulty in respiration (mainly in 2-5 yrs of child)
Gonorrhea	Neisseria Gonorrhea	Urinary Tract	Swelling in urinary tract
Leprosy	Mycobacterium Leprae	Skin, Bones, Peripheral Nerves	Ulcers, nodules, scaly scabs (the infected part of the body becomes senseless)
Plague	Pasteurella, Yersinia pestis	Blood and lung	High fever, weakness and haemorrhage which turn black, anemia, fever
Pneumonia	Diplococcus pneumoniae	Lungs	Chest pain, cough, high, fever.
Salmonellosis	Salmonella	Intestine	diarrhea, fever, & abdominal cramps
Tetanus (lock jaw)	Clostridium tetani	Central nervous system	Painful contraction of neck and jaw muscles followed by paralysis of thoracic muscles.
Tuberculosis	Mycobacterium Tuberculosis	Lungs	Repeated coughing, high fever
Typhoid	Salmonella typhi	Intestine	High fever, diarrhoea, headache
Typhus	Salmonella Typhi	Blood, Skin	
Whooping cough or pertussis	Bacillus pertussis	Respiratory system	Continuous coughing

### Major Diseases Caused by Virus

Disease	Pathogen	Affected Organs	Symptoms
AIDS Acquired Immune Deficiency Syndrome	HIV Human Immunodeficiency Virus	T-lymphocytes, White blood cells	Weak immune system
Chicken pox (Varicella)	Varicella virus	Whole body	High fever, reddish eruption on body.
Dengue Fever	dengue virus	Blood, Muscles, head, eye and joints	High fever, backache, headache, retro-orbital pain behind the eye ball.
Ebola	Ebola Virus (filovirus)	Whole body	Fatal hemorrhagic fever, liver and kidney dis-function vomiting, headache.
Hepatitis A (Not fatal) and B (fatal)	Hepatitis-A & B virus	Liver	Loss of appetite, nausea, whitish stool and jaundice
Herpes Simplex	herpes simplex virus	Skin, Pharynx, Genital organs	multiple blisters on or around affected areas
Influenza (flu)	Influenza virus	Respiratory Tract	Inflammation of upper respiratory tract, nose throat and eyes.
Measles (Rubeola)	Rubella virus	Whole body	Loss of appetite, reddish eruption on the body.

Mumps (Epidemic Parotitis)	mumps virus	Salivary Glands, Blood	low-grade fever, malaise, headache, muscle aches
Polio or poliomyelitis	Polio virus	Intestine, Brain, Spinal Cord, throat, backbone and nerve	Fever, backbone and intestine wall cells are destroyed. It leads to paralysis.
Rabies (hydrophobia)	rabies virus	Brain, Spinal cord	Encephalitis fear of water, high fever, headache, spasm of throat and chest leading to death.
Small Pox (Variola)	Variola virus	Whole body	Light fever, eruption of blood on body
Swine influenza (flu)	H <sub>1</sub> N <sub>1</sub> flu virus	Whole body (muscles)	Headache, tiredness, sore throat, Vomiting, breathing problems.
Viral Fevers	Viral fever virus	Blood	runny nose, sore throat, cough, hoarseness, and muscle aches
Yellow Fever	Flavi-virus	Liver, Blood	fever, chills, loss of appetite, nausea, muscle pain, headache

### Major Diseases Caused by Protozoan

Disease	Pathogen	Affected Organs	Symptoms
African Trypanosomiasis	Trypanosoma gambiense <b>Vector</b> - Tse-tse fly	Blood and nervous tissue.	feels sleepy, may cause death
Amoebic dysentery (Amoebiasis)	Entamoeba histolytica	Colon (intestine)	loose motion with blood, pain in abdomen
Diarrhoea	Giardia	Digestive system	loose motions, vomiting
Filaria or elephantiasis	Wuchereria bancrofti <b>Vector</b> - Culex mosquito	arms and legs	Swelling of legs and arms
Kala azar or dum-dum fever	Leishmania Donovanii <b>Vector</b> - Sand flies	Spleen and liver	high fever and liver enlargement
Malaria	Plasmodium parasites <b>Vector</b> - Female Anopheles mosquito	blood, spleen, liver, eyes, central nervous system, lungs, kidneys	Periodical attacks of high fever, pain in joints accompanied by chill, heavy perspiration and fast pulse
Pyorrhoea	Entamoeba gingivalis	Gums of mouth, teeth	tenderness, redness and swelling of gums

### Major Diseases Caused by Fungi

Disease Name	Pathogen	Organs Affected	Symptoms
Aspergillitis	Aspergillus fumigatus	Lung, Air Tract	Obstruction in the functioning of lungs.
Athlete's foot	Tinea pedis	Skin	Cracking of feet
Baldness	Tinea capitis	Hair	Hair fall
Beriberi	deficiency of thiamin (vitamin B1)	Heart and nerve	weight loss, pain in the limbs, irregular heart rate
Fungal Meningitis	Cryptococcus	Brain	
Ringworm	Trichophyton Verrucosum	Skin	Round red spot on skin, itching
Scabies	Acarus scabiei	Skin	itching and white spot

## Some Important Medical Tests

*A medical test is a kind of medical procedure performed to detect, diagnose, or monitor diseases, disease processes, susceptibility, and determine a course of treatment.*

### Diagnostic

It is a procedure performed to confirm, or determine the presence of disease in an individual suspected of having the disease, usually following the report of symptoms, or based on the results of other medical tests. This includes posthumous diagnosis. Such tests include:

- Utilizing nuclear medicine techniques to examine a patient having a lymphoma.
- Measuring the blood sugar in a person suspected of having diabetes mellitus, after periods of increased urination.
- Taking a complete blood count of an individual experiencing a high fever, to check for a bacterial infection.
- Monitoring electrocardiogram readings on a patient suffering chest pain, to diagnose or determine any heart irregularities.

### Imaging

These tests provide a picture of the inside of the body - in its entirety or only of certain parts. Ordinary x-rays are the most common imaging tests. Others include ultrasonography, radioisotope (nuclear) scanning, computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography (PET), and angiography.

### Endoscopy

A viewing tube (endoscope) is used to directly observe the inside of body organs or spaces (cavities). Most often, a flexible endoscope is used, but in some cases, a rigid one is more useful. The tip of the endoscope is usually equipped with a light and a camera, so the examiner watches the images on a television monitor rather than looking directly through

the endoscope. Tools are often passed through a channel in the endoscope. One type of tool is used to cut and remove tissue samples.

### Biopsy

Tissue samples are removed and examined, usually with a microscope. The examination often focuses on finding abnormal cells that may provide evidence of inflammation or of a disorder, such as cancer. Tissues that are commonly examined include skin, breast, lung, liver, kidney, and bone.

### Genetic Testing

Usually, cells from skin, blood, or bone marrow are analyzed. Cells are examined to check for abnormalities of chromosomes, genes (including DNA), or both. Genetic testing may be done in the following:

1. **Fetuses:** To determine whether they have a genetic disorder
2. **Children and young adults:** To determine whether they have a disorder or are at risk of developing a disorder
3. **Adults:** Sometimes to help determine the likelihood that their relatives, such as children or grandchildren, will develop certain disorders

**Radiologic tests :** In which, for example, x-rays are used to form an image of a body target.

In **vivo diagnostics** which test in the body, such as: Manometry

In **vitro diagnostics** which test a sample of tissue or bodily fluids. It can be classified according to the location of the sample being tested, including: Blood tests, Urine tests, Stool tests, Sputum (phlegm).

### Major Immunological Tests and Diseases

Test	Disease
Ames test	Carcinogenicity
Dick test	Scarlet fever
Montoux test	Tuberculosis
Rose-Waaler test	Rheumatoid fever
Wassermann test	Syphilis
Widal test	Typhoid
Wayson stain test	Plague
Tourniquet test	Dengue fever
ELISA test	AIDS

### Some Viral Diseases in Animals

Animal	Diseases	Pathogen
Cow	Small pox	Variola vera
Buffalo	Small pox	Pox virido orthopox
Cow	Blue tongue	Blue tongue virus
Cow	Herpes	Herpes virus
Dog	Rabies	Street rabies virus

### Some Bacterial Diseases in Animals

Animal	Diseases	Pathogen
Cow	Anthrax	Bacillus anthracis
Monkey	Dysentery	Shigella dysenteriae
Rabbit	Diphtheria	Corynebacterium diphtheria
Cow	Tuberculosis	M. bovis
Rat	Plague	Yersinia pestis

## TYPES AND FORMS OF MEDICINE

Types	Function
Amphetamine	a drug that increases energy and excitement and makes you less hungry
Anabolic steroid	a drug that increases muscles, used illegally by some sports people to make themselves stronger
Anaesthesia	an anaesthetic that is given to someone before they have a medical operation, or the use of anaesthetics
Anaesthetic	a drug or gas that is given to someone before a medical operation to stop them feeling pain.
Analgesic noun	a drug that reduces pain
Antacid	a medicine that reduces the amount of acid in your stomach
Antibiotic	a drug that cures illnesses and infections caused by bacteria.
Anticoagulant	a substance that prevents blood from coagulating
Antidepressant	a drug used for treating someone who is depressed
Antidote	a substance that prevents a poison from having bad effects
Antihistamine	a drug used to treat an allergy
Anti-inflammatory	a drug taken to reduce inflammation
Antiretroviral	antiretroviral drugs are used to treat certain types of virus, especially HIV
Barbiturate	a strong drug that doctors give to people to make them calm or help them sleep
Beta-blocker	a drug that makes your heart work more slowly, used for treating high blood pressure
Booster	medical a small extra amount of a medical drug that you are given so that a drug you had before will continue to be effective
Caplet	a pill shaped like an oval
Capsule	a small round container filled with medicine that you swallow whole
Contraceptive	a drug, method, or object used for preventing a woman from becoming pregnant
Cough drop	a type of sweet containing medicine that you suck when you have a cough or a sore throat
Cough mixture	a liquid medicine that you take to help to cure a cough
Decongestant	a drug that helps you breathe more easily when you have a cold
Depressant	a drug or substance that makes you feel relaxed and makes your body work and react more slowly
Draught	literary a liquid medicine that you drink
Drops	liquid medicine that you put into your eyes, ears, or nose
Ear drops	liquid medicine that you put in your ear to treat an ear infection
Emetic	a substance that makes you vomit



Enema	a liquid used to give someone an enema
Expectorant	a medicine that you use for helping you to cough liquid up from your lungs
Fertility drug	a drug given to a woman to improve her fertility
Gas	a gas given to people before an operation to make them sleep, or during medical treatment so that they will feel less pain
General anaesthetic	a substance that a doctor puts into your body so that you will sleep and not feel any pain during an operation
Herbal medicine	medicine made from plants
Hypnotic	a drug that makes you go to sleep
Inhalant	a medicine or drug that you breathe into your lungs
Injection	a drug or another substance that is injected into your body
Laxative	a medicine, food, or drink that helps you to make solid waste leave your body when you use the toilet
Legal high	a drug that makes the user feel happy, excited, or relaxed and that is not illegal
Lozenge	medicine shaped like a sweet that you suck if you have a cough or sore throat
Magic bullet	a medicine designed to cure an illness quickly and completely, without affecting other parts of the body
MMR vaccine	a drug given to young children by injection to protect them against measles, mumps, and rubella. Some parents are worried about their children being given the MMR vaccine because they believe it may cause autism.
Multivitamin	a pill that some people take to make them healthier, containing various vitamins and minerals
Narcotic	medical a drug that people use when they are very ill in order to feel less pain and sleep better
Opiate	medical a drug that contains opium and is used for reducing pain and making you go to sleep
Painkiller	a medicine that reduces pain
Pastille	a round sweet that contains medicine, for example for a sore throat
Patent medicine	a medicine that you can buy from a shop without a doctor's prescription
The pill	a small piece of solid medicine that you swallow with water
Prescription drug	a drug that you can only get if you have a prescription from your doctor
Prophylactic	medical a medicine or treatment used for preventing disease or infection
Purgative	a food or drug that makes you go to the toilet
Relaxant	something, especially a drug, that relaxes you
Sedative	a drug that makes someone calmer, or makes them sleep
Serum	a liquid that is put into someone's blood to help them to fight an infection or a poison
Sleeping pill	a pill that you take to help you to sleep
Sports supplement	a food substance or drug that people can take to increase their energy or to become more healthy
Statin	a drug that is used to reduce the amount of cholesterol in the blood
Steroid	a chemical that is produced in the body or made as a drug. Steroids can act as hormones or be used for treating conditions such as swelling, or, illegally, by athletes to improve their performance.
Supplement	a pill or special food that you take or eat when your food does not contain everything that you need
Suppository	a drug in the form of a small block that is put inside the rectum or vagina to treat a medical condition
Suppressant	a drug that stops or limits the effects of something
Syrup	a sweet liquid that contains medicine
Tablet	a small hard round piece of medicine that you swallow
Tincture	a medicine made by mixing a small amount of a drug with alcohol
Tonic	a medicine that you take to get more energy and feel healthier, especially after you have been ill or working too hard
Tranquillizer	a drug that makes people calmer when they are very worried or nervous
Truth drug	a drug used for trying to make someone tell the truth
Vaccine	a substance put into the body, usually by injection, in order to provide protection against a disease
Vitamin	a pill containing vitamins

### Medical Instruments/Components

Instrument	Uses
Stethoscopes	used to hear sounds from movements within the body like heart beats, intestinal movement, breath sounds, etc.
Reflex testing hammer (padded)	to test motor reflexes of the body
Sphygmomanometer (Blood pressure meter)	to record the patient's blood pressure
A thin beam electric torch	to see into the eye, body's natural orifices, etc., and to test for pupillary light reflex, etc.
Tongue Depressor	for use in oral examination
Tuning forks	to test for deafness and to categorize it
Kidney dish	as a tray for instruments, gauze, tissue, etc.
Bedpan	for patients who are unconscious or too weak to even sit up or walk to the toilet to defecate
Thermometer	to record the body temperature
Gas cylinders	supply of oxygen, nitrous oxide, carbon dioxide, etc.
Oxygen mask or tubes	delivering gases up to the nostrils to assist in oxygen intake or to administer aerosolized or gaseous drugs
Vaporizer	to produce vapors
Instrument sterilizers	Used to sterilize instruments in absence of an autoclave
Nebulizer	to produce aerosols of drugs to be administered by respiratory route
Positive pressure ventilator	to assist or carry out the mechanical act of inspiration and expiration so that the patient who cannot respire on his / her own may respire; it is a component of "life support"
Cardioverter / Defibrillator	to correct arrhythmias of the heart or to start up a heart that is not beating
Dialyser	to remove toxic materials from the blood that are generally removed by the kidneys; used in case of renal failure
Rubber catheter	to drain and collect urine directly from the bladder (primary use); also to act as a makeshift oxygen tube, etc.
Syringe	for injections and aspiration of blood or fluid from the body
Sucker	for sucking up blood or secretions
Spectacles	for protection of the eyes or for refractive error correction
Enema set	to passively evacuate the rectum of faeces
Pipettes or droppers	to measure out doses of liquid, specially in children
Ophthalmoscope	to look at the retina
Otoscope	to look into the external ear cavity
Endoscope	to look inside the oesophagus, stomach, upper intestines, bile duct, larynx, trachea, bronchi-through the mouth; anal canal, rectum, colon- through anus; used mainly in Surgery or by surgical consultants
Proctoscope	to look inside anal canal and lower part of the rectum

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## BOTANY

*Botany, also called plant science(s) or plant biology, is the science of plant life and a branch of biology.*

### CLASSIFICATION OF PLANTS

While there are many ways to structure plant classification, one way is to group them into vascular and non-vascular plants, seed bearing and spore bearing, and angiosperms and gymnosperms. Plants can also be classified as grasses, herbaceous plants, woody shrubs, and trees.

**Vascular:** plants that use roots and stems to take in water and nutrients

**Non-vascular:** plants that don't use roots and stems

**Angiosperms:** also known as flowering plants; all have seeds that are protected by an ovule (think of an apple or other fruit).

**Gymnosperms:** a term meaning "naked seed;" refers to plants with seeds that aren't protected by an ovule. Examples are conifers, which have pinecones.

**Grasses:** plants that have slender leaves and reproduce by sending out underground stems called rhizomes that usually grow horizontally

**Herbaceous plants:** those with leaves and stems that die at the end of the growing season

**Woody shrubs:** plants that have stems that are covered by a layer of bark

**Trees:** woody shrubs that have a main trunk and many branches

### PLANT MORPHOLOGY or Phytomorphology

It is the study of the physical form and external structure of plants.

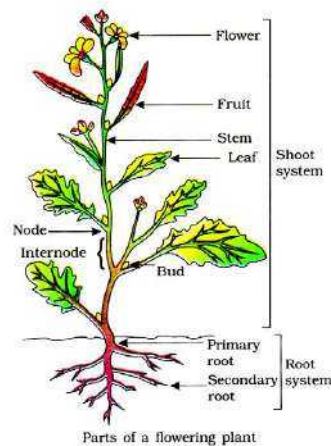
It is useful in the visual identification of plants.

The concept was put in circulation by the author Johann Wolfgang von Goethe, in the early 1800s.

*Plant anatomy or phytotomy is the general term for the study of the internal structure of plants.*

#### Morphology of Flowering Plants

- The flowering plants, also known as **Angiospermae** or **Magnoliophyta**, are the most diverse group of land plants, with about 350,000 species.
- Angiosperms are seed-bearing vascular plants. Their reproductive structures are flowers in which the ovules are enclosed in an ovary.
- **Adaptation:** Any alteration in the structure or function of an organism or any of its part that results from natural selection and by which the organism becomes better fitted to survive and multiply in its environment.



*Basically, the external structure of flowering plant is divided into two systems : root system (underground), shoot system (aerial)*

## ROOT SYSTEM (ROOT)

The root is underground part of the plant and develops from elongation of radicle of the embryo.

### Function of root

- Absorption of water and mineral from soil
- Anchorage of the plant body
- Storing reserve food material.
- Synthesis of plant growth regulators.

### Various types of root

#### Tap root

- Originated from the radicle.
- Persistent in dicot plant. E.g. gram, pea, mango

#### Fibrous root

- Originates from the base of the stem.
- Large number of roots replaces the primary root.
- This type of root found in monocot plant. E.g. wheat, paddy, grass.

#### Adventitious root

- Roots developed from any part of the plant other than radicle.
- Found in grass, Monstera and the banyan tree.

### Regions of root

1. **Root Cap** : The root is covered at the apex by the thimble-like structure which protects the tender apical part.
2. **Region of meristematic activity** : Cells of this region have the capability to divide. The cells of this region are very small, thin-walled and with dense protoplasm.
3. **Region of elongation** : Cells of this region are elongated and enlarged.
4. **Region of Maturation** : This region has differentiated into matured cells. Some of the epidermal cells of this region form thread-like root hairs, which absorb water and minerals from the soil.

## Modifications of Root

Roots are modified for support, storage of food, respiration.

1. **For support** : Prop roots in banyan tree, stilt roots in maize and sugarcane.
2. **For respiration**: pneumatophores in Rhizophora (Mangrove).
3. **For storage of food**: Fusiform (radish), Napiform (turnip), Conical (carrot).

## SHOOT SYSTEM (STEM)

- Stem is the aerial part of the plant and develops from plumule of the embryo.
- It bears nodes and internodes.
- Bears bud, may be axillary or terminal
- Main function is to spreading branches bearing leaves, flower and fruits.

### Types of Stem

There are three types of stem: Underground stem, Aerial stem and Sub-aerial stem.

#### Underground stem

Stems of some plants remain in the ground and serve the function of perennation and storage of food. They produce aerial shoots annually. They resemble roots superficially but are distinguishable by the presence of scale leaves and buds at nodes. Such stem also act as a means of vegetative propagation. The modified underground stems are the following

Tuber : e.g. Potato

Rhizome : e.g. Ginger

Corm : e.g. Saffron

Bulb : e.g. Onion

#### Sub – aerial stems

Lower buds of the stem in some plants grow out into short, lateral branches. These are named according to their origin, nature and mode of reproduction.

Runner : e.g. Doob grass

Stolon : e.g. Jasmine

Offset : e.g. Pistia

Sucker : e.g. Mentha

## Aerial stems

These modified aerial stems perform unusual functions. Different forms of these stems are the following

Stem tendrils : e.g. Passiflora

Stem thorn : e.g. Duranta

Phylloclade : e.g. Opuntia

Cladode : e.g. Asparagus

Bulbil : e.g. Dioscorea

## Modifications of Stem

1. **For food storage:** Rhizome (ginger), Tuber (potato), Bulb (onion), Corm and Colocasia).
2. **For support:** Stem tendrils of watermelon, grapevine, and cucumber.
3. **For protection:** Axillary buds of stem of citrus, Bougainvillea get modified into pointed thorns. They protect the plants from animals.
4. **For vegetative propagation:** Underground stems of grass, strawberry, lateral branches of mint and jasmine.
5. **For assimilation of food:** Flattened stem of opuntia contains chlorophyll and performs photosynthesis.

## LEAF

- Developed from shoot apical meristem, flattened, green structure.



- Manufacture the food by photosynthesis. It has bud in axil.
- A typical leaf has leaf base, petiole and lamina.
- Leaf attached to the stem by leaf base.
- May bear two small leaves like structure called stipules.
- Leaf base may swollen to form pulvinus.

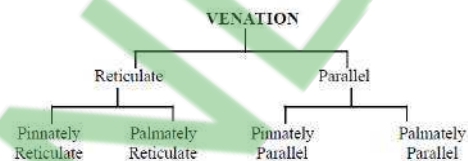
- The structure that holds the leaf called petiole.
- The green expanded part of the leaf is called lamina or leaf blade.

## Venation

The arrangement of veins and the veinlets in the lamina of leaf is termed as venation.

Veinlets form a network – **reticulate** venation. (dicot leaf)

Vein runs parallel to each other – **parallel** venation. (monocot leaf)

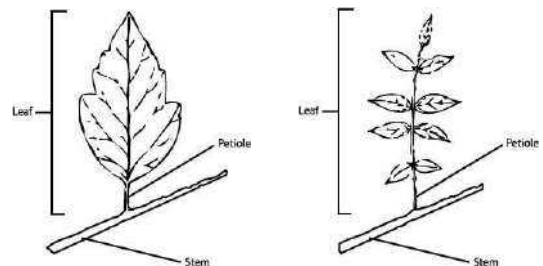


## Types of leaf

1. **Simple Leaf :** when the lamina is entire or when incised, the incisions do not touch the midrib.
2. **Compound Leaf :** When the incisions of the lamina reach up to the midrib breaking it into a number of leaflets

Bud present in the axil of petiole in both simple and compound leaf.

Bud never present in the axil of the leaflets of compound leaf.



**Pinnately compound leaf:** number of leaflets present in a common axis called **rachis**, which represents the midrib of leaf.

**Palmately compound leaves:** leaflets are attached to the common point i.e. at the top of the petiole.

## Phyllotaxy

It is the pattern of arrangement of leaves on the stem of branch.

**Alternate** : a single leaf arises from each node

**Opposite** : a pair of leaves arise at each node and lie opposite to each other.

**Whorled** : more than two leaves arise at a node and form a whorl.

## Modifications of leaves

*Leaves are often modified to perform functions other than photosynthesis.*

- Modified to tendril for climbing as in peas.
- Modified to spines for defense as in cacti.
- Fleshy leaves of onion store food.
- In Australian acacia, the leaves are small the short-lived. The petioles expanded, become green and synthesize food.
- In insectivorous plant leaves are modified to trap insects e.g. pitcher plant, Venus fly trap.

## Inflorescence

It is the arrangement of flowers on the floral axis of stem.

*A flower is a modified shoot*

- Apical meristem changes to floral meristem.
- Internodes do not elongate and the axis gets condensed.
- The apex produces different kinds of floral appendages laterally at successive nodes instead of leaves.

**Racemose** is the main axis continues to grow; the flowers are borne laterally in an acropetal succession.

**Cymose** is the main axis terminates in flower, hence limited to grow. The flowers are borne in a basipetal order.

## FLOWER

- Atypical flower has four different kinds of whorls arranged successively on the

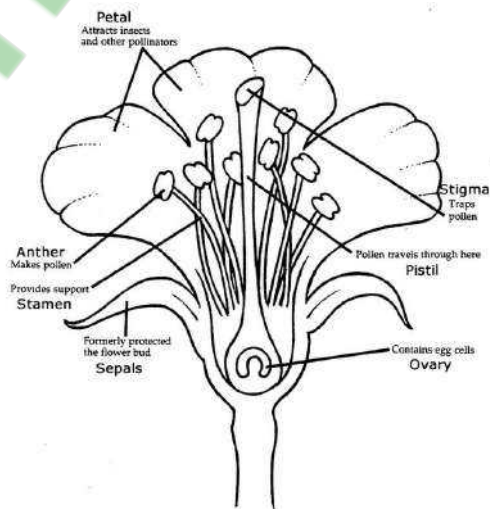
swollen end of the stalk or pedicel called thalamus or receptacle.

- The four whorls are Calyx, corolla, Androecium and Gynoecium.
- **Calyx** and **corolla** are accessory organs.
- **Androecium** and **Gynoecium** are reproductive organs.
- In flower like lily, the calyx and corolla are indistinct and are called **perianth**.
- **Bisexual**: flower having both Androecium and Gynoecium.
- **Unisexual**: flower having either stamens or carpel.

## Pattern of flower

- A flower may be trimerous, tetramerous or pentamerous when the floral appendages are in multiple of 3, 4 or 5 respectively.
- **Reduced leaf found** at the base of the pedicel are called bract.
- Flowers which bears bract are said to be bracteates.
- Flowers without bract are said to be ebracteate.

## Parts of a flower



## Calyx

- It is the outermost whorl
- Each member called sepals.
- Sepals are green leaf like protect the flower in the bud stage.
- **Gamosepalous**: sepals are united.
- **Polysepalous**: sepals are free.

## Corolla

- It is the second whorl of a flower.
- Each member called petal.
- Usually brightly colored to attract insect for pollination.
- *Polypetalous*: petals are free.
- *Gamopetalous*: petals are united or fused.

**Valvate** : sepals or petals in a whorl just touch one another at the margin, without overlapping. E.g. Calotropis.

**Twisted** : one margin of the appendage overlaps that of the next one and so on. E.g. china rose.

**Imbricate** : the margin of sepals or petals overlap one another but not in any particular direction as in Cassia and gulmohur.

**Vexillary** : The large petal (standard) overlaps the two lateral petals (wings) which in turn overlap the two smallest anterior petals (keel).

## Androecium

- It is the male sex organ of the flower.
- Composed of stamens.
- Each stamen consists of a stalk or filament and an anther.
- Each anther is usually bilobed and each lobe has two chambers, pollen sac.
- Pollen grains are produced inside the pollen sacs.
- A sterile stamen is called staminode.
- *Epipetalous*: stamens attached to the petals. E.g. brinjal.
- *Epiphylous*: stamens attached to the perianth. E.g. lily.
- *Polyandrous*: stamens are free.
- *Monoadelphous*: stamens united into one bunch or one bundle e.g. China rose.
- *Diadelphous*: stamens fused to form two bundles as in pea.
- *Polyadelphous*: stamens fused to form more than two bundles as in citrus.

## Gynoecium

- It is the female reproductive part of the flower.
- Members are called carpel.
- Each carpel has three parts namely stigma, style and ovary.

- Ovary is the enlarged basal part on which lies the elongated tube, the style.
- The stigma usually at the tip of the style.
- Stigma is the receptive surface for pollen grain.
- Each ovary bears one or more ovules.
- Ovule attached to a flattened cushion-like placenta in the ovary.
- When more than one carpel is present they may be: **Apocarpous**: all carpels are free. E.g. rose, lotus; **Syncarpous**: carpels fused. E.g. Tomato mustard.
- After fertilization: Ovules develop into seed ; Ovary developed into fruit.

**Marginal**: Placenta forms a ridge along the ventral suture of ovary.

**Axile**: Margins of carpels fuse to form central axis.

**Parietal**: Ovules develop on inner wall of ovary.

**Free central**: Ovules borne on central axis, lacking septa.

**Basal**: Placenta develops at the base of ovary.

**Aestivation** : It is the mode of arrangement of sepals or petals in the floral bud with respect to the other members of the same whorl is known as aestivation.

**Placentation** : It is the arrangement of ovules within the ovary is known as Placentation.

## FRUIT

- It is the ripened or matured ovary after fertilization.
- Parthenocarpic fruits developed from the ovary without fertilization.
- Generally fruits consist of a wall or pericarp and seeds.
- Pericarp may be dry or fleshy.
- Pericarp differentiated into – Outer **epicarp**, Middle **mesocarp**., Inner **endocarp**.
- Fruit developed from monocarpellary superior ovary and are one seeded. Such fruit is said to be drupe as in mango and coconut.
- Edible part of the mango is mesocarp.
- Mesocarp of coconut is fibrous.

## Types of Fruit

Fruits can be eaten raw, frozen, stewed, cooked, or dried. All fruits may be classified into three major groups: simple, aggregate, or multiple.

**Simple Fruits** : one fruit that has developed from the ovary of a single flower. Simple fruits may either be fleshy, like plums and peaches, or dry, such as walnuts and hazelnuts. *e.g.* apples, pears, plums, tomatoes, peaches

**Aggregate Fruits** : a fruit formed from several ovaries of one flower that produces many tiny fruits clustered tightly together. *e.g.* raspberries, blackberries, strawberries

**Multiple Fruits** : a fruit formed from the fusion of the ovaries of many different flowers which develop closely together to form one bigger fruit. *e.g.* pineapples, figs, breadfruit, mulberries

## SEED

- After fertilization ovules developed into seed.
- A seed is made of seed coat and embryo.
- The embryo is made up of a radicle, an embryonal axis, and one or two cotyledons.

## PHOTOSYNTHESIS

- It is the process by which plants, some bacteria, and some protistans use the energy from sunlight to produce sugar, which cellular respiration converts into adenosine triphosphate (ATP), the "fuel" used by all living things.



- The process of photosynthesis takes place in the chloroplasts, specifically using chlorophyll, the green pigment involved in photosynthesis.
- The photosynthetic process uses water and releases the oxygen that we absolutely must have to stay alive.
- The chemical reaction of photosynthesis is:  $6\text{CO}_2 + 6\text{H}_2\text{O} (+ \text{light energy}) \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

MAJOR TYPES OF FRUITS		
Type	Definition	Examples
<b>SIMPLE</b>	From a single pistil	
<b>Dry Indehiscent</b>	At maturity dry; does not split open	
Achene	Close-fitting pericarp surrounding a single seed	Sunflower
Grain	Close-fitting pericarp fused to a single seed	Corn, wheat
Nut	Thick, woody pericarp surrounding a single seed	Walnut, hazelnut
<b>Dry Dehiscent</b>	At maturity dry and splits open	
Legume	Pod that splits along two opposite sides	Beans, peas
Capsule	Fruit opening by several splits or pores	Cotton, poppy
Schizocarp	Fruit splitting into 1-seeded segments	Dill
<b>Fleshy</b>	Mostly fleshy at maturity; do not usually split open	
Drupe	1- to 2-seeded; the innermost pericarp layer, stony and enclosing the seed(s)	Plum, peach
Berry	1- to many-seeded; no stony innermost layer of pericarp	Tomato, grape,
<b>AGGREGATE</b>	Formed by fusion of several separate pistils of one flower	Raspberry, cherimoya
<b>MULTIPLE</b>	Formed by fusion of several separate pistils of several grouped flowers	Pineapple, fig



## GENETICS

It is the study of genes, genetic variation, and heredity in living organisms.

The genetic information lies within the cell nucleus of each living cell in the body.

### Mendel's Laws of genetics

#### Law of Dominance

In a cross of parents that are pure for contrasting traits, only one form of the trait will appear in the next generation. Offspring that are hybrid for a trait will have only the dominant trait in the phenotype.

#### Law of Segregation

During the formation of gametes (eggs or sperm), the two alleles responsible for a trait separate from each other. Alleles for a trait are then "recombined" at fertilization, producing the genotype for the traits of the offspring.

#### Law of Independent Assortment

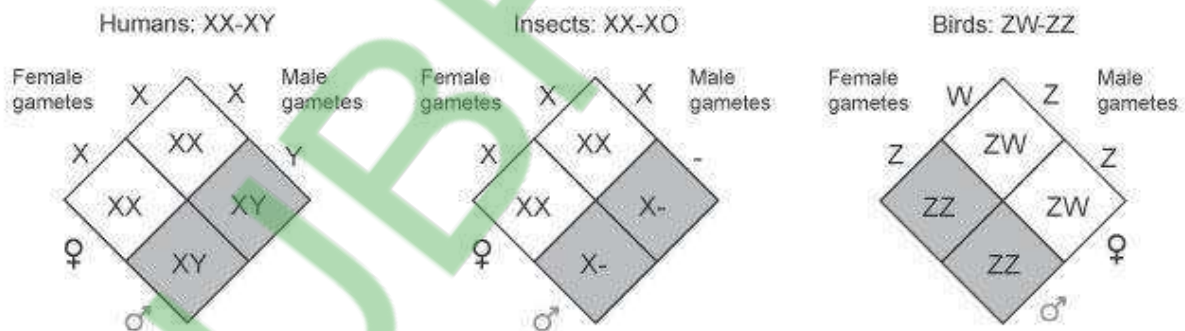
Alleles for different traits are distributed to sex cells (& offspring) independently of one another.

#### Sex Determination and its type

It is a biological system that determines the development of sexual characteristics in an organism.

Three important chromosomal sex-determining systems:

1. XX-XY system
2. XX-XO system
3. ZZ-ZW System



#### Sex Determination in Human

- Sex is determined by the possession of certain sexual characteristics which are governed by sex genes.
- These sex genes reside in sex chromosomes in one's body and in human; there are two types of sex chromosomes, X and Y.
- For human, XY are found in a male and XX in a female.

## Genetic Terms

- **Allele** - one alternative form of a given allelic pair; tall and dwarf are the alleles for the height of a pea plant; more than two alleles can exist for any specific gene, but only two of them will be found within any individual
- **Allelic pair** - the combination of two alleles which comprise the gene pair
- **Homozygote** - an individual which contains only one allele at the allelic pair; for example DD is homozygous dominant and dd is homozygous recessive; pure lines are homozygous for the gene of interest
- **Heterozygote** - an individual which contains one of each member of the gene pair; for example the Dd heterozygote
- **Genotype** - the specific allelic combination for a certain gene or set of genes
- **Backcross** - the cross of an F1 hybrid to one of the homozygous parents; for pea plant height the cross would be Dd x DD or Dd x dd; most often, though a backcross is a cross to a fully recessive parent
- **Testcross** - the cross of any individual to a homozygous recessive parent; used to determine if the individual is homozygous dominant or heterozygous
- **Monohybrid cross** - a cross between parents that differ at a single gene pair (usually AA x aa)
- **Monohybrid** - the offspring of two parents that are homozygous for alternate alleles of a gene pair
- **Dominance** - the ability of one allele to express its phenotype at the expense of an alternate allele; the major form of interaction between alleles

## Chromosomes

- The genes lie within the chromosomes.
- Humans have 23 pairs of these small thread-like structures in the nucleus of their cells.
- 23 or half of the total 46 comes from the mother while the other 23 comes from the father.
- The chromosomes contain genes just like pages of a book.
- Some chromosomes may carry thousands of important genes while some may carry only a few.
- The chromosomes, and therefore the genes, are made up of the chemical substance called DNA (DeoxyriboNucleic Acid). The chromosomes are very long thin strands of DNA, coiled up tightly.
- At one point along their length, each chromosome has a constriction, called the centromere.
- The centromere divides the chromosomes into two 'arms': a long arm and a short arm.
- Chromosomes are numbered from 1 to 22 and these are common for both sexes and called autosomes.
- There are also two chromosomes that have been given the letters X and Y and termed sex chromosomes. The X chromosome is much larger than the Y chromosome.

## Males and females

- Male have 46 chromosomes (44 autosomes plus an X and a Y chromosome) in their body cells and have half of these 22 autosomes plus an X or Y chromosome in their sperm cells.
- Female have 46 chromosomes (44 autosomes plus two copies of the X chromosome) in their body cells. They have half of this or 22 autosomes plus an X chromosome in their egg cells.
- When the egg joins with the sperm, the resultant baby has 46 chromosomes (with either an XX in a female baby or XY in a male baby).

## BIOTECHNOLOGY

*It is the use of plants, animals and micro-organisms to create new products or processes. It includes using bacteria or enzymes to make industrial processes work more efficiently and create less pollution, or to clean up the environment.*

*One kind of biotechnology is **gene technology**, sometimes called 'genetic engineering' or 'genetic modification', where the genetic material of living things is deliberately altered to enhance or remove a particular trait and allow the organism to perform new functions. Genes within a species can be modified, or genes can be moved from one species to another.*

### Biotechnological Applications in Agriculture

Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO).

Advantages of Genetic Modification in plants.

- Made crops more tolerant to abiotic stresses (cold, drought, salt, heat)
- Reduce reliance on chemical pesticides (pest resistant crop)
- Helped to reduce post-harvest losses.
- Increased efficiency of mineral usage by plants.
- Enhanced nutritional values of food e.g. vitamin A enriched rice.

### Bt Cotton

- Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as lepidopterans (tobacco budworm, armyworm), coleopterans (beetles) and dipterans (flies, mosquitoes).
- *Bacillus thuringiensis* forms protein crystals during a particular phase of their growth. These crystals contain a toxic insecticidal protein.
- These proteins are present in inactive protoxin form, but become active toxin in the alkaline pH of insect gut.
- The activated toxin binds to the surface of midgut epithelial cells and create pores that cause cell swelling and lysis and eventually cause death of insect
- Specific Bt toxin genes were isolated from *Bacillus thuringiensis* and genetically

transferred to several plants such as cotton.

- Crystal proteins are produced by a gene called cry in *Bacillus thuringiensis*.
- The protein coded by genes cryIAC and cryIIAb control the cotton bollworms.
- The protein coded by gene cryIAb controls corn borer.

### Pest resistant plants

- Several nematodes parasitize a wide variety of plants and animals including human beings.
- A nematode *Meloidogyne incognita* infects the root of tobacco plants and causes a great reduction in yield.
- Strategy based on RNA interference (RNAi) prevents this infestation.
- Process by which double-stranded RNA (dsRNA) directs sequence-specific degradation of mRNA

### Steps of RNA interference

- Double stranded RNA is produced endogenously or exogenously.
- Using *Agrobacterium* vectors nematode specific genes were introduced into the host plant (tobacco plant).
- Introduction of DNA produces both sense and antisense RNA in the host.
- These two RNA's being complementary to each other formed a double stranded (dsRNA) that initiated RNAi.
- The dsRNA injected into the host plant from outside called exogenous dsRNA.
- The dsRNAs are cleaved into 21-23 nt segments ("small interfering RNAs", or siRNAs) by an enzyme called Dicer.

- siRNAs are incorporated into RNA-induced silencing complex (RISC)
- Guided by base complementarity of the siRNA, the RISC targets mRNA for degradation.
- The consequence was that the parasite could not survive in a transgenic host.

### **Biotechnological Applications in Medicine**

- Biotechnology enables mass production of safe and more effective therapeutic drugs.
- Recombinant therapeutics does not induce unwanted immunological responses as is common in case of similar products isolated from non-human sources.

### **Genetically Engineered Insulin**

- Taking insulin at regular interval of time is required for adult-onset diabetes.
- Previously the source of insulin was the slaughtered cattle and pigs.
- This insulin caused allergy in some patients.
- Each insulin made of two short polypeptide chains; chain A and chain B that are linked together by disulphide linkage.
- Insulin synthesized in pancreas as pro-hormone which is a single polypeptide with an extra stretch called C-peptide.
- C-peptide is removed during matured insulin.
- In 1983 Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of E.coli to produce insulin chains.
- Chain A and chain B produced separately, extracted and combined by creating disulfide bonds to form mature human insulin.

### **Gene therapy**

- Gene therapy is an attempt to cure hereditary or genetic diseases.
- Genes are inserted into a person's cells and tissue to treat the disease.

- The first clinical gene therapy was given in 1990 to a 4-yr old girl with adenosine deaminase (ADA) deficiency.
- This enzyme is required for breakdown of deoxyadenosine into uric acids.
- In the absence of ADA toxic deoxyadenosine is accumulated and destroy the infection fighting immune cells called T-cells and B-cells.
- This disorder is caused due to the deletion of the gene for adenosine deaminase in chromosome 20.

### **Test tube baby**

- A test tube baby is the term that refers to a child that is conceived outside the woman's body. The process is referred to as "in vitro" (outside the body) fertilization.
- The World's first test tube baby (girl) named as Louise Joy Brown was born on July 25, 1978 in Great Britain.
- India's first test tube baby (girl) as named as Harsha was born in Mumbai on August 6, 1986.

### **Cloning**

Cloning describes the processes used to create an exact genetic replica of another cell, tissue or organism. The copied material, which has the same genetic makeup as the original, is referred to as a clone.

Dolly, a Sheep, was the first mammal to have been successfully cloned from an adult cell by Dr. Ian Wilmut, UK.

Noori is a female pashmina goat, the first pashmina goat to be cloned using the process of nuclear transfer.

There are three different types of cloning:

**Gene cloning**, which creates copies of genes or segments of DNA

**Reproductive cloning**, which creates copies of whole animals

**Therapeutic cloning**, which creates embryonic stem cells. Researchers hope to use these cells to grow healthy tissue to replace injured or diseased tissues in the human body.

## AGRICULTURE

*It is the science or practice of farming, including cultivation of the soil for the growing of crops.*

*Agriculture is derived from Latin words 'ager' (field) and 'cultura' (cultivation).*

### **Agronomy**

It is the science and technology of producing and using plants for food, fuel, fiber, and land reclamation. It has come to encompass work in the areas of plant genetics, plant physiology, meteorology, and soil science.

### **Agricultural Seasons in India**

#### **Kharif Season**

Crops are sown at the beginning of south-west monsoon and harvested at the end of the south-west monsoon.

Sowing Season: May to July.

Harvesting Season : September to October.

Important Crops: Jowar, Bajra, Rice, Maize, Cotton, Groundnut, Jute, Hemp, Tobacco etc.

#### **Rabi Season**

Crops need cool climate during growth period but warm climate during the germination of seed and maturation. Sowing Season: October to December Harvesting Season: February to April Important Crops: Wheat, Barley, Gram, Linseed, Mustard, Masoor & Peas.

#### **Zaid Season**

These Crops are raised throughout the year due to artificial irrigation.

#### **Zaid Kharif Crops**

Sowing Season: August to September

Harvesting Season: December-January

Important Crops: Rice, Jowar, Rapeseed, Cotton, Oilseeds.

#### **Zaid Rabi Crops**

Sowing Season: February to March.

Harvesting Season: April-May.

Important Crops: Watermelon, Toris, Cucum-ber & other vegetables.

### **FARMING SYSTEMS IN INDIA**

#### **Irrigation Farming**

An irrigation farming system relies on help from an irrigation system supplying water from a river, reservoir, tank, or well. As India grows and there is an increasing demand for food, water is becoming more and more crucial. Farming methods should be focused on sustaining or recycling water.

