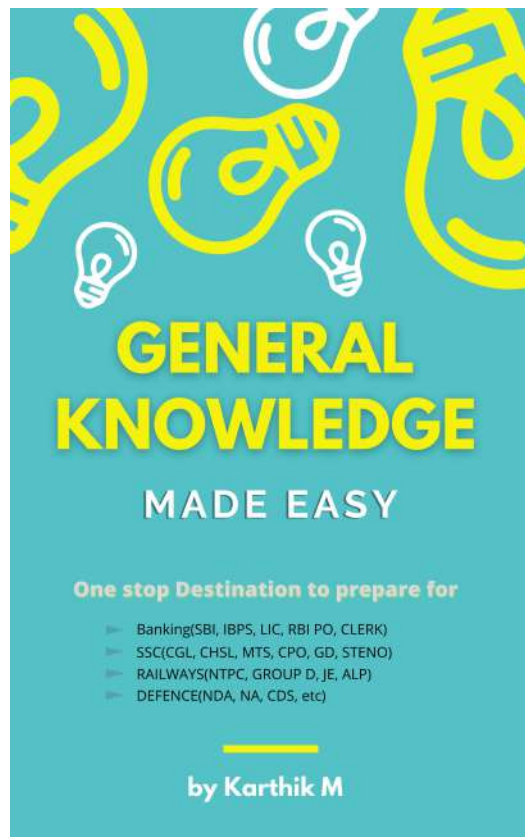


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# GENERAL KNOWLEDGE

## Made Easy



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# General Knowledge Made Easy

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## First in India Male

The first President of Indian Republic	Dr. Rajendra Prasad
The first Prime Minister of free India	Pt. Jawahar Lal Nehru
The first Indian to win Nobel Prize	Rabindranath Tagore
The first President of Indian National Congress	W.C. Banerjee
The first Muslim President of Indian National Congress	Badruddin Tayyabji
The first Muslim President of India	Dr. Zakir Hussain
The first British Governor General of India	Lord William Bentinck(1833-1835)
The first British Governor General of Bengal	Lord Warren Hasting(1774-1885)
The first British Viceroy of India	Lord Canning
The first Governor General of free India	Lord Mountbatten
The first and the last Indian to be Governor General of free India	C. Rajgopalachari
The first man who introduced printing press in India	James Hicky
The first Indian to join the I.C.S	Satyendra Nath Tagore
India's first man in Space	Rakesh Sharma
The first Prime Minister of India who resigned without completing the full term	Morarji Desai
The first Indian Commander-in-Chief of India	General Cariappa
The first Chief of Army Staff	Gen. Maharaj Rajendra Singhji
The first Indian Member of the Viceroys executive council	S.P.Sinha
The first President of India who died while in office	Dr. Zakhir Hussain
The first Muslim President of Indian Republic	Dr. Zakhir Hussain
The first Prime Minister of India who did not face the Parliament	Charan Singh
The first Field Marshal of India	S.H.F. Manekshaw
The first Indian to get Nobel Prize in Physics	C.V.Raman
The first Indian to receive Bharat Ratna award	Dr. Radhakrishnan
The first Indian to cross English Channel	Mihir Sen
The first Person to receive Jnanpith award	Sri Shankar Kurup
The first Speaker of the Lok Sabha	Ganesh Vasudeva Mavalankar
The first Vice-President of India	Dr. Radhakrishnan
The first Education Minister	Abdul Kalam Azad
The first Home minister of India	Sardar Vallabh Bhai Patel
The first Indian Air Chief Marshal	S. Mukherjee
The first Indian Naval Chief	Vice Admiral R.D. Katari
The first Judge of International Court of Justice	Dr. Nagendra Singh
The first person to reach Mt. Everest without oxygen	Sherpa Anga Dorjee
The first person to get Param Vir Chakra	Major Somnath Sharma
The first Chief Election Commissioner	Sukumar Sen
The first person to receive Magsaysay Award	Acharya Vinoba Bhave
The first person of Indian origin to receive Nobel Prize in Medicine	Hargovind Khurana

# General Knowledge Made Easy

The first Chinese traveller to visit India	Fahein
The first person to receive Stalin Prize	Saifuddin Kitchlu
The first person to resign from the Central Cabinet	Shyama Prasad Mukherjee
The first person to receive Nobel Prize in Economics	Amartya Sen
The first Chief Justice of Supreme Court	Justice Hiralal J. Kania
The first Indian Pilot	J.R.D. Tata (1929)

## First in India (Female)

The first lady to become Miss World	Rita Faria
The first woman judge in Supreme Court	Mrs. Meera Sahib Fatima Bibi
The first woman Ambassador	Miss C.B. Muthamma
The first woman Governor of a state in free India	Mrs Sarojini Naidu
The first woman Speaker of a State Assembly	Shanno Devi
The first woman Prime Minister	Mrs Indira Gandhi
The first woman Minister in a Government	Rajkumari Amrit Kaur
The first woman to climb Mount Everest	Bachhendri Pal
The first woman to climb Mount Everest twice	Santosh Yadav
The first woman President of Indian National Congress	Mrs Annie Besant
The first woman pilot in Indian Air Force	Harita Kaur Dayal
The first woman Graduates	Kadambini Ganguly and Chandramukhi Basu, 1883
The first woman Airline Pilot	Durba Banerjee
The first woman Honours Graduate	Kamini Roy, 1886
The first woman Olympic medal Winner	Karnam Malleswari, 2000
The first woman Asian Games Gold Medal Winner	Kamlijit Sandhu
The first woman Lawyer	Cornelia Sorabjee
The first woman President of United Nations General Assembly	Mrs Vijaya Laxmi Pandit
The first woman Chief Minister of an Indian State	Mrs Sucheta Kripalani
The first woman Chairman of Union Public Service Commission	Roze Millian Bethew
The first woman Director General of Police	Kanchan Chaudhary Bhattacharya
The first woman Judge	Anna Chandy (She became judge in a district court in 1937)
The first woman Chief Justice of High Court	Mrs Leela Seth (Himachal Pradesh High Court)
The first woman Judge in Supreme Court of India	Kumari Justice M. Fathima Beevi
The first woman Lieutenant General	Puneeta Arora
The first woman Air Vice Marshal	P. Bandopadhyaya
The first woman chairperson of Indian Airlines	Sushma Chawla
The first woman IPS officer	Mrs. Kiran Bedi
The first and last Muslim woman ruler of India	Razia Sultan
The first woman to receive Ashoka Chakra	Nirja Bhanot
The first woman to receive Jnanpith Award	Ashapurna Devi
The first woman to cross English Channel	Aarti Saha

# General Knowledge Made Easy

The first woman to receive Nobel Prize	Mother Teresa
The first woman to receive Bharat Ratna	Mrs Indira Gandhi
The first woman to receive Jnanpith Award	Ashpurna Devi
<b>First in the World (Male &amp; Female)</b>	
First men to climb Mt. Everest	Sherpa Tenzing Norgay & Sir Edmund Hillary (29th May ,1953)
First man to reach North Pole	Robert Peary
First man to reach South Pole	Ronald Amundsen
First religion of the world	Santosh Dharma
First country to print books	China
First country to issue paper currency	China
First country to start Civil Services Competition	China
First President of United States of America	George Washington
First prime Minister of great Britain	Robert Walpole
First secretary general of United Nations	Trigve Li
First country to make education compulsory	Prussia
First country to win the world cup Football	Uruguay (1930)
First country to make a constitution	United States of America
Pakistan's fist Governor General	Mohammed Ali Jinnah
First Summit of NAM was organized in	Belgrade (former Yugoslavia)
First European to visit China	Marco Polo
First men to fly an aeroplane	Wright Brothers
First person to sail around the world	Ferdinand Magellan
First country to send human to Moon	United States of America
First country to launch satellite into space	Russia (former USSR)
First country to host the modern Olympic games	Greece
First President of the Republic of China	Dr. Sun Yat-sen
First city to be attacked with Atom bomb	Heroshima (Japan)
First Radio Telescope Satellite was launched into space by	Japan
First Russian (Soviet) Prime Minister to visit India	V.I. Bulganin
First University of the world	Taxila University
First man to set foot on the Moon	Nell Armstrong (U.S.A)
First man to go into space	Major Yuri Gagarin (USSR)
First Space Shuttle Launched	Columbia
First space ship landed on mars	Viking -I (July,1976)
First woman Prime Minister of England	Margaret Thacher
First woman Prime Minister of any Muslim country	Benazir Bhutto (Pakistan)
First woman Prime Minister of a country	S. Bhandarnayake (Sri Lanka)
First woman cosmonaut in space	Valentina Tereshkova (USSR)
First woman to climb Mt. Everest	Junko Tabei (Japan )
First deaf and dumb to cross the Srait of Gibraltar	Taranath Shenoy (India)
First woman president of UN General assembly	Smt. Vijayalakshmi Pandit (1953)
First European Invader of Indian soil	Alexander, The Great
First woman to reach the North pole	Ms. Fran
First woman to reach Antartica	Caroline Michaelson

# General Knowledge Made Easy

First man to draw the map of earth	Anexemander
First man to compile Encyclopaedia	Aspheosis (Athens)
First eldest man to climb Mt. Event	Richard Wass
First Asian to win Wimbledon Trophy	Arthur Ashe (U.S.A)
First man to win Nobel Prize for Literature	Rene F.A. & Suilt Pradhom (France )
First man to win Nobel Prize for Peace	Jin F. Dunant (Switzerland) & Frederic Peiry (France)
First man to win Nobel prize for Physics	W.K. Roentgen (Germany)
First man to win Nobel prize for Chemistry	J.H. Wenthoff (Howlland)
First man to win Nobel Prize Medicine (Medical Science)	A.E. Wonn Behring (Germany)
First man to win Nobel Prize Economics	Ranger fish (Norway)& John Tinbergen (Holland)
First woman President of a country	Maria Estela Peron (Argentina)
First Space Tourist (Male)	Dennis Tito
First Space Tourist (Female)	Mrs. Anousheh Ansari

## Superlatives of India

The longest river Bridge	Mahatma Gandhi Setu Patna (5.575 km.)
The largest animal Fair	Sonepur (Bihar)
The largest Auditorium	Sri Shanmukhanand Hall (Mumbai)
The largest Lake	Wular Lake (J & K)
The highest Dam	Bhakhra Dam, on Sutlej River (Punjab)
The largest Desert	Thar (Rajastan)
The largest cave Temple	Kailash Temple (Ellora, Maharashtra)
The largest Zoo	Zoological Garden (kolkatta)
The largest Mosque	Jama Masjid (Delhi)
The highest peak	Godwin Austin/ K-2 (8611m)
The longest Tunnel	Jawahar Tunnel, Banihal Pass (J & K)
The largest Delta	Sundarbans (W. Bengal)
The State with maximum forest area	Madhya Pradesh
The longest Corridor	Corridor of Ramanathaswamy Temple of Rameswaram (Tamil Nadu)
The highest Waterfall	Jog or Garsoppa (Karnataka)
The longest Road	Grand Trunk Road (Kolkatta to Delhi)
The highest Gate way	Buland Darwaza, Fatehpur Sikri (U.P)
The longest River	The Ganga (2640 km. long)
The largest museum	Indian museum, Kolkatta
The largest Dome	Gol Gumbaz, Bijapur (in Karnataka)
The Tallest Statue	Gomateswara (Karnataka)
The largest Public sector Bank	State Bank of India
The Biggest Canti lever Bridge	Rabindra Setu or Howrah Bridge (Kolkatta)
The longest Canal	Indira Gandhi Canal or Rajasthan Canal (Rajasthan)
The longest Railway platform	Kharagpur (W. Bengal)
The Biggest Stadium	Yuva Bharti (Salt Lake) Stadium Kolkatta