#### **Shifting Cultivation**

Shifting cultivation systems cultivate one plot of land for a period of years until the soil becomes infertile. As crop yield decreases, the plot is deserted and the ground is re-fertilized using the slash and burn technique. This method is popular in the northeast and the east coast of the country, and is used to cultivate rain-fed rice, corn, buckwheat, millet, root crops, and vegetables. However, as the population increases, more land is being used up without enough time to regenerate the natural condition of the soil. This has led to severe soil degradation in many areas.

#### **Commercial Agriculture**

Commercial agriculture systems involve large-scale plantations, such as those used for wheat, cotton, sugarcane, tea, rubber, and corn. The yields are exported to other countries for a profit. There are three types of commercial agriculture systems:

**Intensive commercial farming:** With small landholdings and a high population, many farms use a lot of manpower on a relatively small piece of land.

**Extensive commercial farming:** This is the opposite of intensive commercial farming. A small workforce is applied to a large piece of land. Cultivation depends on mechanical methods.

Plantation agriculture: A plantation is a large piece of land with an estate (typically in sub-tropical or tropical countries) where crops are cultivated and then sold internationally as opposed to locally.

### Ley Farming

This type of farming is used to restore soil fertility in India's drylands. A plot of land is used for grain or other crops and when the soil starts to degrade, the land is left uncultivated. It is used to grow hay or as a pasture for grazing animals. After a number of years, it can be used for crops again as the nutrients are restored by ploughing. Land erosion during the ley period is also prevented by the roots of the grass.

### Plantation Farming

As mentioned before, this is the large-scale cultivation of one crop on an estate or vast property. This system is designed to make a profit and as such requires that all technology

and techniques be efficient. Tea, coffee, and rubber are all commonly-grown on plantation farms. Teak wood, bamboo, and timber are also occasionally farmed using this method.

### Crop Rotation

This system is a type of subsistence farming. Usually, there are one or more farmers responsible for the labour and the produce is for their own consumption. A crop rotation schedule includes different varieties of crops such as wheat, barley, mustard, or millet being grown during alternating seasons. The benefits are that weeds, pests, and diseases are controlled, while soil fertility is maintained.

### Main Crops for Rotations

One yearly : paddy and wheat

Two yearly : maize and cotton

Three yearly : Tomato and Lady's finger

Four yearly : Cotton and wheat

## ANIMAL HUSBANDRY

*It is the study of various breeds of domesticated animals and their management for obtaining better products and services from them.*

*The term husbandry derives from the word "husband" which means 'one who takes care'. When it incorporates the study of proper utilisation of economically important domestic animals, it is called Livestock Management.*

### Different Categories of Animals

1. **Wild** – Those that breed better where they are free than they do when they are captivated. They have no common use for humans. Example Lion, Tiger, Rhinoceres, Deer etc.
2. **Tamed** – Those, which are caught from the wild and trained to be useful to humans in some way. Elephant, Chimpanzee, Gorilla, Yak etc.
3. **Domesticated** – Those that are of use at home and are easily bred and looked after by humans. Common domesticated animals are dog, horse, cow, sheep, buffalo, fowl etc.

### Importance of domestic animals

On the basis of utility, domestic animals are categorised into the following functional groups :

1. **Milk giving animals** : Cattle, buffalo, goat, sheep etc.
2. **Draught animals** : camel, elephant, yak etc.
3. **Fibre, hide and skin yielding** : Sheep, goat, cattle, buffalo, camel etc.
4. **Meat and egg yielding animals** : Fowl (hen) and duck, goat, buffalo, pig etc.

### Milk yielding

India is the world's largest producer of milk.

The majority of the milk consumed is also in liquid form in India.

Over 53% of milk produced in India is from the water buffalo and a majority of milk processing plants in the country depend upon buffalo milk.

### Major Indian Cattle Breeds

Breed Name	Geographical range
Dangi	Western Maharashtra
Gir	Saurashtra, Gujarat
Hallikar	Hassan, Mysore, Tunkur districts of Karnataka
Haryana	Haryana, Uttar Pradesh, Bihar, Rajasthan
Kangayam	Coimbatore, Tamil Nadu
Kankrej	Bhuj, North Gujarat, Rajasthan
Kasaragod	Kerala
Kenkatha	Banda, Uttar Pradesh, Madhya Pradesh.
Malvi	Madhya Pradesh, Rajasthan
Mewati	Rajasthan
Ongole	Guntur, Ongole in Andhra Pradesh
Ponwar	Pilbhit, Uttar Pradesh
Red Sindhi	Originated in Sindh, Pakistan. Now widespread.
Sahiwal	Punjab, Uttar Pradesh, Haryana
Siri	Hills around Darjeeling and Sikkim. Originally from Bhutan
Tharparkar	Sindh (Pakistan), Kutch, Jaisalmer, Jodhpur

### Major Indian Buffaloes Breeds

Breed Name	Geographical range
Bhadawari	Uttar Pradesh and Madhya Pradesh
Jaffarabadi	Gujarat
Mehsana	Gujarat (cross breed between Surti and Murrah)
Murrah	Haryana and Punjab
Nagpuri	Maharashtra
Nill Ravi	Punjab
Porlakmedi	Odisha
Surti	Gujarat

### Major Indian Sheep Breeds

Breed Name	Geographical range
Bellary, Hassan, Mandya	Karnataka
Chokla	Rajasthan
Hissardale	Himachal Pradesh and Haryana
Jaisalmeri	Rajasthan
Magra	Rajasthan
Malpura	Rajasthan
Marwari	Rajasthan and Gujarat
Mecheri, Kalikarsal, Vembur	Tamil Nadu
Muzaffaranagari	Haryana
Nellore	Andhra Pradesh
Nial	Rajasthan and Haryana
Potanwadi	Uttar Pradesh and Delhi
Pugul	Bikaner (Rajasthan)

### Major Indian Goat Breeds

Breed Name	Geographical range
Barhari	Delhi, Uttar Pradesh, Haryana
Beetal	Punjab
Bengal	Bihar and Odisha
Cham, Gadd	Himachal Pradesh, Jammu and Kashmir
Chegu	Kashmir
Jamunaparu	Uttar Pradesh, Madhya Pradesh
Kathiawar	Gujarat and Rajasthan
Malabari	Kerala
Marwari, Mehsana and Zelwadi	Rajasthan, Gujarat and Madhya Pradesh
Pashmina	Himachal Pradesh, Ladakh, Lahul and Spiti valley
Surti	Gujarat

### Major Indian Pig Breeds

Breed Name	Geographical range
Ghuri	Manipur, Asom, Meghalaya and Arunachal Pradesh
Desi	UP, Bihar, Punjab and MP

### Major Indian Horse Breeds

Breed Name	Geographical range
Kathiawari or kaunchi	Rajasthan and Gujarat
Marwari or malvi	Rajasthan
Bhutia	Tarai belt of Himalayan region (Punjab-Bhutan)
Manipuri Pony	Eastern hill region
Sipti Pony	Himachal Pradesh

\*\*\*

SUBHENDU



## COMPUTER AND INFORMATION TECHNOLOGY

Computer is an electronic device which is capable of receiving information (data) in a particular form and of performing a sequence of operations in accordance with a predetermined but variable set of procedural instructions (program) to produce a result in the form of information or signals.

**Charles Babbage** was considered to be the **father of computer** after his invention and concept of the Analytical Engine in 1837.



*Charles Babbage*  
1792 – 1871

**Alan Turing** is considered as **father of modern computer science**. He formed the concept of the algorithms and computations with one of his inventions, the Turing machine. He is also regarded as father of theoretical computer science and Artificial Intelligence (AI).

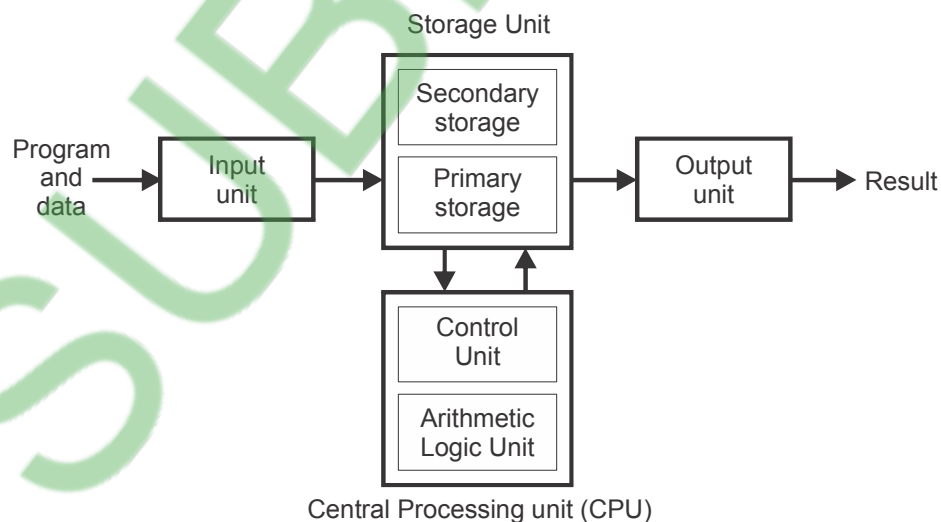
### Characteristics of Computer

- Automatic (Spontaneous)
- Accuracy (Authenticity)
- Speed (Celerity)
- Diligence (Attentiveness)
- Memory (Storehouse)
- Reliability (Consistency)
- Versatility (Adaptability)
- No I.Q.
- No feelings

### Basic Computer Organization

A Computer performs the following three operations in sequence.

- It receives data & instructions from the input device.
- Processes the data as per instructions.
- Provides the result (output) in a preferred form.



## MILESTONES IN COMPUTER AND TECHNOLOGY

Year	Invention	Inventor (s)	Notes
16th Century	Abacus	China	First Mechanical calculator
-	<i>Antikythera mechanism</i>		<i>First known analog computer</i>
1617	Napier's Bones	John Napier	It is used for calculation of products and quotients of numbers and the technique was also called Rabdology.
1620 – 30	Slide Rule : Slipstick in United States	Circular Slide Rule : Edmund Gunter Modern Slide Rule : William Oughtred	It is a mechanical analog computer.
1642	Arithmetic Machine / Pascal's Calculator / Pascaline	Blaise Pascal	It was a complicated set of gears that operated similarly to clock. It was designed to only perform addition.
1672 – 1694	Stepped Reckoner	Gottfried Wilhelm Leibniz	First calculator that could perform all four arithmetic operations: addition, subtraction, multiplication and division.
1801	Jacquard loom	Joseph Marie Jacquard	It used card of holes for weaving pattern. First mechanical loom. Introduced Punch cards.
1823	Difference engine	Charles Babbage	It is an automatic mechanical calculator designed to tabulate polynomial functions.
1837	Analytical Engine	Charles Babbage	First mechanical general-purpose computer
1890	Tabulating Machine	Herman Hollerith	It was developed to help process data for the 1890 U.S. Census.
1935	Z1	Konrad Zuse	First freely programmable computer
1944	MARK - 1	Howard Aiken and Grace Hopper	First electro-mechanical computer
1939	ABC : Atanasoff Berry Computer	John Atanasoff & Clifford Berry	First automatic electronic digital computer. It used the Binary Number system of 1s and 0s.
1946	ENIAC : Electronic Numerical Integrator and Computer	John Presper Eckert & John W. Mauchly	First electronic general-purpose computer
1949	EDSAC : Electronic Delay Storage Automatic Calculator	John von Neumann	First computer to store program
1949	EDVAC : Electronic Discrete Variable Automatic Computer	John Presper Eckert & John W. Mauchly	It was a binary serial computer with automatic addition, subtraction, multiplication, programmed division and automatic checking with an ultrasonic serial memory.
1951	UNIVAC : Universal Automatic Computer	John Presper Eckert & John W. Mauchly	First general-purpose computer for commercial use
1947	Transistors	John Bardeen, Walter Brattain, and William Shockley	It is a semiconductor device that could replace a vacuum tube. First used in IBM 650.
1961	ICs : Integrated Circuits	Jack Kilby and Robert Noyce	It can replaced a hundred of transistors. First used in IBM 360.
1970	Microprocessors	Marcian Hoff, Masatoshi Shima and Stanley Mazor	The Intel 4004 ("four-thousand-four") is a 4-bit central processing unit (CPU) released by Intel Corporation in 1971. It was the first microprocessor.
1964	Computer Mouse & graphical user interface (GUI)	Douglas Engelbart	This marks the evolution of the computer from a specialized machine for scientists and mathematicians to technology that is more accessible to the general public.
1970	Intel 1103 : DRAM chip	Intel company	First Dynamic Access Memory (DRAM) chip
1971	Floppy Disk	Alan Shugart & IBM team	Nicknamed the "Floppy" for its flexibility.
1973	Ethernet	Robert Metcalfe & Xerox	Its connects multiple computers and other hardware.

1974-1975	Personal Computer : <i>Scelbi, Mark-8, Altair, IBM 5100</i>	Scelbi Computer Consulting Company, Jonathan Titus, Micro Instrumentation and Telemetry Systems (MITS), IBM (respectively)	The first consumer computers. The IBM 5100 becomes the first commercially available portable computer.
1976-1977	Apple I, II	Steve Jobs and Steve Wozniak	Apple I, the first computer with a single-circuit board. Apple II offers color graphics and incorporates an audio cassette drive for storage.
1981	MS-DOS Computer Operating System	Bill Gates and Paul Allen	It introduces a whole new language to the general public. Typing "C:" and various cryptic commands gradually becomes part of daily work. People discover the backslash (\) key.
1981	Acorn	IBM	First IBM personal computer
1983-1984	Lisa, Apple Macintosh	Apple Inc.	First personal computer with a Graphical User Interface (GUI)
1985	Microsoft Windows	Microsoft Corporation	Microsoft ships Windows 1.0. Now, rather than typing MS-DOS commands, you just move a mouse to point and click your way through screens, or "windows." Bill Gates says, "It is unique software designed for the serious PC user."
1990	HyperText Markup Language (HTML) and World Wide Web (WWW)	Tim Berners-Lee and Robert Cailliau	WWW is an information system of interlinked hypertext documents that are accessed via the Internet. It has also commonly become known simply as the Web.
2003	AMD's Athlon 64	Advanced Micro Devices, Inc.	First 64-bit processor
2004	Mozilla's Firefox 1.0	Mozilla Foundation and contributors Mozilla Corporation	It challenges Microsoft's Internet Explorer, the dominant web browsers.
2006	MacBook Pro	Apple Inc.	First Intel-based, dual-core mobile computer
2007	iPhone	Apple Inc.	Original Smartphone era begins from here.
2008	Android	Andy Rubin, Rich Miner, Nick Sears and Google	T-Mobile G1 is the First-ever Android device; had quirky design elements like the swing-out keyboard and the "chin".
2010	iPad	Apple Inc.	Apple releases the original iPad.
2011	3D transistors	Intel Corporation	Intel announces the commercialisation of 3D transistors
2012	Ultrabook	Intel Corporation	It is a specification and trademarked brand by Intel for a class of high-end subnotebooks which are designed to feature reduced bulk without compromising battery life.
2014	Intel® Core™ i7-5960X	Intel Corporation	Intel unveiled its first eight-core desktop processor.
2015	Ubuntu operating system	Canonical Ltd., Ubuntu community contributors, The Carrier Advisory Group	The BQ Aquaris E4.5 Ubuntu Edition becomes the first phone running the Ubuntu operating system to be released February 11, 2015.
2016	Smart Mobile Theater system, Royole-X	Royole Corporation	Royole-X is the world's first foldable smart mobile theatre device. The system has noise-canceling headphones and a viewing system that is vision correctable.
2016	Oculus Rift	Oculus VR, LLC	The Oculus Rift is a virtual reality head-mounted display. Software, most notably video games, must be custom programmed to use the Rift.

## GENERATIONS OF COMPUTER

Generation	Key technologies	Speed	Storage Device	Operating System	Language	Example
First (1940-1956)	Vacuum Tubes	10 <sup>-3</sup> Second (Milli Second)	Magnetic Drum	Batch Processing System	Machine Language	UNIVAC, ENIAC, ABC
Second (1956-1963)	Transistors	10 <sup>-6</sup> Second (Micro Second)	Magnetic Core	Time Sharing, Multitasking	Assembly language	IBM 700, IBM 650, 1401, ATLAS, ICL 1901
Third (1964-1971)	Integrated Circuits (ICs)	10 <sup>-9</sup> Second (Nano Second)	Main Storage Memory	Real Time	High Level Language (FORTRAN, COBOL, BASIC)	IBM/360/370, NCR 395, Burroughs-B6500
Fourth (1971-Present)	Large Scale Integrated (LSI) Circuit, Very Large Scale Integrated (VLSI) Circuit, Microprocessors	10 <sup>-12</sup> Second (Pico Second)	Semiconductor Memory Chips	Time Sharing, Real Time, Networks, Graphical User Interface (GUI)	High Level Language (Oracle, SQL, INGRESS)	Altair 8800, Apple computer, IBM-PC, Microsoft PC
Fifth (Present & Beyond)	Ultra Large Scale Integrated (ULSI) Circuit	-	-	-	-	Artificial Intelligence Robotics

## TYPES OF COMPUTER

BASED ON ELECTRONIC SIGNAL		
Type	Defination	Examples
Analog	It is a form of computer that uses the continuously changeable aspects of physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved.	Deltar, Kerrison Predictor, Nomogram, Mechanical computer, Scanimate, etc.
Digital	It Performs calculations and logical operations with quantities represented as binary digits (0 and 1)	Desktop Computer, Main frame Computer, etc.
Hybrid	These computers exhibit features of analog computers and digital computers.	ECG, monitors, HRS-100
BASED ON CONFIGURATION AND SIZE		
Super	It is focused on performing tasks involving intense numerical calculations such as weather forecasting, fluid dynamics, nuclear simulations, theoretical astrophysics, and complex scientific computations	PARAM 8000, Cray-1, PARAM Yuva, EKA, SAGA-220, IBM Roadrunner, Cray Jaguar, Tianhe-1A, Fujitsu K computer, IBM Sequoia
Mainframe	These are powerful computers used primarily by corporate and governmental organizations for critical applications, bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and transaction processing.	IBM 360/370, IBM zSeries, System z9 and System z10, Unisys Dorado, Unisys Libra
Mini	These are lower to mainframe computers in terms of speed and storage capacity.	Control Data's CDC 160A and CDC 1700, HP 3000 series, HP 2100 series, IBM midrange computers,
Micro	It is a small, relatively inexpensive computer with a microprocessor as its central processing unit (CPU). It includes a microprocessor, memory, and input/output (I/O) facilities.	Desktop Computer, Laptop, Notebook, Tablet computer, Smartphone, Palmtop, Handheld Computer / PDA (Personal Digital Assistant)
BASED ON FUNCTION		
Server	It is a device that provides functionality for other programs or devices, called "clients".	File server, Print Server, Database server
Workstations	It is a special computer designed for technical or scientific applications.	PDP-8, Lisp machines, Xerox PARC, Xerox Star, etc.
Information appliances	These are specially designed to perform a specific user-friendly function —such as playing music, photography, or editing text.	Smartphones, PDAs, etc.
Embedded	It is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints.	ATMs, thermostats, videogame consoles, PDAs, Etc.

### Supercomputers of India

Site	Name
Indian Institute of Science	SahasraT (SERC - Cray XC40)
Indian Institute of Tropical Meteorology	Aaditya (iDataPlex DX360M4)
Tata Institute of Fundamental Research	TIFR - Cray XC30
Indian Institute of Technology Delhi	HP Apollo 6000 XI230/250
Centre for Development of Advanced Computing	PARAM Yuva - II
Indian Institute of Technology Kanpur	Cluster Platform SL230s Gen8
CSIR Centre for Mathematical Modelling and Computer Simulation	Cluster Platform 3000 BL460c Gen8
National Centre for Medium Range Weather Forecasting	iDataPlex DX360M4
IT Services Provider	Cluster Platform SL250s Gen8
Network Company	Cluster Platform 3000 BL460c Gen8
IT Services Provider	Cluster Platform SL210T

### Top 10 Super Computer of World as on 2015

Rank	System	Site and (Manufactured Company)	Country	Year
1	Sunway TaihuLight	National Supercomputing Center in Wuxi	China	2016
2	Tianhe-2	National Supercomputing Center in Guangzhou (NUDT)	China	2013
3	Titan	Oak Ridge National Laboratory (Cray Inc.)	USA	2012
4	Sequoia	Lawrence Livermore National Laboratory (IBM)	USA	2013
5	K computer	RIKEN (Fujitsu)	Japan	2011
6	Mira	Argonne National Laboratory (IBM)	USA	2013
7	Trinity	DOE/NNSA/LANL/SNL (Cray Inc.)	USA	2015
8	Piz Daint	Swiss National Supercomputing Centre (Cray Inc.)	Switzerland	2013
9	Hazel Hen	HLRS (Cray Inc.)	Germany	2015
10	Shaheen II	King Abdullah University of Science and Technology (Cray Inc.)	Saudi Arabia	2015

• In this Table 'Year' is the year of installation/last major update  
 • All the above Super computers have Linux Operating System.

## COMPONENTS OF COMPUTER

- **Monitor** - A monitor displays information in visual form, using text and graphics.
- **Keyboard** - A keyboard is used mainly for typing text into your computer.
- **Mouse** - A mouse is a small device used to point to and select items on your computer screen.
- **System Unit** - A system unit is the enclosure that contains the main components of a computer.
- **RAM (Random Access Memory)** is known as Primary Storage/Memory. It is a form of computer data storage. Types : **DRAM** (Dynamic RAM) - (e.g., DDR SDRAM), **SRAM** (Static RAM)
- **ROM (Read only memory)** is a class of storage medium used in computers and other electronic devices. ROM chips contain data, instructions or information that is recorded permanently. It contains the basic input/output system. Types : **PROM** - Programmable ROM, **EPROM** - Erasable programmable ROM, **EEPROM** - Electrically erasable programmable ROM.
- **Hard Disk Drive (HDD)**, hard disk, hard drive or fixed disk is a data storage device used for storing and retrieving digital information using one or more rigid ("hard") rapidly rotating disks (platters) coated with magnetic material. Types : External HDD and Internal HDD.

### System Unit - Components

- **Motherboard** also referred to as system-board or main-board, is the primary circuit board within a personal computer.
- **Central Processing Unit (CPU)** is that part of a computer which executes software program instructions. It is known as the Brain of the Computer. All the computations are really performed by it.

*Other parts of Computer are Floppy disk drive, CD and DVD ROM drive, SMPS - Switched-mode Power supply*

**INPUT DEVICES** used to provide data and instructions to the computer. An input device is any hardware device that sends data to the computer. *e.g.* Keyboard, Mouse, Trackball, Joystick, Light Pen, Touch pad, Touch Screen, Scanner, Optical Character Recognition (OCR), Optical Mark Reader (OMR), Bar Code Reader, Magnetic-ink Character Recognition (MICR), Microphone, Webcam

**OUTPUT DEVICES** are capable of representing information on a computer. These devices receive information from the CPU and present it to the user in the desired form. *e.g.* Monitor, Printer, Plotter, Screen Image Projector, Sound card & Computer Speakers

### Hardware

It is a device, such as a hard drive, that is physically connected to the computer or something that can be physically touched. *e.g.* All Computer Components are hardware such as CD-ROM, computer display monitor, printer, and video card, etc.

### Software

It is collection of computer programs, procedures, and documentation that perform some task on a computer system.

#### Types of Software

**Application software (application or app)**, is designed to help the user to perform specific tasks. *e.g.* Internet Explorer, Google Chrome, Tally, Microsoft Office, Media Player, etc.

**Programming software** includes tools in the form of programs or applications that software developers use to create, debug, maintain, or otherwise support other programs and applications. *e.g.* Java, Lisp, Pascal, Object Pascal, Ada, BASIC, C, C++, C#, COBOL, FORTRAN, etc.

**System software** is designed to operate the computer hardware to provide basic functionality and to provide a platform for running application software. *e.g.* Windows 7, Audio driver, Anti-virus, Win RAR, VGA, LAN Driver, etc.

## PROGRAMMING LANGUAGE

*A programming language such as C, FORTRAN, or Pascal that enables a programmer to write programs that are more or less independent of a particular type of computer.*

*Types of Programming Language are **Low Level Languages** and **High Level Languages***

### Low Level Languages

It provides little or no abstraction from a computer's instruction set architecture. There are two types of low level languages: **Machine Language** (Machine Code) and **Assembly Language**.

**Machine Language** referred to as machine code or object code, is a collection of binary digits or bits that the computer reads and interprets.

**Assembly Language** uses structured commands as substitution of numbers, allowing humans to read and interprets.

### High Level Languages

It is a programming language with strong abstraction from the details of the computer. In the 1960s, high-level programming languages using a compiler were commonly called **autocodes**. *e.g.* BASIC (Beginners All Purpose Symbolic Instruction Code), FORTRAN (Formula Translation), PL/I (Programming Language, Version 1), ALGOL (Algorithmic Language), COBOL (Common Business Oriented Language), RPG (Report Program Generator), C, C++, Java, etc.

### Programming languages used in most popular websites

Websites	Front-end (Client-side)	Back-end (Server-side)	Database
Google.com	JavaScript	C, C++, Go, Java, Python	BigTable, MariaDB
YouTube.com	Flash,HTML5, JavaScript	C/C++, Python, Java, Go	MySQL, BigTable
Facebook.com	JavaScript	Hack, PHP, C++, Java, Python, Erlang, D, Xhp	MySQL, HBase
Yahoo	JavaScript	JavaScript, PHP	MySQL, PostgreSQL
Amazon.com	JavaScript	Java, C++, Perl	
Wikipedia.org	JavaScript	PHP	MySQL, MariaDB
Twitter.com	JavaScript	C++, Java, Scala, Ruby on Rails	MySQL
Bing	JavaScript	ASP.NET	Microsoft SQL Server
eBay.com	JavaScript	Java, JavaScript	Oracle Database
MSN.com	JavaScript	ASP.NET	Microsoft SQL Server
Linkedin.com	JavaScript	Java, JavaScript, Scala	Voldemort

## COMPUTER NETWORK

A computer network is a set of connected computers. Computers on a network are called nodes. The connection between computers can be done via cabling, most commonly the Ethernet cable, or wirelessly through radio waves.

The Internet itself can be considered as a computer network.

### Types of Networks

The three basic types of networks include: LAN, MAN and WAN.

#### Local Area Network (LAN)

A network is said to be Local Area Network (LAN) if it is confined relatively to a small area. It is generally limited to a building or a geographical area, expanding not more than a mile apart to other computers.

#### Metropolitan Area Network (MAN)

Metropolitan Area Network (MAN) covers larger geographic areas, such as cities. Often used by local libraries and government agencies often to connect to citizens and private industries.

#### Wide Area Network (WAN)

Wide Area Networks (WANs) connect larger geographic areas, such as London, the UK, or the world. In this type of network dedicated transoceanic cabling or satellite uplinks may be used.

### Network Topology

The layout pattern of the interconnections between computers in a network is called network topology. There are a number of different types of network topologies, including point-to-point, bus, star, ring, mesh, tree and hybrid.

- **Point-to-point topology** consists of a direct link between two computers.
- **Bus topology** uses one main cable to which all nodes are directly connected. The main cable acts as a backbone for the network. One of the computers in the network typically acts as the computer server.
- **Star topology**, each computer is connected to a central hub using a point-to-point connection.
- **Ring topology**, the computers in the network are connected in a circular fashion, and the data travels in one direction.
- **Mesh topology**, every node has a direct point-to-point connection to every other node.
- **Tree topology** combines multiple star topologies on to a bus.
- **Hybrid topology** is an integration of two or more different topologies to form a resultant topology.

## Generations of Wireless Network

0G	It is known as Mobile radio telephone, are the systems that preceded modern cellular mobile telephony technology.
1G	The first generation of wireless telephone technology (mobile telecommunications). These are the analog telecommunications standards that were introduced in the 1980s.
2G	The second generation 2G cellular telecom networks were commercially launched on the GSM standard in 1991. 2.5G added data (GPRS) and 2.75G faster data (EDGE)
3G	It is based on a set of standards used for mobile devices and mobile telecommunications use services and networks that comply with the International Mobile Telecommunications-2000 (IMT-2000) specifications by the International Telecommunication Union. 3.5G faster data, added packet data onto CS architecture (HSPA)
4G	It provides, in addition to the usual voice and other services of 3G, mobile broadband Internet access, for example to laptops with wireless modems, to smartphones, and to other mobile devices. 4.5G is a grouping of disparate mobile telephony and data technologies designed to provide better performance than 4G systems, as an interim step towards deployment of full 5G capability.
5G	It denotes the next major phase of mobile telecommunications standards beyond the current 4G/IMT-Advanced standards.

## INTERNET

*It is the Biggest Network of computer networks on Earth.*

*It is the global system of interconnected mainframe, personal, and wireless computer networks that use the Internet protocol suite (TCP/IP) to link billions of devices worldwide.*

*Vinton Gray is recognized as one of "the fathers of the Internet", sharing this title with TCP/IP co-inventor **Bob Kahn** and packet switching inventors **Paul Baran** and **Donald Davies**.*

### Internet Connection Types

- **Dial-up connection** uses telephone line to connect PC to the internet. It requires a modem to setup dial-up connection.
- **ISDN** is acronym of Integrated Services Digital Network. It establishes the connection using the phone lines which carry digital signals instead of analog signals.
- **DSL** is acronym of Digital Subscriber Line. It is a form of broadband connection as it provides connection over ordinary telephone lines.
- **Cable Internet** connection is provided through Cable lines. It uses coaxial cable which is capable of transferring data at much higher speed than common telephone line.
- **Satellite Internet** connection offers high speed connection to the internet. There are two types of satellite internet connection: one way connection or two way connection.

- **Wireless Internet** Connection makes use of radio frequency bands to connect to the internet and offers a very high speed.

### Internet related Terms

- **Bandwidth** is the capacity of an electronic line, such as a communications network or computer channel, to transmit bits per second (bps).
- **Blog** is information that is instantly published to a Web site.
- **Bookmark** is a way of storing your favorite sites on the Internet.
- **Cookie** is the information created by a Web server and stored on a user's computer.
- **Domain Name** is the part of a network address which identifies it as belonging to a particular domain.
- **Domain Name Server (DNS)** converts between a machine name and a numerical IP Internet address.



- **Download** is to copy data from a remote computer/internet to a local computer
- **E-Mail** Electronic mail; a means of exchanging messages, which may include enclosed files and graphics, depending on the sophistication of the system.
- **File Transfer Protocol**; a mechanism for transferring files across a network
- **Firewall** is a combination of software and hardware that limits access to a WWW site and provides a degree of security.
- **HTML : Hypertext Markup Language** is the programmatic language that web pages are based on.
- **http** is a technical acronym that means 'hypertext transfer protocol', the language of web pages.
- **https** is 'hypertext transfer protocol secured'.
- **IP Address** is the number or name of the computer from which you send and receive information on the Internet.
- **Router** is a hardware connecting two networks that use the same protocols, allowing transfer of data between them
- **Telnet** is a program that allows users to login to other computers on the Internet via TCP/IP
- **Upload** is to send data from a local computer to a remote computer/internet
- **URL** or Uniform Resource Locator, are the web browser addresses of internet pages and files.
- **Web browser** is a free software package that lets you view web pages, graphics, and most online content.
- **WWW** or **World Wide Web** or '**Web**' for short, is the most popular portion of the Internet.
- **XML** is eXtensible Markup Language, a cousin to HTML.

## COMPUTER SECURITY

- *It refers to techniques for ensuring that data stored in a computer cannot be read or compromised by any individuals without authorization.*
- *Most computer security measures involve **data encryption** and **passwords**.*
- ***Data encryption** is the translation of data into a form that is unintelligible without a deciphering mechanism.*
- *A **password** is a secret word or phrase that gives a user access to a particular program or system.*

### Computer Virus

A computer virus is a malware program that, when executed, replicates by inserting copies of itself (possibly modified) into other computer programs, data files, or the boot sector of the hard drive; when this replication succeeds, the affected areas are then said to be "infected".

### Computer Anti-Virus

It is a software that designed to detect and destroy computer viruses. *e.g.* Kaspersky, McAfee, Norton and AVG, etc.

### MAJOR WORST COMPUTER VIRUS

Year	Computer Virus Name	Description
1971	Creeper	This is noted as possibly the first ever computer virus. It infected computers on ARPANET.
1982	Elk Cloner	Despite Apple's marketing that their systems are less prone to viruses that was not always the case. Notable as possible the first personal computer virus, Elk Cloner infected the boot sector of Apple II floppies.
1988	The Morris Internet Worm	The grandfather of computer worms, the Morris worm infected Unix systems and was notable for its "accidental" virulence.
1999	Melissa	The Melissa virus is notable because it is a Word macro virus. It cleverly spread via e-mails sent to contacts from the infected users' address books.
2000	ILOVEYOU	One of the most widespread and rapidly spreading viruses ever, the ILOVEYOU virus spread via e-mail, posing as an executable attachment sent by a friend from the target's contact list.
2001	Code Red	Code Red was a computer worm observed on the Internet on July 13, 2001. It attacked computers running Microsoft's IIS web server.
2001	Nimda	Nimda is a computer worm, also a file infector. It quickly spread, surpassing the economic damage caused by previous outbreaks such as Code Red. Nimda utilized several types of propagation technique and this caused it to become the Internet's most widespread virus/worm within 22 minutes.
2003	SQL Slammer	This tiny virus infected servers running Microsoft's SQL Server Desktop Engine, and was very fast to spread.
2003	Blaster	Blaster exploited a Windows operating system vulnerability and let users know of its presence with a system shutdown warning.
2004	Sasser	Sasser exploited a buffer overflow and spread by connecting to port 445 on networked Windows systems. The chaos caused was possibly the worst ever, as systems restarted or crashed.

### NOTABLE FOUNDERS RELATED COMPUTER AND INTERNET

Technical Products or Company related CS and IT	Founder
Adobe Systems	Charles Geschke and John Warnock
Amazon.com	Jeff Bezos
Apple Inc.	Steve Jobs, Steve Wozniak and Ronald Wayne
eBay Inc.	Pierre Omidyar
Email	Shiva Ayyadurai
Facebook	Mark Zuckerberg
Flipkart	Rahul Borchate and Binny Bansal
Google	Larry Page and Sergey Brin
HCL	Arjun Malhotra and Shiv Nadar
Hewlett-Packard (HP)	Bill Hewlett, Dave Packard
IBM	Thomas J. Watson, Charles Ranlett Flint
Infosys	Narayan Murthy, Nandan Nilekani, Raghavan, S. Gopalakrishnan and S.D. Shibulal
Intel	Gordon Moore and Robert Noyce
Lenovo	Liu Chuanzhi
LG Electronics	In-Hwoi Koo
Micromax	Rahul Sharma, Vikas Jain, Sumeet Arora and Rajesh Agarwal
Microsoft	Bill Gates, Paul Allen
Nokia	Fredrik Idestam and Leo Mechelin
Oracle Corporation	Larry Ellison, Bob Miner, Ed Oates
Samsung	Lee Byung-chul
SAP SE	Dietmar Hopp, Hans-Werner Hector, Hasso Plattner, Klaus Tschira and Claus Wellenreuther
Snapdeal	Kunal Bahl & Rohit Bansal
Sony	Akio Morita and Masaru Ibuka
Symantec	Gary Hendrix
Tata Consultancy Services	J.R.D Tata
Tech Mahindra	Anand Mahindra
Twitter	Biz Stone, Evan Williams, Jack Dorsey
Wikipedia	Jimmy Wales and Larry Sanger
Wipro	M.H. Premji
World Wide Web	Tim Berners-Lee
Yahoo	Jerry Yang and David Filo
YouTube	Chad Hurley, Steve Chen and Jawed Karim

## Abbreviations

1GL	First-Generation Programming Language	DTP	Desktop Publishing
2GL	Second-Generation Programming Language	DVD	Digital Versatile Disc
3GL	Third-Generation Programming Language	EDSAC	Electronic Delay Storage Automatic Calculator
4GL	Fourth-Generation Programming Language	EDVAC	Electronic Discrete Variable Automatic Computer
5GL	Fifth-Generation Programming Language	EXE	EXEcutable
ABC	Atanasoft Berry Computer	EXT	EXTended file system
AC	Alternating Current	FLOPS	FLoating-Point Operations Per Second
AI	Artificial Intelligence	FTP	File Transfer Protocol
ALGOL	Algorithmic Language	FXP	File eXchange Protocol
ALU	Arithmetic and Logical Unit	Gb	Gigabit
ANSI	American National Standards Institute	GB	Gigabyte
ARPANET		HDD	Hard Disk Drive
	Advanced Research Projects Agency Network	HCL	Hardware Compatibility List
ASCII	American Standard Code for Information Interchange	HP	Hewlett-Packard
ATM	Asynchronous Transfer Mode	HTML	Hypertext Markup Language
BASIC	Beginner's All-Purpose Symbolic Instruction Code	HTTP	Hypertext Transfer Protocol
BINAC	Binary Automatic Computer	IBM	International Business Machines
BIOS	Basic Input Output System	IC	Integrated Circuit
CAD	Computer-Aided Design	IM	Instant Messaging
CAT	Computer-Aided Translation	I/O	Input/Output
CD	Compact Disc	IP	Internet Protocol
CDMA	Code Division Multiple Access	IS	Information Systems
CLR	Common Language Runtime	ISDN	Integrated Services Digital Network
COBOL	Common Business-Oriented Language	IT	Information Technology
CPU	Central Processing Unit	Kb	Kilobit
CRT	Cathode Ray Tube	KB	Kilobyte
CU	Central Unit	LAN	Local Area Network
DARPA	Defense Advanced Research Projects Agency	LCD	Liquid Crystal Display
DAT	Digital Audio Tape	MAC	Mandatory Access Control
DBMS	Database Management System	MAN	Metropolitan Area Network
DDR	Double Data Rate	Mb	Megabit
DLL	Dynamic Link Library	MB	Megabyte
DNS	Domain Name System	NAS	Network-Attached Storage
DOS	Disk Operating System	OLE	Object Linking and Embedding
		OLED	Organic Light Emitting Diode

OS	Operating System	VPN	Virtual Private Network
P2P	Peer-To-Peer	WAN	Wide Area Network
PAN	Personal Area Network	WAP	Wireless Application Protocol
PC	Personal Computer	Wi-Fi	Wireless Fidelity
PNG	Portable Network Graphics	WLAN	Wireless Local Area Network
QA	Quality Assurance	WWW	World Wide Web
RAM	Random Access Memory	WYSIWYG	What You See Is What You Get
RGB	Red, Green, Blue	XAML	eXtensible Application Markup Language
ROM	Read Only Memory	XMS	Extended Memory Specification
SDK	Software Development Kit	XP	Extreme Programming
TB	TeraByte	XSS	Cross-Site Scripting
TRON	The Real-time Operating system Nucleus	ZIFS	Zero Insertion Force Socket
UAC	User Account Control	ZOI	Zero One Infinity
VGA	Video Graphics Array		

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# GENERAL AWARENESS

## GENERAL AWARENESS

### FIRST IN WORLD (MALE)

- First man to climb Mt. Everest : Sherpa Tenzing Norgay (Nepal) and Sir Edmund Hillary (New Zealand) (May 29, 1953)
- First man to climb Mt Everest twice : Nawang Gombu (Nepal) (1963 and 1965)
- First blind Man to Scale Mt. Everest : Eric Weihenmayer (United States) (May 25, 2001)
- Most number of times to reach the summit : Apa Sherpa (Nepal)
- Fastest ascent from Everest Base Camp (man) : Pem Dorjee (Nepal) (8 hours and 10 minutes)
- Eldest man to climb Mt. Everest : Yuichiro Miura (at the age of 80 years) (May 23, 2013)
- Youngest person to climb Mount Everest : Jordan Romero (United States) (May 22, 2010)
- First male swimmer crossing of the english channel (England to France) : Matthew Webb (United Kingdom, 1875)
- First deaf and dumb to cross the strait of Gibraltar : Taranath Shenoy (India)
- First man to reach North Pole : Robert Edwin Peary (United States) (Apr 6, 1909)
- First man to reach South Pole : Roland Amundsen (Norway) (Dec 14, 1911)
- First person to sail around the World : Ferdinand Magellan (Portuguese)
- First European Invader of Indian Soil : Alexander, The Great
- First European to Attack India : Alexander, The Great
- First European to Reach China : Marco Polo
- First man to set foot on the Moon : Neil Armstrong (United States) (July 20, 1969, Apollo 11)
- First man to go into space : Major Yuri Gagarin (Russia)
- First human to conduct a space walk : Alexey Leonov (Russia)
- First Space Tourist : Dennis Tito (United States) (8 days - Apr 28 – May 6, 2001)
- First man to fly an Aeroplane : Wright Brothers (Orville and Wilbur Wright)
- First man to draw the map of Earth : Anaximander
- First President of United State of America : George Washington
- First President of the Republic of China : Dr Sun-Yat-Sen
- First Secretary General of United Nations : Trygve Lie
- First Prime minister of Great Britain : Robert Walpole
- First UN Deputy Secretary General : Louise Frechette
- First Governer General of Pakistan : Mohammed Ali Jinnah
- First Ethnic-Indian Prime Minister of Fiji : Mahendra Choudary
- First man to win Nobel Prize for Literature : Sully Prudhomme (France) (1901)
- First man to win Nobel Prize for Peace : Henry Dunant (Switzerland), Frederic Passy (France) (1901)
- First man to win Nobel Prize for Physics : Wilhelm Conrad Rontgen (Germany) (1901)
- First man to win Nobel Prize for Chemistry : Jacobus Henricus van 't Hoff (Holland) (1901)
- First man to win Nobel Prize for Medicine : Emil Adolf von Behring (Germany) (1901)
- First man to win Nobel Prize for Economics : Ragnar Frisch (Norway) and Jan Tinbergen (Holland) (1969)
- First Asian to head the International Cricket Council : Jagmohan Dalmiya
- First Asian to win Wimbledon Trophy : Arthur Ashe (United States)
- First Residents of International Space Stations : Bill Shepherd (USA), Yuri Gidzanko and Sergie Krikalev (Russia)
- First man to compile Encyclopedia : Aspheosis (Athens)

### FIRST IN WORLD (FEMALE)

- First woman to climb Mt Everest : Junko Tabei (Japan) (May 16, 1975)
- First woman to climb Mt Everest twice : Santosh Yadav (India) (1992 and 1993)
- First oldest Woman to climb Mt. Everest : Tamae Watanabe (Japan)
- Fastest ascent from Everest Base Camp (woman) : Sherpa Lakpa Gelu (Nepal) (10 hours 56 minutes)
- First female swimmer crossing of the english channel (England to France) : Gertrude Ederle (United States, 1926)
- First woman to cross seven important seas of the world by swimming : Bula Chaudhury (India)
- First woman in the World to cross the Strait of Gibraltar : Arti Pradhan (India)
- First woman to reach the North pole : Ms Fran Phipps (1971)
- First woman to reach Antarctica : Caroline Mikkelsen (1935)
- First woman Cosmonaut in Space : Valentina Tereshkova (Russia) (1969)
- First woman to walk in space : Svetlana Savitskaya (Russia) (1984)
- First woman Space Tourist : Mrs Anousheh Ansari (Irani American) (2006)
- First woman to Pilot an Aircraft : Therese Peltier (France) (1908)

- First woman in the World to Receive Pilot License : Raymonde de Laroche (France) (1910)
- First woman President of UN General Assembly : Smt Vijaya Lakshmi Pandit (1953)
- First woman President of a Country : Maria Estela Peron (Argentina)
- First woman Prime Minister of England : Margaret Thatcher
- First woman Prime Minister of any Muslim Country : Benazir Bhutto (Pakistan)
- First woman Prime Minister of a Country : S Bhandarnayake (Sri Lanka)
- First woman to win Nobel Prize for Literature : Selma Lagerlof (Sweden) (1909)
- First woman to win Nobel Prize for Peace : Bertha von Suttner (Austria–Hungary) (1905)
- First woman to win Nobel Prize for Physics : Marie Curie (Poland and France) (1903)
- First woman to win Nobel Prize for Chemistry : Marie Curie (Poland and France) (1911)
- First woman to win Nobel Prize for Medicine : Gerty Theresa Cori (United States) (1947)
- First woman to win Nobel Prize for Economics : Elinor Ostrom (United States) (2009)

## FIRST IN WORLD (MISCELLANEOUS)

- First airport in the world to run completely on solar power : Cochin International Airport, India
- First nation in the world to reach Mars in its first attempt : India ;Mars Orbiter Mission (MOM), also called Mangalyaan (24 September 2014)
- First World War (World War I or Great War) : 1914 – 1918 (Between Allied Powers and Central Powers)
- First City to be attacked with Atom Bomb : Hiroshima (Japan) (August 6, 1945) "Bomb name: Little Boy"
- First Country to launch satellite into Space : Russia (Sputnik 1) (October 4, 1957)
- First Space Shuttle launched : Columbia (April 12, 1981)
- First Space Ship Landed on Mars : Viking-1 (July, 1976)
- First Country to host the Modern Olympic Games : Greece (1896)
- First Religion of the World : Sanatan Dharma
- First Country to make Education Compulsory : Prussia
- First Country to print books : China
- First country to issue paper currency : China
- First country to start Civil Services Competition : China
- First Country to make a constitution : United States
- First Test Tube Baby : Louise Joy Brown (Born: 25 July 1978)
- First University of the World : Taxila University
- First Summit of NAM was organised at : Belgrade (former Yugoslavia)
- First Lamb created using DNA from an adult sheep : Dolly
- First Heart Bypass Operation by a Robot was carried out in : Germany
- First Cloned Human Baby of World : Eve
- First handheld mobile cell phone was demonstrated by : Motorola (1973)
- First commercial automated cellular network : Nippon Telegraph and Telephone Corporation - NTT (Japan, 1979)
- First network in the world : Advanced Research Projects Agency Network (ARPANET)

## FIRST IN INDIA (MALE)

- First Indian to climb Mt. Everest : Avtar Singh Cheema (May 20, 1965)
- First Indian to climb the Mt Everest without oxygen: Phu Dorjee (1984)
- First Indian to go into space: Rakesh Sharma (April 2, 1984)
- First Person to reach the North Pole : Jagannathan Srinivasaraghavan
- First Person to reach the South Pole : Col Jatinder Kumar Bajaj (April 23, 1985)
- First Person to fly in a balloon and land in a parachute : Ram Chandra Chatterjee
- First Indian to reach Antarctica : Ramcharan
- First Indian Space Tourist : Santosh George
- First Indian Pilot : JRD Tata (1929)
- First Indian to cross English Channel : Mihir Sen (1958)
- First President of Indian Republic : Dr Rajendra Prasad (1950 – 1962)
- First Vice President of Indian Republic : Dr. Sarvepalli Radhakrishnan
- First Muslim President of India : Dr Zakir Hussain (1967–1969)
- First Indian President to die in Office: Dr Zakir Hussain, 3 May 1969
- First Temporary President of Constituent Assembly : Dr Sachchida Nand Sinha
- First Prime Minister: Jawaharlal Nehru (1947–64). India held its first constitutional elections in 1952 after which he was re-elected.
- First Deputy Prime Minister: Vallabhbhai Patel (1947–1950)
- First Prime minister of India, who resigned before the full term : Morarji Desai (1979)
- First Law Minister of India: B. R. Ambedkar
- First Chief Election Commissioner : Sukumar Sen
- First Education Minister : Maulana Abul Kalam Azad

- First Home Minister of India : Sardar Vallabhbhai Patel
- First Defence Minister of India : Baldev Singh
- First Commander-in-Chief of Free India : General Sir Roy Bucher
- First Indian Commander-in-Chief of Free India : General Kodandera Madappa Cariappa
- First Chief of Air Staff : Air Marshal Sir Thomas Elmhirst
- First Indian Chief of Staff : General Kodandera Madappa Cariappa
- First Commander-in-Chief, IAF : Air Marshal Subroto Mukerjee
- First Chief of Naval Staff : Vice Admiral R D Katari
- First Person to get Param Vir Chakra : Major Som Nath Sharma
- First Indian member of the Viceroy's Executive Council : SP Sinha
- First Indian to join the (Indian Civil Service) ICS : Satyendranath Tagore (1863)
- First Judge of International Court of Justice : Dr Nagendra Singh
- First Chief Justice of India : Harilal Jekisundas Kania (26 January 1950 - 6 November 1951)
- First Person to resign from the Central Cabinet : Shyama Prasad Mukherjee
- First Speaker of Lok Sabha : Ganesh Vasudev Mavalankar (15 May 1952 - 27 February 1956)
- First Muslim President of Indian National Congress : Badr-ur-din Tyabji
- First Governor-General of India : Warren Hastings (1773 - 85)
- First man to introduce Printing Press in India : James Hicky
- First Chinese Pilgrim to visit India : Fa-Hein
- First American President to visit India : Dwight David Eisenhower
- First Russian (Soviet) Prime Minister to visit India : Nikolai Bulganin
- First Indian to get Bharat Ratna: Dr. Sarvepalli Radhakrishnan, C. Rajagopalachari, and C. V. Raman in 1954
- First Indian to get Padma Vibhushan: Satyendra Nath Bose, Nand Lal Bose, Zakir Hussain, Balasaheb Gangadhar Kher, Jigme Dorji Wangchuk, V. K. Krishna Menon in 1954
- First Indian to get Nishan-e-Pakistan: Morarji Desai, 1990
- First Indian to win the Noble prize : Rabindranath Tagore in 1913
- First Indian to get Nobel Prize in Literature: Rabindranath Tagore in 1913. He was also the first Asian to win the prize.
- First Indian to get Nobel Prize in Physics: C. V. Raman in 1930.
- First Indian to get Nobel Prize in Medicine: Har Gobind Khorana in 1968 (US citizen of Indian origin)
- First Indian to get Nobel Prize in Economics: Amartya Sen in 1998
- First Indian to get Nobel Prize in Chemistry: Venkatraman Ramakrishnan in 2009 (USA citizen of Indian origin)
- First Indian to win Oscar for Lifetime Achievement : Satyajit Ray
- First Person to receive Jnanpith Award : G. Sankara Kurup
- First Person to receive Magsaysay Award : Acharya Vinoba Bhave
- First Person to receive Stalin Prize : Saif-ud-din Kitchew
- First Indian Mr. Universe : Manohar Aich in 1952
- First Mr. International : Aryan Vaid in 2000
- First Indian Formula One racer: Narain Karthikeyan
- First Indian Chess Grandmaster : Viswanathan Anand (1988)
- First Indian to get Grand Slam title : Mahesh Bhupathi (partnering with Japanese Rika Hiraki) in the Mixed Doubles category of the 1997 French Open.

## FIRST IN INDIA (FEMALE)

- First woman to climb Mount Everest : Bachendri Pal (23 May, 1984)
- First woman to climb Mount Everest twice : Santosh Yadav (May 1992 and May 1993)
- First woman to reach South Pole : Reena Kaushal Dharmshaktu
- First woman to go into Space : Kalpana Chawla (1997)
- First woman to swim across the English Channel: Arati Saha (1959)
- First woman President : Pratibha Patil (25 July 2007 - 25 July 2012)
- First woman President of INC : Annie Besant (1917)
- First woman Prime Minister : Mrs Indira Gandhi (1966 - 1977)
- First woman Chief Minister of an Indian State : Mrs Sucheta Kripalani (Uttar Pradesh, 1963 - 1967)
- First woman minister in Government : Rajkumari Amrit Kaur
- First woman Governor of a state in free India : Miss CB Muthamma
- First woman Chairman of Union Public Service Commission : Roze Millian Bathew
- First woman President of United Nations General Assembly : Mrs Vijaya Laxmi Pandit (1953)
- First woman Director General of Police : Kanchan C Bhattacharya
- First woman jawan in the Indian Army: Sapper Shanti Tigga
- First woman Lieutenant General : Puneeta Arora
- First woman Air Vice Marshal : P Bandopadhyaya
- First woman Chairperson of Indian Airlines : Sushma Chawla



- First woman Pilot in Indian Air Force : Harita Kaur Dayal
- First Indian woman to earn a pilot license : Sarla Thakral (1936)
- First woman Speaker of a State Assembly : Mrs Sarojini Naidu
- First woman Ambassador : Cornelia Sorabjee
- First woman Judge in Supreme Court : Mrs Fatima Beevi
- First woman Chief Justice of High Court (Himachal Pradesh) : Mrs Leela Seth (1991)
- First woman Lawyer : Anna Chandy
- First woman IPS Officer : Kiran Bedi (1972)
- First Indian woman to join the Indian Army : Priya Jhingan in 1993
- First Indian female physician (doctor) : Anandibai Gopalrao Joshi
- First Indian to get Nobel Peace Prize: Mother Teresa of Calcutta in 1979 (Indian citizen of Albanian origin)
- First woman to get Bharat Ratna : Indira Gandhi
- First woman Musician to get Bharat Ratna : MS Subbulaxmi
- First woman to get Jnanpith Award : Ashapura Devi
- First woman to win the Booker Prize : Arundhati Roy
- First Indian Women to win Magasasay Award : Kamladevi Chattopadhyay
- First woman to receive Ashoka Chakra : Nirja Bhanot
- First lady to become Miss World : Reita Faria
- First Miss Asia Pacific : Zeenat Aman in 1970
- First Miss Intercontinental Pageant Elizabeth : Anita Reddi in 1978
- First Mrs. World : Aditi Gowitrikar in 2001
- First woman Honours Graduate : Kamini Roy, 1886
- First woman Olympic Medal Winner : Karnam Malleswari (Weightlifter) (1998)
- First woman Asian Games Gold Medal Winner : Kamaljit Sandhu (1970 in 400 m race)
- First Indian woman Chess Grandmaster : Koneru Humpy (2002)
- First Indian Woman to win a Grand Slam title : Sania Mirza (partnering with Mahesh Bhupathi) in the Mixed Doubles category of the 2009 Australian Open.
- First Indian woman to be ranked no. 1 in Women's Tennis Association's double rankings : Sania Mirza in 2015
- First Indian woman to become no. 1 in World ranking in Badminton : Saina Nehwal in 2015
- First Indian woman boxer to win a gold medal in Asian Games : Mary Kom in 2015
- First Indian Test-tube Baby (World's 2nd) : 'Durga' *alias* Kanupriya Agarwal born on Oct 3, 1978 [Doctor : Subhash Mukhopadhyay]

## FIRST IN INDIAN (MISCELLANEOUS)

- First nuclear submarine : INS Arihant in 2016
- First Islamic (tomb) in India : Sultan Ghari Sultan Ghari, built in 1231 CE for Prince Nasir ud, eldest son of Iltutmish
- First true dome : Alai Darwaza, Qutb complex, Delhi, built in 1311 CE, by first Khilji Sultan of Delhi, Ala-ud-din Khilji
- First Mosque in India : Cheraman Juma Masjid Kodungallur (Kerala), built 629-630 A.D by Malik ibn Deenar
- First Post Office Opened in India : Kolkata (1727)
- First Cricket Club in India : Kolkata (1792), Calcutta cricket club
- First test match played in India : India v/s England in Eden Gardens,(Calcutta) (result draw) (5-8 Jan 1934)
- First Cricket Stadium : Eden Gardens in Kolkata
- First Test Victory : Against England At Madras
- First partition of Indian state : Bengal
- First (Metro) rail to become Zone of Indian Railways : Kolkata Metro as the (17Th Zonal Headquarter) (30-12-2010)
- First and the only Indian (Metro) rail under Indian Railways : Kolkata Metro
- First District to achieve 100% literacy rate : Ernakulam district, Kerala, 1990
- First District to be polio-free : Pathanamthitta district, Kerala
- First District to achieve tobacco free : Kottayam district, Kerala, 27 September 2008
- First District to become India's 'total electrified district' : Palakkad, Kerala, 2011

## INDIA'S FIRST STATE TO

- Achieve 100% primary education : Kerala in 2016
- Become Fully Organic State : Sikkim in 2016
- Unveil retail policy : Andhra Pradesh in 2016
- Completes 100% online electoral enrollment : Kerala in 2016
- E- auction limestone blocks : Jharkhand in 2016
- Build first Gender park : Kerala in 2016
- Becomes 'complete digital state' : Kerala in 2016
- Implement Mandatory Undergraduate Course on Gender : Telangana in 2016

## SUPERLATIVES OF THE WORLD

*Highest, Biggest, Longest, Deepest, Largest, Smallest etc.*

<b>Air Evacuation</b>	Largest – Air India (1990 airlift of Indians from Kuwait)
<b>Air force</b>	Largest – United States Air Force
<b>Aircraft</b>	Largest and widest passenger aircraft – Airbus A380 (Length overall : 72.73 m , Height : 24.45 m & Maximum take-off weight : 575,000 kg)
<b>Airport</b>	Largest – King Fahd International Airport (Area : 780 square kilometers) Highest commercial airport – Daocheng Yading Airport, China Busiest - Hartsfield–Jackson Atlanta International Airport ; USA
<b>Animal</b>	Largest (Sea) – Blue Whale Largest (Land) – African Bush Elephant Tallest (Land) – Giraffe Fastest (Short run) – Cheetah Fastest (Long run) – The Peregrine Falcon Fastest fish (Sea) – Sailfish Smallest mammal – Bumblebee Bat Most Intelligent – Chimpanzee Most Cunning – Fox
<b>Archipelago</b>	Largest – Indonesia (comprising 13,466 islands) <i>Archipelago refers to island group or island chain</i>
<b>Army</b>	People's Republic of China
<b>Aquarium</b>	Georgia Aquarium, Atlanta, Georgia, USA
<b>Basin</b>	Largest – Amazon
<b>Bay</b>	Largest – Bay of Bengal (2,172,000 square km) of South Asia (Indian Ocean)
<b>Bell</b>	Biggest – Tsar Bell or <i>Royal Bell</i> or <i>Great Bell at Moscow</i>
<b>Bird</b>	Largest (Land) – Ostrich Largest (Sea) – Albatross Smallest – Humming Bird Fastest (High speed dive - Pointed Long Wings) – Peregrine falcon Fastest (High speed wings) – Swift Wingless or Flightless – Kiwi
<b>Book</b>	Largest – Kuthodaw pagoda Smallest – Teeny Ted from Turnip Town
<b>Bridge</b>	Longest – Danyang–Kunshan Grand Bridge ( <i>Beijing–Shanghai High-Speed Railway</i> ) Length : 164.8 km
<b>Building</b>	Tallest – Burj Khalifa, Dubai, UAE (Height : 829.8 m, Floor : 163) Most voluminous : Boeing Everett Factory, Everett, Washington (Volume : 13,385,378 m <sup>3</sup> )
<b>Canal</b>	Longest – Grand Canal (Beijing-Hangzhou Grand Canal), China (Length : 1,794 km)
<b>Capital City</b>	Highest Altitude – La Paz (Bolivia) Altitude : 3640 m
<b>Church</b>	Longest – St. Peter's Basilica, Vatican city, Rome (Italy) (Length : 220 m)

<b>Cinema House</b>	Biggest – Roxy, New York (5,920 seat)
<b>City</b>	Highest <i>in the Western and Southern Hemisphere</i> – La Rinconada, Peru (Height : 5,099 m) Highest in the Eastern and Northern Hemisphere – Wenquan, China (Height : 5,019 m) Largest (in population) – Tokyo Biggest (in Area) – Mount Isa, Queens Land, Australia
<b>Continent</b>	Largest – Asia Smallest – Australia
<b>Coral Formation</b>	Largest – The Great Barrier Reef (Australia)
<b>Corridor</b>	Longest – Rameshwaram Temple's Corridor
<b>Country</b>	Largest (in area) – Russia Largest (in population) – China Smallest (in area) – Vatican City Smallest (in population) – Pitcairn Islands Highest – Nepal
<b>Dam</b>	Longest – Hirakud Dam, Odisha, India on river Mahanadi (Length Total : 25.8 Kilometers) Highest embankment dam – Rogun Dam on Rier Vakhsh, Tajikistan (Height : 335 m) Highest Concrete arch – Jinping-I Dam, China (Height : 305 m) Highest Concrete gravity–Grande Dixence Dam, Switzerland (Height : 285 m) Highest (Straight) – Bhakra Dam on river Sutlej
<b>Day</b>	Longest – 21 June (in Northern Hemisphere) Shortest – 22 December (in Southern Hemisphere)
<b>Delta</b>	Largest – Ganges–Brahmaputra Delta or <i>Sunderbans Delta</i> , India
<b>Democracy</b>	Largest – India
<b>Desert</b>	Largest (Cold Winter) – Antarctica (Area : 14,000,000 km <sup>2</sup> ) Largest (Subtropical) – Sahara, Africa (Area : 9,400,000 km <sup>2</sup> )
<b>Diamond</b>	Largest – The Cullinan, 3106.75 carat (621.35 g, 1.37 lb) Largest (Mine) – Kimberlay, South Africa
<b>Dome</b>	Biggest Stone Dome – Global Vipassana Pagoda, Mumbai, India (Diameter : 85.15 m) Biggest Steel Dome – Philippine Arena, Bocaue, Philippines (Diameter : 226.5 m)
<b>Epic</b>	Longest – The Mahabharata (100,000 shloka)
<b>Extreme Point</b>	Highest – Mount Everest (Height : 8848 m) Lowest or Deepest – Challenger Deep, at the bottom of the Mariana Trench (Depth : 10,898 to 10,916 m below sea level)
<b>Gas</b>	Lightest – Hydrogen (H) Heaviest – Tungsten Hexafluoride (WF <sub>6</sub> )
<b>Gorge</b>	Largest – Grand Canyon on the Colorado river, USA (Length : 446 km)
<b>Gulf</b>	Longest – Gulf of Mexico (Surface Area : 1,550,000 km <sup>2</sup> )
<b>Island</b>	Largest – Greenland (native name : Kalaallit Nunaat) (Area : 2,130,800 km <sup>2</sup> )

<b>Lake</b>	Largest Lake Salt Water – Caspian sea (Area : 371,000 km <sup>2</sup> ) Largest Fresh Water Lake (By Area) – Lake Superior, USA (Area : 82,100 km <sup>2</sup> ) Largest Fresh Water Lake (By Volume) – Lake Baikal, Siberia, Russia (Volume : 23,615.39 km <sup>3</sup> ) Largest Artificial Lake or reservoir (By area) – Lake Volta (Surface Area : 8,502 km <sup>2</sup> ) Largest Artificial Lake or reservoir (By Volume) – Lake Kariba (Volume : 180 km <sup>3</sup> ) Deepest – Lake Baikal, Siberia, Russia (Depth : 1,741 m) Highest – Lake Titicaca, Bolivia (Surface Elevation : 3,812 m)
<b>Library</b>	Library of Congress in Washington D.C.
<b>Melting Point</b>	Highest – Tungstan (W)
<b>Metal</b>	Lightest – Lithium Heaviest or Densest – Osmium
<b>Minar (Free standing)</b>	Tallest – Qutub Minar, Delhi (73 m)
<b>Mosque</b>	Largest by area – Imam Reza shrine, Iran (Area : 598,657 m <sup>2</sup> ) Largest by Capacity – Masjid al-Haram, Saudi Arabia (Capacity : 4,000,000 person)
<b>Mountain Peak (World)</b>	Highest – Mount Everest, Nepal (Height : 8848 m)
<b>Mountain Range</b>	Longest – Andes, South America (Length : 7,000 km) Highest – Himalayas, Asia (Height from Sea level : 8848 m)
<b>Museum</b>	Biggest – British Museum, London
<b>Ocean</b>	Deepest and Largest Ocean : Pacific Ocean (Area : 165,250,000 square km)
<b>Palace</b>	Largest – Forbidden City (Gugong) Beijing, China
<b>Park</b>	Largest – Northeast Greenland National Park, Greenland (Area : 972,000 km <sup>2</sup> )
<b>Peninsula</b>	Largest – Arabia
<b>Place</b>	Coldest – Vostok Station, Antarctica (Temperature : -89.2 °C) Hottest – Al-Aziziyah, Libya, Africa (Temperature : 57.8 °C) Driest non-polar desert : Atacama Desert
<b>Planet</b>	Largest – Jupiter Smallest - Mercury
<b>Plateau</b>	Highest and largest plateau – Tibetan Plateau, Asia
<b>Poisonous Snake</b>	Longest – King Cobra
<b>Port</b>	Largest – Port of New York and New Jersey (USA) Biggest – Rotterdam (the Netherlands)
<b>Railway line</b>	Longest – Trans-Siberian Railway (Russia) (9,289 km)
<b>Railway Platform</b>	Longest – Gorakhpur railway station, Utter Pradesh, India (1.36 km) Largest – Grand Central Terminal, New York (USA)
<b>Rainiest Spot</b>	Mawsynram, Meghalaya, India (Annual rainfall of 11,872 mm)
<b>Reptile which changes its colour</b>	Chameleon
<b>River</b>	Longest – Nile River, Africa (6,853 km) Largest (Basin) – Amazon River (6570 km) (Basin : 7,050,000 km <sup>2</sup> )

<b>Road</b>	Highest - Khardung La, India
<b>Sea (Inland)</b>	Largest – Mediterranean Sea (Surface area : 2,500,000 km <sup>2</sup> )
<b>Stadium</b>	Largest (Closed) – Strahov Stadium in Prague, Czech Republic (Capacity : 250,000) Largest (Opened) – Rungrado May Day Stadium, North Korea (Capacity : 150,000)
<b>Statue</b>	Tallest – Spring Temple Buddha, Vairocana Buddha, China (Height : 128 m)
<b>Substance</b>	Hardest – Diamond
<b>Swimming Course</b>	Longest – English Channel
<b>Temple</b>	Largest – Angkor Wat, Cambodia
<b>Tower</b>	Tallest – Tokyo Skytree, Tokyo, Japan (Height : 634 m)
<b>Train Non-stop</b>	Longest – Flying Scotsman (Edinburgh to London)
<b>Tunnel</b>	Longest – Delaware Aqueduct, New York state, United States (Length : 137 km) Longest (Railway) – Seikan Rail Tunnel, Japan (Length : 53.85 km) Longest Tunnel Road – Laerdal Tunnel, Norway (Length : 24.51 km)
<b>Volcano</b>	Largest – Mauna Loa (Hawaii) Highest – Ojos del Salado, Andes, Argentine-Chile Chile (6885 m)
<b>Wall</b>	Longest – Great Wall of China
<b>Waterfall</b>	Highest – Angel Falls, Venezuela (Height : 979 m)

## **SUPERLATIVES OF THE INDIA**

*Highest, Biggest, Longest, Deepest, Largest, Smallest etc.*

<b>Airport</b>	Highest – Kushok Bakula Rimpochee Airport, Leh, Jammu Kashmir Busiest – Indira Gandhi International Airport, Delhi
<b>Animal Fair</b>	Largest – Sonapur, Bihar
<b>Auditorium</b>	Largest – Sri Shanmukhanand Hall, Mumbai
<b>Award</b>	Highest – Bharat Ratna Highest (Gallantary) – Param Vir Chakra
<b>Bank (Public Sector)</b>	Largest - State Bank of India
<b>Battle</b>	Highest and Longest - Siachen Glacier
<b>Building</b>	Tallest - Imperial Tower 1, Mumbai (Height : 254 m)
<b>Canal</b>	Longest – Indira Gandhi Canal, Rajasthan
<b>Cantilever Bridge</b>	Largest – Howrah Bridge or Rabindra Setu, Kolkata
<b>Cave</b>	Largest – Amarnath, Jammu and Kashmir
<b>Cave Temple</b>	Largest – Kailash Temple, Ellora, Maharastra
<b>Chruch</b>	Oldest – St. Thomas Church at Palayur, Trichur, Kerala Biggest – Saint Cathedral at Old Goa
<b>City</b>	Populous – Mumbai

<b>Corridor</b>	Longest – Corridor of Ramnathswami Temple at Rameshwaram (Tamil Nadu)
<b>Dam</b>	Longest – Hirakud Dam, Odisha, on river Mahanadi (Length Total : 25.8 Kilometers) Highest - Tehri Dam on the Bhagirathi River near Tehri in Uttarakhand (Height : 260.5 m)
<b>Desert</b>	Largest – Thar (Rajasthan)
<b>Dome</b>	Largest – Gol Gumbuz (Bijapur)
<b>Gate Way</b>	Highest – Buland Darwaza, Fatehpur Sikri (Uttar Pradesh)
<b>Gurudwara</b>	Largest – Golden Temple, Amritsar
<b>Lake</b>	Highest – Cholamu lake, Sikkim Largest Saline Water Lake – Chilika Lake, Odisha (Length : 64.3 km) Largest Freshwater Lake – Wular Lake, Jammu and Kashmir
<b>Mosque</b>	Largest – Jama Masjid, Delhi
<b>National Highway</b>	Longest – NH 7 (Varanasi to Kanyakumari)
<b>Peak</b>	Highest – Godwin Austin, K2 (Height : 8611 m)
<b>Road</b>	Longest – Grand Trunk Road (Kolkata to Delhi) Highest – Road at Khardungla (in Leh - Manali Sector)
<b>Railway Platform</b>	Longest – Gorakhpur railway station, Uttar Pradesh, India (1.35 km)
<b>River</b>	Longest – The Ganges or Ganga (Length : 2,525 km)
<b>River Bridge</b>	Longest – Mahatma Gandhi Setu, Bihar (Length : 5.8 km)
<b>River Islands</b>	Biggest – Majuli island in the Brahmaputra River, Assam
<b>River Valley</b>	Deepest – Bhagirathi and Alaknanda
<b>River of Southern India</b>	Longest – Godavari
<b>River without Delta</b>	Longest – Narmada and Tapi
<b>Sea Beach</b>	Longest – Marina Beach, Chennai (Length : 13 km)
<b>Stadium</b>	Biggest – Salt Lake Stadium or Juba Bharati Krirangan, Kolkata
<b>State</b>	Largest by area : Rajasthan (Area : 342,239 km <sup>2</sup> ) Largest by area : Uttar Pradesh
<b>State with Longest Coastline</b>	Gujrat
<b>State with maximum Forest Area</b>	Madhya Pradesh
<b>Temple</b>	Largest – Sri Ranganathaswamy Temple, Srirangam, Tamil Nadu
<b>Train Route</b>	Longest Passenger – Dibrugarh to Kanyakumari (4286 km)
<b>Tunnel</b>	Longest – Pir Panjal Railway Tunnel or Banihal railway tunnel, Jammu & Kashmir (Length : 11.2 km)
<b>TV Tower</b>	Tallest – Rameswaram TV Tower, Tamil nadu (Height : 323 m)
<b>Village</b>	Largest – Gahmar, Uttar Pradesh
<b>Waterfall</b>	Highest – Kunchikal Falls, Karnataka (Total height : 455 m)
<b>Zoo</b>	Largest – Arignar Anna Zoological Park, Tamil Nadu

## WORLD COUNTRIES, CAPITAL & CURRENCY

Country	Capital	Currency	Country	Capital	Currency
Afghanistan	Kabul	Afghani	Libya	Tripoli	Libyan Dinar
Albania	Tirana	Lek	Madagascar	Antananarivo	Ariary
Algeria	Algiers	Dinar	Malaysia	Kuala Lumpur	Ringgit
Angola	Luanda	New Kwanza	Maldives	Male	Rufiyaa
Argentina	Buenos Aires	Peso	Mexico	Mexico City	Mexican Peso
Australia	Canberra	Australian Dollar	Monaco	Monaco Ville	Euro
Austria	Vienna	Euro	Mongolia	Ulaanbaatar	Tugrik
Bangladesh	Dhaka	Taka	Myanmar	Rangoon	Kyat
Belgium	Brussels	Euro	Namibia	Windhoek	Namibian Dollar
Bhutan	Thimphu	Ngultrum	Nepal	Kathmandu	Napalese Rupee
Brazil	Brasilia	Real	Netherlands	Amsterdam	Euro
Cambodia	Phnom Penh	Riel	New Zealand	Wellington	New Zealand Dollar
Canada	Ottawa	Canadian Dollar	Nigeria	Abuja	Naira
Chile	Santiago	Chilean Peso	Norway	Oslo	Norwegian Krone
China	Beijing	Yuan/Renminbi	Oman	Muscat	Omani Rial
Colombia	Bogota	Colombian Peso	Pakistan	Islamabad	Pakistan Rupee
Denmark	Copenhagen	Krone	Peru	Lima	Nuevo sol
East Timor	Dili	US Dollar	Philippines	Manila	Peso
Egypt	Cairo	Egyptian Pound	Poland	Warsaw	Zloty
Ethiopia	Addis Ababa	Birr	Portugal	Lisbon	Euro
Fiji	Suva (Viti Levu)	Birr	Qatar	Doha	Qatari Riyal
Finland	Helsinki	Euro	Russia	Moscow	Ruble
France	Paris	Euro	Saudi Arabia	Riyadh	Riyal
Georgia	T'bilisi	Lari	Singapore	Singapore	Singapore Dollar
Germany	Berlin	Euro	Somalia	Mogadishu	Somali Shilling
Greece	Athens	Euro	South Africa	Pretoria	Rand
Hungary	Budapest	Forint	Spain	Madrid	Euro
Iceland	Reykjavik	Icelandic Krona	Sri Lanka	Colombo	Sri Lanka Rupee
India	New Delhi	Indian Rupee	Sudan	Khartoum	Dinar
Indonesia	Jakarta	Rupiah	Switzerland	Bern	Swiss Franc
Iran	Tehran	Rial	Syria	Damascus Syrian	Pound
Iraq	Baghdad	Dinar/US Dollar	Taiwan	Taipei	Taiwan New Dollar
Israel	Jerusalem	Shekel	Thailand	Bangkok	Baht
Italy	Rome	Euro	Turkey	Ankara	Turkish New Lira
Japan	Tokyo	Yen	Uganda	Kampala	Ugandan New Shilling
Kazakhstan	Astana	Tenge	UAE	Abu Dhabi	UAE Dirham
Kenya	Nairobi	Kenya Shilling	UK	London	Pound Sterling
Korea, North	Pyongyang	Won	United State	Washington, DC	US Dollar
Korea, South	Seoul	Won	Vatican City	Vatican City	Euro
Kuwait	Kuwait City	Kuwaiti Dinar	Vietnam	Hanoi	Dong
Latvia	Riga	Lat	Zimbabwe	Harare	Zimbabwean dollar

## COUNTRIES IN THE WORLD : Largest and Smallest (Area and Population Wise)

Largest Country (Area Wise)	Largest Country (Population Wise)	Smallest Country (Area Wise)	Smallest Country (Population Wise)
Russia	China	Vatican City	Pitcairn Islands
Canada	India	Monaco	Cocos Islands
United States	United States	Nauru	Vatican City
China	Indonesia	Tuvalu	Tokelau
Brazil	Brazil	San Marino	Niue
Australia	Pakistan	Liechtenstein	Christmas Island
India	Nigeria	Saint Kitts and Nevis	Norfolk Island
Argentina	Bangladesh	Maldives	Svalbard and Jan Mayen
Kazakhstan	Russia	Malta	Falkland Islands
Algeria	Japan	Grenada	Saint Helena, Ascension and Tristan da Cunha

### LANGUAGES BY NUMBER OF NATIVE SPEAKERS

Language	Family	Speakers in million
Mandarin	Sino-Tibetan, Chinese	955
Spanish	Indo-European, Romance	405
English	Indo-European, Germanic	360
Hindi	Indo-European, Indo-Aryan	310
Arabic	Afro-Asiatic, Semitic	295

### RELIGIONS OF THE WORLD

Religion	Adherents	Percentage
Christianity	2.1 billion	31.5%
Islam	1.6 billion	23.2%
Hinduism	1 billion	15.0%
Buddhism	376 million	7.1%
Sikhism	23 million	0.36%

## COUNTRIES AND THEIR INHABITANTS

Country	Nationality	Country	Nationality
Afghanistan	Afghan	Israel	Israeli
Argentina	Argentine / Argentinean	Italy	Italian
Australia	Australian	Japan	Japanese
Belgium	Belgian	Kenya	Kenyan
Brazil	Brazilian	Korea	Korean
Cambodia	Cambodian	Malaysia	Malaysian
Canada	Canadian	Mexico	Mexican
China	Chinese	Morocco	Moroccan
Colombia	Colombian	Netherlands	Dutch
Costa Rica	Costa Rican	New Zealand	New Zealander
Croatia	Croat	Norway	Norwegian
Cuba	Cuban	Paraguay	Paraguayan
Cyprus	Cypriot	Peru	Peruvian
Denmark	Danish (Dane)	Philippines	Filipino
Egypt	Egyptian	Portugal	Portuguese
England	English	Russia	Russian
Ethiopia	Ethiopian	Saudi Arabia	Saudi
Finland	Finnish	Spain	Spanish
France	French	Sweden	Swedish
Germany	German	Switzerland	Swiss
Greece	Greek	Taiwan	Taiwanese
India	Indian	Thailand	Thai
Indonesia	Indonesian	Turkey	Turkish
Iran	Iranian	Ukraine	Ukrainian
Ireland	Irish	United States	American
		Vietnam	Vietnamese



## NATIONAL EMBLEM OF SOME IMPORTANT COUNTRIES

Country	Emblem	Country	Emblem
Australia	Kangaroo	Japan	Chrysanthemum
Bangladesh	Water Lily	Lebanon	Cedar Tree
Barbados	Head of a Trident	Luxembourg	Lion with Crown
Belgium	Lion	Mongolia	The Soyombo
Canada	White Lily	Netherlands	Lion
Chile	Candor & Huemul	New Zealand	Southern Cross, Kiwi, Fern
Denmark	Beach	Norway	Lion
Dominica	Sisserou Parrot	Pakistan	Crescent
France	Lily	Papua New Guinea	Bird of paradise
Germany	Corn Flower	Spain	Eagle
Guyana	Canje Pheasant	Senegal	Bhobab Tree
Hong Kong	Bauhinia (Orchid Tree)	Sierra Leone	Lion
India	Lioned Capital	Sri Lanka	Lion
Iran	Rose	Sudan	Secretary Bird
Ireland	Shamrock	Syria	Eagle
Israel	Candelabrum	Turkey	Crescent & Star
Italy	White Lily	U.K.	Rose
Ivory Coast	Elephant	U.S.A.	Golden Rod

## NATIONAL ANIMALS OF MAJOR COUNTRIES

Country	National animal	Country	National animal
Afghanistan	Snow Leopard	Kuwait	Arabian Camel
Australia	Kangaroo	Libya	Barbary lion
Austria	Black Eagle	Malaysia	Malayan Tiger
Bangladesh	Royal Bengal Tiger	Mexico	Golden Eagle
Belgium	Lion	Namibia	Oryx
Bhutan	Takin	Nepal	Cow
Botswana	Zebra	New Zealand	Kiwi
Brazil	Jaguar	North Korea	Chollima
Canada	Beaver	Pakistan	Markhor
China	Giant Panda, Red-crowned Crane	Russia	Siberian Cat, Russian Bear
Cuba	Tocororo	Saudi Arabia	Arabian horse, Arabian Wolf, Arabian Red Fox, Arabian Camel
Denmark	Mute Swan	South Africa	Springbok
Egypt	Golden Eagle	South Korea	Tiger
France	Gallic Rooster	Spain	Bull
Germany	Golden Eagle	Sri Lanka	The Royal Lion
Ghana	Eagle	Switzerland	Cow
Greenland	Polar Bear	Thailand	White elephant
Iceland	Ptarmigan	United Arab Emirates	Peregrine Falcon
India	Royal Bengal Tiger	United Kingdom	Lion, Bulldog
Italy	Italian Wolf	United States	Bald Eagle
Japan	Koi	Vietnam	Tiger
Kenya	Lion	Zimbabwe	Sable Antelope

**NATIONAL MONUMENTS OF SOME FAMOUS COUNTRIES**

Country Name	Monument	Country Name	Monument
Australia	Opera House (Sydney)	India	The Taj Mahal (Agra)
China	The Great Wall of China	Italy	Leaning Tower of Pisa
Denmark	Kinder disk	Japan	Imperial Palace (Tokyo)
Egypt	Pyramid (Giza)	Malaysia	Tugu Negara
France	Eiffel Tower (Paris)	Russia	Kremlin (Moscow)
		USA	Statue of Liberty (New York)

**YOUNGEST COUNTRIES**

South Sudan	2011
Montenegro	2006
Serbia	2006
East Timor	2002
Palau	1994
Czech Republic	1993
Eritrea	1993
Slovakia	1993
Bosnia/Hertzegovina	1992

**OLDEST COUNTRIES**

San Marino	301 AD
France	486 AD
Bulgaria	632 AD
Denmark	950 AD
Portugal	1143 AD
Andorra	1278 AD
Switzerland	1291 AD

**NAMES OLD AND NEW : Former Place Names of Countries and Cities**

Current name	Old Name	Current name	Old Name
Algeria	Numidia	Istanbul	Constantinople
Ankara	Angora	Jakarta	Batavia
Bangladesh	East Pakistan	Kampuchea	Combodia
Beijing	Peking (China)	Korea (North and South)	Choson
Belize	British Honduras	Lesotho	Basutoland
Botswana	Bechuanaland	Libya	Tripolitania and Cyrenaica
Burkina Faso	Upper Volta	Malawi	Nyasaland
Cambodia	Kampuchea	Malaysia	Malaya
Cape Kennedy	Cape Canaveral	Mali	Sudanese Republic
Central African Republic, Chad	French Equatorial Africa	Manchuri	Manchukuo
China (north)	Cathay	Moldova	Moldavia
China (south)	Mangi	Myanmar	Burma
Czech Republic and Slovakia	Bohemia, Moravia, Chechoslovakia	Namibia	South-West Africa
Democratic Republic of Congo	Zaire	Oslo	Christina
Dhaka	Dacca	Sri Lanka	Ceylon
Djakarta	Batavia	St. Petersburg, Russia	Petrograd and Leningrad, Russia
Ethiopia	Abyssinia	Surinam	Dutch Guiana
France	Gaul	Taiwan	Formosa
Ghana	Gold Coast	Tanzania	Tanganyika and Zanzibar, German East Africa
Guinea	French Guinea	Thailand	Siam
Guyana	British Guiana	Tokyo, Japan	Edo
Harare	Salisbury	Vietnam	Cochin-China (south), Annam (central), Tonkin (north)
Ho Chi Minh City, Vietnam	Saigon, South Vietnam	Yongon	Rangoon
Indonesia	Dutch East Indies	Zaire	Congo
Iran	Persia	Zambia	Northern Rhodesia
Iraq	Mesopotamia	Zimbabwe	Southern Rhodesia

## MAJOR MINERAL PRODUCING COUNTRIES

Mineral	Countries
Aluminium	Jamaica, Surinam, France, Ghana, USA, Russia, Canada, Germany, Norway, Hungary, India, Greenland
Asbestos	Canada Zimbabwe, South Africa
Chromium	India, South Africa, Zimbabwe, Cuba
Coal	India, USA, Russia, China, Germany, UK, France, Poland, Belgium, Australia, Pakistan
Copper	USA, Russia, China, Germany, Zambia, Zaire, Canada, Spain, Mexico, Japan, Australia, India
Gold	China, South Africa, USA, Australia, Canada
Graphite	Sri Lanka
Iron Ore	Russia, USA, Australia, Canada, Sweden, France, Spain, India, China, Brazil
Lead	USA, Russia, Spain, Germany, Belgium
Lignite	Germany, Russia
Magnesium	India, Russia, Mexico, Ivory Coast
Mercury	Italy, Spain, USA
Mica	India
Nickel	Canada
Petroleum	Saudi Arabia, Kuwait, Iran, Iraq, Qatar, UAE, Libya, Algeria, Nigeria, Niger, Egypt, USA, Russia, Indonesia.
Silver	Canada, Russia, Mexico, USA, Australia
Tin	Malaysia, Bolivia
Uranium	Zaire, South Africa, USA, Canada, Germany, Czech, Slovakia, Russia, India, Kazakhstan
Thorium	India, Brazil, USA
Zinc	Canada, Russia, Belgium and Germany

## FAMOUS MOUNTAINS (EIGHT - THOUSANDERS)

The 14 "eight-thousanders", 8,000 meters or higher above sea level, all in the Himalayas (Asia)

Summit	Elevation (m)	Country	Range
Everest	8,848	Nepal-China	Mahalangur Himal
K2	8,611	Pakistan-China	Karakoram
Kangchenjunga	8,586	Nepal-India	-
Lhotse	8,516	Nepal-China	Mahalangur Himal
Makalu	8,463	Nepal-China	Mahalangur Himal
Cho Oyu	8,201	Nepal-China	Mahalangur Himal
Dhaulagiri	8,167	Nepal	Dhaulagiri Himal
Manaslu	8,163	Nepal	Mansiri Himal
Nanga Parbat	8,125	Pakistan	-
Annapurna	8,091	Nepal	-
Gasherbrum I	8,068	Pakistan-China	Karakoram
Broad Peak	8,047	Pakistan-China	Karakoram
Gasherbrum II	8,035	Pakistan-China	Karakoram
Shishapangma	8,012	China	Jugal Himal

## SEVEN SUMMITS : The highest mountains of each continent

Summit	Elevation(m)	Continent	Range	Country
Kilimanjaro (Kibo Summit)	5,895	Africa	Kilimanjaro	Tanzania
Vinson Massif	4,897	Antarctica	Ellsworth Mountains	n/a
Carstensz Pyramid (Puncak Jaya)	4,884	Australia	The Sudirman Range	Indonesia
Mount Everest	8,848	Asia	Himalayas	Nepal-China
Mount Elbrus	5,642	Europe	Caucasus	Russian Federation
Mount McKinley (Denali)	6,194	North America	Alaska Range	United States
Aconcagua	6,962	South America	Andes	Argentina

## THE SEVEN WONDERS OF WORLD

Ancient World	Medieval World	Modern World
Great Pyramid of Giza	Stonehenge	Great Pyramid of Giza
Hanging Gardens of Babylon	Colosseum of Rome	Hagia Sophia
Statue of Zeus at Olympia	Catacombs of Kom el Shoqafa or Catacombs of Alexandria	Leaning Tower of Pisa
Temple of Artemis at Ephesus	The Great Wall of China	The Taj Mahal
Mausoleum at Halicarnassus	Porcelain Tower of Nanjing or Porcelain Pagoda	The Eiffel Tower
Colossus of Rhodes	Hagia Sophia	The Empire State Building
Lighthouse of Alexandria	Leaning Tower of Pisa	Washington Monument

### THE 'NEW' WONDERS OF MODERN WORLD

#### New7Wonders Foundation

Wonder	Location
Great Wall of China	China
Petra	Jordan
Christ the Redeemer	Brazil
Machu Picchu	Peru
Chichen Itza	Mexico
Colosseum	Italy
Taj Mahal	India
Great Pyramid of Giza	Egypt

#### WONDERS OF INDIA

Wonder	Location
Gomateshwara	Karnataka
Harmandir Sahib	Punjab
Taj Mahal	Agra
Hampi	Karnataka
Konark Sun Temple	Odisha
Nalanda	Bihar
Khajuraho	Madhya Pradesh

## INTERNATIONAL BORDERS

Name of the Line / Border	Between Countries
Radcliff Line	India and Pakistan drawn in 1947
Mc. Mohan Line	India (Arunachal Pradesh Region) and China
Maginot Line	France and Germany
49th Parallel	Canada and USA
Mannerheim Line	Finland and Russia
Durand Line	Pakistan and Afghanistan
38th Parallel	North Korea and South Korea
Hindenburg Line	Germany and Poland
Older Neisse Line	Germany and Poland

**\*16th Parallel north:** The 16th parallel north is a circle of latitude that is 16 degrees north of the Earth's equatorial plane. It crosses Africa, Asia, the Indian Ocean, the Pacific Ocean, Central America, the Caribbean and the Atlantic Ocean. At this latitude the sun is visible for 13 hours, 5 minutes during the summer solstice and 11 hours, 11 minutes during the winter solstice

**\*16th parallel south:** The 16th parallel south is a circle of latitude that is 16 degrees south of the Earth's equatorial plane. It crosses the Atlantic Ocean, Africa, the Indian Ocean, Australasia, the Pacific Ocean and South America. A section of the border between Mozambique and Zimbabwe is defined by the parallel.