## General Knowledge Made Easy

The most popular city	Mumbai (Maharastra)
The largest Sea Bridge	Anna Indira Gandhi Bridge (Tamil Nadu)
The Longest Passenger Train Route	Jammu Tawi to Kanyakumari
The Oldest Church	St. Thomas Church at palayer, Thrissur (Kerela)
The longest National Highway	N.H-7 (Varanasi to Kanyakumari)
The State with longest Coast Line	Gujarat
The Highest Lake	Devtal Lake, Gadhwal (Uttrakhand)
The largest Saline water Lake	Chilka Lake (Orissa)
The largest fresh water Lake	Kolleru Lake (Andhra Pradesh)
Largest Cave	Amarnath (J & K)
The longest river of Southern India	Godawari
The longest Dam	Hirakud Dam (Orissa)
The highest Gallantry Award	Param vir Chakra
The highest Award	Bharat Ratna
The largest Gurudwara	Golden Temple, Amritsar
The biggest Church	Saint Cathedral at old Goa (goa)
The Tallest T.V Tower	Pitampura (New Delhi)
The Southern Indian State with Longest Coat line	Andhra Pradesh
The Longest Sea Beach	Marina Beach (Chennai)
The Highest Road	Road at Khardungla, (in Leh –Manali Sector)
The largest artificial Lake	Govind Sagar (Bhakhra Nangal)
The deepest River Valley	Bhagirathi and Alaknanda
The largest River without Delta	Narmada and Tapi
The highest Battle field and the Longest Glacier	Siachen Glacier
The biggest river Island	Majuli Brahmaputra river, (Assam)
The largest Planetarium	Birla Planetarium
The Highest Airport	Leh Airport (Ladakh)
Largest state in area	Rajasthan(3,42,239 sq.km)
Smallest state in area	Goa(3,702sq.km)
Largest Union Territory in Area	Andaman and Nicobar islands
Smallest Union Territory in Area .	Lakshadweep(32 sq.km)
Most populated union Territory	Delhi(1,37,82,976)
Most populated State	Uttar Pradesh (16,60,52,859)
Least populated state	Sikkim (5,40,493)
State having highest literacy rate	Kerala ( 93.11%)
State having lowest literacy rate	Bihar (63.82%)
Union Territory having highest literacy rate	Lakshadweep (92.28%)

### Superlatives of World

Tallest Animal on (land)	Giraffe
Biggest Bell	Great Bell at Moscow
Fastest Bird	Swift
Largest Bird	Ostrich
Smallest Bird	Humming Bird
Longest Bridge (Railway)	Lower Zambeji (Africa )
Tallest Building	Burj khalifa, Dubai (U.A.E)

## General Knowledge Made Easy

Tallest office Building	Patronas Twin Towers Kuala Lumpur (Malaysia)
Longest Big Ship Canal	Seuz Canal (Linkin red sea & Mediterranean)
Busiest Canal (Ship)	Baltic White Sea Canal (152 miles)
Biggest Cinema House	Roxy (New York)
Highest city	Wen Chuan (Tibet, China) 16,732 ft.
Largest City (in population)	Tokyo [(3,42,00000), Est. population in 2006]
Biggest City in (area)	Mount Isa, Queensland, Australia (41225 sq. km.)
Largest Continent	Asia
Smallest continent	Australia
Largest Country (in population)	China
Largest country (in area)	Russia
Largest Coral Formation	The Great Barrier Reef (Australia)
Largest Dam	Grand Coulee- Concrete Dam (U.S.A)
Longest Day	June 21 (in Northern Hemisphere)
Shortest Day	Dec. 22(in Northern Hemisphere)
Largest Delta	Sundarbans, India (8000 sq. miles)
Longest Desert (World)	Sahara, Africa (84, 00,000 sq. km.)
Largest Diamond	The Cullinan (over 1 ½ 1b.)
Biggest Dome	Gol Gumbaz (Bijapur), (Old archi) 144 ft. diameter.
Biggest Dome (New Archi)	Astrodome, Sports
Longest Epic	The Mahabharata
Largest Island	Greenland (renamed kalaatdlit Nunaat)
Largest Lake (Artificial)	Lake mead (Bouler)
Deepest Lake	Baikal (Siberia); average depth2300 ft.
Highest Lake	Titicaca (Bolivia) 12645 ft. above sea level.
Largest Lake (Fresh Water)	Lake Superior, U.S.A
Largest Lake (Salt Water)	Caspian Sea 3, 71,000 sq. km.)
Largest Mosque	Jama Masjid, Delhi, (area 10,000 sq. ft.)
Biggest Library	National Kiev Library,Moscow & Library of the Congress, Washington)
Highest Mountain peak (World)	Himalayas
Longest Mountain Range	Andes (S.America) 5,500 miles in length
Biggest Museum	British Museum (London)
Tallest Minaret (Free Standing)	Qutub Minar, Delhi 238 ft.
Tallest Minaret	Great Hassan Mosque, Casablanca, Morocco
Deepest & Biggest Ocean	The Pacific
Largest Palace	Imperial Palace (Gugong), Beijing (China)
Largest Park	Yellow stone national park(USA).
Largest Peninsula	Arabic (32,50,000 sq. km.)

## General Knowledge Made Easy

Coldest Place or Region	Verkhoyansk (Syberia), Temperature – 85` C
Driest Place	Death Valley (California); rainfall 1 ½ inch.
Hottest Place (World)	Al-Aziziyah (Libya, Africa) 136` F
Largest Planet	Jupiter
Brightest and Hottest Planet (also nearest to Earth)	Venus
Farthest planet (from the Sun)	Neptune
Nearest Planet (to the Sun)	Mercury
Smallest Planet	Mercury
Highest Plateau	Pamir (Tibet)
Longest Platform (Railway)	Kharagpur W.B, India (833m)
Largest Platform (Railway)	Grand Central terminal, New York (U.S.A)
Largest sea Port	Ningbo-zhoushan,china.
Busiest container Port	Shangai ,china.
Longest Railway	Trans-Siberian Railway (6,000 miles Long)
Longest River	Nile (6690 km), Amazon (6570 km.)
Longest River Dam	Hirakund Dam (Orissa), India 15.8 miles.
Largest sea-bird	Albatross
Largest Sea (inland)	Mediterranean
Brightest Star	Sirius (also called Dog star)
Tallest statue	Spring temple Budha,china(128m)
Tallest Statue (Bronze)	Bronze Statue of Lord Buddha, Tokyo (Japan).
Longest Swimming Course	English Channel
Tallest Tower	Skytree ,Tokyo,japan.(634m)
Longest train nonstop	Flying Scoutsman
Longest Tunnel (Railway)	Seikan Rail Tunnel (Japan), (53.85 km.)
Longest & Largest Canal Tunnel	Le Rove Tunnel (South of France)
Longest Tunnel (Road)	Laerdal, Norway
Highest Volcano	Ojos Del Salado, Andes Argentine-Chile (6,885 m.)
Largest Volcano	Mauna Lao (Hawaii)
Longest Wall	Great Wall of China (1500 miles)
Highest Waterfall	Salto Angel Falls (Venezuela)
Longest Strait	Tartar Strait (Sakhalin Island & the Russian mainland)
Broadest Strait	Davis Straits (Greenland & Baffin Island, (Canada)
Narrowest strait	Chaliks-45 yards (Between the Greek mainland the island of Euboea in the Aegean Sea)
Largest Bay	Hudson Bay, Canada (Shore line 7623 miles)
Largest Gulf	Gulf of Mexico,( shoreline 2100 miles)
Largest Archipelago	Indonesia (over 3,000 Islands)
Tallest Active Geyser	Giant (Geyser ) yellowstone park U.S.A



# General Knowledge Made Easy

	200 ft. high
Largest River Basin	Amazon Basin- 27, 20,000 sq. mile.
World rainiest spot	Cherrapunji (Mawsynram), India
Largest Gorge	Grand Canyon, on the Colorado River, U.S.A
Lightest gas	Hydrogen
Lightest Metal	Lithium
Highest Melting Point	Tungsten, 3,410` C
Hardest Substance	Diamond
Longest Animal	Blue Whale, (recorded length 106 ft. weight-195 tons)
Longest Life Span of an Animal	190 to 200 years, (Giant tortoise)
Largest Land Animal	African Bush Elephant
Fastest Animal	Cheetah (Leopard ) 70 m.p.h
Longest Jump Animal	Kangaroo
Longest wing Spread Bird	Albatross
Slowest Animal	Snail
Domestic Dog	Irish Wolf Hound
Fastest Dog	Persian Grey Hound (speed 43 m.p.h)
Longest poisonous snake	King cobra
Biggest Flower	Rafflesia (Java)
Largest Stadium	Strahov stadium in Prague, (the Czech Republic)
Largest Church	Basilica of St. Peter, Vatican city, Rome Italy
Largest Temple	Angkor Vat (Cambodia)
Largest Diamond mine	Kimbarley (S.Africa)
Largest River in volume	Amazon, Brazil
Longest Corridor	Rameshwaram Temple's Corridor (5000 ft.)
Highest Straight Dam	Bhakhra Dam
Highest Capital City	La Paz (Bolivia)
Largest Asian Desert	Gobi, Mongolia
Largest Democracy	India
Longest Thoroughfare	Verazano-Narrows, New York City Harbour
Largest Neck Animal	Giraffe
Largest Animal of the Cat Family	Lion
Most Intelligent Animal	Chimpanzee
Bird, that never makes its nests	Cuckoo
Wingless Bird	Kiwi
Reptile which changes its colors	Chameleon
Largest Mammal	Whale