## FAMOUS WORLD SITES AND LANDMARKS

Site and Landmark	Location		
Abu Simbel	Egypt	Machu Picchu	Peru
Acropolis of Athens	Greece	Mecca	Saudi Arabia
Al-Aqsa Mosque	Jerusalem	Merdeka Place	Jakarta
Angel Falls	Venezuela	Millau Bridge	France
Angkor Wat	Cambodia	Mont St. Michel	France
Big Ben	London	Mount Everest	Tibet
Blue Domed Church	Santorini	Mount Fuji	Japan
Blue Mosque	Istanbul	Mount Rushmore	South Dakota
Brandenburg Gate	Germany	Neuschwanstein	Bavaria
Broadway (Manhattan)	New York	Niagara Falls	New York
Burj Al Arab	Dubai	Oval	London
Burj Khalifa	Dubai	Pentagon	Washington
Capitol Hill	Washington	Petra	Jordan
Christ the Redeemer	Rio de Janeiro	Pompeii	Italy
Colosseum	Rome	Pyramids	Egypt
Downing Street	London	Red Square	Moscow
Eiffel Tower	Paris	Sagrada Familia	Spain
Fleet Street	London	St. Basil's Cathedral	Moscow
Forbidden City	Beijing	St. Peter's Cathedral	Vatican City
Golden Gate Bridge	California	Statue of Liberty	New York
Golden Temple	India	Sydney Opera House	Australia
Grand Canyon	Arizona	Taj Mahal	India
Harley Street	London	The Great Sphinx	Egypt
Hyde Park	London	The Great Wall	China
<b>Site and Landmark</b>	<b>Location</b>	Tower Bridge	London
India House	London	Tower of Pisa	Italy
Kaaba	Mecca	Trevi Fountain	Rome
Kilimanjaro	Tanzania	Uluru	Australia
Konark Sun Temple	India	Vatican City	Rome
Kremlin	Moscow	Victoria Falls	Zimbabwe
Leaning Tower of Pisa	Italy	Wailing Wall	Jerusalem
Loch Ness	Scotland	Wall street	New York
Lotus Temple	India	White Hall	London
		White House	Washington

## OFFICIAL BOOKS

Blue Book	Any official report of the British Government
Green Book	Italian and Iranian Government
Grey Book	Official report of the Japanese and Belgian Government
Orange Book	Official publication of the Netherlands Government
White Book	Official Publication of Germany Portugal and China
Yellow Book	Official book of the French Government
White Paper	Short pamphlet giving authoritative recital of facts issued by the Indian government stating its views on a particular issue for the knowledge of general public
Joint paper	The joint report of two or more than two governments

## PARLIAMENTS OF THE WORLD

Country	Parliament	Country	Parliament
Afghanistan	Shora	Italy	Chamber of Deputies and Senate
Albania	People's Assembly	Japan	Diet
Algeria	National People's Assembly	Korea(North)	Supreme People's Assembly
Argentina	National Congress	Korea(South)	National Assembly
Australia	Federal Parliament	Kuwait	National Assembly
Bangladesh	Jatiya Sansad	Libya	General People's Congress
Bhutan	Tsogdu	Malaysia	Dewan Rakyat and Dewan Negara
Brazil	National Congress	Maldives	Majlis
Botswana	National Assembly	Myanmar	Pyithu Hluttaw
Britain	Parliament (House of Commons and House of Lords)	Nepal	Rashtriya Panchayat
Colombia	Congress	Netherlands	The Staten General
Canada	Parliament	New Zealand	Parliament (House of Representative)
China	National People's Assembly	Oman	Monarchy
Cuba	National Assembly of People's Power	Pakistan	National Assembly & Senate
Czech Republic	Chamber of Deputies and Senate	Philippines	The Congress
Denmark	Folketing	Poland	Sejm
Ethiopia	Federal Council and House of Representative	Romania	Great National Assembly
Egypt	People's Assembly	Russia	Duma & Federal Council
France	National Assembly	South Africa Rep.	House of Assembly
Finland	Eduskunta Parliament	Spain	Cortes
Germany	Bundestag (Lower House) and Bundesrat (Upper House)	Sweden	Riksdag
Greece	Chamber of Deputies	Saudi Arabia	Majlis Al Shura
Iceland	Althing	Sudan	Majlis Watani
India	Sansad	Switzerland	Federal Assembly
Indonesia	People's Consultative Assembly	Syria	People's Council
Iran	Majlis	USA	Congress
Iraq	National Assembly	Vietnam	National Assembly
Israel	Knesset	Zambia	National Assembly

## WORLD FAMOUS POLITICAL PARTIES

Australia	Australian Labor Party (ALP), Liberal Democratic Party (LDP), Australian Greens (GRN)
Bangladesh	Bangladesh National Party (BNP), Bangladesh Awami League (AL), Jatiya Party
China	Communist Party of China
France	Socialist Party, National Front, Union for French Democracy
India	Bahujan Samaj Party (BSP), Bhartiya Janta Party (BJP), Communist Party of India (CPI), Communist Party of India (Marxist) (CPM), Indian National Congress (INC), National Congress Party (NCP), Rashtriya Janta Dal (RJD), Biju Janata Dal (BJD), Aam Aadmi Party (AAP)
Iran	Modern Thinkers Party of Islamic Iran, Islamic Iran Participation Front, Islamic Labour Party
Iraq	National Iraqi Alliance, Ba'ath Party, The Iraqis, Democratic Patriotic Alliance of Kurdistan
Israel	Labor Party, Likud Party, Hadash Party, Shas Party, The Jewish Home, Hatnuah Party
Nepal	Nepali Communist Party, Nepali Congress Party, Nepal Jansangh Party, Nepali Janatantra Party
Pakistan	Pakistan Muslim League, Pakistan People's Party, Pakistan Tehreek-e-Insaf, Pakistan Awami Tehreek, Awami National Party, Jamaat-Islami
Russia	Communist Party, Liberal Democratic Party, Russian Choice
South Africa	African National Congress, National Party, Inkatha Freedom Party
Sri Lanka	United National Party, Sri Lanka Freedom Party, Liberal Party
UK	Conservative Party, Labour Party, Liberal Democratic Party
USA	Republic Party, Democratic Party, Libertarian Party, Constitution Party

## HIGHEST MILITARY DECORATIONS

Country	Name	Country	Name
Australia	The Victoria Cross for Australia	New Zealand	The Victoria Cross for New Zealand
Bangladesh	Bir Sreshtho	Pakistan	Nishan-e-Haider, Hilal-e-Kashmir
China	The Hero's Medal	Russia	The Gold Star
France	The Legion of Honour	United Kingdom	The Victoria Cross
India	Param Vir Chakra	United States	The Medal of Honor

## IMPORTANT SIGNS AND SYMBOLS

Signs	Symbols	Signs	Symbols
Pen or Lotus	Culture and civilization	Black Flag	Demonstration of protest
Wheel	Progress	Red Flag	Sign of danger, revolution
Dove or Pigeon or Olive branch	Peace	Yellow Flag	Displayed by ship with infectious disease on board or ship in quarantine
One skull on two bones crossing each other diagonally	Danger	White Flag	Truce
Red triangle	Family Planning	Flag flown half-mast	National mourning
Red Cross	Hospital/Ambulance	Flag flown upside down	Distress
Red light	Danger/Emergency	A blind-folded woman holding a balance	Justice
Green Light	Line clear signal	-	-

## FATHER OF VARIOUS FIELDS

Field	Father	Field	Father
Aerodynamics	George Cayley	Indian Cinema	Dadasaheb Phalke
Algebra	Diophantus	Indian Industry	Jamsetji Tata
Antibiotics	Alexander Fleming	Internet	Vinton Cerf
Antiseptic Surgery	Joseph Lister	Law	Cicero
Atom Bomb	Dr Robert Oppenheimer	Mathematics	Archimedes
Ayurveda	Charaka	Mechanics	Isaac Newton
Biochemistry	Liebig	Medicine	Hippocrates
Biology	Aristotle	Meteorology	Luke Howard
Biotechnology	Karl Ereky	Microbiology	Louis Pasteur
Blood groups	Landsteiner	Modern Anatomy	Andreas Vesalius
Botany	Theophrastus	Modern Botany	K. Bauhin
Calculus	Gottfried Leibniz	Modern Chemistry	Antoine Lavoisier
Comedy	Aristophanes	Modern Genetics	Bateson
Computer	Charles Babbage	Modern Painting in India	Nandlal Base
Concept of Evolution	Empedocles	Modern Physics	Galileo Galilei
Civil Aviation in India	J.R.D. Tata	Modern Surgery	Pare
DNA printing	Alee Jeffreys	Nano-technology	Richard Errett Smalley
Ecology	Theophrastus	Periodic Table	Dmitri Mendeleev
Economics	Adam Smith	Pharmacy	William Procter
Electricity	Benjamin Franklin	Philosophy	Thales
Electronics	Ray Tomlinson	Physics	Albert Einstein
Embryology	Aristotle	Physiology	Thales
English Literature	Geoffrey Chaucer	Plastic Surgery	Susrutha
Genetics	Gregor Mendel	Psychology	Wilhelm Wundt
Geography	Eratosthenes	Robotics	Nikola Tesla
Geology	James Hutton	Sociology	Auguste Comte
Geometry	Euclid	Statistics	Ronald Fisher
Green Revolution	Norman E Borlaug (In India M.S. Swaminathan)	Taxonomy	Carolus Linnaeus
Hydrogen Bomb	Andrei Sakharov	Trigonometry	Hipparchus
History	Herodotus	Vaccination	Louis Pasteur
Homeopathy	Samuel Hahnemann	White revolution in India	Vergheese Kurien
Indian constitution	B. R. Ambedkar	Zoology	Aristotle

### WORLD'S FAMOUS INTELLIGENCE AGENCIES

Country	Intelligence Agency
India	Research and Analysis Wing (RAW), Intelligence Bureau (IB), Central Bureau of Investigation (CBI)
Australia	Australian Security and Intelligence Organization (ASIO)
China	Central External Liaison Department (CELD)
Egypt	Mukhabarat
Israel	MOSSAD
Iran	SAVAK
Iraq	Al Mukhabarat
Pakistan	Inter-Services Intelligence (ISI)
Japan	NIACHO
Russia	KGB / GRU
South Africa	Bureau of State Security (BOSS)
United Kingdom	MI (Military intelligence) - 5 & 6, Special Branch (SB), Joint Intelligence Organization (JIO)
United States of America	Central Intelligence Agency (CIA), Federal Bureau of Investigation (FBI)
France	Directorate-General for External Security (DGSE)

### GREAT WORK OF FAMOUS PERSONS

Works	Persons	Works	Persons
Foundation of Red Cross	Henery Dunant	Founder of Shantiniketan	Rabindra Nath Tagore
Foundation of Scout	Baden Powell	Founder of Vishwabharati	Rabindra Nath Tagore
Foundation of Red Gaurds	Garrywaldy	Founder of Pawns Ashram	Vinoba Bhawe
Founder of Socialism	Archarya Narendra Dev	Founder of Bhudan Movement	Vinoba Bhawe
Father of Sanskrit Grammer	Panini	Founder of League of Nations	Wooden Willson
Founder of Anand Van	Babe Amte	Founder of Golden Temple	Guru Arjun Dev
Founder of 'Auroville Ashram'	Aurobindo Ghosh	Founder of Khalsa (Panth)	Guru Gobind Singh

### FAMOUS PLACES ASSOCIATED WITH EMINENT PERSONS

Place	Person	Place	Person
Anand Bhawan	Jawaharlal Nehru	Macedonia	Alexander, the Great
Bardoli	Sardar Patel	Mecca	Prophet Mohammed
Belur Math	Rama Krishna Paramhans	Pawanar	Vinoba Bhawe
Chittore	Maharana Pratap	Pawapuri	Mahavir
Corsica	Napoleon Bonaparte	Porbandar	Mahatma Gandhi
Cuttack	Subhash Chandra Bose	Puducherry	Aurobindo Ghosh
Fatehpur Sikri	Akbar, the Great	Sabarmati	Mahatma Gandhi
Haldi Ghati	Maharana Pratap	Seringapatnam	Tipu Sultan
Ibrahim Patti	Chandra Shekhar	Sevagram	Mahatma Gandhi
Jalianwala Bagh	General Dyer	Shantiniketan	Rabindra Nath Tagore
Jeeradei	Dr. Rajendra Prasad	Sitab Diyara	Jai Prakash Narayan
Jerusalem	Jesus Christ	Talwandi	Guru Nanak
Kapilvastu	Gautam Buddha	Trafalgar	Nelson
Kundgram	Mahavir	Trimurti Bhawan	Jawaharlal Nehru
Kushi Nagar	Gautam Buddha	Waterloo	Napoleon Bonaparte
Lumbini	Gautam Buddha	-	-

### CREMATORIUM OF FAMOUS PERSONS OF INDIA

Crematorium	Person	Crematorium	Person
Abhay Ghat	Morarji Desai	Samata Sthal	Dr Shankar Dayal Sharma
Ekta Sthal	Giani Zail Singh, Chandra Shekhar	Shakri Sthal	Indira Gandhi
Kishan Ghat	Chaudhary Charan Singh	Shanti Van	Jawahar Lal Nehru
Karma Bhumi	Dr. Sankar dayal Sharma	Uday Bhoomi	K.R. Narayanan
Mahaprayan Ghat	Dr Rajendra Prasad	Veer Bhumi	Rajiv Ghandhi
Raj Ghat	Mahatma Gandhi	Vijay Ghat	Lal Bahadur Shastri



## FAMOUS NICKNAMES OF IMPORTANT PERSONS

Abbreviated Name	Original Name	Abbreviated Name	Original Name
Acharya	Vinoba Bhave	Lawrence of Arabia	Thomas Edward Lawrence
Andhra Kesari	Tanguturi Prakasam	Lion of Kashmir (Sher- e - Kashmir)	Sheikh Mohammad Abdullah
Anna	C.N. Annadurai	Lion of Punjab (Sher-i-Punjab)	Lala Lajpat Rai
Apostle of Free Trade	Richard Cobden	Little Corporal	Napoleon
Bangabandhu	Sheikh Mujibur Rahman	Ike	Dwight David Eisenhower
Bapu; Mahatma; Father of the Nation	Mohandas Karamchand Gandhi (Mahatma Gandhi)	Lokmanya ; Father of Indian Unrest	Bal Gangadhar Tilak
Bard of Avon	William Shakespeare	Loknayak or JP	Jayaprakash Narayan
Blessed Teresa of Calcutta, M.C.	Mother Teresa	Mahamana	Pandit Madan Mohan Malaviya
C.R. or Rajaji	Chakravarti Rajagopalachari	Maid of Orleans	Joan of Arc
Chacha; Panditji	Jawaharlal Nehru	Maiden Queen	Queen Elizabeth I
Deenabandhu	Charles Freer Andrews	Man of Blood and Iron; Iron Chancellor	Otto Von Bismarck
Desert Fox	Erwin Rommel	Man of Destiny	Napoleon
Deshbandhu	Chittaranjan Das	Man of Peace	Lal Bahadur Shastri
Dr. Robot	Kato Ichire	Man of the Masses	K. Kamaraj
Elvis the Pelvis	Eivis Presley	Mark Twain	Samuel Clemens
Firebrand of South India	S. Satyamurti	Master of Suspense	Sir Alfred Joseph Hitchcock
Flying Sikh	Milkha Singh	Netaji	Subhash Chandra Bose
Frontier Gandhi	Abdul Ghaffar Khan	Nightingale of India	Sarojini Naidu
Fuehrer	Adolf Hitler	Osho	Acharya Rajneesh
G.B.S	George Bernard Show	Poets' Poet	Edmund Spenser
Ghazal King	Jagjit Singh	Punjab Kesari (Lion of the Punjab or She r- e - Punjab)	Lala Lajpat Rai
Grand Old Man of India; Father of Indian Politics and Economics	Dadabhai Naoroji	Queen of Indian track and field or Payyoli Express	P. T. Usha
Grand Old Man of Indian Journalism	Tushar Kanti Ghosh	Robert Frost of West Bengal	Shakti Chattopadhyay
Ground Old Man of Indian Pottery, Daddyji	Gurcharan Singh	Santa Claus	St. Nicholas
Gurudev	Rabindranath Tagore	Shahid - e - Azam	Bhagat Singh
Guruji	M.S. Golwalkar	Sparrow	Major General Rajinder Singh
Indian Napoleon	Samudragupta	Sultan of Beypore	V.M. Basheer
Indian Shakespeare or Shakespeare of India	Kalidas	T.T. Krishnamachari	T.T.K.
Iron Lady of India	Indira Gandhi (Indira Priyadarshini Gandhi)	The Birdman of India	Salim Ali
Iron Man of India, Bismarck of India, Patron Saint	Vallabhbhai Patel	The Incorruptible	M.F. Robespierre
King of Pop, or MJ	Michael Jackson	The Younger Pitt, Grand Commoner	William Pitt
Kipper, Grand Old Man of Indian Army	Kodandera Madappa Cariappa	Tiger of Snows	Tenzing Norgay
Kuvempu	K.V. Puttappa	Wizard of the North	Walter Scott
Lady with the Lamp	Florence Nightingale	Lawrence of Arabia	Thomas Edward Lawrence
Lal Bal Pal	Lala Lajpat Rai, Bal Gangadhar Tilak and Bipin Chandra Pal	-	-

## UNESCO WORLD HERITAGE SITES IN INDIA

Sites	Year of Inclusion	Sites	Year of Inclusion
Agra Fort (Uttar Pradesh)	1983	Buddhist Monuments at Sanchi (Madhya Pradesh)	1989
Ajanta Caves (Maharashtra)	1983	Humayun's Tomb (Delhi)	1993
Ellora Caves (Maharashtra)	1983	Qutb Minar and its Monuments (Delhi)	1993
Taj Mahal (Uttar Pradesh)	1983	Mountain Railways of India (West Bengal)	1999
Group of Monuments at Mahabalipuram (Tamil Nadu)	1984	Mahabodhi Temple (Bodh Gaya) (Bihar)	2002
Sun Temple, Konark (Odisha)	1984	Rock Shelters of Bhimbetka (Madhya Pradesh)	2003
Kaziranga National Park (Assam)	1985	Champaner-Pavagadh Archaeological Park (Gujarat)	2004
Keoladeo National Park (Rajasthan)	1985	Chhatrapati Shivaji Terminus formerly Victoria Terminus (Mumbai)	2004
Manas Wildlife Sanctuary (Rajasthan)	1985	Red Fort Complex (Delhi)	2007
Churches and Convents of Goa (Goa)	1986	The Jantar Mantar, Jaipur (Rajasthan)	2010
Fatehpur Sikri (Uttar Pradesh)	1986	Western Ghats (Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu)	2012
Group of Monuments at Hampi (Karnataka)	1986	Hill Forts of Rajasthan (Rajasthan)	2013
Khajuraho Group of Monuments (Madhya Pradesh)	1986	Great Himalayan National Park Conservation Area	2014
Elephanta Caves (Maharashtra)	1987	Rani-ki-Vav (the Queen's Stepwell) at Patan, Gujarat	2014
Great Living Chola Temples (Tamil Nadu)	1987	Nalanda Mahavihara site, Bihar	2016
Group of Monuments at Pattadakal (Karnataka)	1987	Khangchendzonga National Park, Sikkim	2016
Sundarbans National Park (West Bengal)	1987	The Architectural Work of Le Corbusier, Chandigarh	2016
Nanda Devi and Valley of Flowers National Parks (Uttarakhand)	1988	Historic City of Ahmadabad, Ahmedabad, Gujarat	2017

## FOUNDATION DAYS OF INDIAN STATES

Date	Day	Date	Day
1st January	Nagaland	15th April	Himachal Pradesh
21st January	Manipur, Meghalaya and Tripura	1st May	Maharashtra & Gujarat
6th February	Jammu-Kashmir	16th May	Sikkim
20th February	Mizoram and Arunachal Pradesh	2nd June	Telangana
11th March	Andaman and Nicobar Islands	1st November	Chhattisgarh, Punjab, Haryana, Uttar Pradesh, Karnataka, MP, Kerala and AP (Day)
22nd March	Bihar (Bihar Diwas)	9th November	Uttaranchal (Uttarakhand Day)
30th March	Rajasthan	15th November	Jharkhand (Jharkhand Diwas)
1st April	Odisha Day (Utkal Diwas)	19th December	Goa
14th April	Tamil Nadu	-	-

## LIST OF ENVIRONMENT DAYS

**\*Hours - Earth Hour - 8:30pm (local time), March 23**

Name	Date	Name	Date
World Wetlands Day	February 2	World Population Day	July 11
International Day Of Action for Rivers	March 14	International Tiger Day	July 29
World Sparrow Day	March 20	International Day for the Preservation of the Ozone Layer	September 16
World Water Day	March 22	Clean Up the World	Weekend - September 17-19
Earth Day	April 22	World Water Monitoring Day	September 18

Arbor Day	Last Friday in April	Zero Emissions Day	September 21
Green Up Day	First Saturday of May in Vermont	Car Free Day	September 22
International Migratory Bird Day	May 3	Ecological Debt Day (Earth Overshoot Day)	September 23 in 2008, but receding
Greenery Day	May 4 in Japan	World Rivers Day	Every last Sunday in September
International Day for Biological Diversity (World Biodiversity Day)	May 22	World Habitat Day	First Monday in October
Europarc European day of parks	May 24	International Day for Natural Disaster Reduction	Second Wednesday in October
Bike-to-Work Day	Third Friday in May	World Planting Day	October 22
World Environment Day	June 5	International Day of Climate Action	October 24
World Oceans Day	June 8	International Day for Preventing the Exploitation of the Environment in War and Armed Conflict	November 6
Global Wind Day	June 15	World Soil Day	December 5
World Day to Combat Desertification and Drought	June 17	International Mountain Day	December 11

## IMPORTANT DATES AND DAYS OF THE YEAR

### January

- 1 New Year Day  
Road Safety Week  
Army Medical Corps Establishment Day
- 8 African National Congress Foundation Day
- 9 NRI Day
- 11 APSRTC Establishment Day  
Death anniversary of Lai Bahadur Shastri
- 12 National Youth Day  
(Birthday of Swami Vivekanand)
- 15 Army Day
- 21 Manipur Day  
Meghalaya Day  
Tripura Day
- 23 Desh Prem Divas  
Netaji Subhash Chandra Bose's birth anniversary
- 25 Himachal Pradesh Day  
National Tourism Day
- 26 Indian Republic Day  
Jammu & Kashmir Day  
International Customs Day
- 28 Birth anniversary of Lala Lajpat Rai
- 30 Martyr's Day, Mahatma Gandhi's Martyrdom Day  
World Leprosy Eradication Day  
Sarvodaya Day

### February

- 2 National day of Sri Lanka  
World Wetlands Day
- 5 Kashmir Day (Organized by Pakistan)
- 13 Sarojini Naidu's Birth Anniversary
- 14 St. Valentine's Day
- 24 Central Excise Day
- 28 National Science Day

### March

- 3 National Defence Day
- 4 National Security Day
- 8 International Women's Day
- 12 Mauritius Day; Central Industrial Security Force Day
- 13 No Smoking Day
- 15 World Consumer Rights Day, World Disabled Day
- 16 National Vaccination Day
- 17 St. Patricks Day
- 18 Ordnance Factories Day (India)
- 19 World Disabled Day
- 21 World Forestry Day  
International Day for the Elimination of Racial Discrimination
- 22 World Water Day
- 23 World Meteorological Day
- 24 World TB Day
- 26 Bangladesh Liberation Day
- 27 World Stage Artists Day
- 31 Financial Year Ending

### April

- 1 Odisha Day  
Fool's Day
- 3 World Autism Day
- 5 National Maritime Day  
International Day for Mine Awareness
- 7 World Health Day
- 8 World Tradition Day
- 13 Jallianwallah Bagh Massacre Day (1919)
- 14 B.R. Ambedkar Remembrance Day; Fire Extinguishing Day
- 17 World Haemophilia Day
- 18 World Heritage Day
- 21 Secretaries' Day, National Civil Services Day
- 22 World Earth Day
- 23 World Books and Copyright Day, Easter Day

24 World Lab Animals Day  
25 National Administrative Professionals Day  
29 World Intellectual Property Day

**May**

1 Gujarat Statehood Day  
Workers' Day: International Labour Day  
Maharashtra Statehood Day  
3 International Energy Day  
International Sun Day  
World Press Freedom Day  
4 Coal Miner's Day  
5 World Athletics Day  
7 National Institute of Sports Founder's Day  
8 World Red Cross Day  
9 World Thalassaemia Day  
11 National Resurgence Day  
National Technology Day  
12 International Nurses Day, World Hypertension Day  
13 International Criminal Court Day  
National Solidarity Day  
15 International Family Day  
16 Sikkim Day  
17 World Telecommunications Day  
20 World Metrology Day  
21 Anti-Terrorism Day  
22 International Day for Biological Diversity  
24 Commonwealth Day  
28 Official Language Day  
Telugu People's Self-respect Day  
29 International Mount Everest Day  
(Designated by Nepal)  
30 Goa Statehood Day  
31 World No Tobacco Day

**June**

1 International Children's Day, World Milk Day  
3 World Naturist Day  
4 International Day for Innocent Children,  
Victims of Aggression  
5 World Environment Day  
14 World Blood Donor Day  
21 Hugging Day  
World Music Day  
23 International Olympic Day  
26 International Anti - Drugs Day  
International Day against Drug Abuse and  
illicit Trafficking  
27 World Diabetes Day

**July**

1 Architecture Day  
Doctor's Day  
International Jokes Day  
Vana Mahotsav Week 1-7  
2 World Sports Journalists Day  
4 American Independence Day  
6 World Zonosis Day  
7 International day of Co-Operatives  
11 World Population Day  
20 Man Walks on the Moon  
26 Kargil Victory Day

**August**

1 World Breast-feeding Week  
3 Hiroshima Day  
Liberation Day  
6 Hiroshima Day  
8 World Senior Citizen's Day  
9 Kranti Divas  
International day of Solidarity with the struggle of  
Women in South Africa  
International day of the world's Indigenous People  
Nagasaki Day  
Quit India Movement Day  
10 Dengue Prevention Day  
12 International Youth Day  
Librarians Day  
13 Left Handers' Day  
14 Pakistan's Independence Day  
15 India's Independence Day  
West Bengal Day  
18 Day of the World's Indigenous People  
19 World Photography Day  
20 Sadbhavana Divas  
World Mosquito Day  
24 Kolkata's Birth Day  
Sanskrit Day  
26 Women's Equality Day  
29 National Sports Day  
Sports Day (Dhyanchand's birthday)  
Telugu Language Day  
30 Small Industry Day

**September**

1 Nutrition Week 1-7  
2 Coconut Day  
4 Minority Welfare Day  
5 Teacher's Day  
7 Forgiveness Day  
8 International Literacy Day (UNESCO)  
World Literacy Day  
10 Haryana Statehood Day  
Punjab Statehood Day  
13 World Flowers Day  
14 Hindi Day, World First Aid Day  
15 Engineers Day  
International Day of Democracy  
16 World Ozone Day  
18 International Day of Peace  
21 Biosphere Day  
World Alzheimer's Day  
22 Girl Child Week 22-26, Rose Day  
(Welfare of cancer patients)  
Girl Child Day  
24 World Heart Day  
25 Social Justice Day  
26 CSIR Foundation Day, Day of the Deaf  
27 World Tourism Day  
28 Gunners Day

**October**

1 International Day for the Elderly (UN)  
International Music Day  
National Voluntary Blood Donation Day

- 2 Gandhi Jayanti, International Non-violence Day  
Human Rights Protection Day  
Prisoner's Day  
World Wide Life Week (2-8)
- 3 World Nature Day, World Habitat Day
- 4 International Mental Health Week (4-10)  
World Animal Welfare Day  
World Space Week (4-10)
- 5 World Habitat Day; World Teacher's Day
- 6 World Wildlife Day
- 8 Indian Air force Day  
Rapid Action Force Raising Day
- 9 National Postal Week (9-14)  
World Postal Day
- 10 World Disaster Reduction Day (2nd Wednes Day)  
World Mental Health Day; National Post Day
- 12 World Sight Day
- 13 World Arthritis Day  
World Calamity Control Day (UN)
- 14 World Standards Day
- 15 World White Cane Day  
World White cane day (guiding the blind)
- 16 World Anaesthesiologists Day  
World Food Day
- 17 International Poverty Eradication Day
- 20 National Solidarity Day  
(China attacked India on that day)
- 21 Global Iodine Deficiency Disorders Day  
Police Commemoration Day
- 24 Disarmament Week(24-30)  
United Nations Day
- 27 Infantry Day
- 30 World Thrift day
- 31 Halloween Day  
National Integration Day

**November**

- 1 Andhra Pradesh Formation Day  
Haryana, Karnataka, Kerala, Madhya Pradesh,  
Punjab States Formation Day
- 5 International Week of Science and Peace (5-11)
- 7 Infant Protection Day;  
World Cancer Awareness Day
- 9 Legal Services Day  
Pravasiya Bharatiya Divas/Legal Services Day  
Uttaranchal State Formation Day
- 10 Forest Martyrs Day  
Transport Day
- 11 Armistice Day  
Education Day
- 12 National Broadcasting Day
- 14 Children's Day, World Diabetics day  
Cooperative Week  
National Book Week  
National Land Resources Conservation Week  
National Library Week  
Universal Children's Day  
World Diabetes Day
- 15 Jharkhand State Formation Day  
New Born Week (15-21)

- Thanks Giving Day
- 16 International Day for Tolerance, National Press Day  
Pharmacy Week (16-22)
- 17 Guru Nanak Dev's Birth Anniversary  
National Epilepsy Day
- 18 Territorial Army Day
- 19 National Integration Day, Citizen's Day  
World Heritage Week (19-25)
- 20 Universal Children's day (UN),  
Africa Industrialisation Day
- 21 World Fisheries Day, World Hello Day  
World Television Day
- 25 International Day against Violence against Women
- 26 Law Day, National Law Day
- 29 international Day of Solidarity with Palestinian  
People

**December**

- 1 Border Security Force (BSF) Raising Day  
Nagaland Day  
World AIDS Day
- 2 International Day for Abolition of Slavery (UNO)
- 3 International Day of Disabled Persons  
World Conservation Day
- 4 Chemical Disaster Prevention Day  
Navy Day
- 5 International Volunteers Day
- 6 Armed Forces Day, Civil Defence Day
- 7 Armed Forces Flag Day  
International Civil Aviation Day
- 8 Home Guards Raising Day  
Submarine Day
- 9 National Immunization Day
- 10 Human Rights Day  
International Children's Day of Broadcasting  
UNICEF Day
- 12 Assam Rifles Raising Day
- 14 National Energy Conservation Day
- 16 Vijay Divas
- 17 Pensioner's Day
- 18 International Migrants Day  
Minorities Rights Day (India)
- 19 Goa's Liberation Day
- 22 Mathematics Day
- 23 Kisan Divas (Farmer's day)
- 24 National Consumer Day
- 25 X-Mas Day
- 26 Boxing Day
- 28 Central Reserve Police Force Anniversary
- 29 International Day for Biological Diversity

**World Marriage Day:** February 2nd Sunday

**World Kidney Day:** March 2nd Thursday

**Commonwealth Day:** March 2nd Monday

**World Asthma Day:** May 1st Tuesday

**World Laughter Day:** May 1st Sunday

**Mother's Day:** May 2nd Sunday

**Father's Day:** June 3rd Sunday

**International Friendship Day:** August 1st Sunday

**World Sight Day:** October 2nd Thursday

## MAJOR NEWS AGENCIES OF THE WORLD

Agency	Country	Agency	Country
Australian Associated Press	Australia	Malaysian National News Agency	Malaysia
Australian Broadcasting Corporation	Australia	Sahara Press Service	Morocco
Bangladesh Sangbad Sangstha	Bangladesh	Namibia Press Agency	Namibia
United News of Bangladesh	Bangladesh	New Zealand Press Association	New Zealand
Pressclub Information Agency	Bulgaria	Associated Press of Pakistan	Pakistan
Canadian Press	Canada	Dispatch News Desk	Pakistan
China News Service	China	Pakistan Press International	Pakistan
Xinhua News Agency	China	Philippines News Agency	Philippines
Middle East News Agency	Egypt	Information Telegraph Agency of Russia	Russia
Agency Europe	European Union	Novosti	Russia
Agency France Press	France	RIA Novosti	Russia
Deutsche Press Agentur	Germany	Ruptly	Russia
Asian News International	India	Yonhap News Agency	South Korea
Indo-Asian News Service	India	Asia News Network	Thailand
Press Trust of India	India	News Central Asia	Turkmenistan
Samachar Bharati	India	Ukrainian Independent Information Agency	Ukraine
United News of India	India	BBC News	UK
Univarat	India	Exchange and Telegraph Company	UK
Indonesia National News Agency	Indonesia	Reuters	UK
Islamic Republic News Agency	Iran	World Entertainment News Network	UK
Press TV	Iran	Press Association	UK & Ireland
National Iraqi News Agency	Iraq	All Headline News	USA
Associated Israel Press	Israel	American Broadcasting Company	USA
Agenzia Giornalistica Italia	Italy	Associated Press	USA
Jiji Press	Japan	CNN	USA
Kyodo News	Japan	Fox News	USA
Petra	Jordan	NBC News	USA
East African	Kenya	New York Times	USA
Kenya News Agency	Kenya	United Press International	USA
Media Line	Lebanon	ZUMA Press	USA

## MAJOR NEWSPAPERS OF THE WORLD

Country	Newspapers
Australia	The Age, The Morning Herald, The Australian Financial Review, The Weekly Times, The Monthly
Canada	The Globe and Mail, The Gazette, Toronto Star, Toronto Sun, National Post, La Presse, Le Journal de Montréal
China	Reference News, People's Daily, Southern Metropolis Daily, Yangcheng Evening News, Global Times, Hangzhou Daily, Beijing Evening News, Beijing Youth Daily,
Egypt	Al-Ahram, Al Gomhuria
Germany	Die Zeit, Die Welt, Frankfurter Allgemeine Zeitung, Neues Deutschland
India	The Times of India, Dainik Jagran, Malayala Manorama, Hindustan Dainik, Eenadu, Rajasthan Patrika, The Hindu, Lokmat, Daily Thanthi, Amar Ujala, Deccan Chronicle, Sakshi, Sakal, Mathrubhumi, Hindustan Times, Dinakaran, Ananda Bazar Patrika, Punjab Kesari, Dainik Bhaskar, Divya Bhaskar, The Economic Times, Dharitri, Smabada, Samaja, Orissa Post, The Telegraph, The Sunday Observer, The New Indian Express, The News Today, MiD-DAY, Business Line
Indonesia	Rakyat Merdeka
Japan	Yomiuri Shimbun, Asahi Shimbun, Mainichi Shimbun, Mainichi Shimbun, Nihon Keizai Shimbun, Tokyo Sports
New Zealand	The New Zealand Herald, The Press
Pakistan	Daily Nai Baat, The Express Tribune, Daily Sarhad, Daily Jang, Business Recorder, Daily Times, The News International, The Frontier Post, Daily Naya Zamana, Lahore Post
Paris	International Herald Tribune
Russia	Moskovskij Komsomolets, Komsomolskaya Pravda
United Kingdom	The Times, The Sun, News of the World, The Daily Mail, The Mail on Sunday, Sunday Mirror, Daily Mirror, Daily Star, The Courier, The Scotsman, The Guardian, The Herald
United States	The Wall Street Journal, USA Today, The New York Times, Los Angeles Times, New York Post, The Washington Post, The Dallas Morning News
Sri Lanka	Ada, Daily Mirror, The Island, Ceylon Today, Dinamina, Lakbima News

## MAJOR NEWSPAPERS IN INDIA

Name	Language	Published in (HQ)	Name	Language	Published in (HQ)
Niyamiya Barta	Assamese	Assam	The Times of India	English	Mumbai
Aajkaal	Bengali	Kolkata	Jai Hind	Gujarati	Gujarat
Anandabazar Patrika	Bengali	Kolkata	Western Times	Gujarati	Gujarat
Dainik Sambad	Bengali	Tripura	Aaj	Hindi	Kanpur, Varanasi
Yugantar	Bengali	Kolkata	Amar Ujala	Hindi	Noida
Amrita Bazar Patrika	English	Kolkata	Dainik Jagran	Hindi	Kanpur
Bangalore Mirror	English	Bangalore	Navbharat Times	Hindi	Mumbai
City Journal	English	Kerala	Vijaya Vani	Kannada	Karnataka
Deccan	English	Bangalore	Chandrika	Malayalam	Kerala
Hindustan Times	English	New Delhi	Malayala Manorama	Malayalam	Kerala
MiD-DAY	English	Mumbai	Purogami Vicharache Ekmat	Marathi	Maharashtra
Mumbai Mirror	English	Mumbai	Dharitri	Odia	Odisha
Orissa Post	English	Odisha	Samaja	Odia	Odisha
Sikkim Express	English	Sikkim	Samaya	Odia	Odisha
State Times	English	Jammu & Kashmir	Sambad	Odia	Odisha
The Economic Times	English	New Delhi	Daily Punjab Times	Punjabi	Punjab
The Financial Express	English	New Delhi	Dinakaran	Tamil	Chennai
The Hindu	English	Chennai	Andhra Bhoomi	Telugu	Andhra Pradesh
The Indian Express	English	New Delhi	Eenadu	Telugu	Andhra Pradesh
The New Indian Express	English	Chennai	Namasthe Telangana	Telugu	Telangana
The Telegraph	English	Kolkata	Hind Samachar	Urdu	Mumbai

## TAG LINES OF MAJOR COMPANIES AND PRODUCTS

Company and Product	Tagline/Slogan	Company and Product	Tagline/Slogan
ABN Amro Bank	Making More Possible	Intel	Intel Inside
Accenture	High Performance. Delivered	LG	Life's Good
Addidas	Nothing is impossible	Lufthansa	There's no better to fly
Airtel	Express Yourself	Mc Donalds	I'm Loving It
Amway	We're Listening	Microsoft	Where Do You Want to Go Today ; Your Potential Our Passion
Apple Inc.	Think Different	MRF	Tyres with Muscle
AT&T	The World's Networking Company	Nokia	Connecting People
Bank of America	Higher Standards	ONGC	Making Tomorrow Brighter
Big Bazaar	Naye India Ka Bazaar (Market for New India)	Panasonic	Ideas For Life
BMW	The Ultimate Driving Machine	Phillips	Lets Make Things better
BPL Group	Believe in the Best	Reliance industries Limited	Growth is Life
BSNL	Connecting India	Raymond	The Complete Man
CEAT	Born Tough	Reid and Taylor	Bond With The Best
Citigroup or Citibank	The Citi Never Sleeps	Sansui	Born in Japan Entertaining The World
CNBC	Profit From It	SONY	Like. No. Other.
EPSON	Exceed Your Vision	Tata Motors	Even More Car per Car
Ford	Built for the Road Ahead	TCS	Beyond the Obvious/ Experience Certainty
Haier	Inspired Living	The Indian EXPRESS	Journalism of Courage
Hindustan Times	The Name India trusts for News	Toshiba	Choose Freedom
Honda	The Power of Dreams	Toyota	Touch The Perfection
HSBC	The World's Local Bank	Videocon	The Indian Multinational
IBM	On Demand	WIPRO	Applying Thought
Idea Cellular	An Idea Can Change Your Life		
Infosys	Powered by Intellect, Driven by Values		

## RENAMED INDIAN STATES / UNION TERRITORIES

Old Name	New Name	Change in the year	Old Name	New Name	Change in the year
Assam	Asom	Not yet effective	Orissa	Odisha	November 2011
Hyderabad	Andhra Pradesh	1 November 1956	Pondicherry	Puducherry	1 October 2006
Laccadive, Minicoy & Amindivi Islands	Lakshadweep	1 November 1973	Travancore-Cochin	Kerala	1 November 1956
Madhya Bharat	Madhya Pradesh	1 November 1959	United Provinces	Uttar Pradesh	26 January 1950
Madras State	Tamil Nadu	14 January 1969	Uttaranchal	Uttarakhand	1 January 2007
Mysore	Karnataka	1 November 1973	West Bengal	Paschim Banga	September 2011

## RENAMED INDIAN CITIES

### Andhra Pradesh

Garthapuri to Guntur  
kandenavolu to Kurnool  
Ellore to Eluru  
Vizagapatnam to Visakhapatnam  
Bezawada to Vijayawada  
Kadapa to YSR district  
Ongole Dist. to Prakasam  
Nellore Dist. to Sri Potti Sri Ramulu Nellore district  
Cocanada to Kakinada  
Masulipatnam to Machilipatnam  
Sikkolu to Srikakulam  
Rajamahendravaramu to Rajahmundry

### Assam

Nowgong to Nagaon  
Gauhati to Guwahati  
Sibsagar to Sivasagar

### Gujarat

Baroda to Vadodara  
Broach to Bharuch  
Cambay to Khambhat  
Bulsar to Valsad

### Himachal Pradesh

Simla to Shimla  
Mandav Nagar

### Karnataka

Bangalore to Bengaluru  
Mysore to Mysuru  
Mangalore to Mangaluru  
Hubli to Hubballi  
Tumkur to Tumakuru  
Shimaga to Shivamogga  
Belgaum to Belagavi  
Bellary to Ballari  
Gulbarg to Gulbarga  
Marcera to Madikeri, the settlement was originally called Madanayakana Keri

### Kerala

Trivandrum to Thiruvananthapuram  
Cochin to Kochi  
Calicut to Kozhikode  
Quilon to Kollam  
Trichur to Thrissur  
Cannanore to Kannur  
Palghat to Palakkad  
Alleppey to Alappuzha  
Alwaye to Aluva  
Parur to North Paravur  
Cranganore to Kodungallur  
Tellicherry to Thalassery  
Badagara to Vatakara  
Palai to Pala  
Verapoly to Varapuzha  
Cherpalchery to Cherpulassery  
Koney to Konni

### Madhya Pradesh

Ahilyanagari/Indur to Indore  
Avantika to Ujjain  
Bhelsa to Vidisha  
Rassen to Raisen  
Saugor to Sagar  
Jubbulpore to Jabalpur  
Bhopal Bairagarh to Sant Hirda Ram Nagar, Bhopal  
Bellasgate to Bheraghat  
Ojjain to Ujjaini  
Mandu to Mandavgarh

### Maharashtra

Bombay to Mumbai  
Nasik to Nashik  
Poona to Pune  
Thana to Thane

### Puducherry

Pondicherry to Puducherry  
Yanaon to Yanam

### Punjab

Jullunder to Jalandhar  
Ropar to Rupnagar  
Mohali to SAS Nagar  
Nawan Shahar to Shaheed Bhagat Singh Nagar

### Rajasthan

Ajaymeru to Ajmer

### Tamil Nadu

Tinnevely to Tirunelveli  
Tranquebar to Tharangambadi  
Trichinopoly to Tiruchirappalli  
Madras to Chennai  
Tanjore to Thanjavur  
Karuvur to Karur  
Tuticorin to Thoothukudi  
Cape Comorin to Kanyakumari  
Ootacamund to Udagamandalam  
Conjeevaram to Kanchipuram  
Virudupatti to Virudhunagar  
Potonovo to Parangipettai  
Mayavaram to Mayiladuthurai

### Uttar Pradesh

Cawnpore to Kanpur  
Banaras to Varanasi  
Prayag to Allahabad  
Muzaffamagar to Lakshminagar

### West Bengal

Calcutta to Kolkata  
Burdwan to Bardhaman  
Chinsurah to Hugli-Chuchura

### Telangana

Edlabad to Adilabad  
Bhagyanagaram to Hyderabad  
Elgandal to Karimnagar  
Indur to Nizamabad  
Metuku to Medak  
Paalamuru to Mahabubnagar  
Ekasilanagaram to Warangal



## NATIONAL INSTITUTIONS

### AGRICULTURE AND ANIMAL HUSBANDRY

- Indian Agriculture Research Institute : New Delhi
- Central Rice Research Institute : Cuttack
- Central Sugarcane Research Institute : Coimbatore
- Central Tobacco Research Institute : Rajamundry
- Central Potato Research Institute : Shimla
- National Center of Organic Farming : Ghaziabad
- National Plant Protection Training Institute : Hyderabad
- Central Frozen Semen Production and Training Institute : Hissar Ghatta (Karnataka)
- Central Sheep Breeding Farm : Hissar
- Indian Veterinary Research Institute : Izzatnagar
- Animal Health Institute : Jalandhar
- Central Institute of Fisheries, Nautical and Engineering Training : Kochi
- Integrated Fisheries Project : Kochi
- Central Agriculture Research Institute : Port Blair
- Central Institute of Cotton Research : Nagpur
- Central Institute of Agricultural Engineering : Bhopal
- Central Institute of Fisheries Education : Mumbai
- Central Institute of Fisher Technology : Cochin
- Central Institute of Fresh Water Agriculture : Bhubaneswar
- Central Soil Salinity Research Institute : Karnal
- Central Inland Fisheries Research Station : Jodhpur
- Locust Warning Organisation : Jodhpur
- National Institute of Agricultural Marketing : Jaipur
- Random Sample Poultry Performance Testing Center : Gurgaon
- National Institute of Animal Health : Bhagpat (Uttar Pradesh)
- Disease Investigation Laboratory : Pune
- Institute of Animal Health and Veterinary Biologicals : Kolkata

### COMMERCE

- Rubber Board : Kottayam
- Coffee Board : Bengaluru
- Tea Board : Kolkata
- Tobacco Board : Guntur, Andhra Pradesh
- Spices Board : Kochi
- Indian Institute of Foreign Trade : New Delhi
- Indian Institute of Packaging : Mumbai
- Indian Diamond Institute : Surat

### COMMUNICATION

- Bharat Ratna Bhim Rao Ambedkar Institute of Telecom Training : Jabalpur
- Tele Communication Engineering Center : New Delhi
- National Academy of Telecom Finance and Management : Hyderabad
- Advance Level Telecom Centre : Ghaziabad

### EDUCATION

- Central Institute of Indian Languages : Mysore
- Central Institute of English and Foreign Languages : Hyderabad
- Rashtriya Sanskrit Sansthan : New Delhi
- Rashtriya Sanskrit Vidyapeetha : Tirupati
- Indian National Academy of Engineering : New Delhi
- High Altitude Training Centre : Shilaroo (Himachal Pradesh)
- Fire Training Centre : New Delhi
- Maharishi Sandipani Rashtriya Veda Vidya Prathisthan : Ujjain
- Indian School of Business : Hyderabad
- Indian Statistical Institute : Kolkata

### ENERGY

- National Power Training Institute : Faridabad
- Centre for Wind Energy Technology : Chennai

### ENVIROMENT

- Centre for Environmental Education : Ahmedabad
- Centre for Mining Environment : Ahmedabad
- GB Pant Institute of Himalayan Environment and Development : Almora (Uttarakhand)
- Centre for Ecological Sciences : Bengaluru
- National Biodiversity Authority : Chennai
- CPR Environmental Education Centre : Chennai
- Animal Welfare Board of India : Chennai
- Forest Survey of India : Dehradun
- Indian Council of Forest Research and Education : Dehradun
- Indira Gandhi National Forest Academy : Dehradun
- Wildlife Institute of India : Dehradun
- Indian Institute of Chemical Technology : Hyderabad
- Central Soil and Material Research Station : New Delhi
- National Mangrove Genetic Resource Centre : Odisha
- National Coral Reef Research Centre : Port Blair
- National Institute of Hydrology : Roorkee

### FOREST

- Centre for Social Forestry and Eco-rehabilitation : Allahbad
- Indian Plywood Industries Research and Training Institute : Bengaluru
- Indian Institute of Forest Management : Bhopal
- Institute of Forest Genetics and Tree Breeding : Coimbatore
- Forest Research Institute : Dehradun
- Tropical Forestry Research Institute : Jabalpur
- Arid Forest Research Institute : Jodhpur
- Rain Forest Research Institute : Jorhat
- Institute for Forest Productivity : Ranchi
- Himalayan Forest Research Institute : Shimla

## FOOD AND CIVIL SUPPLIES

- Bureau of Indian Standards : Delhi
- Indian Grain Storage Management and Research Institute : Hapur
- National Institute of Training for Standardisation : New Delhi

## GOVERNMENT INDUSTRIAL UNDERTAKINGS

- Bharat Electronics Limited : Jalahalli (Bengaluru)
- Heavy Engineering Corporation Ltd : Ranchi
- Heavy Machine Building Plant : Ranchi
- Heavy Vehicles Factory : Avadi (Chennai)
- Hindustan Aeronautics Ltd : Bengaluru
- Hindustan Aircraft Factory : Bengaluru
- Hindustan Housing Factory Ltd : New Delhi
- Hindustan Teleprinters Ltd : Chennai
- Integral Coach Factory : Perambalur (Tamil Nadu)
- Security Paper Mill : Hoshangabad (Madhya Pradesh)
- Neyveli Lignite Corporation Ltd : Neyveli (Tamil Nadu)
- Hindustan Organic Chemicals Ltd : Kolaba (Maharashtra)
- Hindustan Photo Films Manufacturing Company Ltd : Ooty
- Hindustan Zinc Ltd : Udaipur (Rajasthan)

## HEALTH AND FAMILY WELFARE

- National Academy of Medical Science : New Delhi
- National Institute of Ayurveda : Jaipur
- National Institute of Unani Medicines : Bengaluru
- National Institute of Homeopathy : Kolkata
- National Institute of Naturopathy : Pune
- National Institute of Siddha : Chennai
- Morarji Desai National Institute of Yoga : New Delhi

## HEALTH AND MEDICINAL RESEARCH CENTRES IN INDIA

- School of Tropical Medicine : Kolkata
- Central Leprosy Training and Research Institute : Chinglepet
- PGI Medical Education and Research : Chandigarh
- National Institute of Nutrition : Hyderabad
- National Institute of Occupational Health : Ahmedabad
- King Institute of Preventive Medicine : Guindy (Chennai)
- All India Institute of Hygiene and Public Health : Kolkata
- All India Malaria Research Institute : New Delhi
- All India Institute of Medical Sciences : New Delhi
- National Tuberculosis Institute : Bengaluru
- Indian Cancer Research Centre : Mumbai
- Institute of Ayurvedic Studies and Research : Jamnagar (Gujrat)
- Vallabhbhai Patel Chest Institute : Delhi
- Haffkine Institute : Mumbai
- National Institute of Communicable Diseases : Delhi

## INDUSTRY

- Sardar Vallabhbhai Institute of Textile Management : Coimbatore
- Institute of Pesticide Formulation Technology : Gurgaon
- Central Institute of Plastic Engineering and Technology : Chennai

## JUSTICE AND LAW

- National Judicial Academy : Bhopal
- Sardar Vallabhbhai Patel National Police Academy : Hyderabad
- National Institute of Criminology and Forensic Science : New Delhi
- National Law School of India University : Bengaluru

## LABOUR

- V V Giri National Labour Institute : Noida (Uttar Pradesh)
- National Instructional Media Institute : Chennai
- Central Staff Training and Research Institute : Kolkata

## LABORATORIES

- Central Scientific Instrument Organisation : Chandigarh
- Central Leather Research Institute : Chennai
- Indian Institute of Petroleum : Dehradun
- Central Mining Research Station : Dhanbad
- Central Fuel Research Institute : Dhanbad (Jharkhand)
- National Geophysical Research Institute : Hyderabad
- National Metallurgical Laboratory : Jamshedpur
- Central Glass and Ceramic Research Institute : Kolkata
- National Botanical Research Institute : Lucknow
- Central Drug Research Institute : Lucknow
- Central Institute of Medical and Aromatic Plants : Lucknow
- Central Food Technological Research Institute : Mysore
- National Environmental Engineering Institute : Nagpur
- National Physical Laboratory : New Delhi
- Pulsars Research Laboratory : Pachmarhi (Madhya Pradesh)
- National Biological Laboratory : Palampur (Himachal Pradesh)
- National Institute of Oceanography : Panaji (Goa)
- Central Electronic Engineering Research Institute : Pilani (Rajasthan)

## SCIENCE AND TECHNOLOGY RESEARCH INSTITUTES

- Physical Research Laboratory : Ahmedabad
- Jawaharlal Nehru Centre for Advanced Scientific Research : Bengaluru
- Indian Institute of Astrophysics : Bengaluru
- The National Centre for Biological Science : Bengaluru
- Raman Research Institute : Bengaluru
- Institutes of Life Sciences : Bhubaneswar
- National Institute of Ocean Technology : Chennai
- Central Marine Research Station : Chennai

- Wadia Institute of Himalayan Geology : Dehradun
- National Centre for Antarctic and Ocean Research : Goa
- High Altitude Research Laboratory : Gulmarg (Kashmir)
- The Survey Training Institute : Hyderabad
- Centre for DNA Finger Printing and Diagnostics : Hyderabad
- Indian National Centre for Ocean and Information Services : Hyderabad
- Institute of Microbial Technology : Hyderabad
- Institute of Bio-resources and Sustainable Development : Imphal
- National Sugar Research institute : Kanpur (Uttar Pradesh)
- The Centre for Marine Living Resource and Ecology : Kochi
- SN Bose National Centre for Basic Sciences : Kolkata
- National Brain Research Centre : Manesar
- Indian Institute of Geomagnetism : Mumbai
- Indian Cancer Research Centre : Mumbai
- Visvesvaraya National Institute of Technology : Nagpur
- National Environmental Engineering Research Institute : Nagpur (Maharashtra)
- Indian National Academy of Engineering : New Delhi
- National Institute of Immunology : New Delhi
- Indian National Science Academy : New Delhi
- National Seismological Database Centre : New Delhi
- National Centre for Plant Genome Research : New Delhi
- National Centre for Cell Science : Pune
- Indian Institute of Tropical Meteorology : Pune
- Indian Lac Research Institute : Ranchi
- SV National Institute of Technology : Surat
- Shri Chitra Tirunal Institute for Medical Science and Technology : Thiruvananthapuram

#### NUCLEAR AND SPACE RESEARCH CENTRES IN INDIA

- Indian Rare Earths Limited : Alwaye (Kerala)
- Uranium Corporation of India Limited : Jahugoda
- Atomic Energy Commission (AEC) : Mumbai
- Electronics Corporation of India Limited : Hyderabad
- Bhabha Atomic Research Centre (BARC) : Trombay
- Radio Astronomy Centre : Ootacamund
- Tata Institute of Fundamental Research : Mumbai
- Saha Institute of Nuclear Physics : Kolkata
- Centre of Earth Science's Studies : Thiruvananthapuram (Kerala)
- Physical Research Laboratory : Ahmedabad
- Space Commission : Bengaluru
- Vikram Sarabhai Space Centre : Thiruvananthapuram
- Space Application Centre : Ahmedabad
- Thumba Equatorial Rocket Launching Station : Thumba (Kerala)
- College of Satellite Communication Technology : Ahmedabad

#### MASS COMMUNICATION

- Film and Television Institute of India : Pune
- Satyajit Ray Film and Television Institute : Kolkata
- Indian Institute of Mass Communication : New Delhi

#### SOCIAL WELFARE INSTITUTES

- Institute for Empowerment of Persons with Multiple Disabilities : Chennai
- National Institute of Rehabilitation Training and Research : Cuttack
- National Institute for Visually Handicapped : Dehradun
- National Institute for Orthopaedically Handicapped : Kolkata
- Ali Yavar Jung National Institute for the Hearing Handicapped : Mumbai
- Institute of Physically Handicapped : New Delhi
- National Institute of Public Cooperation and Child Development : New Delhi
- National Institute for Mentally Handicapped : Secunderabad (Andhra Pradesh)

#### TRANSPORT

- Rail Wheel Factory : Bengaluru
- Chittaranjan Locomotive Works : Chittaranjan
- The National Institute of Aviation Management and Research : Delhi
- Indira Gandhi Rashtriya Uran Akademi : Fursatganj (Uttar Pradesh)
- National Institute of Water Sport : Goa
- The Indian Institute of Tourism and Travel Management : Gwalior
- Rail Coach Factory : Kapurthala
- LBS College of Advance Maritime Studies and Research : Mumbai
- Marine Engineering and Research Institute : Mumbai
- Fire Service Training Institute : Powai (Mumbai)

#### WATER RESOURCES

- The Central Soil and Material Research Station : New Delhi
- The Central Water and Power Research Station : Khadakwasla
- The National Institute of Hydrology : Roorkee

#### YOUTH AFFAIRS AND SPORTS

- Netaji Subash National Institute of Sports : Patiala
- The Rajiv Gandhi National Institute of Youth Development : Sriperumbudur
- The Lakshmi Bai National Institute of Physical Education : Gwalior

## UNITED NATIONS

The United Nations (UN) is an intergovernmental organization to promote international co-operation. A replacement for the ineffective League of Nations, the organization was established on 24 October 1945 after World War II in order to prevent another such conflict.

**Headquarters :** New York City, USA

**Official languages :** Arabic, English, French, Chinese, Russian, Spanish

**Membership :** 193 member states, 2 observer states

### The purposes of UN are

1. Peace Keeping
2. Friendly Relations among nations
3. Human Rights
4. Economic development and humanitarian assistance
5. Maintain International Law and Security

### Principle Organs of UN

There are six principle organs of the United Nations:

1. UN General Assembly
2. UN Security Council
3. UN Economic and Social Council
4. UN Trusteeship Council
5. International Court of Justice
6. UN Secretariat

### UN General Assembly (UNGA, GA, AG)

- Formation : 1945
- Headquarter : United Nations in New York
- All 193 members states of the United Nations are members of the General Assembly.
- Its powers are to oversee the budget of the United Nations, appoint the non-permanent members to the Security Council, receive reports from other parts of the United Nations and make recommendations in the form of General Assembly Resolutions.

- It has also established a wide number of subsidiary organs.
- The first session was convened on 10 January 1946 in the Westminster Central Hall in London and included representatives of 51 nations.

### UN Security Council (UNSC)

- Formation : 1945
- Headquarter : New York
- The Security Council has primary responsibility, under the UN Charter, for the maintenance of international peace and security.
- It has 15 Members (5 permanent and 10 non-permanent members).
- The Security Council takes the lead in determining the existence of a threat to the peace or act of aggression. It calls upon the parties to a dispute to settle it by peaceful means and recommends methods of adjustment or terms of settlement.
- The Security Council held its first session on 17 January 1946 at Church House, Westminster, London.

### UN Economic and Social Council (ECOSOC)

- Formation : 1945
- Headquarter : New York
- It is the principal body for coordination, policy review, policy dialogue and recommendations on economic, social and environmental issues, as well as implementation of internationally agreed development goals.
- It has 54 Members, elected by the General Assembly for overlapping three-year terms.
- It is the United Nations' central platform for reflection, debate, and innovative thinking on sustainable development.

### UN Trusteeship Council

- Formation : 1945
- Headquarter : New York

- It provides international supervision for 11 Trust Territories that had been placed under the administration of seven Member States, and ensure that adequate steps were taken to prepare the Territories for self-government and independence.
- By 1994, all Trust Territories had attained self-government or independence. The Trusteeship Council suspended operation on 1 November 1994.
- The last was Palau, formerly part of the Trust Territory of the Pacific Islands, which became a member state of the United Nations in December 1994.

#### **International Court of Justice (ICJ) (*World Court*)**

- Established : 1945
- Country : Worldwide, 193 State Parties
- Location (HQ) : The Hague, Netherlands
- Number of judges : 15
- Judge term length : 9 years
- Official languages : English and French
- It is the primary judicial branch of the United Nations (UN).

- It's role is to settle, in accordance with international law, legal disputes submitted to it by States and to give advisory opinions on legal questions referred to it by authorized United Nations organs and specialized agencies.

#### **UN Secretariat**

- Formation : 1945
- Headquarter : New York
- It is headed by the Secretary-General, assisted by a staff of international civil servants worldwide.
- The Secretariat has an important role in setting the agenda for the UN's deliberative and decision making bodies of the UN (the General Assembly, Economic and Social Council, and Security Council), and the implementation of the decision of these bodies.
- Secretary-General, who is appointed by the General Assembly, is the head of the secretariat.

#### **Secretaries-General of the United Nations**

No.	Name	Country of origin	Took office	Left office
1	Trygve Lie	Norway	2 February 1946	10 November 1952
2	Dag Hammarskjold	Sweden	10 April 1953	18 September 1961
3	U Thant	Myanmar	30 November 1961	31 December 1971
4	Kurt Waldheim	Austria	1 January 1972	31 December 1981
5	Javier Perez de Cuellar	Peru	1 January 1982	31 December 1991
6	Boutros Boutros-Ghali	Egypt	1 January 1992	31 December 1996
7	Kofi Annan	Ghana	1 January 1997	31 December 2006
8	Ban Ki-moon	South Korea	1 January 2007	31 December 2016
9	António Guterres	USA	1 January 2017	Incumbent

### Important UN Agencies

Name of Agency	Estd. in	Headquarters	Purpose
International Labour Organization (ILO)	1919	Geneva, Switzerland	To improve conditions and living standard of workers.
World Health Organization (WHO)	1948	Geneva, Switzerland	Attainment of highest possible level of health by all people.
United Nations Educational, Scientific and Cultural Organization (UNESCO)	1946	Paris, France	To Promote collaboration among nations through education, science and culture.
International Atomic Energy Agency (IAEA)	1957	Vienna, Austria	To promote peaceful uses of atomic energy.
United Nations International Children's Emergency Fund (UNICEF)	1946	New York	To promote children's welfare all over the world.
United Nations High Commissioner for Refugees (UNHCR)	1950	Geneva, Switzerland	To provide protection to refugees.
United Nations Fund for Population Activities (UNFPA)	1969	New York, US	For formulating population policies.
World Intellectual Property Organisation (WIPO)	1967	Geneva, Switzerland	To encourage creative activity, to promote the protection of intellectual property throughout the world.
International Fund for Agricultural Development (IFAD)	1977	Rome, Italy	For financing agricultural projects in the world to raise the economic growth.
United Nations Conference on Trade and Development (UNCTAD)	1964	Geneva, Switzerland	Promotes international trade to accelerate economic growth of developing countries.
International Civil Aviation Organization (ICAO)	1947	Montreal, Canada	Promotes safety of international aviation.
International Monetary Fund (IMF)	1945	Washington D.C., US	Promotes international monetary cooperation.
International Finance Corporation (IFC)	1956	Washington D.C., US	Promotes economic development by encouraging private enterprise in its member countries.
United Nations Environmental Programme (UNEP)	1972	Nairobi, Kenya	Promotes international co-operation in human environment.
United Nations Industrial Development Organization (UNIDO)	1966	Vienna, Austria	Promotion and acceleration of industrial development.
Food and Agricultural Organization (FAO)	1945	Rome, Italy	To improve living condition of rural population.
International Bank for Reconstruction and Development (IBRD)	1946	Washington D.C., US	Development of economic of members by facilitating investment of capitals by providing loans.
World Meteorological Organization (WMO)	1950	Geneva, Switzerland	Promote international exchange of weather reports.
World Trade Organization (WTO)	1995	Geneva, Switzerland	Setting rules for world trade to reduce tariffs.
United Nations Development Programme (UNDP)	1965	New York, US	Help developing countries increase the wealth producing capabilities o their natural and human resources.
International Maritime Organization (IMO)	1958	London, UK	Promotes co-operation on technical matters of maritime safety, navigation and encourages anti-pollution measures.
International Development Association (IDA)	1960	Washington D.C., US	An affiliate of the World Bank, aims to help under-developed countries raise living standards.
International Tele-communication Union (ITU)	1947	Geneva, Switzerland	Sets international regulations for radio telegraph, telephone and space radio communications.
United Nations Institute for Training and Research (UNITAR)	1965	New York, US	Provides training and research to help facilitate UN objectives of world peace and security and of economic and social progress.
United Nations Relief and Work for Palestine Refugees (UNRWA)	1949	New York, US	Provides basic amenities and education for the victims of Arab-Israel War.
United Nations Fund for Population Activities (UNFPA)	1969	New York, US	Studying population dynamics, collecting population data, formulating and evolving population policies, family planning and related programmes.

### International Organisation and Groups

Organisation	Estd. in	Headquarter	Member
The Commonwealth	1949	London, UK	53
Asia-Pacific Economic Cooperation (APEC)	1989	Singapore	21
Asian Development Bank (ADB)	1966	Philippines	67
Association of Southeast Asian Nations (ASEAN)	1967	Jakarta, Indonesia	10
Commonwealth of Independent States (CIS)	1991	Minsk, Belarus	11
Group of Eight (G8)	1975	-	9
Group of 15 (G15)	1989	Geneva, Switzerland	17
International Olympic Committee (IOC)	1894	Lausanne, Switzerland	105
International Organization for Standardization (ISO)	1947	Geneva, Switzerland	163
Non-Aligned Movement (NAM)	1961	New York	120
European Union (EU)	1965	Brussels, Belgium	28
North Atlantic Treaty Organization (NATO)	1949	Brussels, Belgium	28
Organization of the Petroleum Exporting Countries (OPEC)	1960	Vienna, Austria	12
South Asian Association for Regional Cooperation (SAARC)	1985	Kathmandu, Nepal	8
Amnesty International (AI)	1961	London, UK	-
World Wide Fund for Nature (WWF)	1961	Gland, Switzerland	All Countries
BRICS (Brazil, Russia, India, China, and South Africa)	2006	-	5
African Union (AU)	2002	Addis Ababa & Midrand	54
Group of 20 (G20+)	2003	Cancun, Mexico	23
Group of 77 (G77)	1964	-	133
International Criminal Police Organization (INTERPOL)	1923	Lyon, France	190
Red Cross	1863	Geneva, Switzerland	-
Organisation of Islamic Cooperation (OIC)	1969	Jeddah, Saudi Arabia	57
Shanghai Cooperation Organization (SCO)	1996	Beijing, China	6
Arab League	1945	Cairo	22
Organisation for Economic Co-operation and Development (OECD)	1961	Paris, France	34
Group of 5 (G5) (India, China, Brazil, Mexico, South Africa)	2005	-	5
South East Asia Treaty Organization (SEATO)	1954	Bangkok, Thailand	8
Colombo Plan	1950	Colombo, Sri Lanka	27
World Economic Forum (WEF)	1971	Cologny, Switzerland	-
Organization of Arab Petroleum Exporting Countries (OAPEC)	1968	Kuwait	10

## BOOKS & AUTHORS

### FAMOUS BOOKS BY FOREIGN AUTHORS

Authors	Books	Authors	Books
Abdul Salam Zaeef	My Life with the Taliban	Earnest Hemingway	Old Man and the Sea,
Abraham Lincoln	In Lincoln's hand		For whom the Bell Tolls
	This Fiery Trial	E. L. James	Fifty Shades of Grey
Abul Fazal	Ain-i-Akbari	Erich Segal	The Class
	Akbar-Nama	Firdausi	Shah Nama
Adam Gilchrist	True Colours	Franz Kalka	The Castle
Adam Smith	Wealth of Nations	Gabrielle Hamilton	Blood, Bones and Butter
Adolf Hitler	Mein Kampf	George Bernard Shaw	Man and Superman,
A. G. Noorani	India-China Boundary Problem, 1846-1947		Man of Destiny
	The Kashmir Dispute 1947- 2012	Geoffrey Chaucer	The Canterbury Tales
Al Gore	An Inconvenient Truth	George Eliot	Silas Marner, Middle March
Albiruni	Tahakak - E - Hind	George Orwell	Nineteen Eighty-four
Alexander Dumas	Three Musketeers	Goethe	Faust
Albert Einstein	Theory of Relativity	H.G. Wells	Time Machine,
Arthur Conan Doyle	Adventures of Sherlock Holmes		The War of the Worlds, Invisible Man
Arthur I. Miller	Empire of the Stars, Death of a Salesman	Harold T. Laski	Grammar of Politics
Ayub Khan	Friend Not Master	Herodotus	Historica
Barack Obama	The Audacity of Hope, Dreams from My Father, Of Thee I Sing, Change We Can Believe In, The Wit and Wisdom of Barack Obama	Homer	Illiad, Odyssey
	The Road Ahead	Issac Newton	Philosophae Naturalis Principia Mathematica, Opticks
Bill Gates	Last Days of Pompeii	J. K. Rowling	The Harry Potter Series, The Casual Vacancy
Bulwar Lytton	The Masters	Jacqueline Susann	The Love Machine
C.P. Shaw	Origin of Species	James Joyce	Ulysses
Charles Darwin	A Tale of Two Cities, David Copperfield, Oliver Twist, Great Expectations	Jasper F Forde	Shades of Grey
Charles Dickens	A view from Delhi	John Galsworthy	Forsyte Saga
Chester Bowles	The Da Vinci Code	John Kenneth Galbraith	China Passage
Dan Brown	Inferno	John Milton	Paradise lost, Paradise Regained
	The Lost Symbol	Jonathan Swift	Gulliver's Travels
Dalai Lama	Beyond Religion	J. R. R. Tolkien	The Lord of the Rings, The Hobbit
	The Art of Living		Around the World in Eighty days
Dante Alighieri	Divine Comedy, Inferno, Paradiso	Jules Verne	The Communist Manifesto, Das Kapital
David Loshak	Pakistan Crisis	Karl Marx	Mother India
Dominique Lapierre	The City of Joy	Katherine Mayo	War and peace
E. M. Forster	A Passage to India	Leo Tolstoy	Alice in Wonderland
		Lewis Carrol	Don Juan
		Lord Byron	Problems of the East
		Lord Curzon	



<b>Authors</b>	<b>Books</b>	<b>Authors</b>	<b>Books</b>
Lord Hardinge II	My Indian Years	Romain Rolland	Mahatma Gandhi
Louis Fisher	A Week with Gandhi	Richard Burton	Arabian Nights
M Veerappa Moily	Shree Ramayana Mahanveshanam	Rudyard Kipling	Jungle Book
		Russ M Lala	For the Love of India
Malala Yousafzai	I Am Malala	Samuel Taylor Coleridge	Biographia Literaria
Margaret Mitchell	Gone with the World	Sohaib Akhtar	Controversially Yours
Mario Puzo	The Godfather, The Last Don	Stephen Hawking	A Brief History of Time, Black Holes and Baby Universes
Mark Twain	Adventures of Tom Sawyer		
Martin Amis	The Pregnant Widow	Syyed Amir Ali	The Spirit of Islam
Maxim Gorky	The Mother, Enemies	T. S. Eliot	The Waste Land
Michael Crichton	Jurassic Park	Tony Blair	A Journey
Michel Madhusudan Dutta	Captive Lady	U Thant	View From the UN
Nelson Mandela	Conversations with Myself, Long Walk to Freedom, The Struggle Is My Life	Vladimir Nabokov	Lolita
		Walter Issacson	Steve Jobs
Niccolo Machiavelli	The Prince	Walter Scott	Ivanhoe
Oliver Goldsmith	The Desert Village	William Manchester	The Death of President
Oprah Winfrey	What I Know for Sure, Oprah: Make the Connection	William Shakespeare	Antony and Cleopatra, First Folio, The Rape of Lucrece, Macbeth, The Klingon Hamlet, Twelfth Night, King Lear, Othello, The Tempest, Comedy Errors, Julius Ceasar
Oscar Wilde	Importance of Being Earnest		
Panini	Astyadhaye	Winston Churchill	Gathering Strom,
Paulo Coelho	The Alchemist, Adultery		The River War
Parvez Musharaf	In the Line of Fire	Yann Martel	Life of Pi, 101 Letters to a Prime Minister
Pearl S Buck	Imperial Woman		Myth of Independence
Plato	The Republic		
Robert L.Stevenson	Treasure Island	Zulfikar Ali Bhutto	

### FAMOUS BOOKS BY INDIAN AUTHORS

<b>Authors</b>	<b>Books</b>	<b>Authors</b>	<b>Books</b>
Atal Bihari Vajpayee	New Dimensions of India's Foreign Policy, Four decades in parliament	Amit Choudhary	A Strange and Sublime Address, The Immortals
Abdul Kalam Azad	India Wins Freedom	Amit Dasgupta	India for A Billion Reasons
A. P. J. Abdul Kalam	Ignited Minds, Mission India, Turning Points, Wings of Fire, India 2020	Amitav Ghosh	In an Antique Land, Shadow Line, Circle of the Region, River of Smoke, The Hungry Tide, Flood of fire
Abhinav Bindra	A Shot at History: My Obsessive Journey to Olympic Gold	Amrita Pritam	A Revenue Stamp, Kora Kagaz, Death of a City
AL Basham	Wonder That was India	Anil Kumble	Wide Angle
Amartya Sen	Development as Freedom, The Idea of Justice, An Uncertain Glory	Annie Besant	New India, Wake up India
		Anuradha Roy	The Folded Earth
Amish Tripathi	Scion of Ikshvaku, The Immortals of Meluha, The Oath of the Vayuputras, The Secret of Nagas	Aravind Adiga	The White Tiger, Last Man in Tower
		Arundhati Roy	Broken Republic, The Hanging of Afzal Guru, The God of Small Things, Capitalism : A Ghost Story

<b>Authors</b>	<b>Books</b>	<b>Authors</b>	<b>Books</b>
Ashapura Devi	Subarnalata	Khushwant Singh	The Company of Women, Train to Pakistan, Sahibs Who Loved India, A Bride of Sahib
Ashwin Sanghi	Chanakya's Chant, The Rozabal Line	Kiran Bedi	Dare to Do, Empowering Women
Aurobindo Ghosh	The Life Divine	Kiran Desai	The Inheritance of Loss
B. G. Tilak	Gita Rahasya	Kuldip Nayar	The Judgement
B. R. Ambedkar	The Annihilation of Caste, The Untouchables	Lal Krishna Advani	My Country My Life
Balwant Gargi	Naked Triangle	Lala Lajpat Rai	Unhappy India
Bana Bhatt	Harsha Charit, Kadambari	Mahatma Gandhi	The Story of My Experiments with Truth, Hind Swaraj
Bankim C. Chattopadhyay	Anand Math	Mahadevi Verma	Yama
B. Bandyopadhyay	Chander Pahar, Aparajito	Mala Sen	Bandit Queen
Bipan Chandra	India Since Independence	Mamata Banerjee	My Unforgettable Memories
Chetan Bhagat	India After Independence : 1947-2000	Meghnad Desai	Marx's Revenge
Daisy Mason	Half Girlfriend, 2 States, Five Point Someone, One Night @ the Call Centre, Revolution 2020, The 3 Mistakes of my Life, What Young India Wants	M. J. Akbar	Nehru : The Making of India
Devdutt Pattanaik	The Toilet House	Morarji Bhai Desai	A Minister and his Responsibilities
Dadabhai Naoroji	Seven secrets of Shiva, Indian Mythology, The goddess in India, Vishnu: An Introduction	Mulk Raj Anand	Coolie, Two Leaves and a Bud, Untouchable, The Village, Seven Summers
Dinbandhu Mitra	Poverty & Un-British Rule in India	Munshi Prem Chand	Rang Bhoomi, Godan
S. Radhakrishnan	Neel Darpan	N.R. Narayana Murthy	A Better India
Dr. Rajendra Prasad	Dhammapada	Narendra Modi	Convenient Action
G. Gandhi	India Divided	Naveen Patnaik	A Second Paradise, A Desert Kingdom, The Garden of Life
Gopinath Mohanty	Saranam, Refuge	Nirod C. Choudhary	The Autobiography of an Unknown Indian
Gulzar	Matimatala, Paraja	Patanjali	Mahabhashya
Hamid Ansari	Half a Rupee	P. M. Nayar	The Kalam Effect : My Years With the President
Indira Gandhi	Travelling Through Conflict	Prakash Iyer	The Secret of Leadership
Jayaprakash Narayan	My Truth	Pratibha Ray	Yajnaseni : The Story of Draupadi
Jaswant Singh	Prison Diary	Preeti Shenoy	The Secret Wish List, Life Is What You Make It
Jawaharlal Nehru	Jinnah- India, India at Risk	R.K. Laxman	The Distorted Mirror
Jaya Dev	The Discovery of India, Glimpses of World History	R. K. Narayanan	Guide, Swami and Friends, Malgudi days, The Man-Eater of Malgudi, Talkative Man, The Vendor of Sweet
Jhumpa Lahiri	Geet Govind	Rabindra Nath Tagore	Gora, Bisarjan, Chitra, The Post Office, Chandalika, Geetanjali
K Natwar Singh	The Lowland, The Namesake, Interpreter of Maladies	Robin S Sharma	The Monk Who Sold His Ferrari, Leader Who Had No Title, Who Will Cry When You Die?
K. M. Munshi	One Life Is Not Enough	Ram Mohan Roy	Precepts of Jesus
Kalhan	I follow the Mahatma	Ramachandra Guha	The Makers of Modern India, India After Gandhi
Kalidas	Rajtarangini	Ramendra Kumar	Mohini
Kanika Dhillon	Avigyan Sakuntalam, Meghdut, Shakuntala		
Kapil Dev	Bombay Duck is a Fish		
Kapil Sibal	Bombay Duck is a Fish		
Kautilya	Straight from the Heart		
Khan Abdul G. Khan	My World Within		
	Arthashastra		
	Pakhtoon		

<b>Authors</b>	<b>Books</b>	<b>Authors</b>	<b>Books</b>
Ramesh Chandra Dutta	The Civilization of India	Sunil Gavaskar	Sunny Days
Ravi Shankar	My Music, My Life	Susmita Das Gupta	Amitabh
Ravinder Singh	I Too Had a Love Story, Can Love Happen Twice?	Swami Dayanand Saraswati	Satyarth Prakash
Ronal Segal	Crisis of India	Swami Vivekananda	Karma-yoga, Living at the source
Ruskin Bond	Notes from a Small Room, A Flight of Pigeons	Syyed Amir Ali	The Spirit of Islam
Salman Rushdie	Midnight Children, The Satanic Verse, Shame	T. S. Krishnamurthy	The Miracle of Democracy
Samar Guha	Netaji Dead or Alive	V.S. Naipaul	A Bend in the River
S. C. Chattopadhyay	Devdas, Parineeta	V. V. Giri	Voice of Conscience
Sarojini Naidu	The Song of India, Broken King	Veerappa Moily	Unleashing Earth
Shashi Tharoor	India: The Future is Now, Pax Indica, An Era of Darkness: The British Empire in India, Inglorious Empire: What the British Did to India	V. Damodar Savarkar	Hindutva
Shobhaa De	Sethji, Superstar India, Starry Nights, Small Betrayals	Vinita Kamte	To the Last Bullet
Sivanand	Divine Life	Valmiki	Ramayana
Subash Chandra Bose	The Indian Struggle	Ved Vyas	Bhagwat Gita
		Vikram Seth	A Suitable Boy, Two Lives, The Golden Gate
		Vinod Mehta	Lucknow Boy
		Vishnu Sharma	Panchatantra
		Vyas	Mahabharata
		Yogendra Singh	Modernization of Indian Tradition
		Yuvraj Singh	The Test of My Life

## GAMES AND SPORTS

### OLYMPIC GAMES

*The Olympic Games are considered to be the world's foremost sports competition with more than 200 nations participating.*

**Summer Olympic Games** or the Games of the Olympiad, first held in 1896, are an international multi-sport event, occurring every four years, organized by the International Olympic Committee.

**Winter Olympic Games** is a major international sporting event that occurs once every four years. Unlike the Summer Olympics, the Winter Olympics feature sports practiced on snow and ice. The first Winter Olympics, the 1924 Winter Olympics, was held in Chamonix, France.

#### OLYMPIC SYMBOLS

**Olympic Motto : Citius, Altius, Fortius**, which is Latin for "Faster, Higher, Stronger." It was proposed by **Pierre de Coubertin** on the creation of the International Olympic Committee in 1894.

**Olympic Flag** : It was created by Pierre de Coubertin in 1914. It was adopted in 1914 but flown for the first time only at the 1920 Summer Olympics in Antwerp, Belgium.

**Olympic Rings** : It consists of five intertwined rings and represents the unity of the five inhabited continents [Blue (Europe), Yellow (Asia), Black (Africa), Green (Australia), and Red (America)]

#### Olympic Mascot

It is an animal native to the area or occasionally human figures representing the cultural heritage of the place where the Olympic Games are held.

First Mascot of Winter Olympics : **Schuss** in 1968 in Grenoble, France

First Mascot of Summer Olympics : **Misha** in 1980 in Moscow

#### OLYMPIC FLAME AND TORCH RELAY

The Olympic flame is a manifestation of the positive values that Man has always associated with the symbolism of fire. The purity of the flame is guaranteed by the special way of lighting it - the sun's rays. The choice of Olympia as a departure point emphasises the link between the Ancient and Modern Games and underlines the profound connection between these two events.

The flame is carried by relay all the way to its final destination in the stadium. Although it is usually carried by runners on foot, other modes of transport are also used. For air transportation, the flame is sheltered in a security lamp, similar to a miner's lamp. At night time, it is kept in a special cauldron. The Relay's function is twofold: to herald the Olympic Games and to transmit a message of peace and friendship to the people along its route.

*The fire was introduced at the 1928 Summer Olympics in Amsterdam, and it has been part of the modern Olympic Games ever since.*

#### OLYMPIC MEDAL

It is awarded to successful competitors at one of the Olympic Games.

1. **First place: Gold Medal** : It is composed of silver of at least .925 grade, plated with 6 grams of gold.
2. **Second place: Silver Medal** : .925 silver
3. **Third place: Bronze Medal** : It is mostly copper with some tin and zinc

#### INTERNATIONAL OLYMPIC COMMITTEE

- It is the supreme authority of the Modern Olympic Movement.
- **Formation** : 23 June 1894
- **Headquarters** : Lausanne, Switzerland

- **Membership** : 105 active members, 32 honorary members
- **President** : Thomas Bach

### INDIAN OLYMPIC ASSOCIATION

- **Created and Recognized:** 1927

- **Continental Association** : Olympic Council of Asia (OCA)
- **Headquarters** : New Delhi
- It selects athletes to represent India at the Olympic Games, Asian Games and other international athletic meets and for managing the Indian teams at the events.