## Important Places in India

Monuments	Place	Founded
Akbar Tomb	Agra, Uttar Pradesh	Akbar and Jahangir

## General Knowledge Made Easy

Akshardham	Delhi	Bochasanwasi Akshar-Purushottam Swaminarayan Sanstha
Amaravati Stupa	Andhra Pradesh	An emissary of Emperor Ashoka
Amer Fort	Rajasthan (Jaipur)	Raja Man Singh I
Arjuna Penance	Mahabalipuram, (Tamil Nadu)	
Aurangabad Caves	Aurangabad, (Maharashtra )	
Bara Imambara	Lucknow, (Uttar Pradesh)	
Gurudwara Bangla Sahib	New Delhi	Sardar Baghel Singh
Basilica of Bom Jesus	Near Panaji, (Goa)	
Bekal Fort	Kasargod District, (Kerala)	
Bolgatty Palace	Bolghatty Island, Kochi (Kerala)	
Brihadeeswarar Temple	Thanjavur, (Tamil Nadu)	Rajaraja Chola I
Buland Darwaza	Fatehpur Sikri, near Agra (Uttar Pradesh)	Mughal Emperor, Akbar
Cellular Jail	Port Blair, Andaman & Nicobar Islands	The British
Charminar	Hyderabad, Andhra Pradesh	Sultan Muhammed Quli Qutub Shah
Chettinad Palace	Chettinad, Tamil Nadu	Dr Annamali Chettiyar
Chittorgarh Fort	Udaipur, Rajasthan	
City Palace	Jaipur, Rajasthan	Maharaja Sawai Jai Singh
Dhamekh Stupa	Sarnath, Uttar Pradesh	
Dilwara Temples	Near Mount Abu, Rajasthan	
Dutch Palace	Mattancherry, Kochi (Kerala)	The Portuguese
Elephanta Caves	Near Mumbai, Maharashtra	
Ellora Caves	Near Aurangabad, Maharashtra	
Fateh Prakash Palace	Udaipur, Rajasthan	
Feroz shah Kotla	Bahadur Shah Zafar Marg, Delhi	
Fort St George	Chennai, Tamil Nadu	The British
Gangaikondacholapuram	Thanjavur, Tamil Nadu	King Rajendra Chozhan
Gateway of India	Mumbai, Maharashtra	Sir George Sydenham Clarke
Gingee Fort	Villupuram District, near Chennai (Tamil Nadu)	Chola Dynasty and then, Vijayanagar Empire
Golconda Fort	Hyderabad, Andhra Pradesh	Mohammed Quli Qutub Shah
Golden Temple	Amritsar, Punjab	
Gol Gumbaz	Vijayapura , Karnataka	Muhammad Adil Shah
Gomateshwara Statue	Karnataka	
Hampi Ruins	Karnataka	
Hawa Mahal	Jaipur, Rajasthan	Maharaja Sawai Pratap Singh
Humayun Tomb	New Delhi	
India Gate	Near Connaught Place, Delhi	
Jagannath Temple	Puri, Orissa	Anantavarman Chodaganga Dev
Jaigarh Fort	Jaipur, Rajasthan	
Jaisalmer Fort	Jaisalmer, Rajasthan	
Jama Masjid	Chandni Chowk, Old Delhi	Shah Jahan
Murud-Janjira	Maharashtra	
Jantar Mantar Delhi	(New Delhi)	

## General Knowledge Made Easy

Jantar Mantar Jaipur	Jaipur, Rajasthan	Maharaja Jai Singh II
Paradesi Synagogue	Mattancherry, Kochi (Kerala)	
Junagarh Fort	Bikaner, Rajasthan	Raja Rai Singh
Khajuraho Temples	Madhya Pradesh	Rulers of Chandela Empire
Kumbhalgarh Fort	Near Udaipur, Rajasthan	Rana Kumbha
Lake Palace	Udaipur, Rajasthan	Maharana Jagat Singh
Lalgarh Palace	Bikaner, Rajasthan	Maharaja Lal Singh
Leh Palace	Leh, Ladakh Valley	
Lodi Tomb	Lodi Gardens, New Delhi	
Lotus Temple	Kalkaji, South Delhi	
Mahabodhi Temple	Gaya, Bihar	Ashoka
Meenakshi Temple	Madurai, Tamil Nadu	
Mehrangarh Fort	Jodhpur, Rajasthan	Rao Jodha
Moti Masjid	Red Fort, Agra (Uttar Pradesh)	Mughal Emperor Shah Jahan
Mysore Palace	Mysore, Karnataka	
Padmanabhapuram Palace	Thiruvananthapuram, Kerala	Iravi Iravi Varma Kulasekhara Perumal
Palitana Temples	Palitana, near Bhavnagar (Gujarat)	
Pattadakal Temple	Pattadakal, Karnataka	
Patwon ki Haveli	Jaisalmer Rajasthan	
Purana Qila	Near Pragati Maidan, Delhi	
Qutub Minar	New Delh	Qutub-ud-Din Aibak
Rashtrapati Bhavan	New Delhi	
Red Fort	New Delhi	Mughal Emperor Shah Jahan
Rock Fort Temple	Trichy, Tamil Nadu	The Nayaks
Rumi Darwaza	Near Bada Imambara, Lucknow (Uttar Pradesh)	Nawab Asaf-ud-Daula
Safdarjung Tomb	Near Safdarjung Airport (New Delhi)	Nawab Shuja-ud-Daulah
Sanchi Stupa	Sanchi, Madhya Pradesh	Maurya Emperor Ashoka
Shore Temple	Mahabalipuram, Tamil Nadu	Rajasimha
Sun Temple	Konark, Orissa	King Narsingha Deva
Taj Mahal	Agra, Uttar Pradesh	Mughal Emperor Shah Jahan
Thirumalai Nayak Palace	Madurai, Tamil Nadu	King Thirumalai Nayak
Tughlaqabad Fort	Qutub-Badarpur Road, Delhi	Ghiyas-ud-Din Tughlaq
Umaid Bhawan Palace	Jodhpur, Rajasthan	Maharaja Umaid Singh
Valluvar Kottam	Chennai, Tamil Nadu	
Velankanni Church	Nagapattinam, (Tamil Nadu)	
Victoria Memorial	Kolkata, West Bengal	The Prince of Wales
Vivekananda Memorial	Kanyakumari	Vivekananda Rock Memorial Committee
Akshardham Gandhinagar	Gandhinagar, near Ahmedabad (Gujarat)	Bochasanwasi Akshar-Purushottam Swaminarayan Sanstha
Agra Fort	Agra, Uttar Pradesh	Emperor Akbar
Ajanta Caves	Aurangabad District, Maharashtra	

# General Knowledge Made Easy

## Monuments World

The Statue of Liberty	New York, USA
The Eiffel Tower	Paris, France
St Basil's Cathedral	Moscow, Russia
Blue Domed Church	Santorini, Greece
The Great Sphinx	Giza, Egypt
The Pyramids	Giza Egypt
The Little Mermaid	Copenhagen, Denmark
Neptune and the Palace of Versailles	France
Windmills at Kinderdijk	Holland/ Netherlands
The Great Chinese Wall	China
The Taj Mahal	Agra, India
Machu Picchu	Peru
Big Ben	London
The Burj al Arab Hotel	Dubai
Tower of Pisa	Italy
Christ the Redeemer	Rio de Janeiro, Brazil
Lascaux caves	France
Mecca	Saudi Arabia
Loch Ness	Scotland
Mont St Michel	France
Bran Castle	Transylvania, Romania
Hagia Sophia	Istanbul, Turkey
Brandenburg Gate	Berlin, Germany
Acropolis of Athens	Greece
Sagrada Familia	Barcelona, Spain
Uluru in the Northern Territory (Ayers Rock)	Australia
Neuschwanstein	Bavaria, Germany
Mount Fuji	Japan
Mount Eden crater	New Zealand
Easter Island	the Polynesian Triangle, Pacific Ocean
Capitol Hill	Washington DC
Al Aqsa Mosque	Jerusalem
Niagara Falls	the border of Ontario ( Canada ) and New York (USA)
Angkor Wat	Cambodia
Manneken Pis	Brussels, Belgium
Mount Everest	on the border of Tibet and Nepal
St Peter's Basilica	Vatican City, Rome
St Peter's Cathedral	Adelaide, Australia
Mount Rushmore	South Dakota, USA
Victoria Falls	Zambia (On the border of Zambia and Zimbabwe)
The Grand Canyon	Arizona, USA
Nevado Mismi	Peru
The Great Buddha of Kamakura	Japan
Petra	Jordan

## General Knowledge Made Easy

Trevi Fountain	Rome, Italy
Auschwitz	Poland
Cape of Good Hope	Cape Town, South Africa
North Cape	Norway
Chichen Itza	Mexico
Inukshuk	Canada
Table Mountain	Cape Town, South Africa
Golden Gate Bridge	San Francisco, California
Sydney Opera House	Australia
Parc Guell	Barcelona, Spain
Kilimanjaro	Tanzania
Forbidden City	Beijing
Iguazu Falls	Argentina (the border of Brazil and Argentina)
The Colosseum	Rome, Italy
Twyfelfontein	Namibia
Tower Bridge	London
The Blue Mosque	Istanbul, Turkey
The Sphinx	Bucegi, Romania
Millau Bridge	France
Luxor Temple	Egypt
Berliner Dom (Berlin Cathedral)	Berlin, Germany
Faisal Mosque	Islamabad, Pakistan
Kremlin	Moscow, Russia
The Empire State Building	New York
Hermitage	Saint Petersburg, Russia
Newgrange	Ireland
Waterloo	Belgium
Carnac	France
Tilicho Lake	Nepal
Temple of Besakih	Bali, Indonesia
Pompeii	Italy
The Wailing Wall	Jerusalem
Konark Sun Temple	Odisha, India
Abu Simbel	Egypt
Middle of the Earth	Ecuador
The Prophet's Mosque (Al-Masjid an Nabawi)	Medina, Saudi Arabia
Jin Mao and SWFC	Shanghai, China
Sacré Coeur	Paris, France
American Cemetery	Normandy
Potala Palace	Lhasa, Tibet
Skellig Michael	the coast of Ireland
Angel Falls	Venezuela
The Louvre	Paris, France
Atomium	Brussels
White Cliffs of Dover	Coast of England

## General Knowledge Made Easy

Minaret of Jam	Afghanistan
Golden Temple	Amritsar in India
The Palace of Parliament	Bucharesti, Romania
Rock of Gibraltar	Gibraltar
Lotus Temple	New Delhi, India
Half Dome	Yosemite Valley in California
CN Tower	Canada
Hollywood Sign	Los Angeles
Ephesus	Turkey
Twelve Apostles	Australia
Piazza San Marco	Venice, Italy
Vinson Massif	Antarctic

<b>IMPORTANT MONUMENTS</b>	<b>PLACE</b>
Ancient City of Polonnaruwa	Polonnaruwa District, North Central Province, Sri Lanka
Ancient City of Sigiriya	Matale District, Central Province, Sri Lanka
Archaeological Ruins at Moenjodaro	Sindh, Pakistan
Buddhist Ruins of Takht-i-Bahi and Neighbouring City Remains at Sahr-i-Bahlol	Khyber Pakhtunkhwa, Pakistan
Central Highlands of Sri Lanka	Sri Lanka
Chitwan National Park	Chitwan District, Narayani Zone, Nepal
Fort and Shalamar Gardens in Lahore	Punjab, Pakistan
Golden Temple of Dambulla	Matale District, Central Province, Sri Lanka
Historical Monuments at Makli, Thatta	Sindh, Pakistan
Historic Mosque City of Bagerhat	Bagerhat District, Khulna Division, Bangladesh
Kathmandu Valley	Kathmandu Valley, Nepal
Lumbini, the Birthplace of the Lord Buddha	Rupandehi District, Lumbini Zone, Nepal
Minaret and Archaeological Remains of Jam	Ghor, Afghanistan
Old Town of Galle and its Fortifications	Galle, Southern Province, Sri Lanka
Rohtas Fort	Jhelum, Punjab, Pakistan
Ruins of the Buddhist Vihara at Paharpur	Naogaon District, Rajshahi Division, Bangladesh
Sacred City of Anuradhapura	Anuradhapura District, North Central Province, Sri Lanka
Sacred City of Kandy	Central Province, Sri Lanka
Sagarmatha National Park	Solukhumbu District, Sagarmatha Zone, Nepal
Sinharaja Forest Reserve	Sabaragamuwa and Southern Province, Sri Lanka
<u>Taxila</u>	Punjab, Pakistan
The Sundarbans	Khulna Division, Bangladesh
Chilzina Mausoleum of Ahmad Shah Durrani and Shrine of Baba Wali.	Afghanistan
Angkor	Siem Reap Province, Cambodia
Archaeological Heritage of the Lenggong Valley	Perak, Malaysia
Ban Chiang Archaeological Site	Udon Thani Province, Thailand
Baroque Churches of the Philippines	Philippines