### LIST OF OLYMPIC GAMES HOST CITIES

Year	Host	Year	Host
1896	Athens, Greece	1960	Rome, Italy
1900	Paris, France	1964	Tokyo, Japan
1904	St. Louis, United States	1968	Mexico City, Mexico
1908	London, United Kingdom	1972	Munich, West Germany
1912	Stockholm, Sweden	1976	Montreal, Canada
1916	Not held due to World War I	1980	Moscow, Soviet Union
1920	Antwerp, Belgium	1984	Los Angeles, United States
1924	Paris, France	1988	Seoul, South Korea
1928	Amsterdam, Netherlands	1992	Barcelona, Spain
1932	Los Angeles, United States	1996	Atlanta, United States
1936	Berlin, Germany	2000	Sydney, Australia
1940	Not held due to World War II	2004	Athens, Greece
1944	Not held due to World War II	2008	Beijing, China
1948	London, United Kingdom	2012	London, United Kingdom
1952	Helsinki, Finland	2016	Rio de Janeiro, Brazil
1956	Melbourne, Australia	2020	Tokyo, Japan

### INDIA AT THE OLYMPICS

Games	Medal	Name/Team	Sport	Event
1900 Paris	Silver	Norman Pritchard	Athletics	Men's 200 metres
1900 Paris	Silver	Norman Pritchard	Athletics	Men's 200 metre hurdles
1928 Amsterdam	Gold	National team	Field hockey	Men's competition
1932 Los Angeles	Gold	National team	Field hockey	Men's competition
1936 Berlin	Gold	National team	Field hockey	Men's competition
1948 London	Gold	National team	Field hockey	Men's competition
1952 Helsinki	Gold	National team	Field hockey	Men's competition
1952 Helsinki	Bronze	Khashaba Dadasaheb Jadhav	Wrestling	Men's freestyle Bantamweight
1956 Melbourne	Gold	National team	Field hockey	Men's competition
1960 Rome	Silver	National team	Field hockey	Men's competition
1964 Tokyo	Gold	National team	Field hockey	Men's competition
1968 Mexico	Bronze	National team	Field hockey	Men's competition
1972 Munich	Bronze	National team	Field hockey	Men's competition
1980 Moscow	Gold	National team	Field hockey	Men's competition
1996 Atlanta	Bronze	Leander Paes	Tennis	Men's singles
2000 Sydney	Bronze	Karnam Malleswari	Weightlifting	Women's 69 kg
2004 Athens	Silver	Rajyavardhan Singh Rathore	Shooting	Men's double trap
2008 Beijing	Gold	Abhinav Bindra	Shooting	Men's 10 m Air Rifle
2008 Beijing	Bronze	Vijender Singh	Boxing	Men's 75 kg
2008 Beijing	Bronze	Sushil Kumar	Wrestling	Men's 66 kg Freestyle
2012 London	Bronze	Gagan Narang	Shooting	Men's 10m Air Rifle
2012 London	Silver	Vijay Kumar	Shooting	Men's 25 Rapid Fire Pistol
2012 London	Bronze	Saina Nehwal	Badminton	Women's singles
2012 London	Bronze	Mary Kom	Boxing	Women's flyweight
2012 London	Bronze	Yogeshwar Dutt	Wrestling	Men's 60 kg Freestyle
2012 London	Silver	Sushil Kumar	Wrestling	Men's 66 kg Freestyle
2016 Rio	Silver	P. V. Sindhu	Badminton	Women's singles
2016 Rio	Bronze	Sakshi Malik	Wrestling	Women's freestyle 58 kg

## COMMONWEALTH GAMES

- It is an international, multi-sport event involving athletes from the Commonwealth of Nations.
- It has taken place every four years.
- **Motto** : Humanity – Equality – Destiny
- **First event** : 1930, Hamilton, Canada
- **Headquarters** : London, United Kingdom
- There are **53 members** of the Commonwealth of Nations, **71 teams** participate in the Commonwealth Games
- The four Home Nations of the United Kingdom : **England, Scotland, Wales, and Northern Ireland**
- Only six countries have attended every Commonwealth Games: Australia, Canada, England, New Zealand, Scotland, and Wales.
- Australia has been the highest achieving team for twelve games, England for seven, and Canada for one.

### 2014 COMMONWEALTH GAMES : XX Commonwealth Games

- **Host city** : Glasgow, Scotland
- **Opening ceremony** : 23 July 2014
- **Closing ceremony** : 3 August 2014
- **Mascot** : Clyde
- **Nations participating** : 71 Commonwealth Teams

## ASIAN GAMES (Asiad)

- It is a Pancontinental multi-sport event held every four years among athletes from all over Asia.
- **First event** : 1951 Asian Games in New Delhi, India
- **Last event** : 2014 Asian Games in Incheon, South Korea
- **Future event** : 2018 Jakarta, Indonesia
- In 2014 Asian Games, India ranked 8th with 11 Gold, 10 Silver and 36 Bronze medals.

## SOUTH ASIAN GAMES

- The South Asian Games are a bi-annual multi-sport event held among the athletes from South Asia.
- First event : September 1984 Kathmandu, Nepal
- Last event : 5 - 16 February 2016 Guwahati, Shillong, India (2019 in Kathmandu, Nepal)
- In 2016 South Asian Games, India ranked 1st with 188 Gold, 90 Silver and 30 Bronze medals.

## AFRO-ASIAN GAMES

- It held between athletes from Asia and Africa.
- These Games are supposed to be held once every four years.
- The **2003 Afro-Asian Games**, officially known as the **First Afro-Asian Games** or **I Afro-Asian Games** was a major international multi-sport event held in **Hyderabad, India**, from October 24 (excluding football and hockey, which began on October 22 and October 23 respectively) to November 1, 2003.
- The Mascot is **Sheroo**, a cartoon representation of the **Royal Bengal Tiger**, India's National Animal.
- The **second Games** were set to take place in **Algiers, Algeria in 2007**. However, the Games were **indefinitely postponed** because "*Asians failed to line up the Asian Games gold medalists*".

## FIELD HOCKEY

- **Highest governing body** : International Hockey Federation
- **Nickname(s)** : Hockey, grass hockey
- **First played** : 19th century, England
- **Team members** : 11 field players, with 7 substitutes
- **Equipment** : Hockey ball, Hockey stick, mouthguard, shinpads, eye guards
- **Olympic** : 1908, 1920, 1928–present
- **The penalty cards** : green card (warning), yellow card (temporary suspension), red card (permanent suspension)
- **Dhyan Chand** (the Wizard) was an Indian field hockey player, who is widely considered as the greatest field hockey player of All Time. The Government of India honoured him with the **Padma Bhushan** in 1956.
- 2014 Hockey World Cup Winner : Australia ; Runner-up : Netherlands

## CRICKET

- **Highest governing body** : International Cricket Council (ICC)
- **First played** : 18th century (modern)
- **Team members** : 11 players per side, substitute fielders (only) are permitted in cases of injury or illness
- **Mixed gender** : Single
- **Categorization** : Team, Bat-and-ball
- **Equipment** : Cricket ball, cricket bat, wicket: stumps, bails
- **Venue** : Cricket field
- **Olympic** : 1900 Summer Olympics only

### TYPES OF INTERNATIONAL CRICKET MATCHES

Type	Time	Note
Test cricket	5 days	The first officially recognised Test match began on 15 March 1877, between England and Australia (won by 45 runs) at the Melbourne Cricket Ground (MCG).
One Day	1 day (50 overs)	The first ODI was played on 5 January 1971 between Australia (won the game by 5 wickets) and England at the Melbourne Cricket Ground. The Cricket World Cup is played in this format.
T20	3 hours (20 overs)	The inaugural ICC World Twenty20 was played in South Africa in 2007 with India winning by five runs against Pakistan in the final.

#### International Cricket Council (ICC)

**Motto** : Great Sport Great Spirit

**Formation** : 15 June 1909

**Headquarters** : Dubai, United Arab Emirates

**Chairperson**: Shashank Manohar

#### Board of Control for Cricket in India (BCCI)

**Founded** : 1928

**Headquarters** : Mumbai

**President**: Vinod Rai

### Cricket World Cup : Men

Year	Host Nation(s)	Final Venue	Winner	Runner-up
1975	England	Lord's, England	West Indies	Australia
1979	England	Lord's, England	West Indies	England
1983	England	Lord's, England	India	West Indies
1987	India, Pakistan	Eden Gardens, India	Australia	England
1992	Australia, New Zealand	MCG, Australia	Pakistan	England
1996	India, Pakistan & Sri Lanka	Gaddafi Stadium, Pakistan	Sri Lanka	Australia
1999	England	Lord's, England	Australia	Pakistan
2003	South Africa	Wanderers, SA	Australia	India
2007	West Indies	Kensington Oval	Australia	Sri Lanka
2011	India, Bangladesh, & Sri Lanka	Wankhede Stadium, India	India	Sri Lanka
2015	Australia, New Zealand	MCG, Australia	Australia	New Zealand
2019	England	-	-	-
2023	India	-	-	-

### Cricket World Cup : Women

Year	Host nation(s)	Final venue	Winner	Runner-up
1982	New Zealand	Lancaster Park, Christchurch	Australia	England
1988	Australia	MCG, Melbourne	Australia	England
1993	England	Lord's, London	England	New Zealand
1997	India	Eden Gardens, Kolkata	Australia	New Zealand
2000	New Zealand	Bert Sutcliffe Oval, Lincoln	New Zealand	Australia
2005	South Africa	Super Sport Park, Centurion	Australia	India
2009	Australia	North Sydney Oval, Sydney	England	New
2013	India	Brabourne Stadium, Mumbai	Australia	West Indies
2017	England	Lord's, London	England	India
2021	New Zealand	-	-	-

### ICC WORLD TWENTY20 : Men

Year	Host Nation(s)	Final		
		Winner	Result	Runner Up
2007	South Africa	India 157/5	India won by 5 runs	Pakistan 152 all out
2009	England	Pakistan 139/2	Pakistan won by 8 wickets	Sri Lanka 138/6
2010	West Indies	England 148/3	England won by 7 wickets	Australia 147/6
2012	Sri Lanka	West Indies 137/6	West Indies won by 36 runs	Sri Lanka 101 all out
2014	Bangladesh	Sri Lanka 134/4	Sri Lanka won by 6 wickets	India 130/4
2016	India	West Indies 161/6	WestIndies won by 4 wickets	England 155/9

### ICC WORLD TWENTY20 : Women

Year	Host Nation(s)	Final		
		Winner	Result	Runner Up
2009	England	England 86/4	England won by six wickets	New Zealand 85 all out
2010	West Indies	Australia 106/8	Australia won by 3 runs	New Zealand 103/6
2012	Sri Lanka	Australia 142/4	Australia won by 4 runs	England 138/9
2014	Bangladesh	Australia 106/4	Australia won by 6 wickets	England 105/8
2016	India	West Indies 149/2	West Indies won by 8 wickets	Australia 148/5



## FOOTBALL or SOCCER

### FIFA : International Federation of Association Football

- The FIFA (International Federation of Association Football) is the international governing body of association football.
- **Motto** : For the Game. For the World.
- **Formation** : 21 May 1904 (110 years ago)
- **Headquarters** : Zurich, Switzerland
- **Membership** : 209 national associations

### AIFF : All India Football Federation

- **Founded** : 23 June 1937
- **Headquarters** : Dwarka, New Delhi

### FIFA WORLD CUP

- **Founded** : 1930
- **Current champions** : Germany (4th title)
- **Most successful team(s)** : Brazil (5 titles)

### 2014 FIFA WORLD CUP

- **Host country** : Brazil
- **winner**: Germany
- **Top scorer(s)** : James Rodríguez (6 goals)
- **Best player** : Lionel Messi
- **Best young player** : Paul Pogba
- **Best goalkeeper** : Manuel Neuer

## SOME OTHER SPORTS

### VOLLEYBALL

- It is a team sport in which two teams of six players are separated by a net. Each team tries to score points by grounding a ball on the other team's court under organized rules.
- **Highest governing body** : FIVB (International Federation of Volleyball) [Founded : 1947]
- **Governing body of India** : Volleyball Federation of India [Founded : 1950]
- **First played** : 1895, Holyoke, Massachusetts, United States
- **First World Volleyball Championship** : Prague in 1949 (Champion : Soviet Union)

### BASKETBALL

- It is a sport played by two teams of five players on a rectangular court.
- **Highest governing body** : FIBA (International Basketball Federation) [Founded : 1932]
- **Governing body of India** : Basketball Federation of India (BFI) [Founded : 1950]
- **First played** : 1891, Springfield, Massachusetts, U.S.

- **First World Basketball Championship** : Buenos Aires, Argentina in 1950 (Champion : Argentina)

### BASEBALL

- It is a bat-and-ball game played between two teams of nine players each who take turns batting and fielding.
- **Highest governing body** : International Baseball Federation (IBAF) [Formation : 1938]
- **First played** : Mid-18th century or prior, England or Flanders (early form) ; June 19, 1846, Hoboken, New Jersey (first recorded game with codified rules)
- **First World Baseball Classic** : San Diego in 2006 [Champion : Japan]

### BADMINTON

- It is a game with rackets in which a shuttlecock is hit back and forth across a net.
- **Highest governing body** : Badminton World Federation (BWF) [Formation : 1934]
- **Governing body of India** : Badminton Association of India (BAI) [Formation : 1934]

- **First played** : 17th century
- **First World Badminton Championship** : Malmö, Sweden in 1977

#### TENNIS : Lawn Tennis

- It is a racket sport that can be played individually against a single opponent (singles) or between two teams of two players each (doubles).
- **Highest governing body** : International Tennis Federation (ITF) [Formation: 1913]
- **Governing body of India** : All India Tennis Association (AITA) [Formation: 1920]
- **First played** : Between 1859 and 1865 (Birmingham, England)

#### TABLE TENNIS or PING-PONG

- It is a sport in which two or four players hit a lightweight ball back and forth using a table tennis racket.
- **Highest governing body** : International Table Tennis Federation (ITTF) [Formation : 1926]
- **Governing body of India** : Table Tennis Federation of India (TTFI) [Formation : 1937]
- **First played** : 1880s, England

#### GOLF

- It is a club and ball sport in which players use various clubs to hit balls into a series of holes on a course in as few strokes as possible.
- **Highest governing body** : International Golf Federation (IGF), Founded in 1958
- **Governing body of India** : Indian Golf Union (IGU), Founded in 1955
- **First played** : 15th century, Scotland

#### POLO

- It is a team sport played on horseback in which the objective is to score goals against an opposing team. The modern game lasts roughly two hours and is divided into periods called chukkas.

- **Highest governing body** : Federation of International Polo [Founded : 1983]
- **First played** : Achaemenid Empire, 6th century BC

#### BILLIARDS or POOL or CUE SPORTS

- It played with a cue stick which is used to strike billiard balls, moving them around a cloth-covered billiards table bounded by rubber cushions.
- **Highest governing body** : World Confederation of Billiard Sports [Founded : 1992]
- **Governing body of India** : Billiards and Snooker Federation of India
- **First played** : 15th-century Europe, with roots in ground billiards

#### CHESS

- It is a two-player strategy board game played on a chessboard, a checkered gameboard with 64 squares arranged in an eight-by-eight grid.
- Years active :
- **Highest governing body** : World Chess Federation (FIDE)[Founded : 1924]
- **Governing body of India** : All India Chess Federation (AICF) [Founded : 1951]
- **First played** : c. 6th-century India to present
- **First official World Chess Champion (WCC)** : In 1886 winner **Wilhelm Steinitz**
- **Current World Champion** : Norwegian chess Grandmaster **Magnus Carlsen**.
- **Viswanathan Anand** has won the World Chess Championship five times (2000, 2007, 2008, 2010, 2012), and was the undisputed World Champion from 2007 to 2013.
- **Padmini Rout** (born January 5, 1994, Odisha, India) holds the title of **Woman Grandmaster**. She was winner of **World Under-14 girl's championship**, 2008. She also has won five Asian and four national titles.

## WRESTLING

- It is a combat sport involving grappling type techniques such as clinch fighting, throws and takedowns, joint locks, pins and other grappling holds.
- **Highest governing body** : United World Wrestling (UWW) [Founded : 1912]
- **Governing body of India** : Wrestling Federation of India (WFI)
- **India's performance in Olympics:** Silver: Sushil Kumar in 2012 Bronze: Khashaba Dadasaheb Jadhav in 1952, Sushil Kumar in 2008 & 2012, Yogeshwar Dutt in 2012 and Sakshi Malik in 2016.

## KABADDI

- It is a contact sport that originated in ancient India.
- The word Kabaddi has actually originated from Sanskrit roots (Kar-badhi, which means holding through hands).
- It received international introduction during the 1936 Berlin Olympics, revealed by Hanuman Vyayam Prasarak Mandal, Amaravati, Maharashtra.
- **Highest governing body** : International Kabaddi Federation [Founded : 2004]
- **Governing body of India** : Kabaddi Federation of India (KFI) [Founded : 1950]

## SWIMMING

- It is a water based sport.
- **Highest governing body** : International Swimming Federation [Founded : 1908]
- **Governing body of India** : Swimming Federation of India (SFI)
- **First World Aquatics Championships** : Belgrade, Yugoslavia in 1973 [Winner : United States]

## BOXING

- It is a martial art and combat sport in which two people throw punches at each other, usually with gloved hands.
- **Highest governing body** : World Boxing Association (WBA) [Founded : 1962]
- **Governing body of India** : Indian Boxing Federation [Founded : 1925]

## RIFLE SHOOTING

- It is an important Olympic sport in India.
- **Highest Governing body** : International Shooting Sport Federation [Established : 1907]
- **Governing body of India** : National Rifle Association of India (NRAI) [Established : 1951]
- Indian shooters who have excelled at the world stage include Abhinav Bindra, Rajyavardhan Singh Rathore, Vijay Kumar, Gagan Narang, Ronjan Sodhi and Anjali Bhagwat.

## FORMULA ONE RACING

- It is the highest class of single-seat auto racing.
- **Highest Governing body** : International Automobile Federation (FIA) [Established : 1904]
- **Governing body of India** : Federation of Motor Sports Clubs of India (FMSCI) [Established : 1971]
- **First World championship race** was held at Silverstone, United Kingdom in 1950.
- **First World Championship for Drivers** was won by Italian Giuseppe Farina in his Alfa Romeo in 1950.
- First F1 race in India was held at the Buddha International Circuit in Greater Noida, Uttar Pradesh in 2011.

### Measurements of Sports Fields and Instruments

Badminton	<b>Court</b> 13.40m x 5.18m or 44 x 20 ft <b>Net height</b> 1.524 m <b>Shuttle</b> 4.73 to 5.50 gm in weight and shall have 14 to 16 feathers fixed in Court
Baseball	<b>Distance</b> of each case 90 feet <b>Base distance along with hypotenuse</b> 127 feet
Boxing	<b>Length and Width of the Ring</b> 4.9 x 4.9 m <sup>2</sup> to 6.1 x 6.1 m <sup>2</sup>
Chess	64 Squares on chessboard <b>Colour</b> Black and White <b>Nos. of same colour chess</b> 16
Cricket	<b>Ball</b> 155.9 gm to 163 gm in weight <b>Bat</b> 96.5 cm in length and 10.8 cm width (Maximum) <b>Pitch</b> 20.12 m <b>Length of the Stumps</b> 71.1 cm (28 inch) <b>Length of the crease</b> 1.21 – 1.83 (4 ft)
Derby Course	<b>Length</b> 2.41 km
Football	<b>Field</b> 100 x 64 m to 110 x 75 m
Hockey	<b>Field</b> 100 yards x 60 yards <b>Weight of the Ball</b> 155-163 gm <b>Colour of the Ball</b> White <b>Weight of Hockey Stick</b> 280 gm
Kabaddi	<b>Field</b> 13m x 10 m
Kho-Kho	<b>Field</b> 34 x 16 m
Lawn Tennis	<b>Court</b> 23.77 m x 8.23 m (Singles) <b>Ball</b> 6.35 cm to 6.67 cm (in diameter), 56.7 gm to 2.53 gm (weight)
Marathon Race	<b>Length</b> 41.8 km
Polo	<b>Field Length</b> 300 yards <b>Field Width</b> 150 yards <b>Distance between the Goals</b> 250 yards <b>Distance between the Goal post</b> 8 yards
Volley Ball	<b>Field</b> 18 m x 9 m <b>Net</b> 1 m deep and 9.50 m long 2.43 m (for men) and 2.24 m for women (Height) <b>Ball Circumference</b> 66 cm + 1 cm, <b>Weight</b> 270 gm + 10 gm

### SPORTS TERMS : Alphabetically

Sports	Terms
Athletics	baton, bell lap, decathlon, discus, false start, field, foul, hammer, heptathlon, high jump, hurdles, javelin, lane, lap, long jump, marathon, middle-distance, pole-vault, relay, record, shot put, sprint, starting blocks, steeplechase, track, track and field, triple jump, Cross Country, etc.
Badminton	Alley, Back Alley, Backcourt, Balk, Baseline, Carry, Center or Base Position, Center Line, Clear, Court, Drive, Drop, Fault, Feint, Flick, Forecourt, Hairpin Net Shot, Halfcourt Shot, Kill, Let, Long Service Line, Match, Midcourt, Net Shot, Push Shot, Racquet, Rally, Serve, Service Court, Short Service Line, Shuttlecock, Smash, Wood Shot etc.
Baseball	Pinching, Home run, Base runner, Throw, Perfect game, Strike, Put out, etc.
Billiards	Cue, cannon, baulk, pot scratch, long jenny, short jenny, frame, spider, short and long rest, in-off, etc.
Boxing	Accidental Butt, Bleeder, Bolo Punch, Bout, Brawler, Break, Buckle, Canvas, Card, Caught Cold, Clinch, Corkscrew Punch, Cornerman, Counterpunch, Cross, Cutman, Dive, Eight Count, Glass Jaw, Haymaker, Kidney Punch Liver Shot, Low Blow, Mauler, Neutral Corner, Plodder, Ring Generalship, Roughhousing, Southpaw, Spar, Stablemate, Technical Knockout, Walkout Bout, Whiskers etc.
Bridge	Contract bridge, duplicate bridge, tricks, suite, rubber, trump, grand slam, little slam, etc.
Billiards & Snooker	Pull, Cue, Hit, Object ball, Break shot, Scoring, Cushion billiards, etc., etc.
Boxing	Knock. out, Round, Ring Stoppage, Punch, Upper-cut, Kidney punch, Timing, Foot work

Chess	Gambit, stalemate, move, resign, checkmate, etc.
Cricket	Hat-trick, maiden, follow-on, declare, bowled, caught, run-out, leg before wicket(LBW), stumped, striker, slips, gully, short leg, silly, mid-on, point, cover, mid-off, bouncer, beamer, googly, full toss, drive, cut, pull, hook, flick, etc.
Cycling	Sprint, Time trial, Point race, Trackrace, etc.
Football	Attacker, Back Heel, Back Pass, Ball Carrier, Bending the Ball, Bicycle Kick, Center Spot, Corner Flag, Corner Kick, Cross, Defender, Direct Free Kick, Dribble, Far Post, FIFA, Futsal, Give and Go, Goal Line, Goal Mouth, Goalkeeper, Header, Indirect Free Kick, In-swinger, Kickoff, Man to Man Marking, Midfielder, Near-post, Obstruction, Offside Trap, Offside, One-Touch Pass, Penalty Spot, Red Card, Striker, Sweepe, Tackle, Volley etc.
Golf	ace, albatross, double eagle, all square, approach putt, apron, ball mark, ballooning, beach, birdie, blind shot, bogey, bunker, caddy, chip, Claw grip, condor, dogleg, dub, flag, Four-Ball, Mulligan, off the deck, peg, sand trap, tee shot etc.
Gymnastics	Aerial, Back Handspring, Back Somersault, Double Back, Double Twist, Flyaway, Front Hip Pullover, Front Pike Somersault, Front Split, Front Walkover, Gienger, Handstand, Hip Circle, Miller, Pike, Rudi, Straddle, Swedish Fall, Tsukahara, Tuck, Whip Back etc.
Hockey	Centre, defender, forward, half, penalty-stroke, penalty corner, push-in, free-hit, striking circle goal, goal-line, touch-line, goal keeper, off-side, foul, stick, carry, dribble, tiebreaker, trapping, etc.
Horse Racing	Race course, steeplechase, bets, bookies, jockey, punter, etc.
Judo	Cocoa, Blue, white, Green belt, etc.
Polo	Mallet, bunker, chukker, handicap, goal, sixty yarder, etc.
Shooting	Bag, bull's eye, marksmanship, plug, skeet, etc.
Swimming	Add Up, Anchor, Approved Meet, Backstroke, Banner, Beep, Bonus Heat, Bottom, Breaststroke, Bull Pen, Bulletin, Cap, Car pool, Cards, Check-In, Check-Out, Course, Dryland, False Start, Freestyle, Gun Lap, Heats, Jump, Lane Lines, Paddle, Parka, Pool, Pull Buoy, Relays, Split, Stroke, Yardage etc.
Table Tennis	Backhand, Backspin, Block, Chop, Closed, Dead ball, Doubles, Drive, Drop shot, Expedite rule, Forehand, Inverted, Let, Lob, Long pips, Loop, Match, Medium-long, Open, Penhold, Pips-in, Pips-out, Push, Receive, Seemiller, Serve, Set, Shakehands, Short, Sidespin, Skunk, Smash, Topspin etc.
Tennis	smash, cross-court, passing shot, backhand, forehand, slice, top-spin, serve, dropshot, lob, down-the-line, deuce, tie-breaker, set, game, grand slam, ace, volley, etc.
Volleyball	Assist, Attack, Attack line, Back row attack, Block, Block assist, Campfire defense, Carry, Center line violation, Chester, Coach kill, Cover the hitter, Cut shot, Deep dish, Dig, Facial, Fish, Floater, Friendly fire, Free ball, Heat, Husband-and-wife-play, Jedi defense, Joust, Jump serve, Kill, Kong, Line shot, Lollipop, Mintonette, Monument valley, Net violation, Paint brush, Pancake, Pepper, Prince/Princess of whales, Quick set, Rainbow, Red card, Redwood, Roof, Screening, Service ace, Set, Shank, Side out, Six-pack, Sizzle the pits, Spike, Strong side, Stuff, Tandem, Tip, Tool, Trap set, Tuna, Whale, Yellow card etc.
Weight Lifting	Bulking, bitch tits, shredded, Six pack, Feeling the Burn, Power Rack, Smith Machine, Muscle Memory, Pump and Toners, Cardio Bunny, Plateau, Vascularity, Supersets, Drop Sets/Strip Sets, Periodization, Pyramiding, Standard Plates and Bars etc.
Wrestling	Free style, Hal Nelson, Point, Heave, etc.

### CUPS AND TROPHIES OF MAJOR SPORTS

Sport	Cups And Trophies
Hockey	Aga Khan Cup, Begam Rasul Trophy (women's), Maharaja Ranjit Singh Gold Cup, Lady Ratan Tata Trophy (women's), Gurunanak Championship (women's), Dhyanchand Trophy, Nehru Trophy, Sindhia Gold Cup, Murugappa Gold Cup, Wellington Cup etc
Football	Beghum Hazarat Mahal Cup, BILT Cup, Colombo Cup, Confederation Cup, DCM Trophy, Durand Cup, Rovers Cup, BC Rai Trophy (National Championship), FIFA World Cup, Kalinga Cup, Santosh Trophy (National Championship), IFA Shield, Sir Ashutosh Mukherjee Trophy, etc.
Cricket	Anthony D' Mellow Trophy, Ashes, Asia Cup, Champions Trophy, Charminar Challenger Cup, Deodhar Trophy, Duleep Trophy, Gavaskar - Border Trophy, ICC World Cup, Irani Trophy, Jawaharlal Nehru Cup, Lombard World Challenge Cup, Prudential Cup (World Cup), Ranji Trophy, Sahara Cup, Sharjah Cup, Singer Cup, Vijay Hazare Trophy, Wisden Trophy, World Series Cup.

Table Tennis	Berna Bellack Cup (men), Corbillion Cup (women), Jai Laxmi Cup (women), Rajkumari Challenge Cup (women junior), Ramanuja Trophy (men junior), Travancore Cup (women), Swathling Cup (men), etc
Badminton	Aggarwal Cup, Amrit Diwan Cup, Asia Cup, Australasia Cup, Chaddha Cup, European Cup, Harilela Cup, Ibrahim Rahimatollah Challenger Cup, Konica Cup, Narang Cup, SR Ruia Cup, Sophia Cup, Kitiakara Cup, Thomas Cup, Tunku Abdulrahman Cup, Uber Cup, World Cup, Yonex Cup etc
Basketball	Basalat Jha Trophy, BC Gupta Trophy, Federation Cup, SM Arjuna Trophy, Todd Memorial Trophy, William Jones Cup, Bangalore Blues Challenge Cup, Nehru Cup, Federation Cup etc.
Bridge	Basalat Jha Trophy, Holkar Trophy, Ruia Gold Cup, Singhania Trophy, etc
Polo	Ezra Cup, Gold Cup, King's Cup, Prithi Cup, Schneider Cup etc.
Athletics	Charminar Trophy, Federation Cup etc
Air Racing	Jawaharlal Challenge Trophy, King's Cup, Schneider Cup etc
Billiards	Arthur Walker Trophy, Thomas Cup etc
Boxing	Aspy Adjahia Trophy, Federation Cup, Val Baker Trophy etc.
Golf	Canada Cup, Eisenhower Trophy, Muthiah Gold Cup, Nomura Trophy, President's Trophy, Prince of Wales Cup, Ryder Cup, Solheim Cup, Topolino Trophy, Walker Cup, World Cup etc
Chess	Naidu Trophy, Khaitan Trophy, Limca Trophy, Lin Arc City Trophy, World Cup, etc
Horse Racing	Beresford Cup, Blue Raiband Cup, Derby, Grand National Cup etc.
Netball	Anantrao Pawar Trophy, etc
Rugby Football	Bledisloe Cup, Calcutta Cup, Webb Ellis Trophy, etc
Shooting	North Wales Cup, Welsh Grand Pix etc
Volleyball	Centennial Cup, Federation Cup, Indira Pradhan Trophy, Shivanthi Gold Cup, etc
Yatching	America Cup, etc

### FAMOUS STADIA AND SPORTS : INDIA

Stadium	Sports	Place
Dhyan Chand National Stadium	Hockey	Delhi
International Hockey Stadium	Hockey	Ajithgarh
Mahindra Hockey Stadium	Hockey	Mumbai
Shivaji Stadium	Hockey	Delhi
Ambedkar Stadium	Football	Delhi
Salt Lake Stadium	Football	West Bengal
JRD Tata Sports Complex	Football	Jamshedpur
Kanchenjunga Stadium	Football	Siliguri
Sree Kanteerava Stadium	Football	Bengaluru
Fatorda Stadium	Football	Margao
Jawaharlal Nehru Stadium	Cricket	Chennai
Vidarbha Cricket Association Ground	Cricket	Nagpur
Ferozeshah Kotla Ground	Cricket	Delhi
Greater Noida Cricket Stadium	Cricket	Greater Noida
M. A. Chidambaram Stadium	Cricket	Chennai
Rajiv Gandhi International Cricket Stadium	Cricket	Hyderabad
Sardar Patel Stadium	Cricket	Ahmedabad
Wankhede Stadium	Cricket	Mumbai
Brabourne Stadium	Cricket	Mumbai
Eden Gardens	Cricket	Kolkata
Barabati Stadium	Cricket	Cuttack
Green Park Stadium	Cricket	Kanpur
Nehru Stadium, Coimbatore	Cricket	Coimbatore
Keenan Stadium	Cricket	Jamshedpur
IPCL Sports Complex Ground	Cricket	Baroda
Buddh International Circuit	Auto Racing	Greater Noida
Indraprastha Stadium	Indoor Games	Delhi
MGR Race Course Stadium	Horse Racing, Kabaddi	Madurai
Jawaharlal Nehru Stadium	Athletics	Delhi

### FAMOUS STADIA AND SPORTS : WORLD

Stadium	Sports	Place	Stadium	Sports	Place
Headingley Manchester	Cricket	England	Flemington	Horse racing	Melbourn
Lords, Oval, Leeds	Cricket	England	Black Heath	Rugby Football	London
Trent Bridge	Cricket	England	Eden Park	Rugby Union	New Zealand
Brisbane, Melbourne	Cricket	Australia	Wimbledon	Lawn Tennis	London
Perth, Sydney	Cricket	Australia	Twickenham	Rugby Football	England
Wembley Stadium	Football	London	Putney Mart Lake	Boat Race	England
Brookland	Football	England	White City	Dog race	England
Estadio Libertadores de America	Football	Argentina	Hurlington	Polo	England
Shanghai Stadium	Football	China	Henlay	Regata	England
Centenario Stadium	Football	Uruguay	Yankee Stadium	Boxing	New York
Estadio da Luz	Football	Portugal	Brooklyn	Baseball	New York
International Stadium Yokohama	Football	Japan	Rangers Ballpark in Arlington	Baseball	United States
Rungrado May Day Stadium	Football, athletics	North Korea	Forest Hill	Tennis	United States
Olympiastadion	Football, athletics	Germany	Sendy Lodge	Golf	Scotland
Athens Olympic Stadium	Football, athletics	Greece	Michigan Stadium	American football	United States
Seoul Olympic Stadium	Football, athletics	South Korea	Sanford Stadium	American football	United States
Aintree, Doncaster, Epsom	Horse racing	England	Jinan Olympic Sports Center Stadium	Football, athletics	China
Flemington	Horse racing	Melbourn	Newlands Stadium	Rugby union, football	South Africa

### NATIONAL GAMES AND SPORTS OF SOME IMPORTANT COUNTRIES

Country	Games	Country	Games
Argentina	Pato	Cuba	Baseball
Bahamas	Sloop	Dominican	Republic Baseball
Bangladesh	Kabaddi	Finland	Pesäpallo
Brazil	Capoeira	Grenada	Cricket
Canada	Ice Hockey (winter), Lacrosse (summer)	Guyana	Cricket
Chile	Chilean rodeo	India	Field hockey*(supposed)
Colombia	Tejo	Ireland	Gaelic games
Mexico	Charrería	Jamaica	Cricket
Korea	Tae Kwon Do	Latvia	Basketball (summer sport)
Philippines	Arnis	Latvia	Ice hockey (winter sport)
Puerto	Rico Paso fino	Lithuania	Football
Sri Lanka	Volleyball	New Zealand	Rugby Union
Uruguay	Gaicho	Norway	Cross-country
Afghanistan	Buzkashi	Pakistan	Field Hockey
Anguilla	Yacht racing	Papua New Guinea	Rugby league
Antigua and Barbuda	Cricket	Peru	Paleta Frontón
Barbados	Cricket	Slovenia	Alpine
Bermuda	Cricket	Switzerland	Shooting, Gymnastics
Bhutan	Archery	Turkey	Wrestling & Jereed
China	Table Tennis	United States	Baseball
Colombia Association	Football	Wales	Rugby union

### COURT, CAMPUS OR FIELDS ASSOCIATED WITH SPORTS

Court/Campus/Field	Games/Sports	Court/Campus/Field	Games/Sports
Court	Tennis, Badminton, Net Ball, Handball, Volleyball, Squash, Kho-Kho, Kabaddi	Vellodrome	Cycling
Diamond	Baseball	Field	Polo, Football, Hockey
Ring	Skating, Boxing	Track	Athletics
Course	Golf	Pitch	Cricket
Pool	Swimming	Greens	Bowls
Board	Table Tennis	Rink	Curling, Ice Hockey
Mat	Judo, Karate, Taikwondo	Range	Shooting, Archery
Arena	Horse riding	-	-

### NUMBER OF PLAYERS IN SPORTS

Sports	Number of Players per Team	Sports	Number of Players per Team
Hockey	11	Netball	7
Football (Soccer)	11	Volleyball	6
Cricket	11	Gymnastic	Several individuals compete simultaneously
Badminton, Tennis & Table Tennis	1 or 2 (Singles & Doubles respectively)	Billiards/Snooker	1
Basketball	5	Boxing	1
Baseball	9	Chess	1
Rugby football	15	Bridge	2
Polo	4	Croquet	13 or 15
Water Polo	7	Golf	Several individuals compete simultaneously
Kho Kho	9	Lacrosse	12
Kabaddi	7	-	-

### Nickname of Players

Player	Nickname
Dhyan Chand	Hockey ka Jadoogar
Harbhajan Singh	Bhaji, The Turbanator
Javagal Srinath	Mysore Express
Milkha Singh	Flying Sikh
Paes and Bhupati	Indian Express
PT Usha	Golden Girl, Payyoli Express
Rahul Dravid	The Wall
Sohaib Akhtar	Rawalpindi Express

### Players and their books

Player	Book
Balvir Singh	Golden Hatrick
David Beckham	My Side
Dhyan Chand	Goal
Kapil Dev	Cricket my Style
Sachin Tendulkar	Playing It My Way
Sunil Gavaskar	Sunny Days, Idols
Tiger Woods	How I play Golf
Viswanathan Anand	My best Game of Chess
Yuvraj Singh	The Test of My Life



## INDIAN DEFENCE

### MINISTRY OF DEFENCE (MoD)

- It is charged with co-ordinating and supervising all agencies and functions of the government relating directly to national security and the Indian armed forces.
- **Headquarters** : Cabinet Secretariat, Raisina Hill, New Delhi
- **First Minister of Defence** : Baldev Singh
- **Formation** : 2 September 1946
- Ministry of Defence comprises of four Departments :
  1. Department of Defence (DOD)
  2. Department of Defence Production (DDP)
  3. Department of Defence Research & Development (DDR&D)
  4. Department of Ex-Servicemen Welfare and also Finance Division (DESW)

### INDIAN ARMED FORCES : BHARATIYA SASHASTRA SENAEN

- The Indian Armed Forces are the military forces of the Republic of India.
- **World rank** : 3rd
- **Service branches** : Indian Army, Indian Navy, Indian Air Force and Indian Coast Guard
- **Commander-in-Chief** : President of India
- **Headquarters** : New Delhi

### Indian Army Commands

Command	Headquarter
Central Army Command	Lucknow
Western Army Command	Chandigarh
Eastern Army Command	Kolkata
Northern Army Command	Udhampur
Southern Army Command	Pune
South Western Command	Jaipur
Army Training Command	Shimla

### Indian Navy Commands

Command	Headquarter
Eastern Naval Command	Vishakhapatnam
Southern Naval Command	Kochi
Western Naval Command	Mumbai

### Indian Air Force Commands

Command	Headquarter
<b>Operational Commands</b>	
Central Air Command	Allahabad
Eastern Air Command	Shillong
Southern Air Command	Thiruvananthapuram
South Western Air Command	Gandhinagar
Western Air Command	New Delhi
<b>Functional Commands</b>	
Training command	Bangaluru
Maintenance command	Nagpur

### Indian Coast Guard Regions

Coast Guard regions	Headquarter
Western Region	Mumbai
Eastern Region	Chennai
North East Region	Kolkata
Andaman & Nicobar Region	Port Blair
North West Region	Gandhinagar

## MILITARY ACADEMIES IN INDIA

Military Academies	Place
<b>Indian Army</b>	
Army War College	Mhow
Infantry School	Mhow
Junior Leaders Wing	Belgaum
Indian Military Academy	Dehradun
Officers Training Academy	Chennai
High Altitude Warfare School	Gulmarg
Armoured Corps Centre and School	Ahmednagar
School of Artillery	Deolali
Army Air Defence College	Gopalpur
College of Military Engineering	Pune
Military college of telecommunication engineering	Mhow
Counter Insurgency and Jungle Warfare School	Vairengte
Junior Leader's Academy	Bareilly and Ramgarh
Army Supply Corps (ASC) Centre and College	Bangalore
Army Medical Corps (AMC) Centre and School	Lucknow
College of Materials Management	Jabalpur
Military College of Electronic and Mechanical Engineering	Secunderabad
Remount and Veterinary Corps (RVC) Centre and School	Meerut
Army Education Corps (AEC) Training College and Centre	Pachmarhi
Corps of Military Police (CMP) Centre and School	Bangalore
Army School of Physical Training	Pune
Army Airborne Training School	Agra
Institute of National Integration	Pune
Institute of Military Law	Kamptee
Army Sports Institute	Pune
Army Cadet College	Dehradun
Combat Army Aviation Training School	Nashik
Army Clerks Training School	Aurangabad
Army School of Mechanical Transport	Bangalore
Army/ Air Transport Support School	Agra
EME School	Vadodara
Military Intelligence Training School and Depot	Pune
Military School of Music	Pachmarhi
<b>Indian Navy</b>	
Indian Naval Academy (Officers Training)	Ezhimala
INS Agrani (Leadership Training)	Coimbatore
INS Chilka (Sailors Training)	Chilka
INS Dronacharya (Gunnery School)	Kochi
INS Garuda (Aviation)	Kochi
INS Hamla (Logistics Training)	Mumbai
Institute of Naval Medicine	Mumbai
INS Kunjali (Music Training School)	Mumbai
INS Mandovi (Provost and Physical Training School)	Goa
Naval Institute of Educational and Training Technology (NIETT)	Kochi
National Institute of Hydrography	Goa
INS Shivaji (Engineering Training)	Lonavla
Shipwright School	Visakhapatnam
INS Valsura (Electrical Training)	Jamnagar
INS Venduruthy (Seamen Training)	Kochi
INS Satavahana (Submarine School)	Vishakhapatnam
<b>Indian Air Force</b>	
College of Air Warfare	Secunderabad
Pilot Training Establishment	Allahabad
Air Force Administrative College	Coimbatore

School of Aviation Medicine	Bangalore
Air Force Technical Training College	Jalahalli, near Bangalore
Paratrooper's Training School	Agra
Indian Air Force Test Pilot School	Bangalore
TETTRA Schools	Pune
<b>Indian Coast Guard</b>	
Indian Coast Guard Academy	Azhikkal
<b>Tri-service Institutions</b>	
National Defence College	New Delhi
College of Defence Management	Secunderabad
Defence Services Staff College	Wellington
National Defence Academy	Khadakwasla
<b>Medical Personnel</b>	
Armed Forces Medical College	Pune

### RANKS OF COMMISSIONED OFFICERS

Army	Air Force	Navy
General	Air Chief Marshal	Admiral
Lt. General	Air Marshal	Vice Admiral
Major General	Air Vice Marshal	Rear Admiral
Brigadier	Air Commodore	Commodore
Colonel	Group Captain	Captain
Lt. Colonel	Wing Commander	Commander
Major	Squadron Leader	Lt Commander
Captain	Flight Lieutenant	Lieutenant
Lieutenant	Flying Officer	Sub-Lieutenant

<b>PARAMILITARY AND RESERVED FORCES : INTERNAL SECURITY OF INDIA</b>	
Indo-Tibetan Border Police (ITBP)	<ul style="list-style-type: none"> <li>It was established in 1962, after the Chinese attack.</li> <li>It is basically employed in the Northern borders for monitoring the borders and also to stop smuggling and illegal immigration.</li> </ul>
National Security Guard (NSG)	<ul style="list-style-type: none"> <li>It was established in 1984.</li> <li>It has been established to counter the surge of militancy in the country.</li> <li>It is highly trained force which deals with militants effectively</li> </ul>
Central Industrial Security Force (CISF)	<ul style="list-style-type: none"> <li>It was set up in 1969 after the recommendations of Justice B Mukherji.</li> <li>Its objective is to monitor the industrial complexes of Central Government</li> </ul>
Assam Rifles	<ul style="list-style-type: none"> <li>It was established in 1835 and is the oldest paramilitary force in the country.</li> <li>Its main objective is to keep vigilance of international borders in North East and countering insurgency operations in Arunachal Pradesh, Manipur, Mizoram and Nagaland.</li> </ul>
Border Security Force (BSF)	<ul style="list-style-type: none"> <li>It was established in 1965.</li> <li>It keeps a vigil over the international borders against the intrusion in the country.</li> </ul>
Central Reserve Police Force (CRPF)	<ul style="list-style-type: none"> <li>It was set up in 1939.</li> <li>Its main objective is to assist the State/Union Territory Police in maintenance of law and order.</li> <li>The 88th Battalion of CRPF, known as 'Mahila Battalion' (commissioned on March 30, 1986) is the world's first paramilitary force comprising entirely of women.</li> </ul>
National Cadet Corps (NCC)	<ul style="list-style-type: none"> <li>It was established in 1948.</li> <li>Its main objective is to stimulate interest among the youth in the defence of the country in order to build up a reserve man power to expand armed forces.</li> </ul>
Territorial Army (TA)	<ul style="list-style-type: none"> <li>It was established in 1948.</li> <li>It is a voluntary, part time force (between 18 and 35 years), not professional soldiers, but civilians, who wish to assist in defence of the country.</li> </ul>

Home Guards	<ul style="list-style-type: none"><li>• It was established in 1962, to assist the police in maintaining security, to help defence forces and to help local authorities in case of any eventuality.</li></ul>
Coast guard	<ul style="list-style-type: none"><li>• It was setup in 1978.</li><li>• Its main objective is to protect the maritime and other national interests in the maritime zones of India.</li></ul>
Intelligence Bureau (IB)	<ul style="list-style-type: none"><li>• It was set up in 1920.</li><li>• Its objective is to collect secret information relating to country's security</li><li>• It was originally set up as Central Special Branch (CSB) in 1987 and renamed IB in 1920.</li></ul>
Central Bureau of Intelligence (CBI)	<ul style="list-style-type: none"><li>• It was established in 1953.</li><li>• Its objective is to investigate cases of misconduct by public servants, cases of cheating, embezzlement and fraud</li><li>• CBI is also entrusted with the investigation of international crime cases in collaboration with INTERPOL.</li></ul>
National Crime Records Bureau (NCRB)	<ul style="list-style-type: none"><li>• It was established in 1986.</li><li>• Its objective is to collect crime statistics at the national level, information of inter-state and international criminals to help investigation agencies.</li></ul>
Rapid Action Force (RAF)	<ul style="list-style-type: none"><li>• It was established in 1992.</li><li>• Under the operational command of CPRF 10 battalions of the CPRF have been reoriented for tackling communal riots in the country.</li></ul>

### SPECIAL FORCES OF INDIA

PARA Special Forces	Created in 1966 by the Indian Army
Special Frontier Force (SFF)	created in 1962 by paramilitary special force
MARCOS	Created in 1987 by the Indian Navy
Garud Commando Force	Created in 2004 by Indian Air Force
Ghatak Force	Created by Indian Army

### DEFENCE RESEARCH IN INDIA

#### Defence Research and Development Organisation (DRDO)

- It is responsible for the development of technology for use by the military.
- **Headquarter : New Delhi**
- **Formed : 1958**
- **No. of Laboratories : 52**

#### Integrated Guided Missile Development Program (IGMDP)

It was managed by the Defence Research and Development Organisation (DRDO) and Ordnance Factories Board in partnership with other Indian government research organisations. The project started in 1982–83 under the leadership of A. P. J. Abdul Kalam and ended in 2008 after these strategic missiles were successfully developed. On 8 January 2008, the DRDO formally announced the successful completion of the IGMDP.