# General Knowledge Made Easy

Borobudur Temple Compounds	Central Java, Indonesia
Central Sector of the Imperial Citadel of Thang Long	Hanoi, Vietnam
Complex of Huế Monuments	Vietnam
Citadel of the Hồ Dynasty	Vietnam
Cultural Landscape of Bali Province: the Subak System as a Manifestation of the Tri Hita Karana Philosophy	Bali, Indonesia
Dong Phrayayen-Khao Yai Forest Complex	Thailand
Gunung Mulu National Park	Northern Sarawak, Borneo, Malaysia
Hạ Long Bay	
Historic City of Ayutthaya	Ayutthaya province, Thailand
Historic Town of Sukhothai and Associated Historic Towns	Thailand
Historic Town of Vigan	Philippines
Kinabalu Park	Sabah, Borneo, Malaysia
Temple of Preah Vihear	Preah Vihear Province, Cambodia

## Important Cups and Trophies Associated With Sports

### National

Agarwal Cup	Badminton
Agha Khan Cup	Hockey
All-India Women's Guru Nanak Championship	Hockey
Bandodkar Trophy	Football
Bangalore Blues Challenge Cup	Basketball
Barna-Bellack Cup	Table Tennis
Beighton Cup	Hockey
Bombay Gold Cup	Hockey
Burdwan Trophy	Weight-Lifting
Charminar Trophy	Athletics
Chadha Cup	Badminton
C. K. Naydu Trophy	Cricket
Chakoia Gold Trophy	Football
Divan Cup	Badminton
Deodhar Trophy	Cricket
Duleep Trophy	Cricket
D. C. M. Cup	Football
Durand Cup	Football
Dhyan Chand Trophy	Hockey
Dr. B. C. Roy Trophy	Football (Junior)
Ezra Cup	Polo
F. A. Cup	Football
G. D. Birla Trophy	Cricket
Ghulam Ahmed Trophy	Cricket
Gurmeet Trophy	Hockey
Gura Nanak Cup	Hockey

## GENERAL SCIENCE

Gyanuati Devi Trophy	Hockey
Holkar Trophy	Bridge
Irani Trophy	Cricket
I. F. A. Shield	Football
Indira Gold Cup	Hockey
Jawaharlal Challenge	Air Racing
Jaswant Singh Trophy	Best Services Sportsman
Kuppuswamy Naidu Trophy	Hockey
Lady Rattan Tata Trophy	Hockey
MCC Trophy	Hockey
Moinuddaula Gold Cup	Cricket
Murugappa Gold Cup	Hockey
Modi Gold Cup	Hockey
Narang Cup	Badminton
Nehru Trophy	Hockey
Nixan Gold Cup	Football
Obaid Ullah Gold Cup	Hockey
Prithi Singh Cup	Polo
Rani Jhansi Trophy	Cricket
Ranjit Trophy	Cricket
Rangaswami Cup	Hockey
Ranjit Singh Gold Cup	Hockey
Rajendra Prasad Cup	Tennis
Ramanujan Trophy	Table Tennis
Rene Frank Trophy	Hockey
Radha Mohan Cup	Polo
Raghibir Singh Memorial	Football
Rohinton Baria Trophy	Cricket
Rovers Cup	Football
Sanjay Gold Cup	Football
Santosh Trophy	Football
Sir Ashutosh Mukherjee	Football
Subroto Cup	Football
Scindia Gold Cup	Hockey
Sahni Trophy	Hockey
Sheesh Mahal Trophy	Cricket
Todd Memorial Trophy	Football
Tommy Eman Gold Cup	Hockey
Vittal Trophy	Football
Vizzy Trophy	Cricket
Vijay Merchant Trophy	Cricket
Wellington Trophy	Rowing
Wills Trophy	Cricket

### International

American Cup	Yacht Racing
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## GENERAL SCIENCE

Ashes	Cricket
Benson And Hedges	Cricket
Canada Cup	Golf
Colombo Cup	Football
Corbitton Cup	Table Tennis (Women)
Davis Cup	Lawn Tennis
Derby	Horse Race
Grand National	Horse Steeple Chase Race
Jules Rimet Trophy	World Soccer Cup
King's Cup	Air Races
Merdeka Cup	Football
Rydet Cup	Golf
Swaythling Cup	Table Tennis (Men)
Thomas Cup	Badminton
U. Thant Cup	Tennis
Uber Cup	Badminton (Women)
Walker Cup	Golf
Westchester Cup	Polo
Wightman Cup	Lawn Tennis
World Cup	Cricket
World Cup	Hockey
Reliance Cup	Cricket
Rothman's Trophy	Cricket
William's Cup	Basketball
European Champions Cup	Football
Eisenhower Cup	Golf
Essande Champions Cup	Hockey
Rene Frank Trophy	Hockey
Grand Prix	Table Tennis
Edgbaston Cup	Lawn Tennis
Grand Prix	Lawn Tennis
World Cup	Weight-Lifting

### Important Geographical Discoveries

- ❖ America - Christopher Columbus (Italian)
- ❖ Sea Route to India - Vasco Da Gama (Portuguese)
- ❖ New Foundland - John Cabot (British)
- ❖ Brazil - Pedro Alvarez Cabral (Portuguese)
- ❖ Island of Tasmania and New Zealand - Tasman (Dutch)
- ❖ Hawaiian Islands - Captain Cook (Britain)
- ❖ North Pole - Robert Peary (USA)
- ❖ South Pole - Amundsen (Norway)
- ❖ Suez Canal - Ferdinand De Lesseps
- ❖ Victoria Falls - David Livingston (British)

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- ❖ Cape of Good Hope - Bartholomew Diaz (Portuguese)
- ❖ Greenland - Norseman Eric
- ❖ North America - Leif Ericsson
- ❖ Niger River - Mungo Park
- ❖ Lake Tanganyika - Richard Francis Burton
- ❖ Hudson Bay - Henry Hudson
- ❖ New Foundland - Gobot Sebastian
- ❖ China - Marco Polo

## Important Boundary Lines

- ❖ **Durand Line** is the line demarcating the boundaries of Pakistan and Afghanistan. It was drawn up in 1896 by Sir Mortimer Durand.
- ❖ **Hindenburg Line** is the boundary dividing Germany and Poland. The Germans retreated to this line in 1917 during World War I
- ❖ **Mason-Dixon Line** is a line of demarcation between four states in the United State.
- ❖ **Marginal Line** was the 320 km line of fortification on the Russia-Finland border. Drawn up by General Mannerheim.
- ❖ **McMahon Line** was drawn up by Sir Henry McMahon, demarcating the frontier of India and China. China did not recognize the McMahon line and crossed it in 1962.
- ❖ **Medicine Line** is the border between Canada and the United States.
- ❖ **Order-Neisse Line** is the border between Poland and Germany, running along the Oder and Neisse rivers, adopted at the Poland Conference (Aug 1945) after World War II.
- ❖ **Radcliffe Line** was drawn up by Sir Cyril Radcliffe, demarcating the boundary between India and Pakistan. Siegfried Line is the line of fortification drawn up by Germany on its border with France.
- ❖ **17th Parallel** defined the boundary between North Vietnam and South Vietnam before two were united.
- ❖ **24th Parallel** is the line which Pakistan claims for demarcation between India and Pakistan. This, however, is not recognized by India
- ❖ **26th Parallel** south is a circle of latitude which crosses through Africa, Australia and South America.
- ❖ **30th Parallel** north is a line of latitude that stands one-third of the way between the equator and the North Pole.
- ❖ **33rd Parallel** north is a circle of latitude which cuts through the southern United States, parts of North Africa, parts of the Middle East, and China.
- ❖ **35th Parallel** north forms the boundary between the State of North Carolina and the State of Georgia and the boundary between the State of Tennessee and the State of Georgia, the State of Alabama, and the State of Mississippi.

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- ❖ **36th Parallel** forms the southernmost boundary of the State of Missouri with the State of Arkansas.
- ❖ **36°30' Parallel** north forms the boundary between the Tennessee and the Commonwealth of Kentucky between the Tennessee River and the Mississippi River, the boundary between Missouri and Arkansas west of the White River, and the northernmost boundary between the Texas and the Oklahoma.
- ❖ **37th Parallel** north formed the southern boundary of the historic and extralegal Territory of Jefferson.
- ❖ **38th Parallel** is the parallel of latitude which separates North Korea and South Korea.
- ❖ **39th Parallel** north is an imaginary circle of latitude that is 39 degrees north of Earth's equatorial plane.
- ❖ **40th Parallel** north formed the original northern boundary of the British Colony of Maryland.
- ❖ **41st Parallel** north forms the northern boundary of the State of Colorado with Nebraska and Wyoming and the southern boundary of the State of Wyoming with Colorado and Utah.
- ❖ **42nd Parallel** north forms most of the New York - Pennsylvania Border.
- ❖ **43rd Parallel** north forms most of the boundary between the State of Nebraska and the State of South Dakota and also

formed the northern border of the historic and extralegal Territory of Jefferson.

- ❖ **The Parallel 44°** north is an imaginary circle of latitude that is 44 degrees north of the Earth's equatorial plane.
- ❖ **45th Parallel** north is often the halfway point between the Equator and the North Pole. The 45th parallel makes up most of the boundary between Montana and Wyoming.
- ❖ **49th Parallel** is the boundary between USA and Canada.