## Indian Missiles

Missile Name	Type	Operational range
Agni-I	Short-range ballistic missile	700 - 1250 km
Agni-II	Medium-range ballistic missile	2000 - 3000 km
Agni-III	Intermediate-range ballistic missile	3500 - 5000 km
Agni-IV	Intermediate-range ballistic missile	4000 km
Agni-V	Intercontinental ballistic missile	> 5000 km
Agni-VI	Intercontinental ballistic missile	10000 km
Prithvi-I	Short-range ballistic missile	150 km
Prithvi-II	Short-range ballistic missile	250 - 350 km
Prithvi-III	Short-range ballistic missile	350 - 600 km
Dhanush	Dhanush is reportedly a naval version of Prithvi which can be launched from ships.	350 - 600 km
Astra	Beyond Visual Range (BVR) air-to-air missile	80 - 110 km
Akash	Mobile Surface-to-air missile system	30 km
Trishul	Short range surface-to-air missile	12 km
Nag	"Fire-and-forget" anti-tank missile	3 - 7 km
Sagarika (K-15)	Submarine-launched ballistic missile	700 km
BrahMos	Supersonic cruise missile	300 - 500 km
Shourya	Ballistic missile	700 km
Nirbhay	Long-range, all-weather, subsonic cruise missile	1000 km
Prahaar	Solid-fuelled surface-to-surface guided short-range tactical ballistic missile	150 km
Helina	Anti-tank guided missile	7 - 8 km
K-4	Submarine-launched ballistic missile	3,500–5,000 km

## Indian Military Radar

### Naval Radars

- Super Vision-2000 3D airborne naval surveillance radar.
- Revathi 3D Naval Medium range radar derived from the 3D CAR.

### Land-based and airborne Radars

- Swordfish Long Range Tracking Radar
- INDRA series of 2D radars, low level radar to search and track low flying cruise missiles, helicopters and aircraft for the Indian Army This is a phased array radar with swift multiple beam tracking of targets and the Indian Air Force.

- BFSR-SR 2D short range battlefield surveillance radar for the Indian Army.
- Rajendra Radar 3D medium range fire control radar for Akash SAM.
- Central Acquisition Radar (3D-CAR) planar array tracking radar for all branches of the Indian armed forces. Air force version known as the Rohini. Naval version known as Revathi.
- 3D AESA Long Range Tracking Radar tracking high speed ballistic missile targets.
- Low Level Lightweight Radar (LLLR) 2D low level aircraft tracking radar.

### Indian Military Aircraft - Fixed-wing aircraft

Aircraft	Origin	Role
Beriev A-50 Phalcon	Israel, Russia	AEW&C
EMB-145 AEWCS	India, Brazil	AEW&C
Sukhoi Su-30MKI	Russia, India	Air Superiority Fighter
Mikoyan MiG-29	Soviet Union	Air Superiority Fighter
Dassault Mirage 2000	France	Multirole Fighter Aircraft
Mikoyan-Gurevich MiG-21	Soviet Union, India	Fighter Aircraft
HAL Tejas	India	Fighter Aircraft
Mikoyan-Gurevich MiG-27 Bahadur	Soviet Union	Ground-Attack Aircraft
SEPECAT Jaguar	France, United Kingdom	Ground-Attack Aircraft
Gulfstream III	United States	Reconnaissance
Ilyushin Il-78 MKI	Russia	Tanker Aircraft
C-17 Globemaster	United States	Transport Aircraft
Ilyushin Il-76 Candid	Soviet Union	Transport Aircraft
C-130J Super Hercules	United States	Transport Aircraft
Antonov An-32 Cline	Soviet Union	Transport Aircraft
Hawker Siddeley HS 748	United Kingdom, India	Airliner (Passenger)
Boeing 737	United States	Airliner (Passenger)
Saras	India	Utility Transport
Dornier Do 228	Germany, India	Utility Transport
IAI Astra 1125	Israel	VIP Transport
BAE Hawk	United Kingdom, India	Trainer Aircraft
HAL HJT-16 Kiran	India	Trainer Aircraft
HAL HJT-36 Sitara	India	Trainer Aircraft
Pilatus PC-7	Switzerland	Trainer Aircraft
HAL HPT-32 Deepak	India	Trainer Aircraft
<b>Helicopters</b>		
HAL Rudra	India	Attack Helicopter
HAL Light Combat Helicopter	India	Attack helicopter
Mil Mi-35 Hind-E	Soviet Union	Attack Helicopter
Mil Mi-8, Mi-17	Soviet Union	Transport Helicopter
Mil Mi-26 Halo	Soviet Union	Transport Helicopter
AgustaWestland AW101	Italy	Transport Helicopter
HAL Dhruv	India	Utility Helicopter
HAL Cheetah	France, India	Utility Helicopter
HAL Chetak	France, India	Utility Helicopter

### Indian Naval Aircrafts - Fixed-wing aircraft

Aircraft	Origin	Role
Mikoyan MiG-29K	Russia	Multirole combat aircraft
BAE Sea Harrier	United Kingdom	Fighter aircraft
BAE Hawk	United Kingdom	Trainer Aircraft
Boeing P-8 Poseidon	United States	Maritime Patrol
Tupolev Tu-142 Bear	Soviet Union	Bomber
Ilyushin Il-38 May	Soviet Union	Maritime Patrol
Dornier Do 228	Germany, India	Utility Aircraft
HAL HJT-16 Kiran	India	Trainer Aircraft
HAL HPT-32 Deepak	India	Trainer Aircraft
<b>Helicopters</b>		
Kamov Ka-31 Helix-B	Russia	Airborne early warning
Westland Sea King	United Kingdom	Anti-submarine warfare, Search & Rescue, Utility Transport
Sikorsky SH-3 Sea King	United States	Anti-submarine warfare Utility Helicopter
Kamov Ka-25 Hormone	Soviet Union	Anti-submarine warfare
Kamov Ka-28 Helix-A	Russia	Anti-submarine warfare
Aerospatiale SA 316 Alouette III	France, India	Utility Helicopter
HAL Dhruv	India	Utility Helicopter

### Indian Army Aviation Corps

Aircraft	Origin	Role
HAL Rudra	India	Attack Helicopter
HAL Light Combat Helicopter	India	Attack helicopter
HAL Dhruv	India	Utility helicopter
HAL Lancer	France, India	Light Attack helicopter
HAL Chetak	France, India	Utility helicopter
HAL Cheetah	France, India	Utility helicopter
Mi-17V Hip	Soviet Union	Transport Helicopter

### Indian Navy Submarines

Class	Submarines
Chakra	INS Chakra
Sindhughosh	INS Sindhughosh INS Sindhudhvaj INS Sindhuraj INS Sindhuvir INS Sindhuratna INS Sindhukesari INS Sindhukirti INS Sindhuvijay INS Sindhurashtra
Shishumar	INS Shishumar INS Shankush INS Shalki INS Shankul
Arihant	INS Arihant INS Aridhaman
Kalvari	INS Kalvari

### Indian Navy ships

*All Ships are prefixed with letters 'INS'*

Class	Type	Ships
Kiev class(Modified)	Aircraft carrier	Vikramaditya
Centaur class	Aircraft carrier	Viraat
Kolkata class	Stealth guided missile destroyer	Kolkata, Kochi
Delhi class	Guided missile destroyer	Delhi, Mysore, Mumbai
Rajput class	Guided missile destroyer	Rajput, Rana, Ranjit, Ranvir, Ranvijay
Shivalik class	Stealth guided missile frigate	Shivalik, Satpura, Sahyadri
Talwar class	Stealth guided missile frigate	Talwar, Trishul, Tabar, Teg, Tarkash, Trikand
Brahmaputra class	Guided missile frigate	Brahmaputra , Betwa, Beas
Godavari class	Guided missile frigate	Ganga, Gomati
Kamorta class	Stealth ASW Corvette	Kamorta, Kadmatt
Kora class	Corvette	Kora, Kirch, Kulish, Karmuk
Khukri class	Corvette	Khukri, Kuthar, Kirpan, Khanjar
Abhay class	Corvette	Abhay, Ajay, Akshay, Agray
Veer class	Corvette	Veer, Nirbhik, Nipat, Nishank, Nirghat, Vibhuti, Vipul, Vinash, Vidyut, Nashak, Prabal, Pralaya

## INDIA'S ATOMIC RESEARCH

### DEPARTMENT OF ATOMIC ENERGY (DAE)

DAE has been engaged in the development of nuclear power technology, applications of radiation technologies in the fields of agriculture, medicine, industry and basic research.

**Founded :** 3 August 1954

**Headquarters :** Mumbai, Maharashtra

**Organization :** Atomic Energy Commission (AEC), Mumbai, Maharashtra [Founded: August 3, 1948]

### Regulatory Board and Organisation

Atomic Energy Regulatory Board (AERB), Mumbai, Maharashtra [Founded: November 15, 1983]

### Research & Development Sector

1. Bhabha Atomic Research Centre (BARC), Mumbai, *following Research institutions affiliated to BARC* [Founded: January 3, 1954]
2. Atomic Minerals Directorate for Exploration and Research (AMD), Hyderabad [Founded: 1948]
3. Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam, Tamil Nadu [Founded: 1971]
4. Variable Energy Cyclotron Centre (VECC), Kolkata [Founded: 1977]
5. Raja Ramanna Centre for Advanced Technology, Indore [Founded: February 19, 1984]

### Public Sector

1. Indian Rare Earths Limited (IREL), Mumbai [Founded: August 18, 1950]
2. Electronics Corporation of India (ECIL), Hyderabad [Founded: April 11, 1967]
3. Uranium Corporation of India, Singhbhum [Founded: October 4, 1967]

4. Nuclear Power Corporation of India (NPCIL), Mumbai, Maharashtra [Founded: September 17, 1987]
5. Bharatiya Nabhkiya Vidyut Nigam Limited (BHAVINI), Kalpakkam, Tamil Nadu [Founded: October 22, 2003]

### Industrial Organizations

1. Heavy Water Board (HWB), Mumbai [Founded: August, 1962]
2. Nuclear Fuel Complex (NFC), Hyderabad [Founded: 1971]
3. Board of Radiation & Isotope Technology (BRIT), Mumbai [Founded: March 1, 1989]

### Universities

1. Homi Bhabha National Institute, Mumbai [Founded: June 4, 2005]
2. Tata Institute of Fundamental Research, Mumbai [Founded: June 1, 1945]
3. Tata Institute of Fundamental Research, Hyderabad [Founded: October 2010]

### Aided Sector

1. Atomic Energy Education Society (AEES), Mumbai [Founded: 1969]
2. Tata Memorial Centre, Mumbai [Founded: February 28, 1941]
3. Center for Excellence in Basic Sciences, Mumbai [Founded: September 17, 2007]
4. Saha Institute of Nuclear Physics (SINP), Kolkata [Founded: 1949]
5. Institute of Physics, Bhubaneswar [Founded: 1972]
6. Harish-Chandra Research Institute (HRI), Allahabad [Founded: 1965]
7. Institute of Mathematical Sciences (IMSc), Chennai [Founded: 1962]
8. Institute for Plasma Research, Gandhinagar [Founded: 1986]
9. National Institute of Science Education and Research, Bhubaneswar [Founded: 2006]
10. National Board for Higher Mathematics (NBHM), New Delhi [Founded: 1983]



### NUCLEAR POWER STATIONS

Power station	State	Units	Total capacity (MW)
<b>Functional</b>			
Kaiga	Karnataka	220 x 4	880
Kakrapar	Gujarat	220 x 2	440
Kalpakkam	Tamil Nadu	220 x 2	440
Narora	Uttar Pradesh	220 x 2	440
Rawatbhata	Kota Rajasthan	100 x 1 200 x 1 220 x 4	1180
Tarapur	Maharashtra	160 x 2 540 x 2	1400
Kudankulam	Tamil Nadu	1000 x 2	2000
<b>Under Construction</b>			
Kudankulam	Tamil Nadu	1000 x 2	2000
Kalpakkam	Tamil Nadu	500 x 1	500
Kakrapar	Gujarat	700 x 2	1400
Rawatbhata	Rajasthan	700 x 2	1400

### HEAVY WATER PRODUCTION

- Nangal is the first heavy water plant in India, set up in August, 1962.
- Heavy Water Plants based on Ammonia-Hydrogen exchange process were set up at Baroda and Tuticorin.
- First plant based on Hydrogen Sulphide-water exchange process developed indigenously was set up at Rawatbhata near Kota, Rajasthan.

Plant	Location	Plant	Location
Nangal	Punjab	Thal	Maharashtra
Baroda	Gujarat	Hazira	Gujarat
Talcher	Odisha	Manuguru	Andhra Pradesh
Tuticorin	Tamil Nadu	Rawatbhata	Rajasthan

### NUCLEAR WEAPONS TESTS

#### Pokhran I

- Test Code Name : Operation Smiling Buddha
- Test site : Pokhran
- Period : 18 May 1974
- Test type : Underground Shaft
- Device type : Fission
- Elevation : 235 m

#### Pokhran II

- Test Code Name : Operation Shakti
- Test site : Pokhran
- Period : 11 May 1998
- Test type : Underground and Underground Shaft
- Device type : Fission / Fusion
- Elevation : 226 m

## SPACE PROGRAM OF INDIA

### Indian Space Research Organisation (ISRO)

- It is the primary space agency of the Indian government.
- **Primary objective** : Advance space technology and use its applications for national benefit.
- **Established** : 15<sup>th</sup> August 1969
- **Headquarter** : Bengaluru
- **Motto** : Space Technology in the Service of Human Kind
- **Administrator** : A. S. Kiran Kumar (Chairman)

### ISRO CENTRES

Facility	Location
<b>Research facilities</b>	
Vikram Sarabhai Space Centre	Thiruvananthapuram
Liquid Propulsion Systems Centre	Thiruvananthapuram and Bengaluru
Physical Research Laboratory	Ahmedabad
Semi-Conductor Laboratory	Chandigarh
National Atmospheric Research Laboratory	Chittoor
Space Applications Centre	Ahmedabad
North-Eastern Space Applications Centre	Shillong
<b>Test facilities</b>	
ISRO Propulsion Complex	Mahendragiri
<b>Construction and launch facilities</b>	
ISRO Satellite Centre	Bengaluru
Laboratory for Electro-Optics Systems	Bengaluru
Satish Dhawan Space Centre	Sriharikota
Thumba Equatorial Rocket Launching Station	Thiruvananthapuram
<b>Tracking and control facilities</b>	
Indian Deep Space Network (IDSN)	Bengaluru
National Remote Sensing Centre	Hyderabad
Indian Space Research Organisation Telemetry, Tracking and Command Network	Bangalore
Master Control Facility	Bhopal
<b>Human resource development</b>	
Indian Institute of Remote Sensing (IIRS)	Dehradun
Indian Institute of Space Science and Technology (IIST)	Thiruvananthapuram
Development and Educational Communication Unit	Ahmedabad
<b>Commercial wing</b>	
Antrix Corporation	Bengaluru
<b>Other facilities</b>	
Balasore Rocket Launching Station (BRLS)	Odisha
ISRO Inertial Systems Unit (IISU)	Thiruvananthapuram
Indian Space Science Data Centre (IISDC)	Bengaluru

### INDIAN SPACE PROGRAMME

Satellite	Type	Launch Vehicle	Date	Place
Aryabhata	Scientific	Cosmos	19 Apr 1975	Baikonur
Bhaskara I	Geosurvey	Cosmos	7 Jun 1979	Baikonur
Rohini	Geosurvey	S L V-3	10 Aug 1979	Sriharikota
Rohini D-1	Geosurvey	S L V-3	18 Jul 1980	Sriharikota
Rohini	Geosurvey	Ariane	31 May 1981	Kourou
Apple	Communication	Cosmos	19 Jun 1981	Baikonur
INSAT –IA	Scientific	Delta	10 Apr 1982	America
Rohini	Communication	S L V-3 D2	17 Apr 1983	Sriharikota
INSAT –IB	Technological	Space Shuttle	30 Aug 1983	America
SROSS I	Remote sensing	ASLV D -1	24 Mar 1987	Sriharikota
SROSS II	Communication	ASLV -D2	13 Jul 1988	Sriharikota
INSAT –IC	Communication	Ariane -4	21 Jul 1988	Kourou
INSAT –ID	Remote sensing	Delta	12 Jun 1990	America
IRS –IB	Multipurpose	Vostok	29 Aug 1991	Baikonur
INSAT 2A	Multipurpose	Ariane -4	10 Jul 1992	Kourou
INSAT 2B	Remote sensing	Ariane -4	23 Jul 1993	Kourou
SROSS IV	Remote sensing	ASLV -D3	4 May 1994	Sriharikota
IRS P2	Multipurpose	PSLV -D2	15 Oct 1994	Sriharikota
INSAT -2C	Remote sensing	Ariane -4	7 Dec 1995	Kourou
IRS-IC	Remote sensing	Molnia	28 Dec 1995	Baikonur
IRS-P3	Communication	PSLV –D3	21 Mar 1996	Sriharikota
INSAT 2D	Remote sensing	Ariane -4	4 Jun 1997	Kourou
INSAT -2E	Remote sensing	Ariane -4	3 Apr 1999	Kourou
IRS P4	Communication	PSLV –C2	4 May 1999	Sriharikota
INSAT -3B	Communication	Ariane -5	22 Mar 2000	Kourou
GSAT – 1	Communication	GSLV – D1	28 Mar 2001	Sriharikota
GSAT – 1	Communication	GSLV – D1	18 Apr 2001	Sriharikota
INSAT – 3C	Communication	Ariane – 4	24 Jan 2002	Kourou
INSAT – 3A	Communication	Ariane – 5	10 Apr 2003	Kourou
GSAT – 2	Communication	GSLV – D2	8 May 2003	Sriharikota
EDUSAT	Education	GSLV – F01	20 Sep 2004	Sriharikota
CARTOSAT	Mapping	PSLV – C6	5 May 2005	Sriharikota
HAMSAT	Communication	PSLV – C6	5 May 2005	Sriharikota
SRE-1	Experimental	PSLV – C7	10 Jan 2007	Sriharikota
INSAT – 4B	Mapping	Ariane-5	12 Mar 2007	Kourou
AGILE	Communication	PSLV – C8	23 Apr 2007	Sriharikota
Tech SAR	Experimental	PSLV – C10	21 Jan 2008	Sriharikota
IMS – 1	Communication	PSLV – C9	28 Apr 2008	Sriharikota
CHANDRAYAAN - 1	Astronomy	PSLV – C11	22 Oct 2008	Sriharikota
OCEANSAT – 2	Surveillance	PSLV – C14	23 Sep 2009	Sriharikota
CARTOSAT – 2B	Remote Sensing	PSLV – C15	15 Jul 2010	Sriharikota
GSAT – 5P	Communication	GSLV – F06	25 Dec 2010	Sriharikota
YOUTHSAT	Communication	PSLV – C16	20 Apr 2011	Sriharikota
RESOURCESAT – 2	Earth Observation	PSLV – C16	20 Apr 2011	Sriharikota
GSAT – 8	Geo-stationary	Ariane – 5 VA – 202	21 May 2011	Kourou
GSAT – 12	Geo-stationary	PSLV – C17	15 Jul 2011	Sriharikota
SRMSAT	Earth Observation	PSLV – C18	12 Oct 2011	Sriharikota
Megha Tropiques	Earth Observation	PSLV – C18	12 Oct 2011	Sriharikota
Jugnu	Earth Observation	PSLV – C18	12 Oct 2011	Sriharikota
RISAT-1	Earth Observation	PSLV – C19	26 Apr 2012	Sriharikota
GSAT – 10	Geo-stationary	Ariane 5 VA 209	29 Sep 2012	Kourou
SARAL	Earth Observation	PSLV – C20	25 Feb 2013	Sriharikota
IRNSS-1A	Navigation	PSLV-C22	1 Jul 2013	Sriharikota

INSAT-3D	Geo Stationary / Meteorological	Ariane-5VA-214	26 Jul 2013	Kourou
GSAT-7	Geo-Stationary	Ariane-5VA-215	30 Aug 2013	Kourou
Mars Orbiter Mission (MOM)	Space Mission	PSLV-C25	5 Nov 2013	Sriharikota
GSAT-14	Geo-Stationary	GSLV-D5	5 Jan 2014	Sriharikota
IRNSS-1B	Navigation	PSLV-C24	4 Apr 2014	Sriharikota
SPOT-7	Earth Observation	PSLV-C23	30 Jun 2014	Sriharikota
IRNSS-1C	Navigation	PSLV-C26	16 October 2014	Sriharikota
GSAT-16	Communication	Ariane-5	7 December 2014	Kourou
IRNSS-1D	Navigation	PSLV-C27	28 March 2015	Sriharikota
GSAT-6	Communication	GSLV-D6	27 August 2015	Sriharikota
Astrosat	Space observatory	PSLV-C30	28 September 2015	Sriharikota
GSAT-15	Communication	Ariane 5 VA-227	11 November 2015	Kourou
IRNSS-1E	Navigation	PSLV-C31	20 January 2016	Sriharikota
IRNSS-1F	Navigation	PSLV-C32	10 March 2016	Sriharikota
GSAT-18	Communication	Ariane-5 VA-231	6 October 2016	Europe
GSAT-17	Communication	Ariane-5 VA-238	Jun, 29, 2017	Kourou

- India, a one-rocket fledgling in space transportation compared to its European and U.S. counterparts, created launch history on Wednesday by placing a record 104 spacecraft in their desired orbits. The satellites launched by the PSLV- C-37, which took off from the first launch pad at the Satish Dhawan Space Centre, Sriharikota, at 9.28 a.m on 15 February 2017.
- India, on June 21, 2017, created history after NASA launched the world's smallest satellite, built by 18-year old Tamil Nadu student Rifath Sharook and his team. Named as **KalamSat**, after former President APJ Abdul Kalam, the tiny satellite weighs around 64 grams. The satellite was flown into the space in a NASA sounding rocket from a NASA facility in Wallops Island.

## AWARDS & HONOURS

### INTERNATIONAL AWARDS

#### NOBEL PRIZE

- **Awarded for** : Outstanding contributions for humanity in chemistry, literature, peace, physics, physiology or medicine
- **Announced by** : Royal Swedish Academy of Sciences every year in the memory of **Alfred Nobel**.
- **Presented on** : 10 December
- First awarded : 1901; 115 years ago
- **Nobel Prizes are Presented by** : Swedish Academy (Literature), Nobel committee of Royal Swedish Academy of Sciences (Physics and Chemistry), Nobel committee of Karolinska Institutet (Medicine), Norwegian Nobel Committee (Peace), The Bank of Sweden (Economics).
- The related Nobel Memorial Prize in **Economic Sciences** was created in **1968**.

#### INDIAN NOBEL LAUREATES

Year	Name	Field	Notes
1913	Rabindranath Tagore	Literature (Gitanjali)	First Indian winner.
1930	C.V. Raman	Physics (Raman Effect)	Also Knighted.
1968	Har Gobind Khorana	Medicine (Genetic Code)	Foreign citizen of Indian origin
1979	Mother Teresa	Peace	Was Born in Albania.
1983	Subrahmanyam Chandrasekhar	Physics (Chandrasekhar's Limit)	Foreign citizen of Indian origin
1998	Amartya Sen	Economic Sciences	for his contributions to welfare economics
2001	Sir V. S. Naipaul	Literature	Trinidadian born British citizen of Indian descent
2009	Venkatraman Ramakrishnan	Chemistry (Ribosomes)	Indian-born U.S citizen
2014	Kailash Satyarthi	Peace	He is an Indian children's rights activist.

#### THE YOUNGEST NOBEL LAUREATES

Category	Name	Age	Year of Award
Physics	William Lawrence Bragg	25	1915
Chemistry	Frederic Joliot	35	1935
Physiology or Medicine	Frederick Banting	32	1923
Literature	Rudyard Kipling	41	1907
Peace	Malala Yousafzai	17	2014
Economic Sciences	Kenneth J. Arrow	51	1972

#### THE OLDEST NOBEL LAUREATES

Category	Name	Age	Year of Award
Physics	Raymond Davis Jr.	88	2002
Chemistry	John B. Fenn	85	2002
Physiology or Medicine	Peyton Rous	87	1966
Literature	Doris Lessing	88	2007
Peace	Joseph Rotblat	87	1995
Economic Sciences	Leonid Hurwicz	90	2007

### NOBEL PRIZE TO AMERICAN PRESIDENT

- Theodore Roosevelt (Peace) : 1906
- Woodrow Wilson (Peace) : 1919
- Jimmy Carter (Peace) : 2002
- Barack Obama (Peace) : 2009

### PERSONS REFUSING NOBEL PRIZE

- Jean-Paul Sartre (Literature) : 1964
- Le Duc Tho (Peace) : 1973
- Henry A. Kissinger (Peace) : 1973

### Posthumous Nobel Prize Winners

- Dag Hammarskjold (Nobel Peace Prize 1961)
- Erik Axel Karlfeldt (Nobel Prize in Literature 1931)

### MULTIPLE NOBEL LAUREATES

- John Bardeen : 1956 (Physics : Transistor), 1972 (Physics : Superconductivity)
- Marie Curie : 1903 (Physics : radiation phenomena), 1911 (Chemistry : Discovered Polonium and Radium)
- Linus Carl Pauling : 1954 (Chemistry : Chemical bond), 1962 (Peace)
- Frederick Sanger : 1958 (Chemistry : Structure of proteins), 1980 (Chemistry : Biochemistry of Nucleic Acids)
- International Committee of the Red Cross (ICRC) : 1917, 1944, 1963 (Peace)
- United Nations High Commissioner for Refugees (UNHCR) : 1954, 1981 (Peace)

### 2017 NOBEL LAUREATES

Physics	Rainer Weiss, Barry C. Barish and Kip S. Thorne
Chemistry	Jacques Dubochet, Joachim Frank and Richard Henderson
Physiology or Medicine	Jeffrey C. Hall, Michael Rosbash and Michael W. Young
Literature	Kazuo Ishiguro
Peace	International Campaign to Abolish Nuclear Weapons (ICAN)
Economics	Richard H. Thaler

### FAMILY NOBEL LAUREATES

Married couples	Marie Curie and Pierre Curie ; Irene Joliot-Curie and Frederic Joliot ; Gerty Cori and Carl Cori ; Alva Myrdal and Gunnar Myrdal
Mother , Father & daughter	Marie Curie , Pierre Curie and Irene Joliot-Curie
Father & son	William Bragg and Lawrence Bragg ; Niels Bohr and Aage N. Bohr ; Hans von Euler-Chelpin and Ulf von Euler ; Arthur Kornberg and Roger D. Kornberg ; Manne Siegbahn & Kai M. Siegbahn ; J. J. Thomson & George Paget Thomson
Brothers	Jan Tinbergen & Nikolaas Tinbergen

### LIST OF FEMALE NOBEL LAUREATES

Year	Laureate	Year	Laureate
1905	Bertha von Suttner	1992	Rigoberta Menchú
1931	Jane Addams	1997	Jody Williams
1946	Emily Greene Balch	2003	Shirin Ebadi
1976	Betty Williams	2004	Wangari Maathai
1976	Mairead Corrigan	2011	Ellen Johnson Sirleaf
1979	Mother Teresa	2011	Leymah Gbowee
1982	Alva Myrdal	2011	Tawakel Karman
1991	Aung San Suu Kyi	2014	Malala Yousafzai

### NOBEL PEACE PRIZE WINNER'S ORGANISATION

Organisation	Country	Year(s)
Institute of International Law	Belgium	1904
Permanent International Peace Bureau	Switzerland	1910
International Committee of the Red Cross	Switzerland	1917, 1944, 1963
Nansen International Office for Refugees	League of Nations	1938
American Friends Service Committee (The Quakers)	United States	1947
Friends Service Council	United Kingdom	1947
United Nations High Commissioner for Refugees	United Nations	1954, 1981
League of Red Cross Societies	Switzerland	1963
International Labour Organization	United Nations	1969
Amnesty International	United Kingdom	1977
International Physicians for the Prevention of Nuclear War	United States	1985
United Nations Peace-Keeping Forces	United Nations	1988
Pugwash Conferences on Science and World Affairs	Canada	1995
International Campaign to Ban Landmines	Switzerland	1997
Medecins Sans Frontieres	Switzerland	1999
United Nations	United Nations	2001
International Atomic Energy Agency	United Nations	2005
Grameen Bank	Bangladesh	2006
Intergovernmental Panel on Climate Change	United Nations	2007
European Union (EU)	Europe	2012
Organisation for the Prohibition of Chemical Weapons	International	2013
Tunisian National Dialogue Quartet	Tunisia	2015
International Campaign to Abolish Nuclear Weapons (ICAN)	Australia	2017

#### THE OSCARS (ACADEMY AWARD)

- **Awarded for** : Excellence in cinematic achievements in every year in February
- **Presented by** : Academy of Motion Picture Arts and Sciences
- **Country** : United States
- **First awarded** : 16<sup>th</sup> May, 1929
- **Indian Films Nominated for Oscar** : Mother India (1957), Salam Bombay (1988), Lagan (2001)
- **First Indian to win an Oscar Award** : Bhaun Athaiya in 1982 for costume design in film **Gandhi**

#### GRAMMY AWARDS

- **Awarded for** : Outstanding achievements in the music industry
- **Presented by** : National Academy of Recording Arts and Science
- **Country** : United States
- **First awarded** : 1959

#### Grammy Awards Winner Indian

- Pandit Ravi Shankar (3 time) : 1967, 1972, 2001
- Zakir Hussain : 1992, 2009
- Vishwa Mohan Bhatt : 1994
- Vikku Vinayak : 2008
- A.R. Rehman : 2008
- Ricky Kej, Neela Vaswani : 2015

#### GOLDEN GLOBE AWARD

- **Awarded for** : Excellence in film and television
- **Presented by** : Hollywood Foreign Press Association
- **First awarded** : 1944
- **Country** : United States
- **First Indian to win a Golden Globe Award** : A.R. Rehman in 2008-09 for Slumdog Millionaire

### PULITZER PRIZE

- **Awarded for** : Excellence in newspaper journalism, literary achievements, and musical composition
- **Presented by** : Columbia University
- **Country** : United States
- **First awarded** : 1917

### Pulitzer Prize Winner Indian

- Gobind Behari Lal (for Reporting) : 1937
- Jhumpa Lahiri (for her book “Interpreters of Maladies”) : 2000
- Geeta Anand (for Journalism) : 2003
- Siddhartha Mukharjee (for his book on cancer ‘The Emperor of all Maladies : A biography of Cancer’) : 2011
- Vijay Seshadri (for his collection of poems “3 Sections”) : 2014

### MAN BOOKER PRIZE

- **Awarded for** : Best full-length English Novel
- **Presented by** : Man Group
- **Country** : Commonwealth of nations, Ireland and Zimbabwe
- **First awarded** : 1968

### Indian Winning Man Booker Prize

- Arundhati Roy (Novel : The God of Small Things) in 1997
- Kiran Desai (Novel : The Inheritance of Loss) in 2006

- Aravind Adiya (Novel : The White tiger) in 2008

### MAN BOOKER INTERNATIONAL PRIZE

- Awarded for : Best English (or available for translation into English) fiction
- Presented by : Man Group
- Country : United Kingdom
- First awarded : 2005
- First winner : Ismail Kadare (Albanian novelist)

### LOST MAN BOOKER PRIZE

- Awarded for : Best full-length English novel from 1970
- Presented by : Man Group
- First awarded : 2010

### RAMON MAGSAYSAY AWARD

- **Awarded for** : Outstanding contributions in Government Service, Public Service, Community Leadership, Journalism, Literature and Creative Communication Arts, Peace and International Understanding and Emergent Leadership
- **Presented by** : Ramon Magsaysay Award Foundation
- **Country** : Philippines
- **First awarded** : 1958

Indian Winner of Ramon Magsaysay Award		
<b>GS</b> : Government Service, <b>PS</b> : Public Service, <b>CL</b> : Community Leadership, <b>JLCCA</b> : Journalism, Literature, and Creative Communication Arts, <b>PIU</b> : Peace and International Understanding, <b>EL</b> : Emergent Leadership, <b>-</b> : Uncategorized		
Name / Organisation	Year Awarded	Category
Vinoba Bhave	1958	CL
Chintaman Deshmukh	1959	GS
Amitabha Chowdhury	1961	JL
Mother Teresa	1962	PIU
Dara Khurody	1963	CL
Vergheze Kurien	1963	CL
Tribhuvandas Patel	1963	CL
Welthy Honsinger Fisher	1964	PIU
Jayaprakash Narayan	1965	PS



Kamaladevi Chattopadhyay	1966	CL
Satyajit Ray	1967	JLCCA
Moncompu Sambasivan Swaminathan	1971	CL
M. S. Subbulakshmi	1974	PS
Boobli George Verghese	1975	JLCCA
Henning Holck-Larsen	1976	PIU
Sombhu Mitra	1976	JLCCA
Ela Ramesh Bhatt	1977	CL
Mabelle Rajanikant Arole	1979	CL
Rajanikant Shankarrao Arole	1979	CL
Pramod Karan Sethi	1981	CL
Gour Kishore Ghosh	1981	JLCCA
Chandi Prasad Bhatt	1982	CL
Manibhai Bhimbhai Desai	1982	PS
Arun Shourie	1982	JLCCA
Rasipuram Laxman	1984	JLCCA
Murlidhar Devidas Amte	1985	PS
Lakshmi Chand Jain	1989	PS
K. V. Subbanna	1991	JLCCA
Ravi Shankar	1992	JLCCA
Banoo Jehangir Coyaji	1993	PS
Kiran Bedi	1994	GS
Tirunellai Narayanaiyer Seshan	1996	GS
Pandurang Shastri Athavale	1996	CL
Mahesh Chander Mehta	1997	PS
Mahasweta Devi	1997	JLCCA
Aruna Roy	2000	CL
Jockin Arputham	2000	PIU
Rajendra Singh	2001	CL
Sandeep Pandey	2002	EL
James Michael Lyngdoh	2003	GS
Shantha Sinha	2003	CL
Laxminarayan Ramdas	2004	PIU
V. Shanta	2005	PS
Arvind Kejriwal	2006	EL
Palagummi Sainath	2007	JLCCA
Mandakini Amte	2008	CL
Prakash Amte	2008	CL
Deep Joshi	2009	-
Nileema Mishra	2011	EL
Harish Hande	2011	-
Kulandei Francis	2012	-
Anshu Gupta and Sanjiv Chaturvedi	2015	-
Sanjiv Chaturvedi	2015	EL
Thodur Madabusi Krishna	2016	EL
Bezwada Wilson	2016	CL

## WORLD FOOD PRIZE

- **Awarded for :** Outstanding achievement in advancement of human development through improved food quality, quantity, or availability
- **Presented by :** World Food Prize Foundation, with various sponsor companies
- **Location :** Des Moines, Iowa, United States
- **First awarded :** 1987
- **Prize Money :** 2.5 Lakh USD

### Indian Winner of World Food Prize

Year	Laureates	Year	Laureates
1987	Prof. M. S. Swaminathan	2000	Dr Surinder K. Vasal
1989	Dr Verghese Kurien	2005	Dr Modadugu Vijay Gupta
1996	Dr Gurdev Khush	2014	Dr Sanjaya Rajaram
1998	Dr B. R. Barwale	-	-

### RIGHT LIVELIHOOD AWARD

- It is also referred as the **Alternative Nobel prize**.
- **Awarded for** : "practical and exemplary solutions to the most urgent challenges facing the world today"
- **Presented by** : Right Livelihood Award Foundation
- **Country** : Sweden
- **First awarded** : 1980
- **Prize Money** : 2 Lakh Euro

### Indian Winner of Right Livelihood Award

- 1984 : Self-Employed Women's Association / Ela Bhatt
- 1985 : Lokayan / Rajni Kothari
- 1986 : Ladakh Ecological Development Group / Helena Norberg-Hodge
- 1987 : Chipko movement
- 1991 : Narmada Bachao Andolan
- 1993 : Vandana Shiva
- 1994 : Dr. H. Sudarshan / VGKK (Vivekananda Girijana Kalyana Kendra (for working of soliga tribes in MM hills)
- 1996 : People's Science Movement of Kerala (Kerala Sasthra Sahithya Parishad)
- 2004 : Swami Agnivesh / Asghar Ali Engineer
- 2006 : Ruth Manorama
- 2008 : Krishnammal Jagannathan and Sankaralingam Jagannathan LAFTI

### INTERNATIONAL BEAUTY CONTEST

#### MISS WORLD

- Formation : 1951
- Founder : Eric Morley
- Location : United Kingdom
- Headquarters : London
- First Winner : **Kerstin "Kiki" Hakansson** (Sweden)
- First Indian woman to win : **Reita Faria Powell** in 1966. (Born : 1945, Mumbai, India)
- Other Indian Woman to win Miss World : Aishwarya Rai (1994), Diana Hayden

(1997), Yukta Mookhey (1999) & Priyanka Chopra (2003).

- **Stephanie Del Valle** from Puerto Rican is 2016 Miss World.

#### MISS UNIVERSE

- Formation : 1952
- Headquarters : New York City
- Location : USA
- First Winner : **Armi Kuusela** (Finland)

- First Indian woman to win : **Susmita Sen** in 1994 (Born : 19 November 1975 in Hyderabad, Telangana, India)
- Other Indian Woman to win Miss Universe : Lara Dutta (2000)
- **Iris Mittenaere** from France is 2016 Miss Universe.

### MISS INTERNATIONAL

- Formation : 1960
- Headquarters : Tokyo
- First Winner : Stella Marquez from Colombia
- **Kylie Verzosa** from Philippines is 2016 Miss International.

### MISS EARTH

- Formation : 2001
- Headquarters : Philippines Mandaluyong, Philippines
- First Winner : Catharina Svensson from Denmark

- First Indian woman to win : Nicole Faria in 2010.
- Katherine Espin from Ecuador is 2016 Miss Earth.

### MISS INDIA (FEMINA MISS INDIA)

- It is a national beauty pageant in India that annually selects representatives to compete globally. The winner of Femina Miss India vies in Miss World, the first runner up competes in Miss Earth, and the second runner up goes to compete in Miss International.
- Formation : 1964
- Headquarters : Mumbai
- First Miss India : Pramila (Esther Victoria Abraham), from Calcutta, who won in 1947.
- Manushi Chhillar of Haryana is the current title holder of Femina Miss India 2017 beauty pageant.

## INDIA'S INTERNATIONAL AWARDS

### INTERNATIONAL GANDHI PEACE PRIZE

- Awarded by : Government of India
- First awarded : 1995
- First awardee : Julius Nyerere (First President of Tanzania)
- Last awardee : ISRO in 2014

### INDIRA GANDHI PRIZE

- Awarded for : Outstanding contributions in peace
- Location : New Delhi
- Prize Money : 25 lakh Indian rupees

- First awarded : 1986 (Parliamentarians for Global Action)
- Last awardee : UNHCR in 2015

### JAWAHARLAL NEHRU AWARD

- Awarded by : Government of India
- Cash award : 25 lakh Indian Rupee
- First awarded : 1965
- First awardee(s) : U Thant (1965, Burma), 3<sup>rd</sup> UN Secretary General
- Last awardee(s) : Angela Merkel (2009), Germany's First Female Chancellor

## NATIONAL AWARDS

### BHARAT RATNA

- Highest civilian Award of India.
- Instituted in : 1954
- Awarded for : exceptional service/performance of the highest order in any field of human endeavour
- The recommendations for Bharat Ratna are made by the Prime Minister himself to the President.
- Recipients receive a Sanad (certificate) signed by the President and a peepal-leaf-shaped medallion; there is no monetary grant associated with the award.
- The award has been conferred to a naturalised Indian citizen Mother Teresa (1980) and to two non-Indians Khan Abdul Ghaffar Khan and Nelson Mandela (1990).