### Important Tribes of World

- ❖ **Aleuts:** Alaska
- ❖ **Ainus:** Japan
- ❖ **Bedouin:** Sahara and Middle East
- ❖ **Bindibu or Aborigines:** Australia
- ❖ **Bushman:** Kalahari
- ❖ **Chukchi:** NE Asia, USSR, North Siberia
- ❖ **Eskimos:** Greenland, North Canada, Alaska, N Siberia
- ❖ **Fulani:** Western Africa
- ❖ **Gobi Mongols:** Gobi
- ❖ **Guicas:** Amazon forest area
- ❖ **Hausa:** North Nigeria
- ❖ **Hotten tots:** Hot tropical Africa
- ❖ **Ibanas:** Equatorial rain forest region of South-East Asia
- ❖ **India Tribes:** Amazon basin
- ❖ **Berbers:** N. Africa
- ❖ **Samoyeds:** Siberia
- ❖ **Kalmuk:** Central Asia

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| <ul style="list-style-type: none"> <li>❖ <b>Kazakhs:</b> Kazakhstan</li> <li>❖ <b>Kirghiz:</b> Asiatic steppes</li> <li>❖ <b>Koryakas:</b> N. Siberia, Eurassian</li> <li>❖ <b>Lapps:</b> N. Finland, Scandinavian country</li> <li>❖ <b>Maoris:</b> New Zealand</li> <li>❖ <b>Masai:</b> East &amp; Central Africa</li> <li>❖ <b>Meos:</b> Myanmar</li> <li>❖ <b>Orang Alsi:</b> Malaysia</li> </ul> | <ul style="list-style-type: none"> <li>❖ <b>Pygmies:</b> Congo basin, Zaire</li> <li>❖ <b>Red Indian:</b> N. America</li> <li>❖ <b>Semangs:</b> East Sumatra</li> <li>❖ <b>Tapiro:</b> Papua New Guinea</li> <li>❖ <b>Turregs:</b> Sahara</li> <li>❖ <b>Yoakuts:</b> Siberia</li> <li>❖ <b>Zulus:</b> South Africa</li> <li>❖ <b>Buryak:</b> Central Asia</li> </ul> |
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## Transport in India

### List of International Airports in India

State	City	Airport
Andhra Pradesh	Hyderabad	Rajiv Gandhi International Airport
Assam	Guwahati	Lokpriya Gopinath Bordoloi International Airport
Bihar	Gaya	Gaya Airport
Bihar	Patna	Loknayak Jai Prakash Narayan International Airport
Delhi	New Delhi	Indira Gandhi International Airport
Gujarat	Ahmadabad	Sardar Vallabhbhai Patel International Airport
Karnataka	Bengaluru	Kampagowada International Airport
Karnataka	Mangalore	Mangalore Airport
Kerala	Kochi	Cochin International Airport
Kerala	Kozhikode	Calicut International Airport
Kerala	Thiruvananthapuram	Trivandrum International Airport
Madhya Pradesh	Bhopal	Raja Bhoj Airport
Madhya Pradesh	Indore	Devi Ahilyabai Holkar Airport
Maharashtra	Mumbai	Chhatrapati Shivaji International Airport
Maharashtra	Nagpur	Dr. Babasaheb Ambedkar International Airport
Maharashtra	Pune	Pune Airport
Meghalaya	Shillong	Zaruki International Airport
Punjab	Amristar	Guru Ramdasji(Rajasansi) International Airport
Rajasthan	Jaipur	Jaipur International Airport
Tamil Nadu	Chennai	Chennai International Airport
Tamil Nadu	Coimbatore	Civil Aerodrome
Tamil Nadu	Tiruchirappalli	Tiruchirapalli International Airport
Uttar Pradesh	Lucknow	Amausi Airport
West Bengal	Kolkata	Netaji Subhash Chandra Bose International Airport
Andaman Nicobar Island	Port Blair	Veer Savarkar International Airport

### Waterways in India

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• National Waterway 1: Allahabad–Haldia stretch of the Ganga - Bhagirathi - Hooghly river system with a total length</li> </ul> | <ul style="list-style-type: none"> <li>of 1,620 kilometers (1,010 mi) in October 1986.</li> <li>• National Waterway 2: <i>Saidiya</i>–Dhubri stretch of the Brahmaputra river</li> </ul> |
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# GENERAL SCIENCE

system with a total length of 891 kilometers (554 mi) in 1988.

- National Waterway 3: Kollam–Kottapuram stretch of the West Coast Canal along with Champakara and Udyogmandal canals, with a total length of 205 kilometers (127 mi) in 1993.
- National Waterway 4: Bhadrachalam–Rajahmundry and Wazirabad–Vijaywada stretch of the Krishna–Godavari river system along with the Kakinada–Pondicherry canal network, with a total length of 1,095 km (680 mi) in 2007.
- National Waterway 5: *Mangalgadi*–Paradeep and Talcher–*Dhamara* stretch of the Mahanadi–Brahmani river system

along with the East Coast Canal, with a total length of 623 km (387 mi) in 2007.

### Ports in India:

- ✓ India has a coastline spanning 7516.6 kilometers, forming one of the biggest peninsulas in the world. It is serviced by 13 major ports, 200 notified minor and intermediate ports.
- ✓ The total 200 non-major ports are in the following States:- Gujarat (42); **Maharashtra (48)**; Tamil Nadu (15); Karnataka (10); Kerala (17); Andhra Pradesh (12); Odisha (13); Goa (5); West Bengal (1); Daman and Diu (2); Lakshadweep (10); Pondicherry (2); and Andaman & Nicobar.

### Major Ports in India

Name of the Port	Coast	State
Kandla	Western Coast	Gujarat
Mumbai	Western Coast	Maharashtra
Jawaharlal Nehru	Western Coast	Maharashtra
Marmugoa	Western Coast	Goa
Manglore	Western Coast	Karnataka
Cochin	Western Coast	Kerala
Haldia	Eastern Coast	West Bengal
Paradip	Eastern Coast	Odisha
Vishakapatnam	Eastern Coast	Andhra Pradesh
Chennai	Eastern Coast	Tamil Nadu
Ennore	Eastern Coast	Tamil Nadu
Tutikorin	Eastern Coast	Tamil Nadu

### Interesting Facts about Major Ports in India

- Kandla Port is located on the Gulf of Kutch. It is the largest port of India by volume of cargo handled.
- Mormugao Port is the leading iron ore exporting port of India with an annual throughput of around 27.33 million tonnes of iron ore traffic.
- Panambur is the site of sea port called New Mangalore Port.
- Paradip Port is an artificial and deep-water port.
- Ennore Port, officially renamed Kamarajar Port Limited, is the only corporatised major port and is registered as a company.
- Jawaharlal Nehru Port is the largest container port in India. It was formerly known as Nhava Sheva port.

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- New Mangalore Port is a deep water all weather port and the only major port of Karnataka.
- Tuticorin Port is an artificial deep-sea harbour of India.
- Madras Port is the one of the oldest port of India and the second largest port in the country.
- Mumbai Port handles one-fifth of India's foreign trade with predominance in dry cargo and mineral oil from the Gulf countries.
- Tuticorin Port is officially known as VO Chidambaranar Port.

### Important National Highways

National Highway	Route	Distance
NH-1	Jalandhar – Uri	663
NH-1A	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	Thane and Chennai via Pune and Belgaun	1235
NH-5	Kolkata - Chennai	1533
NH-6	Kolkata – Dhule	1949
NH-7	Varanasi – Kanyakumari	2369
NH-8	Delhi-Mumbai-(via Jaipur, Baroda and Ahmedabad)	1428
NH-9	Mumbai-Vijaywada	841
NH-10	Delhi-Fazilka	403
NH-11	Agra- Bikaner	582
NH-12	Jabalpur-Jaipur	890
NH-13	Sholapur-Mangalore	691
NH-15	Pathankot-Samakhiali	1526
NH-44	Shillong-Sabroom	630
NH-49	Cochin-Dhanshkodi	440
NH-52	Baihata-Junction NH-47 (near Saikhoaghat)	850
NH-58	Delhi-Mana	538
NH-65	Ambala-Pali	690
NH-75	Gwalior-Ranchi	955
NH-205	Ananthapur-Chennai	442
NH-209	Dindigul-Bengaluru	456
NH-217	Raipur-Gopalpur	508
NH-220	Kollam (Quilon)-Teui	265

Major Festivals	State/Region
Makar Sankranti or Pongal	Tamil Nadu, Karnataka and Andhra Pradesh.
Vasant Panchami	Saraswati Puja by Bengalis, Oriyas and Biharis
Thaipusam or Kavadi	Tamilnadu
Maha Shivaratri	Popular throughout India
Holi	Popular in North India.
Shigmo	Goa

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Vasant Navratri	Popularly called navarathiri
Rama Navami	Throughout India.
Gudi Padwa	Celebrated by Marathas and Konkanis
Ugadi	Karnataka ,Andrapradesh and Telungana
Vishu	Kerala
Tamil New Year	Tamil nadu
Hanuman Jayanti	Throughout India
Bihu	Assam
Sitalsasthi	Throughout India
Vat Pournima	Maharastra
Bonalu	Telangana
Bathukamma	Telangana
Rath Yatra	Jagannath Temple
Raja Parba	Orissa.
Guru Purnima	North India
Mahalakshmi Vrata	Throughout India
Onam	Kerala
Raksha Bandhan	Northern India.
Krishna Janmaashtami	Throughout India
Gowri Habba	Karnataka, Andhra Pradesh, and Tamil Nadu.
Ganesh Chaturthi	Throughout India
Nuakhai	Orissa (Kosal).
Navarathri	Throughout India
Vijayadashami	Throughout India
Deepavali	Throughout India
Bhai dooj	Throughout India
Kartik Poornima	Varanasi
Chhath	Bihar and Terai.
Prathamastami	Orissa
Yatra	Throughout India in all temples
Karthikai Deepam	Tamil nadu
Kumbh Mela	Allahabad and 12 years once in a Temple

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## Important Countries and their Parliament Names

Country	National Assembly Name
Argentina	National Congress
Brazil	National Congress
Venezuela	National Congress
USA	Congress
Philippines	The Congress
Colombia	Congress
Libya	General People's Congress
Vietnam	National Assembly
Pakistan	National Assembly & Senate
Madagascar	National People's Assembly
Korea(South)	National Assembly
Kuwait	National Assembly
Iraq	National Assembly
France	National Assembly
China	National People's Assembly
Austria	National Assembly
Turkey	Grand National Assembly
Egypt	People's Assembly
Indonesia	People's Consultative Assembly
Korea(North)	Supreme People's Assembly
Seychelles	People's Assembly
South Africa Rep.	House of Assembly
Switzerland	Federal Assembly
Australia	Federal Parliament
Britain	Parliament (House of Common's and House of Lords)
Canada	Parliament
New Zealand	Parliament (House of Representative)

India	Sansad
Finland	Eduskunta (Parliament)
Bangladesh	Jatiya Sansad
Iran	Majlis
Maldives	Majlis
Saudi Arabia	Majlis Al Shura
Bhutan	Tsogdu
Chile	Chamber of Deputies and Senate
Greece	Chamber of Deputies
Italy	Chamber of Deputies and Senate
Denmark	Folketing
Fiji Islands	Senate & House of Representative
Germany	Bundestag (Lower House) and Bundesrat (Upper House)
Iceland	Althing
Israel	Knesset
Japan	Diet
Malaysia	Dewan Rakyat and Dewan Negara
Myanmar	Pyithu Hluttaw
Nepal	Rashtriya Panchayat
Netherlands	The Staten General
Oman	Monarchy
Russia	Duma & Federal Council
Afghanistan	Shora
Spain	Cortes
Sweden	Riksdag
Syria	People's Council

### United Nations Organization (UNO)

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. At its founding, the UN had 51 member states; there are now **193**. The headquarters of the United Nations is in Manhattan, **New York City**, and experiences extraterritoriality.



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Further main offices are situated in Geneva, Nairobi and Vienna. The organization is financed by assessed and voluntary contributions from its member states. Its objectives include maintaining international peace and security, promoting human rights, fostering social and economic development, protecting the environment, and providing humanitarian aid in cases of famine, natural disaster, and armed conflict.

- ✓ The name 'United Nations' was adopted of the suggestion of the US president F. D Roosevelt.
- ✓ The preamble to the Charter was the work of Field Marshal Smuts.
- ✓ The main office of the UN was built in 1952, where the first meeting of the General Assembly was held in 1952.
- ✓ **Flag of UN:** White UN emblem (two bent olive branches open at the top, and in between them is world map) on a light blue background.
- ✓ **Languages of UN:** Official languages & Working Languages of General Assembly, Economic & Social Council and Security Council– English, French, Chinese, Russian, Arabic, Spanish. UN Secretariat has English and French only as its working languages.

The UN has **six** principal organs:

- The General Assembly (the main deliberative assembly).

- The Security Council (for deciding certain resolutions for peace and security).
- The Economic and Social Council (ECOSOC) (for promoting international economic and social co-operation and development).
- The Secretariat (for providing studies, information, and facilities needed by the UN).
- The International Court of Justice (the primary judicial organ) - English & French – official Languages.
- The United Nations Trusteeship Council (**inactive** since 1994). International Court of Justice sits at **The Hague** (Netherlands), while all other organs of the UN are situated in New York.

UN System agencies include the World Bank Group, the World Health Organization, the World Food Programme, UNESCO, and UNICEF. The UN's most prominent officer is the Secretary-General, an office held by South Korean Ban Ki-moon since 2007.

### **The Security Council (Policeman of the World)**

The Security Council is made up of **15** member states, consisting of **5** permanent members—**China, France, Russia, the United Kingdom, and the United**

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**States**—and ten non-permanent members—Angola (term ends 2016), Chad (2015), Chile (2015), Jordan (2015), Lithuania (2015), Malaysia (2016), New Zealand (2016), Nigeria (2015), Spain (2016), and Venezuela (2016). The five permanent members hold **veto** power over UN resolutions, allowing a permanent member

to block adoption of a resolution, though not debate. The ten temporary seats are held for **two-year** terms, with member states voted in by the General Assembly on a regional basis. The presidency of the Security Council rotates alphabetically each month.

### International Organizations and their Headquarters and Heads 2015

International Organization	Headquarters	Heads
Food and Agriculture Organization (FAO)	Rome, Italy	José Graziano da Silva (Director-General)
International Atomic Energy Agency (IAEA)	Vienna, Austria	Yukiya Amano (Director-General)
International Civil Aviation Organization (ICAO)	Quebec, Canada	Raymond Benjamin (Secretary-General)
International Labour Organization (ILO)	Geneva, Switzerland	Guy Ryder (Director-General)
United Nations (UN)	New York City, USA	Ban Ki Moon (Secretary-General)
United Nations Children's Fund (UNICEF)	New York City, USA	Anthony Lake (Executive Director)
United Nations Educational, Scientific and Cultural Organization (UNESCO)	Paris, France	Irina Bokova (Director-General)
United Nations Industrial Development Organization (UNIDO)	Vienna, Austria	Kandeh Yumkella (Director-General)
World Food Programme (WFP)	Rome, Italy	Josette Sheeran (Executive Director)
World Health Organization (WHO)	Geneva, Switzerland	Margaret Chan (Director-General)
World Meteorological Organization (WMO)	Geneva, Switzerland	Michel Jarraud (Secretary-General)
World Tourism Organization (UNWTO)	Madrid, Spain	Taleb Rifai (Secretary-General)
Asia-Pacific Economic Cooperation (APEC)	Singapore	Muhamad Noor (Executive Director)
Association of Southeast Asian Nations (ASEAN)	Jakarta, Indonesia	Surin Pitsuwan (Secretary-General)
Commonwealth of Nations	London, United Kingdom	Queen Elizabeth II (Head)
Council of Europe	Strasbourg	Thorbjørn Jagland (Secretary General)
North Atlantic Treaty Organisation	Brussels, Belgium	Anders Fogh Rasmussen

## GENERAL SCIENCE

		(Secretary-General)
Shanghai Cooperation Organisation (SCO)	Beijing, China	Bolat Nurgaliyev (Secretary-General)
South Asian Association for Regional Cooperation	Kathmandu, Nepal	Ahmed Saleem (Secretary-General)
World Trade Organization (WTO)	Geneva, Switzerland	Roberto Azevedo (Director-General)
African Development Bank	Abidjan, Ivory Coast	Donald Kaberuka (President)
Asian Development Bank	Metro Manila, Philippines	Haruhiko Kuroda (President)
International Monetary Fund	Washington, D.C., United States	Christine Lagarde (Managing Director)
World Bank	Washington D.C., United States	Jim Yong Kim (President)
Fédération Internationale des Échecs (FIDE)	Athens, Greece	Kirsan Ilyumzhinov (President)
Fédération Internationale de Football Association (FIFA)	Zürich, Switzerland	Sepp Blatter (President)
International Cricket Council (ICC)	Dubai, United Arab	N. Srinivasan (President)
International Olympic Committee (IOC)	Lausanne, Switzerland	Thomas Bach (President)
International Paralympic Committee (IPC)	Bonn, Germany	Philip Craven (President)
Union of European Football Associations (UEFA)	Nyon, Switzerland	Michel Platini (President)
Colombo Plan	Colombo, Sri Lanka	Patricia Yoon-Moi Chia (Secretary-General)
EDU - Intergovernmental Organization (EDU)		G. Irving Levance (Secretary-General)
International Committee of the Red Cross	Switzerland, England	Peter Maurer, Switzerland (President)
International Criminal Police Organization (Interpol)	Lyon, France	Ronald Noble (Secretary-General)
International Federation of Red Cross and Red Crescent Societies	Geneva, Switzerland	Tadateru Konoé (President)
International Maritime Organization	London, United Kingdom	Koji Sekimizu (Secretary-General)
International Organization for Migration (IOM)	Geneva, Switzerland	William Lacy Swing (Director-general)
International Telecommunication Union	Geneva, Switzerland	Hamadoun Touré (Secretary-General)
Organisation for the Prohibition of Chemical Weapons (OPCW)	The Hague, Netherlands	Ahmet Üzümcü (Director-General)
Organization of Petroleum Exporting Countries (OPEC)	Vienna, Austria	Mohammed S. Barkindo (Secretary-General)
Universal Postal Union	Bern, Switzerland	Édouard Dayan (Director-General)

# GENERAL SCIENCE

World Intellectual Property Organization  
(WIPO)

Geneva, Switzerland

Francis Gurry (Director-General)

## 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 Hammarskjöld	Sweden	10 April 1953	18 September 1961
3	U Thant	Burma	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	Incumbent

## Language Days at UN:

In 2010, the UN's Department of Public Information announced an initiative of six "language days" to be observed throughout the year, one for each official language, with the goal of celebrating linguistic diversity and learning about the importance of cross-cultural communication.

- UN Arabic Language Day: 18 December (the date on which the United Nations General Assembly designated Arabic as the **sixth** official language of the United Nations in 1973).
- UN Chinese Language Day: first celebrated 12 November, now set on 20 April ("to pay tribute to Chang Jie).
- UN English Language Day: 23 April ("the date traditionally observed as the birthday of William Shakespeare").
- UN French Language Day: 20 March.
- UN Russian Language Day: 6 June (the birthday of Alexander Pushkin)
- UN Spanish Language Day: 12 October.

## International UN Weeks:

February 1st Week	World Interfaith Harmony Week
19–23 April	Global Soil Week
24–30 April	World Immunization Week
4–10 May 2015	UN Global Road Safety Week
1–7 August	World Breastfeeding Week
4 -10 October	World Space Week
24 – 30 October	International Disarmament Week
9 – 15 November	International Week of Science and Peace

## United Nations International Years:

### 2016

- ✓ International Year of Pulses

### 2015

- ✓ International Year of Light and Light-Based Technologies

# GENERAL SCIENCE

✓ International Year of Soils

**2014**

✓ International Year of Small Island  
Developing States

✓ International Year of Crystallography

✓ International Year of Family Farming

**2013**

✓ International Year of Water Cooperation

✓ International Year of Quinoa

**2012**

✓ International year of Cooperatives

✓ International Year of Sustainable Energy  
for All

**2011**

✓ The International Year of Forests

✓ The International Year of Chemistry

✓ The International Year for People of  
African Descent

**2010**

✓ The International Year of Biodiversity

✓ The International Year for the  
Rapprochement of Cultures

✓ The International Year of Youth

**United Nations International Decades:**

2015-2024: International Decade for People  
of African Descent.

2014-2024: United Nations Decade of  
Sustainable Energy for all.

2011-2020: United Nations Decade on  
Biodiversity.

2010-2020: United Nations Decade for  
Deserts and the flight against  
Desertification.

2005-2015: International Decade for Action,  
"Water for life".

**List of Important Summits of the World**

**G-20 Summits (1999)**

The Group of Twenty Finance Ministers and  
Central Bank Governors is a group of finance  
ministers and central bank governors from  
20 major economies: 19 countries plus the  
European Union, which is represented by the  
President of the European Council and by the  
European Central Bank. Chairperson- Tony  
Abott, Total Countries- 20

Countries= BRICS + G7 + Argentina,  
Australia, Indonesia, Mexico, South Korea,  
Saudi Arabia, Turkey

- 9th G 20 Meeting 2014 – Brisbane,  
Australia

- 10th G 20 Meeting 2015 – Antalya, Turkey

- 11th G 20 Meeting 2016 – Hangzhou,  
China

- 12th G 20 Meeting 2017 – Germany

- 13th G 20 Meeting 2018 – India

**BRICS Summits (2009)**

Countries (5)- Brazil, Russia, India, China  
and South Africa

- 6th BRICS Summit 2014 – Fortaleza, Brazil

- 7th BRICS Summit 2015 – UFA, Russia

- 8th BRICS Summit 2016 – New Delhi,  
India

**G-7 Annual Summits (Earlier it was G8,  
Now Russia suspended Temporarily)  
(1975)**

## GENERAL SCIENCE

Group of Seven Countries – France, Germany, Italy, Japan, United Kingdom, United States of America, Canada.

- 40th G8 Summit 2014 – Brussels, Belgium
- 41st G8 Summit 2015 – Schloss Elmau, Germany
- 42nd G8 Summit 2016 – Shima, Japan
- 43rd G8 Summit 2017 – Italy
- 44th G8 Summit 2018 – Canada
- 45th G8 Summit 2019 – France

### **SAARC Summits (South Asian Association for Regional Cooperation) (1985)**

HQ- Nepal , Secretary General- Arjun Bahadur Thapa and Indian Representative at SAARC- Lakshmi Savithri

Countries (8)- Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka

Theme of 18th SAARC Summit – ‘Deeper Integration for Peace, Progress and Prosperity’

- 18th SAARC Summit 2014 – Kathmandu, Nepal
- 19th SAARC Summit 2016 – Islamabad, Pakistan

### **ASEAN Summits (Association of South East Asian Nation)**

HQ- Jakarta, Indonesia , Total Countries- 10 and Secretary General- Le Luong Minh (Vietnam)

INDIA IS NOT IN ASEAN COUNTRIES.

• 24th ASEAN Summit 2014 (May)– Nay Pyi Taw, Myanmar

• 25th ASEAN Summit 2014 (November)– Nay Pyi Taw, Myanmar

• 26th ASEAN Summit 2015 (April)– Langkawi, Malaysia

• 27th ASEAN Summit 2015 (November)– Manila, Philippines

### **East Asia Summit (EAS)**

EAS meetings are held after annual ASEAN leaders’ meetings.