### LIST OF RECIPIENTS OF BHARAT RATNA : \* (star) mark refers to Posthumous

Name	Awarded In	Name	Awarded In
Shri Chakravarti Rajagopalachari	1954	Shri Rajiv Gandhi (Posthumous)	1991
Dr. Sarvapali Radhakrishnan	1954	* Sardar Vallabhbhai Patel	1991
Dr. Chandrasekhara Venkata Raman	1954	Shri Morarji Ranchhodji Desai	1991
Dr. Bhagwan Das	1955	* Maulana Abul Kalam Azad	1992
Dr. Mokshagundam Visvesvaraya	1955	Shri Jehangir Ratanji Dadabhai Tata	1992
Pt. Jawaharlal Nehru	1955	Shri Satyajit Ray	1992
Pt. Govind Ballabh Pant	1957	Shri Gulzarilal Nanda	1997
Dr. Dhondo Keshave Karve	1958	* Smt. Aruna Asaf Ali (Posthumous)	1997
Dr. Bidhan Chandra Roy	1961	Dr. A.P.J. Abdul Kalam	1997
Shri Purushottam Das Tandon	1961	Smt. Madurai Sanmukhavadiyu Subbulakshmi	1998
Dr. Rajendra Prasad	1962	Shri Chidambaram Subramniam	1998
Dr. Zakir Hussain	1963	* Loknayak Jayaprakash Narayan	1999
Dr. Pandurang Vaman Kane	1963	Professor Amartya Sen	1999
* Shri Lal Bahadur Shastri	1966	* Lokpriya Gopinath Bordoloi	1999
Smt. Indira Gandhi	1971	Pandit Ravi Shankar	1999
Shri Varahagiri Venkata Giri	1975	Sushri Lata Dinanath Mangeshkar	2001
* Shri Kumaraswami Kamraj	1976	Ustad Bismillah Khan	2001
Mother Mary Taresa Bojaxhiu (Mother Teresa)	1980	Pandit Bhimsen Gururaj Joshi	2009
* Shri Acharya Vinobha Bhave	1983	Prof. CNR Rao	2014
Khan Abdul Ghaffar Khan	1987	Sachin Ramesh Tendulkar	2014
* Shri Marudu Gopalan Ramachandran	1988	* Madan Mohan Malaviya	2015
* Dr. Bhim Rao Ramji Ambedkar	1990	Atal Bihari Vajpayee	2015
Dr. Nelson Rolihlahla Mandela	1990	-	-

## PADMA AWARDS

- These are one of the highest Civilian Awards and are conferred to people in three different categories namely, Padma Vibhushan, Padma Bhushan and Padma Shri.
- These awards are given on Republic Day (26<sup>th</sup> January) every year.

### Padma Vibhushan

- Second highest civilian award.
- Given for : exceptional and distinguished service
- Established : 2 January 1954.

### Padma Bhushan

- Third highest civilian award
- Given for : exceptional and distinguished service

- Established : 2 January 1954

### Padma Shri

- Fourth highest civilian award
- Given for : contribution in various spheres of activity including the Arts, Education, Industry, Literature, Science, Sports, Medicine, Social Service and Public Affairs.
- Established : 1954

## MILITARY AWARD

To be given on Republic Day (26<sup>th</sup> January)

### WARTIME GALLANTRY AWARD

All Wartime Gallantry Awards are awarded by Government of India and established on 26 January 1950.

All awards are also given posthumously.

Award	Awarded for
Param Vir Chakra	"Most conspicuous bravery or some daring or pre-eminent act of valour or self-sacrifice, in the presence of the enemy, whether on land, at sea, or in the air."
Maha Vir Chakra	Acts of gallantry in the presence of the enemy on land, at sea or in the air.
Vir Chakra	Acts of bravery in the battlefield.

### Recipient of Param Vir Chakra

Name	Regiment	Date	Place
Major Som Nath Sharma	4th Battalion, Kumaon Regiment	November 3, 1947	Badgam, Kashmir
Lance Naik Karam Singh	1st Battalion, Sikh Regiment	October 13, 1948	Tithwal, Kashmir
Second Lieutenant Rama Raghoba Rane	Corps of Engineers	April 8, 1948	Naushera, Kashmir
Naik Jadu Nath Singh	1st Battalion, Rajput Regiment	February 1948	Naushera, Kashmir
Company Havildar Major Piru Singh Shekhawat	6th Battalion, Rajputana Rifles	17 July 1948–18 July 1948	Tithwal, Kashmir
Captain Gurbachan Singh Salaria	3rd Battalion, 1st Gorkha Rifles (The Malaun Regiment)	December 5, 1961	Elizabethville, Katanga, Congo
Major Dhan Singh Thapa	1st Battalion, 8th Gorkha Rifles	October 20, 1962	Ladakh, India

Subedar Joginder Singh	1st Battalion, Sikh Regiment	October 23, 1962	Tongpen La, Northeast Frontier Agency, India
Major Shaitan Singh	13th Battalion, Kumaon Regiment	November 18, 1962	Rezang La
Company Quarter Master Havildar Abdul Hamid	4th Battalion, The Grenadiers	September 10, 1965	Pakistan, Khem Karan Sector
Lieutenant-Colonel Ardeshir Burzorji Tarapore	17th Poona Horse	October 15, 1965	Phillora, Sialkot Sector, Pakistan
Lance Naik Albert Ekka	14th Battalion, Brigade of the Guards	December 3, 1971	Gangasagar, Agartala Sector
Flying Officer Nirmal Jit Singh Sekhon	No.18 Squadron, Indian Air Force	December 14, 1971	Srinagar, Kashmir
2/Lieutenant Arun Khetarpal	17th Poona Horse	December 16, 1971	Jarpal, Shakargarh Sector
Major Hoshiar Singh	3rd Battalion, The Grenadiers	December 17, 1971	Basantar River Shakargarh Sector
Naib Subedar Bana Singh	8th Battalion, Jammu and Kashmir Light Infantry	June 23, 1987	Siachen Glacier, Jammu and Kashmir
Major Ramaswamy Parameshwaran	8th Battalion, Mahar Regiment	November 25, 1987	Sri Lanka
Captain Manoj Kumar Pandey	1st Battalion, 11th Gorkha Rifles	July 3, 1999	Khaluber/Juber Top, Batalik sector, Kargil area, Jammu and Kashmir
Yogendra Singh Yadav	18th Battalion, The Grenadiers	July 4, 1999	Tiger Hill, Kargil area
Rifleman Sanjay Kumar	13th Battalion, Jammu & Kashmir Rifles	July 5, 1999	Area Flat Top, Kargil Area
Captain Vikram Batra	13th Battalion, Jammu & Kashmir Rifles	July 5, 1999	Point 5140, Point 4875, Kargil Area

## PEACETIME GALLANTRY AWARDS

All Peacetime Gallantry Awards are awarded by Government of India and established on 4 January 1952.

All awards are also given posthumously.

Award	Awarded for
Ashoka Chakra	Bravery, courageous action or self-sacrifice away from the battlefield.
Kirti Chakra	Bravery, courageous action or self-sacrifice away from the battlefield.
Shaurya Chakra	Bravery, courageous action or self-sacrifice while not engaged in direct action with the enemy.

## Other Military Awards

Category	Medal
Wartime/Peacetime Service and Gallantry	Sena Medal (Army), Nao Sena Medal (Navy) and Vayusena Medal (Air Force)
Wartime Distinguished Service	Sarvottam Yudh Seva Medal, Uttam Yudh Seva Medal, Yudh Seva Medal
Peacetime Distinguished Service	Param Vishisht Seva Medal, Ati Vishisht Seva Medal, Vishisht Seva Medal

## NATIONAL SPORTS AWARDS

### Rajiv Gandhi Khel Ratna

- India's highest honour given for achievement in sports.
- It carries a medal, a scroll of honour and a substantial cash component.
- Prize Money : 7.5 Lakh Indian Rupees.
- Instituted in : 1991–92
- Awarded by : Government of India.
- First awardee(s) : Viswanathan Anand *Chess* 1991 - 92
- Recent awardee(s): Devendra Jhajharia *Para Athlete* 2017, Sardara Singh *Hockey* 2017.

### Arjuna Award

- Instituted in : 1961
- Awarded for : outstanding achievement in National sports
- Award Comprises : 5 Lakh Indian Rupee, a bronze statuette of Arjuna and a scroll
- From the year 2001, the award is given only in disciplines falling under the following categories: Olympic Games, Asian Games, Commonwealth Games, World Cup, World Championship Disciplines and Cricket,

Indigenous Games and Sports for the Physically Challenged

### Dronacharya Awards

- Instituted in : 1985
- Awarded for : excellence in sports coaching
- Award Comprises : 5 lakh Indian Rupees, a bronze statuette of Dronacharya and a scroll of honour
- 2017 awardee(s) : R. Gandhi (Athletics), Heera Nand Kataria (Kabaddi) along with G. S. S. V. Prasad (Badminton), Brij Bhushan Mohanty (Boxing), P. A. Raphel (Hockey), Sanjoy Chakraverty (Shooting), and Roshan Lal (Wrestling)

### Dhyan Chand Award

- India's highest award for lifetime achievement in sports and games.
- Instituted in : 2002
- Awarded by : Ministry of Youth Affairs and Sports, Government of India
- Award Comprises : 5 lakh Indian Rupees, a plaque and a scroll of honour.
- 2017 awardee(s) : Bhupender Singh (Athletics), Syed Shahid Hakim (Football), Sumrai Tete (Hockey).

## SOME FAMOUS AWARDS BY STATE GOVERNMENT

Award	Awarded/Instituted By	Field of Honour
Kalidas Samman	Madhya Pradesh Government	Outstanding achievement in four categories i.e. Plastic Arts, Theatre, Classical Music and Classical Dance.
Tansen Samman	Madhya Pradesh Government	classical music
Mahatma Gandhi Award	Madhya Pradesh Government	social work done as per the Gandhian Philosophy
Kishore Kumar Samman	Madhya Pradesh Government	film direction, acting, script writing and lyric writing
Lata Mangeshkar Award	Madhya Pradesh Government	singing and music direction
Iqbal Samman	Madhya Pradesh Government	creative Urdu writing
Tulsi Samman	Madhya Pradesh Government	outstanding achievement in the tribal, traditional and folk arts in one of the four categories of art, theatre, dance and music
Basava Puraskar	Karnataka Government	social reforms and social change and for bringing about religious harmony
Shantala Natya Award	Karnataka Government	dance
Konark Samman	Odisha Government	Popularising Oriya literature, rural leadership and leadership in the field of rural education

## FILM AWARDS

### National Film Awards

- Awarded for : Excellence in cinematic achievements for Indian cinema
- Location : Vigyan Bhavan, New Delhi
- Presented by : Directorate of Film Festivals
- First awarded : 10 October 1954 (Best Feature Film : Shyamchi Aai)
- Recent awarded : 2017 (Best Feature Film : Kaasav)
- Due to the national scale of the National Film Awards, it is considered the Indian equivalent of the American Academy Awards.

### Dadasaheb Phalke Award

- It is India's highest award in cinema given annually by the Government of India for lifetime contribution to Indian cinema.
- Instituted in : 1969
- Award comprises : Swarna Kamal (Golden Lotus) medallion, a cash prize of 10 Lakh Indian Rupees and a shawl.
- First awardee(s) : Devika Rani
- Recent awardee(s) in 2017 : Kasinathuni Viswanath

### Filmfare Awards

- Awarded for : Excellence in cinematic achievements
- Presented by : The Times Group
- First awarded : 21 March 1954 (Best Film : Do Bigha Zamin)
- Last awarded : 2017 (Best Film : Dangal)

## LITERATURE AND CULTURAL AWARDS IN INDIA

### Sahitya Akademi Award

- Established in : 1954
- Category : Literature
- Awarded by : Sahitya Akademi, Government of India
- Award comprises : a plaque and a cash prize of 1 Lakh Indian Rupees.
- First awarded : 1955
- 2017 winner for Hindi : Nasira Sharma for *Parijat* novel.

- First awarded : 1965
- First awardee(s) : G. Sankara Kurup
- 2016 awardee : Shankha Ghosh

### Bhasha Samman

- Instituted in : 1996
- Awarded by : Sahitya Akademi
- Awarded for : significant contribution of writers to Indian languages other than the above 24 major ones and also for contribution to classical & medieval Literature.
- Award comprises : a plaque and a cash prize of 1 lakh Indian Rupees.

### Jnanpith Award

- Established in : 1961
- Category : Literature
- Awarded by : Bharatiya Jnanpith, a trust founded by the Sahu Jain family, the publishers of the newspaper The Times of India.
- Award comprises : 11 lakh Indian Rupee, a citation plaque and a bronze replica of Saraswati

### Translation Awards

- Established in : 1989
- Awarded by : Sahitya Akademi
- Awarded for : outstanding translations of major works in other languages into one of the 24 major Indian languages.



- Awards comprises : a plaque and a cash prize of Rs. 20,000.

### **Anand Coomarswamy Fellowships**

Established in : 1996

Given to : scholars from Asian countries to spend 3 to 12 months in India to pursue a literary project

### **Premchand Fellowships**

- Established in : 2005
- Given to : persons of eminence in the field of Culture from SAARC countries.

### **Sangeet Natak Akademi Award**

- The awards are given in the categories of music, dance, theatre, other traditional arts and puppetry, and for contribution/scholarship in performing arts.
- Awarded by : Sangeet Natak Akademi, India's National Academy of Music, Dance & Drama
- Award for : performing arts in India
- Instituted : 1952
- Award consists : Rs. 50,000, a citation, an angavastram (a shawl), and a tamrapatra (a brass plaque).

### **Lalit Kala Akademi Ratna or National Art Award**

- Awarded by : Lalit Kala Akademi
- Given to : eminent artists for their lifetime achievements in the field of visual arts
- Instituted : 1955
- Award consists : Rs. 25,000, a citation and a plaque.
- First awarded : 1955
- Last awarded : 2006
- First awardee : Jamini Roy (1955)
- Recent awardee : Ram Kumar (2011)

### **Saraswati Samman**

- Awarded for : outstanding prose or poetry literary works
- Awarded by : K. K. Birla Foundation
- Instituted in : 1991,
- Award consists : Rs 10 lakh, a citation and a plaque.
- First Awardee : Harivanshrai Bachchan in 1991
- 2016 Awardee : Mahabaleshwar Sail ("Hawthan" Novel)

### **Tansen Award**

- Instituted in : 1980
- Awarded by: Govt. of Madhya Pradesh
- Awarded for : outstanding contribution in the field of music
- Award consist : Rs. 2 lakhs

### **Vyas Samman Award**

- Category: literary award
- Awarded by : K.K. Birla Foundation
- Award consist : Rs 2.5 lakh.
- First awarded : 1991 (Dr. Ram Vilas Sharma)
- 2017 Awardee : Rishabh Jain for Aadhe Adhure (autobiography)

### **Iqbal Samman**

- Awarded by : Govt. of Madhya Pradesh
- Awarded for : outstanding contribution in the field of music
- Instituted in : 1990
- Award consist : Rs. 1 lakh and certificate

### **Moortidevi Award**

- Awarded by the Bharatiya Jnanpith organization
- Awarded for : work which emphasizes Indian philosophy and culture
- Award consist : Rupees 4 Lakh, a plaque, a statue of Saraswati, and a shawl.
- First awarded : 1983 (C.K.Nagaraja Rao)
- 2016 Awardee : MP Veerendrakumar for Hymavathabhoovil

## SCIENCE AWARDS

### India Science Award

- Highest national science award.
- Instituted in : 2003
- Awarded by : Government of India
- Awarded for : outstanding contribution to science.
- Award Consist : Rs 25 lakhs, and it also carries a citation and a gold medal.
- First awardee : Prof CNR Rao in 2004
- Announced and presented every year at the Indian Science Congress (ISC).

### Jamnalal Bajaj Award

- Awarded for : promoting Gandhian values, social work and social development
- Established in : 1978
- Presented by : the President, Vice president, Prime Minister of India or a leading figure.
- Award comprises : a citation, a trophy and a cheque of Rs. 5 lakh
- First Awarded : 1978 Jugatram Dave

### Shanti Swarup Bhatnagar Award

- Awarded for : Research in science in India
- Awarded by : Council of Scientific and Industrial Research (CSIR)
- First awarded : 1958
- Any citizen of India engaged in research in any field of science and technology up to the age of 45 years is eligible for the prize.
- The prize comprises a citation, a plaque, and a cash award of Rs. 500,000.
- In addition recipients also get Rs. 15,000 per month up to the age of 65 years.

### BORLAUG AWARD

- Awarded for : outstanding Indian scientists for their research and contributions in the field of agriculture and environment.

- Awarded by : Coromandel International – a fertilizer company
- Instituted in 1972
- Named in honour of : Norman E. Borlaug (Nobel Laureate)
- Award consists : Rs 5 lakh, a gold medal, and a citation

### DR. B. C. ROY AWARD

- Awarded for : Statesmanship of the Highest Order in India, Medical man-cum-Statesman, Eminent Medical Person, Eminent person in Philosophy and Eminent person in Arts.
- Awarded by : Medical Council of India.
- Instituted in : 1976
- Presented by : President of India in New Delhi on July 1, the National Doctor's Day.
- Award consists : a Silver Medal, certificate and Rs. 1 lakh cash.

### HOMI BHABHA AWARD

- Instituted in : 1990
- Awarded for : excellence in field of atomic energy.
- Award consists : Rs. 50000 and certificate.

### VIKRAM SARABHAI AWARD

- Instituted in : 1990
- Awarded for : excellence in field of space research
- Award consists : Rs. 50000, medal and certificate.

### GD BIRLA AWARD

- Instituted in : 1991
- Awarded for : scientific research
- Award consists : Rs. 1.45 lakhs and certificate.

## ABBREVIATIONS

### A

AAA	Asian Athletics Association
AAFI	Amateur Athletics Federation of India
AAPSO	Afro-Asian People's Solidarity Organisation
AASU	All Assam Students Union
ABM	Anti Ballistic Missiles
ABVP	Akhil Bharatiya Vidyarthi Parishad
AC	Alternating Current; Ashoka Chakra
ACU	Asian Currency Union
AD	anno Domini; in the year of Lord Christ
ADB	Asian Development Bank
ADC	Aide-de-Camp; Access Deficit Charge
ADF	Asian Development Fund
ADS	Air Defence Ship
AERE	Atomic Energy Research Establishment
AGOC	Asian Games Organisation Committee
AICC	All India Congress Committee
AICTE	All India Council of Technical Education
AIDS	Acquired Immuno Deficiency Syndrome
AIFE	All India Football Federation
AIIMS	All India Institute of Medical Sciences
AIL	Aeronautics India Limited
AIMPLB	All India Muslim Personal Law Board
AIR	All India Radio (Broadcasting)
AJT	Advanced Jet Trainer
AG	Accountant General; Adjutant General
AI	Air India
AIDS	Acquired Immune Deficiency Syndrome
AIIMS	All India Institute of Medical Sciences
AIR	All India Radio; Annual Information Report
AITUC	All India Trade Union Congress
AJT	Advanced Jet Trainer
ALH	Advanced Light Helicopter
AM	ante meridiem; before noon
AMC	Army Medical Corps; Asset Management Companies
AME	Associate Member of the Institute of Engineers
ANC	African National Congress
APC	Agricultural Prices Commission
APEC	Asia-Pacific Economic Cooperation
APPLE	Ariane Passenger Payload Experiment
APPU	Asian Pacific Postal Union
ARC	Asset Reconstruction Company

ARDR	Agricultural and Rural Debt Relief
ASAT	Anti-Satellite weapon
ASC	Army Service Corps
ASCI	Advanced Strategic Computing Initiative
ASCII	American Standard Code for Information
ASEAN	Association of South-East Asian Nations
ASEM	Asia-Europe Meeting
ASIMO	Advanced Step in Innovative Mobility
ASLV	Augmented Satellite Launch Vehicle
ASMA	Antarctica Specially Managed Area
ASSOCHAM	Associated Chambers of Commerce and Industry
ATA	Air Time Authority; Allen Telescope Array
ATC	Air Traffic Controller
ATM	Automatic Teller Machine
ATR	Action Taken Report
APSC	Army Postal Services Core
ATS	Anti Tetanus Serum
ATV	Automatic Transfer Vehicle
AUM	Assets Under Management
AVC	Army Veterinary Corps
AVM	Additional Volatility Margin
AWACS	Airborne Warning and Control System

### B

B.Com	Bachelor of Commerce
B.Ed	Bachelor of Education
B.Pharm	Bachelor of Pharmacy
B2B	Business to Business
B2C	Business to Consumer
BAC	Business Advisory Committee
BAI	Badminton Association of India
BAMS	Bachelor of Ayurvedic Medicine and Surgery
BARC	Bhabha Atomic Research Centre
BBC	British Broadcasting Corporation
BC	Before Christ; Board of Control; British Columbia; Battery Commander
BCCI	Board of Control for Cricket in India
BCG	Bacillus Calmette Guerin-Anti-Tuberculosis Vaccine
BICP	Bureau of Industrial Costs and Prices
BIFR	Board of Industrial and Financial Reconstruction
BIOS	Basic Input Output System
BIS	Bureau of Indian Standards
BKU	Bharatiya Kisan Union

BMD	Ballistic Missile Defence System	CITU	Centre of Indian Trade Unions
BOLT	BSE On-Line Trading (System)	CLASS	Computer Literacy and Studies in Schools
BOSS	Bharat Operating System Solutions	CLAWS	Centre for Land Warfare Studies
BPO	Business Process Outsourcing	CM	Command Module; Chief Minister
BPR	Bottom Pressure Records	CMP	Common Minimum Programme
BRO	Border Road Organisation	CNG	Compressed Natural Gas
BSE	Bombay Stock Exchange	CNN	Cable News Network
BSF	Border Security Force	CNS	Chief of the Naval Staff
BSNL	Bharat Sanchar Nigam Ltd	CO	Commanding Officer
<b>C</b>		COD	Central Ordnance Depot; Cash on Delivery
CA	Chartered Accountant	CPCB	Central Pollution Control Board
CABE	Central Advisory Board of Education	CPI	Communist Party of India
CAD	Command Area Development	CPI(M)	Communist Party of India (Marxists)
CAG	Comptroller & Auditor General	CPU	Central Processing Unit
CAIR	Centre for Artificial Intelligence and Robotics	CR	Central Railway
CARE	Cooperative for American Relief Everywhere	CRAC	Cyber Regulation Advisory Council
CAPART	Council for People's Action and Advancement of Rural Technology	CRDI	Common Rail Direct Injection
CAPES	Computer-Aided Paperless Examination System	CRISIL	Credit Rating Information Services of India Limited
CAS	Chief of Army Staff; Chief of Air Staff; Conditional Access System	CRM	Customer Relationship Management
CB	Citizen Band (Radio)	CRR	Cash Reserve Ratio
CASE	Commission for Alternative Sources of Energy	CRPF	Central Reserve Police Force
CBI	Central Bureau of Investigation	CSIR	Council of Scientific and Industrial Research
CBFC	Central Board of Film Certification	CTBT	Comprehensive Test Ban Treaty
CCPA	Cabinet Committee on Political Affairs	CTT	Commodities Transaction Tax
CCS	Cabinet Committee on Security	CTS	Computerised Tomography Scanner
CD	Conference on Disarmament	CVC	Central Vigilance Commission
C-DAC	Centre for Development of Advanced Computing	CVRDE	Combat Vehicles Research and Development Establishment
CDMA	Code Division Multiple Access	<b>D</b>	
CECA	Comprehensive Economic Cooperation Agreement	DA	Dearness Allowance; Daily Allowance
CERN	European Organisation for Nuclear Research	DAVP	Directorate of Advertising and Visual Publicity
CFC	Chlorofluoro Carbon	DC	Deputy Commissioner; Direct Current in Electricity
CFS	Container Freight Station	DDT	Dichloro-Diphenyl Trichloro-ethane (disinfectant)
CHOGM	Commonwealth Heads of Government Meeting	DIG	Deputy Inspector General
CIA	Central Intelligence Agency (of U.S.A.)	DIN	Director Information Number
CIBIL	Credit Information Bureau (India) Ltd	DM	District Magistrate; Deputy Minister
CIC	Chief Information Commissioner	DMIC	Delhi-Mumbai Industrial Corridor
CID	Criminal Investigation Department	DMK	Dravida Munnetra Kazhagam
C-in-C	Commander-in-Chief	DNA	de-oxyribonucleic acid
CIF	cost, insurance and freight	DO	Demi-official (letter)
CIS	Commonwealth of Independent States	DOD	Department of Ocean Development
CISF	Central Industrial Security Force	DPI	Director of Public Instruction
CITES	Convention on International Trade in Endangered Species	DRAM	Dynamic Random Access Memory
		DRDO	Defence Research and Development Organisation
		DST	Daylight Saving Time

DRES Department of Renewable Energy Sources  
DTH Direct to Home (broadcasting)

## E

ECG Electro Cardio-gram  
ECS Electronic Clearing Service  
ECT Electro-convulsant Therapy  
EDUSAT Education Satellite  
EEG Electro-encephalography  
EET Exempt Exempt Taxation  
EFA Education for All  
EFF Extended Fund Facility  
e.g. exempli gratia; for example  
EHTP Electronic Hardware Technology Parks  
ELISA Enzyme Linked Immuno Solvent Assay  
EMI Equated Monthly Instalment  
EMS European Monetary System  
EMU Electric-Multiple Unit; Extra-vehicular Mobility Unit;  
EPROM Erasable Programmable Read Only Memory  
ER Eastern Railway  
ERM Exchange Rate Mechanism  
ERNET Educational and Research Network  
ESA European Space Agency  
ESCAP Economic and Social Commission for Asia & the Pacific  
ESMA Essential Services Maintenance Act  
ESOP Employee Stock Option Programme  
etc. et cetera (and other things)  
EU European Union  
EVM Electronic Voting Machine

## F

FAO Food and Agriculture Organisation  
FBI Federal Bureau of Investigation (of the U.S.A.)  
FCNR Foreign Currency (non-resident) Accounts Scheme  
FDR Flight Data Recorder; Fixed Deposit Receipt  
FEMA Foreign Exchange Management Act  
FERA Foreign Exchange Regulations Act  
FICCI Federation of Indian Chambers of Commerce and Industry  
FII Foreign Institutional Investors  
FIPB Foreign Investment Promotion Board (of India)  
FIR First Information Report  
FLAG Fibre Optic Link Around the Globe  
FM Field Marshal; Frequency Modulated  
FPSB Financial Planning Standards Boards (India)

FRS Fellow of the Royal Society  
FRBM Fiscal Responsibility and Budget Management  
FSSAI Food Safety and Standards Authority (of India)  
FTA Free Trade Area  
FTP File Transfer Protocol

## G

GAGAN GPS-aided Geo-augmented Navigation  
GAIL Gas Authority of India Limited  
GAIN Global Alliance for Improved Nutrition  
GATS General Agreement on Trade in Services  
GATT General Agreement on Tariffs and Trade  
GCA General Currency Area  
GCC Gulf Cooperation Council  
GCM Greatest Common Measure  
GEF Global Environment Fund  
GHQ General Headquarters  
GIC General Insurance Corporation  
GIST Graphics and Intelligence-based Script Technology  
GMPS Global Mobile Personal Communications System  
GMRT Giant Meterwave Radio Telescope  
GMT Greenwich Mean Time  
GNSS Global Navigation Satellite System  
GNP Gross National Product  
GOC General Officer Commanding  
GPO General Post Office  
GPRS General Packet Radio System  
GPS Global Positioning System  
GSLV Geosynchronous Satellite Launch Vehicle  
GSP Generalised Special Preferences  
GST Goods and Service Tax  
GSTP Global System of Trade Preferences

## H

HAWS High Altitude Warfare School  
HCF Highest Common Factor  
HDI Human Development Index  
HDTV High Definition Television  
HE His (or Her) Excellency; His (or Her) Eminence;  
HIV Human Immuno-deficiency Virus  
HMS Hybrid Mail Service  
HP Himachal Pradesh; Horizontal Plane; Horse Power  
HTML Hyper Text Markup Language  
HTTP Hypertext Transfer Protocol

HUDCO Housing and Urban Development Corporation  
HVDC High Voltage Direct Current  
HYVS High Yield Variety Seeds

I

IAAI International Airport Authority of India  
IAAS Indian Audit and Accounts Service  
IADF International Agricultural Development Fund  
IAEA International Atomic Energy Agency  
IAF Indian Air Force  
IAMC Indian Army Medical Corps  
IAS Indian Administrative Service  
IATA International Air Transport Association  
IATT Inland Air Travel Tax  
IBRD International Bank for Reconstruction and Development  
IBEX Interstellar Boundary Explorer Mission  
ICANN Internet Corporation for Assigned Names and Numbers  
ICAO International Civil Aviation Organisation  
ICAR Indian Council of Agricultural Research  
ICCR Indian Council of Cultural Relations  
ICCW Indian Council for Child Welfare  
ICDS Integrated Child Development Service  
ICJ International Court of Justice  
ICL Indian Cricket League  
ICMR Indian Council of Medical Research  
ICPA Indian Cricket Players' Association  
ICRC International Committee of the Red Cross  
IDA International Development Association  
IDBI Industrial Development Bank of India  
IDSA Institute of Defence Studies and Analysis  
i.e. id est; that is  
IEA International Energy Agency  
IES Indian Economic Service  
IEX Indian Energy Exchange  
IFRS International Financial Reporting Standard  
IFS Indian Foreign Service; Indian Forest Service  
IFTU International Federation of Trade Unions  
IFWJ Indian Federation of Working Journalists  
IGNOU Indira Gandhi National Open University  
IIPA Indian Institute of Public Administration  
IISS International Institute of Strategic Studies  
IIT Indian Institutes of Technology  
ILO International Labour Organisation  
IMA Indian Military Academy

IMET International Military Education Training Programme  
IMF International Monetary Fund  
IMO International Maritime Organisation  
IN Indian Navy; Intelligent Network  
INA Indian National Army  
INK International Newspaper Kiosks  
INMARSAT International Maritime Satellite Organisation  
INMAS Institute of Nuclear Medicines and Allied Sciences  
INS Indian Naval Ship; Indian Newspaper Society  
INSAS Indian Small Arms System  
INSAT Indian National Satellite  
INTERPOL International Police Organisation  
INTUC Indian National Trade Union Congress  
IOC International Olympic Committee  
IP Indian Police  
IPC Indian Penal Code  
IPCC Intergovernmental Panel on Climate Change  
IPEC International Programme on Elimination of Child Labour  
IPR Intellectual Property Right  
IPS Indian Police Service; Indian Postal Service  
IPTV Internet Protocol Television  
IPU Inter-Parliamentary Union  
IQ Intelligence Quotient  
IR Infra-red  
IRA Insurance Regulatory Authority  
IRBM Intermediate Range Ballistic Missile  
IREP Integrated Rural Energy Planning  
IRS Indian Remote Sensing Satellite; Indian Revenue Service  
ISAF International Stabilization and Assistance Force  
ISC Inter-State Council  
ISCS Integrated Smart Card System  
ISD International Subscriber Dialed (telephone)  
ISH Information Super Highway  
ISKCON International Society for Krishna Consciousness  
ISO International Standardisation Organisation  
ISP Internet Service Provider  
ISRO Indian Space Research Organisation  
ISS International Space Station  
IST Indian Standard Time  
ISTRAC ISRO Telemetry, Tracking and Command Network  
ITDC Indian Tourism Development Corporation  
ITO International Trade Organisation; Income-tax Officer  
ITU International Tele-communication Union  
IUC Interconnect User Charge

## J

JCO	Junior Commissioned Officer
JMM	Jharkhand Mukti Morcha
JNNURM	Jawahar Lal Nehru National Urban Renewal Mission
JPC	Joint Parliamentary Committee
JPEG	Joint Photographic Experts Group
JWG	Joint Working Group

## K

KG	Kinder Garten
Kg	Kilogram
KPO	Knowledge Process Outsourcing

## L

LAC	Line of Actual Control
LASER	Light Amplification by Stimulated Emission of Radiation
LCA	Light Combat Aircraft
LDC	Least Developed Countries
LHC	Large Hadron Collider
LIC	Life Insurance Corporation (of India)
LLB	Bachelor of Law
LLM	Master of Law
LLP	Limited Liability Partnership
LOAC	Line of Actual Control
LTA	Light Transport Aircraft
LTTE	Liberation Tigers of Tamil Eelam
LMG	Light Machine Gun
LoAC	Line of Actual Control (China)
LoC	Line of Control (Pakistan)
LPG	Liquefied Petroleum Gas
LSD	Lysergic acid diethylamide

## M

MA	Master of Arts
MAT	Minimum Alternative Tax
MBA	Master of Business Administration
MER	Mars Exploration Rover
MBBS	Bachelor of Medicine and Bachelor of Surgery
MBT	Main Battle Tank
MCF	Master Control Facility
MEP	Minimum Export Price
MES	Military Engineering Service
METSAT	Meteorological Satellite

MFA	Multi-Fibre Agreement
MFN	Most Favoured Nation
MI	Military Intelligence
MISA	Maintenance of Internal Security Act
MIP	Moon Impact Probe
MLA	Member of Legislative Assembly
MLC	Member of Legislative Council
MMS	Multimedia Messaging Service
MMTC	Minerals and Metals Trading Corporation of India
MNC	Multi-national Corporation
MNIC	Multi-purpose National Identity Card
MODEM	Modulator-Demodulator
MRI	Magnetic Resonance Imaging
MRTPC	Monopolies and Restrictive Trade Practices Commission
MRTS	Mass Rapid Transit System
MSA	Maritime Safety Agency
MSCF	Maritime Security Cooperation Framework
Mss	Manuscript
MTCR	Missile Technology Control Regime
MTO	Multilateral Trade Organisation
MVC	Maha Vir Chakra

## N

NAA	National Airport Authority
NACIL	National Aviation Company of India Ltd
NADA	National Anti-Doping Agency
NAEP	National Adult Education Programme
NAFTA	North America Free Trade Agreement
NAG	National Air Guard
NAM	Non-aligned Movement
NAMA	Non-Agriculture Market Access
NASA	National Aeronautics and Space Administration
NASDAQ	National Association of Securities Dealers Automated Quotation
NATA	Natural Aptitude Test for Architecture
NATO	North Atlantic Treaty Organisation
NAV	Net Asset Value
NB	Nota bene; note well, or take notice
NCA	Nuclear Command Authority
NCC	National Cadet Corps
NCEP	National Committee on Environmental Planning
NCERT	National Council of Education Research and Training
NCR	National Capital Region
NAEP	National Adult Education Programme

NAFED	National Agricultural and Marketing Federation
NABARD	National Bank for Agriculture and Rural Development
NACO	National AIDS Control Organisation
NCW	National Commission for Women
NDA	National Defence Academy; National Democratic Alliance
NDF	National Defence Fund
NDNC	National Do Not Call (Registry)
NDPS	Narcotic Drugs & Psychotropic Substances
NDRF	National Disaster Response Force
NDTL	National Dope Testing Laboratory
NeGP	National e-governance Plan
NEDB	North-Eastern Development Bank
NEP	National Education Policy
NEPA	National Environment Protection Authority
NFO	New Fund Offers
NHDP	National Highways Development Project
NHRC	National Human Rights Commission
NIC	National Integration Council
NIFT	National Institute of Fashion Technology
NIDC	National Industrial Development Corporation
NIO	National Institute of Oceanography
NIS	National Institute of Sports
NIT	National Institute of Technology
NLMA	National Literacy Mission Authority
NMD	Nuclear Missile Defence
NMDC	National Mineral Development Corporation
NPL	National Physical Laboratory
NPR	National Population Register
NPT	(Nuclear) Non-Proliferation Treaty
NRBI	National Rural Bank of India
NREGA	National Rural Employment Guarantee Act
NREP	National Rural Employment Programme
NRF	National Renewal Fund
NRI	Non-Resident Indian
NRR	National Reproduction Rate
NRSA	National Remote Sensing Agency
NSA	National Security Act
NSC	National Service Corps; National Security Council
NSDL	National Securities Depository Limited
NSE	National Stock Exchange
NSR	National Skills Registry
NTPC	National Thermal Power Corporation
NWDA	National Water Development Agency
NWRC	National Water Resources Council

## O

OAS	Organisation of American States
OAU	Organisation of African Unity
OBC	Other Backward Communities
OBU	Offshore Banking Unit
ODA	Official Development Assistance
ODF	Open Document Format
ODS	Ozone Depletion Substances
OECD	Organisation of Economic Co-operation and Development
OGL	Open General Licence
OIC	Organisation of Islamic Countries
OIGS	On India Government Service
OIL	Oil India Limited
OM	Order of Merit
ONGC	Oil and Natural Gas Commission
OPEC	Organisation of Petroleum Exporting Countries
OSCE	Organisation for Security and Cooperation in Europe
OSD	Officer on Special Duty
OXML	Open Extended Marking Language

## P

Ph. D	Doctor of Philosophy
PAC	Political Affairs Committee; Public Accounts Committee
PACER	Programme for Acceleration of Commercial Energy Research
PAN	Permanent Account Number (of Income-Tax)
PATA	Pacific-Asia Travel Association
PCS	Public Civil Service; Punjab Civil Service
PIB	Press Information Bureau
PIN	Postal Index Number
PIO	Persons of Indian Origin
PLF	Plant Load Factor
PM	Post Meridiem; after-noon; also Postmaster; Prime Minister; post-mortem (after death)
PMG	Postmaster General
PN	Participatory Note
PO	Post Office; Postal Order
POTA	Prevention of Terrorism Act
POW	Prisoner of War
PP	Public Prosecutor; Particular Person
PRO	Public Relations Officer
PS	Post Scriptum; Post Script; written after
PSC	Public Service Commission
PSE	Public Sector Enterprises
PSLV	Polar Satellite Launch Vehicle



PTA	Preferential Trade Area
PTI	Press Trust of India
PTO	Please Turn Over; Privilege Ticket Order
PVC	Param Vir Chakra
PVSM	Param Vishisht Sewa Medal
PWD	Public Works Department
PLO	Palestine Liberation Organisation
PWG	People's War Group

## Q

QMG	Quarter Master General
QR	Quantitative Restriction

## R

RAF	Rapid Action Force
RAM	Random Access Memory
RBI	Reserve Bank of India
RCC	Reinforced Concrete Cement
RDF	Rapid Development Force
RDS	Radio Data Servicing
RDSS	Radio Determination Satellite Service
REACH	Rehabilitate, Educate and Support Street Children
RLO	Returned Letter Office
RLV	Reusable Launch Vehicle
RPM	Revolution Per Minute
RPO	Recruitment Process Outsourcing; Regional Passport Officer
RRB	Regional Rural Bank
RRPI	Rural Retail Price Index
RSS	Rashtriya Swyamsevak Sangh
RSVP	Repondez s'il vous plait (Fr.) reply, if you please
RTGS	Real Time Gross Settlement System
RTO	Regional Transport Officer

## S

SAARC	South Asian Association for Regional Co-operation
SAFTA	South Asian Free Trade Area
SAC	Space Application Centre
SAIL	Steel Authority of India Limited
SAPTA	SAARC Preferential Trading Agreement
SARS	Severe Acute Respiratory Syndrome
SATNAV	Satellite Navigation (Initiative)
SAVE	SAARC Audio Visual Exchange
SC	Security Council; Supreme Court; Scheduled Caste
SCI	Shipping Corporation of India
SCO	Shanghai Cooperation Organisation

SCOPE	Standing Conference on Public Enterprises
SDO	Sub-Divisional Officer
SDR	Special Drawing Rights
SEBI	Securities and Exchange Board of India
SFC	Strategic Forces Command
SGPC	Shiromani Gurdwara Prabandhak Committee
SIDBI	Small Industries Development Bank of India
SIT	Special Investigation Team
SITE	Satellite Instructional Television Experiment
SLR	Statutory Liquidity Ratio
SLV	Satellite Launch Vehicle
SMS	Short Messaging Service; Subscriber Management System
SOS	Save Our Souls—distress signal
SPG	Special Protection Group
SPIN	Software Process Improvement Networks
SPV	Solar Photo Voltaic
SQUID	Super-conducting Quantum Interference Device
SRE	Space Capsule Recovery Experiment
SRV	Submarine Rescue Vessel
SSN	Social Security Number
STARS	Satellite Tracking and Ranging Station
START	Strategic Arms Reduction Talks
STEP	Science and Technology Entrepreneurship Park
STT	Securities Transaction Tax
STD	Subscribers Trunk Dialing
SWAN	State-wide Area Network
SWIFT	Society for Worldwide Financial Telecommunications

## T

TA	Travelling Allowance; Territorial Army
TAAI	Travel Agents Association of India
TACDE	Tactics and Air Combat Development Establishment
TADA	Terrorist and Disruptive Activities (Prevention) Act
TAPS	Tarapur Atomic Power Station
TB	Tuberculosis
TDC	Transport Development Council
TDS	Tax Deduction at Source
TDSAT	Telecom Dispute Settlement Appellate Tribunal
TERLS	Thumba Equatorial Rocket Launching Station
TIFR	Tata Institute of Fundamental Research
TIN	Tax Information Network
TINXSYS	Tax Information Exchange System
TISCO	Tata Iron and Steel Company
TMC	Terrain Mapping Camera

TMO	Telegraphic Money Order
TNT	Tri-nitro-toluene (high explosive)
TPP	20-Point Programme
TRAI	Telecom Regulatory Authority of India
TRIMs	Trade Related Investment Measures
TRIPS	Trade Related Intellectual Property Rights
TRP	Television Rating Points; Tax Return Preparer
TRYSEM	Training of Rural Youth for Self Employment
TTE	Travelling Ticket Examiner
TTF	Tourism Task Force

## U

UAE	United Arab Emirates
UAV	Unmanned Aerial Vehicle
UF	United Front
UFO	Unidentified Flying Object
UGC	University Grants Commission
ULFA	United Liberation Front of Assam
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEF	United Nations Emergency Force
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFPO	United Nations Fund for Population Activities
UNHCR	United Nations High Commissioner for Refugees
UNHRC	United Nations Human Rights Commission
UNI	United News of India
UNICEF	United Nations International Children's (Emergency) Fund
UNIDO	United Nations Industrial Development Organisation
UNRRA	United Nations Relief and Rehabilitation Administration
UNTAC	United Nations Transitional Authority for Cambodia
UPA	United Progressive Alliance
UPSC	Union Public Service Commission
UPTN	Universal Personal Telephone Number
USA	United States of America
USIS	United States Information Service
UTI	Unit Trust of India

## V

VAT	Value-added Tax
VC	Vice-Chancellor; Vice Counsel; Victoria Cross; Vir Chakra
VDIS	Voluntary Disclosure of Income Scheme
VHRR	Very High Resolution Radiometer
VIP	Very Important Person
VLSI	Very Large Scale Integration
VOIP	Voice Over Internet Protocol
VPN	Virtual Private Network
VPP	Value Payable Post
VRS	Voluntary Retirement Scheme
VSAT	Very Small Aperture Terminals

## W

WADA	World Anti-Doping Agency
WAP	Wireless Application Protocol
WAVE	Wireless Access for Virtual Enterprise
WDF	Wasteland Development Force
WEF	World Economic Forum
WFP	World Food Programme
WFTU	World Federation of Trade Unions
WGIG	Working Group on Internet Governance
WIPO	World Intellectual Property Organisation
WLL	Wireless in Local Loop
WMO	World Meteorological Organisation
WMD	Weapons of Mass Destruction
WR	Western Railway
WTO	World Trade Organisation ; World Tourism Organisation
WWF	World Wild Life Fund for Nature
WWW	World Wide Web

## X

XML	eXtensible Markup Language
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## Y

YMCA	Young Men's Christian Association
YWCA	Young Women's Christian Association

## Z

ZBB	Zero Based Budgeting
ZPZ	Zero Population Growth
ZS	Zoological Society
ZSI	Zoological Survey of India
ZUPO	Zimbabwe United Peoples Organisation

SUBHENDU

*Please give us your valuable ratings and reviews*