• 9th East Asia Summit 2014 – Nay Pyi Taw, Myanmar

• 10th East Asia Summit 2015 – Kuala Lumpur, Malaysia

• 11th East Asia Summit 2016 – Vientiane, Laos

### **IBSA Summits (2003)**

IBSA Dialogue Forum – India, Brazil, South Africa.

• 7th IBSA Summit 2015 – New Delhi, India

### **BIMSTEC Summits (Bay of Bengal Initiative for Multisectoral Technical and Economic Cooperation)(1997)**

Total Countries (7)- Bangladesh, India, Myanmar, Nepal, Sri Lanka, Thailand, Bhutan. Chairmanship- Nepal

• 3rd BIMSTEC Summit 2014 – Nay Pyi Taw, Myanmar

• 4th BIMSTEC Summit 2015 – Nepal

### **APEC Summits (Asia Pacific Economic Cooperation) (1989)**

# GENERAL SCIENCE

Total Countries- 21 , HQ- Singapore and  
Executive Director- Alan Bolard

INDIA IS NOT IN APEC COUNTRIES.

- 26th APEC Summit 2014 – Beijing, China
- 27th APEC Summit 2015 – Philippines, Manila
- 28th APEC Summit 2016 – Peru, Lima
- 29th APEC Summit 2017 – Vietnam, Hanoi

## **Nuclear Security Summit (NSS) (2010)**

Total Countries participated in the 2nd NSS  
2012 summit was 53 countries.

- 3rd NSS 2014 – Hague, Netherlands
- 4th NSS 2016 – Washington, USA

## **NATO Summit (North Atlantic Treaty Organization) (1949)**

Total Countries- 28 , HQ- Belgium and  
Secretary General- Jenus Stoltenberg (newly  
elected from Norway)

INDIA IS NOT IN NATO SUMMIT  
COUNTRIES.

- NATO 2014- Cardiff, UK
- NATO 2016- Warsaw, Poland

## **OTHER SUMMITS:-**

1. 16th International OPEC Summit, 2015–  
Paris, France
2. 48th ADB Meeting, 2015– Baku,  
Azerbaijan
3. United Nations Climate Change Meeting,  
2015– Paris, France
4. 9th WTO Ministerial Conference, 2013–  
Bali, Indonesia (10th WTO Ministerial  
Conference, 2014 Venue not yet decided)

5. 18th BASIC Ministerial Meeting, 2014–  
New Delhi, India (Basic- Brazil, South Africa,  
India, China)

6. 6th International Nuclear Energy Forum  
ATOMEXPO 2014– Moscow, Russia

7. World Economic forum 2014– Abuja,  
Nigeria (Sunil Bharti Mittal was the CO-  
Chairperson this year)

8. Internet Governance Forum 2014–  
Istanbul, Turkey

9. NAM (Non Aligned Movement) Summit  
2015 – Venezuela.

10. 83rd Interpol General Assembly–  
Monaco

## **Important Days in a Year**

January 01 : Global family day.

January 09 : NRI Day.

January 10 : World laughter day.

January 12 : National Youth Day.

January 15 :Army Day.

January 23: Netaji Subhash Chandra bose  
birthday

January 26 : India's Republic Day

January 26 : International Customs day.

January 28 : Lala lajpat rai birthday

January 28 : Data protection day

January 30 : Martyrs' Day

January 30 : World leprosy eradication day

February 04 : World Cancer day

February 06 : International day against  
female genital mutilation

February 12 : Darwin day

February 12 : World day of the sick.

February 13 : Sarojini Naydu's birthday

## GENERAL SCIENCE

February 14 : Valentine's day	April 2 : World autism day
February 20 : World day of social justice	April 5 : National Maritime Day.
February 21 : International mother language day	April 7 : World Health Day.
February 22 : World scout day	April 17 : World haemophilia day
February 23 : World peace and understanding day	April 18 : World Heritage Day.
February 24 : Central Excise Day.	April 22 : Earth Day.
February 28 : National Science Day.	April 23 : World book and copyright day
Also check out: list of All Countries, their Capital and Currency	April 25 : World Malaria day
March 4 : World day of fight against sexual exploitation, National Security day.	April 29 : International Dance day
March 8 : International Women's Day	May 1 : International Labour Day (Workers Day)
March 13 : World kidney day	May 3 : Press Freedom Day.
March 15 : World Disabled Day	May 4 : Coal miner's day
March 15 : World consumer right day.	May (2nd Sunday) : Mother's Day
March 20 : World day of theatre for children and young people.	May 8 : World Red Cross Day.
March 20 : International day for Francophonie	May 9 : Victory day
March 20 : World Sleep day	May 11 : National Technology Day.
March 21 : World Forestry Day.	May 12 : International Nurses day
March 21 : International Day for the Elimination of Racial Discrimination.	May 14 : World Migratory day
March 22 : World water day	May 15 : International Day of the Family.
March 23 : World Meteorological Day.	May 17 : World Telecommunication Day (Information society day)
March 24 : World T.B. day	May 21 : Anti-terrorism day
March 24 : International day for achievers	May 24 : Commonwealth Day.
March 25 : International day of remembrance-victims of slavery and transatlantic slave trade	May 31 : Anti-Tobacco Day.
March 27 : World Drama day	June 4 : International Day of Innocent Children Victims of Aggression.
	June 5 : World Environment Day.
	June 7 : International level crossing awareness day
	June 8 : World ocean day
	June 12 : World day against child labour
	June(2nd Sunday) : Father's Day.



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June 14 : World blood donor day	September 14 : Hindi day, World first aid day
June 17 : World day to combat desertification and drought	September 16 : World Ozone Day. Engineer's day in India
June 20 : World Refugee day.	September 21 : Alzheimer's Day, International day of peace
June 21 : Father's day, World Music day.	September 25 : Social justice day
June 23 : United Nation's public service day	September 26 : Day of the Deaf.
June 23 : International Widow's day	September 27 : World Tourism Day.
June 26 : International day against Drug abuse & Illicit Trafficking.	October 1 : International day of the Older person
June 27 : World Diabetes Day.	October 2 : Mahatma Gandhi birthday, International day of non-violence
July 1 : National Doctor's day.	October 3 : World Habitat Day, World nature day
July 6 : World Zoonosis Day.	October 4 : World Animal Welfare Day.
July 11 : World Population Day.	October 5 : World Teacher's day.
July 12 : World Malala day	October 8 : Indian Air Force Day.
July 18 : Nelson Mandela International day	October 9 : World Post Office day.
July 28 : World Nature conservation day	October 10 : National Post Day.
August 2 : International Friendship Day.	October 11 : International girl child day
August 3 : Independence day of Niger	October 12 : World Arthritis day.
August 5 : Independence day of upper volta	October 13 : UN International Day for National disaster reduction.
August 6 : Hiroshima Day	October 14 : World Standards Day.
August 9 : International day of World's indigenous people	October 15 : World White Cane Day( guiding the Blind)
August 9 : Quit India Day and Nagasaki Day.	October 16 : World Food Day.
August 12 : International Youth day	October 17 : International day for the eradication of poverty.
August 15 : Independence Day of India	October 20 : World statistics day
August 23 : International day for the remembrance of the slave trade and its abolition	October 24 : UN Day, World development information Day.
August 29 : National Sports Day.	
September 5 : Teachers' Day (Dr. Radhakrishnan's birthday)	
September 5 : Forgiveness day	
September 8 : World Literacy Day.	

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October 30 :World Thrift Day.  
 November 1 : World vegan day  
 November 5 : World Radiography day.  
 November 9 : World services day  
 November 14 : Children's Day in India,  
 Jawaharlal Nehru birthday  
 November 16 : International day for  
 Endurance  
 November 17 : World Student day, National  
 Journalism day  
 November 18 : World Adult day.  
 November 19 : World Citizen day.  
 November 20 : Africa Industrialization Day,  
 Universal children day.  
 November 21 : World Television day, World  
 Fisheries day.  
 November 25 : World Non-veg day.  
 November 26 : Law day  
 November 29 : International Day of  
 Solidarity with Palestinian People.  
 November 30 : Flag day.  
 December 1 : World Aids Day.  
 December 2 : World Computer literacy day,  
 International day of abolition of slavery  
 December 3 : International day of People  
 with disabilities, World conservation day  
 December 4 : Navy Day.  
 December 5 : International volunteer day for  
 economic and social development.  
 December 7 :Armed Forces Flag Day,  
 International civil aviation day.  
 December 9 : The International day against  
 corruption.

December 10 :Human Right Day.  
 December 11 : International Mountain day.  
 December 14 : International Energy day.  
 December 18 : International Migrants day.  
 December 19 : Goa's liberation day.  
 December 20 : International Human  
 solidarity.  
 December 23 :Kisan Divas Farmer's Day).  
 December 29 : International Bio-diversity  
 day

### Important Research Centres in India

Research Institute	Centre
Indian Agricultural Research Institutes	New Delhi
Central Rice Research Institute	Cuttack
Central Sugarcane Research Institute	Coimbatore
Central Potato Research Institute	Shimla
Central Tobacco Research Institute	Rajamundry
Central Forest Research Institute	Dehradun
National Sugar Research Institute	Kanpur
Indian Lac Research Institute	Ranchi
National Dairy Research Institute	Karnal
Central Fuel Research Institute	Dhanbad
Central Leather Research Institute	Chennai
Central Mining Research Institute	Dhanbad
Central Drug Research Institute	Lucknow
Indian Meteorological Observatory	Pune and Delhi
Raman Research Centre	Banglore
Central Scientific Instruments Organization	Chandigarh
National Metallurgical Laboratory	Jameshedpur

## GENERAL SCIENCE

Central Salt & Marine Chemical Research Institute	Bhavnagar
Archaeological Survey of India, India Museum	Kolkata
Central Jute Technological Research Institutes	Kolkata
Central Coconut Research Institute	Kasergod, Kerala
Textile Research Institute	Ahmedabad
All India Institute of Medical Science (AIIMS)	New Delhi
National Aeronautical Laboratory	Bangalore
National Institute of Oceanography	Panaji
National Geophysics Research Institute	Hyderabad
Indian Institute of Petroleum	Dehradun
Central Building Research Institute	Roorkee
Central Road Research Institute	New Delhi
Tata Institute of Fundamental Research	Mumbai
High Altitude Research Laboratory	Gulmarg
National Botanical Research Institute	Lucknow
Central Food Technological Research Institute	Mysore
Central Glass AND Ceramic Research Institute	Kolkata
National Environmental Engineering Research Institute	Nagpur
Central Electro-Chemical Research Institute	Karaikudi
Indian Institute of Chemical Biology	Kolkata
Industrial Toxicology Research Centre	Lucknow
Centre Mechanical Engineering	Durgapur

Research Institute	
Centre for Cellular and Molecular Biology	Hyderabad

### Health and Medicinal Research Centres in India

Health and Medicinal Research	Centres
All India Malaria Research Institute	New Delhi
National Tuberculosis Institute	Bangalore
Indian Cancer Research Centre	Mumbai
Indian Veterinary Research Institute	Mukteshwar(H.P), Izzatnagar (U.P)
Institute of Ayuvedic Studies and Research	Jamnagar (Gujarat)
Vallabh Bhai Patel Chest Institute	Delhi
Haffkine Institute	Mumbai
National Institute of Communicable Diseases	Delhi
School of Tropical Medicine	Kolkata
Central Leprosy Training and Research Institute	Chengelpet
P.G.I. 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 & Public Health	Kolkata

# GENERAL SCIENCE

## Important Indian Musicians and their Instruments

Flute	Hari Prasad Chaurasia, Raghunath Seth, Pannalal Ghosh, B. Kunjamani, N. Neela, Rajendra Prasanna, Rajendra Kulkarni, Prakash Saxena
Ghatam	T.H. Vinayakaram
Guitar	Vishwamohan Bhatt, Jatin Mazumdar, Brij Bhushan Kabra, Sri Krishna Nalin, Keshav Jalegaonkar
Harmonium	Jnan Prakash Ghosh, Shri Purushottam Walawalkar, Appa Jalgaonkar
Israj	Alauddin Khan
Jal Tarang	Himanshu Biswas, Jagdish Mohan, Ghasiram Nirmal, Ram Swaroop Prabhakar
Mandolin	U. Srinivas, Khagen Dey, Nagen Dey
Mohan Veena	Pt. Vishwa Mohan Bhatt
Mridang	Thakur Bhikam Singh, Palghat Raju, Dr. Jagdish Singh, T.K. Moorthy, U.K. Sivaram, K.R. Mani
Nadaswaram	Sheikh Chinna Maulana, Rajaratna Pillai, Niru Swami Pillai, N. Krishna
Pakhawaj	Ustad Rehman Khan, Gopal Das, Chhatrapati Singh, Ramakant Pathak, Arun Saiwal
Piano	V. Balsara
Rudra Veena	Ustad Sadiq Ali Khan, Zia Moinuddin Dagar Asad Ali Khan
Santoor	Pt. Shiv Kumar Sharma, Tarun Bhattacharya, Bhajan Sopori
Saranggi	Ustad Bendu Khan, Pt. RAMnarayanji, Aruna Kale, Santosh Mishra, Indralal, Ashiq Ali Khan
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
Shehnai	Ustad Bishmillah Khan, Daya Shankar, Jagannath, Hari Singh, Shailesh Bhagwat, Ali Ahmed Hussain Khan
Symphony	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
Surbahar	Imrat Khan, Anapurna Devi
Tabla	Ustad Shafat Ahmed Khan, Sapan Choudhry, Zakir Hussain, Latif Khan, Allah Rakha Khan, Gudai Maharaj, Kishan Maharaj, Payaz Khan, Sukhbinder Singh
Veena	S. Balachandran, Badruddin Dagar, Kalyan Krishna Bhagavata, B. Doraiswami Iyengar Gopal Krishna, Ashad Ali
Vichitra Veena	Ahmed Raja Khan, Abdul Aziz Khan
Violin	Dr. N. Rajan, Vishnu Gobind (VG) Jog, L. Subramaniam, Sangitha Rajan, Kunakkadi Baidyanathan, Shishir Choudhry, Lagudi Jayaraman, R.P. Shastri, Suryadev Pawar, Govind Swami Pillai, T.N. Krishnan

### Various Forms of Dances in India:

steps, and poses. 8 Classical Dances in

**Classical Dance:** A classical dance form

India.

characterized by grace and precision of movement and by elaborate formal gestures,

## GENERAL SCIENCE

**Folk Dance:** Folk dancing is a simple dance form meant for group performance based on a reason like harvest of food.

State	Classical Dance	Folk Dance
Kerala	Kathakali, Mohiniyattam	Chakyar koothu, Theyyam, kaikotti kalai, Mudiyyettu, Chavittu nadagam, Koodiyattam (UNESCO recognised), Krishna aattam., Thullal, Thirayattam
Andra Pradesh	Kuchipudi	Kolattam, Dhimsa, Veera natyam.
Assam	Sattriya	Ojapali, Bihu, Ankia Naat, Jhumur Naach, Bayurumba, Ali ai ligang
Arunachal Pradesh	-	Lion and peacock dance, Cardo chham, Aji lamu.
Bihar	-	Jata jatin, Bikhari.
Chattisgarh	-	Pantheni, Raut Nacha.
Gujarat	-	Dandya Ras, Garba, Bhavi, Tippani
Goa	-	Fugdi, Tarangamel, Dhala, Dekhni(Going to be Classical recognised), Dhangar
Haryana	-	Saang, Khorla, Gugga Dance, Teej, Phag
Punjab	-	Luddi, Pandass, Kikkli, Giddha, Bhangra(Going to be Classical recognised)
Jammu and Kashmir	-	Hikat, Rouf, Kud, Dumhal
Jharkhand	-	Karma or Munda
Karnataka	-	Bayalata, Dollu Kunitha, Veeragase, Yakshagana(Going to be Classical recognised)
Lakshadweep	-	Lava
Madhya Pradesh	-	Teratali, Charkula, Jawara, Matki, Maanch, Grida Dance.
Mizoram	-	Cheraw Dance(Bamboo Dance)
Manipur	Manipuri	Dhol Cholom, Thang Ta(form of martial art)
Maharashtra	-	Tamasha, Pavri Nah, Lavani.
Odisha	Odissi	Ghumura Dance, Chau Dance, Baagh Naach(Tiger Dance), Dalkhai, Karma Naach.
Puducherry	-	Garadi
Rajasthan	-	Kalbelia, Bhavai, Kach hi Ghodi, Ghoomar

## GENERAL SCIENCE

Tamilnadu	Bharathanatyam	Kamandi, Devarattum, Kummi, Kollatum, Karagattum, Mayil attum, Paambattum, Puliyattum, Poikal kudirai, Bommalattum, Therukoothu.
Tripura	-	Hojagiri, Gorla, Labang Boomani.
Sikkim	-	Singhi Chham, Yak Chaam, Rechungma.
Telangana	-	Perini Thandavam, Dappu, Lambadi.
Himachal Pradesh	-	Kinnauri Nati, Namgen
Nagaland	-	Chang Lo or Sua Lua
Uttarakhand	-	Chholiya, Thali Jadda, Jhainta
Uttar Pradesh	Kathak	Rasiya, Swang , Nautanki, Naqual
West Bengal	-	Chau, Gumbhira, Kalikapatadi, Alkap, Gaundiya Nritya(Going to be Classical recognised)

### **Important Fathers of Various Fields**

Father of Biology : Aristole

Father of Modern Biology: Linnaeus

Father of Antibiotics : Alexander Fleming

Father of Taxonomy : Carolus Linnaeus

Father of Immunology : Edward Jenner

Father of Microbiology : Anton van

Leenuwenhoek

Father of Modern Microbiology : Louis

Pasteur

Father of Medical Microbiology : Robert Koch

Father of Pathology : Rudolph Virchow

Father of Bacteriology : Robert Koch

Father of Virology : W.M.Stanley

Father of Embryology : Aristotle

Father of Modern Embryology : Ernst Von

Baer

Father of Physiology : Stephan Hales

Father of Modern experimental physiology :

Calude Bernard

Father of Genetics : Rev. Gregor Mendel

Father of Modern Genetics : Bateson

Father of Human Genetics/ Biochemical genetics : Arachibald Garrod

Father of Experimental Genetics : T.H. Morgan

Father of Haploid Genetics / Neurospora Genetics : Dodge

Father of Ecology : Theophrastus

Father of Cloning : Ian Willmut

Father of Plant anatomy : Grew

Father of Histology (Microscopic anatomy) : Malpighi

Father of Cytology : Robert Hooke

Father of modern Cytology : Swanson

Father of Paleontology : Leonard da Vinci

Father of modern Paleontology : Cuvier

Father of Concept of Evolution: Empedocles

Father of Botany: Theophrastus

Father of Modern Botany : Bauhin	Father of Phycology: Wilhelm Wundt
Father of Zoology : Aristotle	Father of ATP cycle: Lipmann
Father of Biochemistry : Liebig	Father of Chemotherapy : Paul Ehrlich
Father of Epidemiology : John Snow	Father of Anatomy : Herophilus
Father of Plant Pathology : de Bary	Father of Modern Anatomy : Andreas Vesalius
Father of Modern Pathology : Rudolf Virchow	Father of actinobiology / radiation biology : HJVS Muller
Father of Genetic Engineering : Paul Berg	Father of Homeopathy : Hahnemann
Father of Gene therapy : Anderson	Father of Ayurveda : Charka
Father of Ethology : Konard Lorentz	Father of Surgery and Plastic Surgery : Susruta
Father of Endocrinology : Thomas Addison	Father of Blood circulation : William Harvey
Father of Eugenics : Galton	Father of Medicine : Hippocrates
Father of Gerontology : Korenchevsk	Father of Blood Group : Landsteiner
Father of Palynology : Erdtman	Father of Polio Vaccine : Jonas Salk
Father of Stress physiology : Hans Selye	Father of Green Revolution: Norman Borlaug
Father of Electrocardiography : Einthoven	
Father of DNA Fingerprinting : Alec Jeffery	
Father of Mycology : Micheli	
Father of Bryology : Hedwig	

## Biology

### Biologists & Their Contribution

1.	Coined the term 'cell'	Robert Hooke
2.	Binomial nomenclature	Carolus Linnaeus
3.	One gene one enzyme hypothesis	Beadle & Tatum
4.	Operon Concept	Jacob & Monod
5.	Jumping Genes concept	Dr. McClintock
6.	Human Blood Groups	Karl Landsteiner
7.	Fluid Mosaic Model	Singer & Nicholson

# GENERAL SCIENCE

## Classification of Animals

### Types of Invertebrates

Placozoa	Single species identified as Trichoplax adherens.
Porifera	Sponges
Coelenterata (cnidaria)	Coral, hydra, jellyfish, Portuguese man-of-war, sea anemone
Platyhelminthes	Flatworms, flukes, tapeworms
Nematoda or Aschelminthes	Ascarids, vinegar eels, cyst nematodes, Pinworms, roundworms hookworms
Annelida	Lugworms, earthworms, leeches
Arthropoda	Crustaceans: prawn, shrimp Insects: butterfly, housefly, mosquito, cockroach Arachnids: Scorpion, wolf spider, King Crab Myriapods: Centipede, Millipede
Mollusca	Chitons, oysters, snails, clams, squid
Echinodermata	Star fish, brittle stars, sea urchins, sand dollars, sea cucumbers
Chordata	Divided into Hemichordata (tongue worm), Urochordata, Cephalanchordata, Gnathastomata.

### Types of Vertebrates

Jawless fishes (Agnatha)	Hagfish, lamprey
Cartilaginous fishes	Sharks, skates, rays, chimaeras
Bony fishes	Sturgeon, herring, salmon, perch, cod, coelacanth
Amphibians	Frogs and toads, salamanders, newts, caecilians
Reptiles	Snakes, crocodiles, alligators, lizards, turtles, tortoises
Birds (Aves)	Penguin, flamingo, eagle, turkey, thrush, parrot
Mammals	Platypus, kangaroo, bat, lion, wolf, mouse, seal, antelope, cow, dolphin, whale, lemur, monkey, ape, human



### Deficiency Diseases

Names	Disease	Comments
<b>Vitamin A (retinol)</b>	Xerophthalmia Dermatosis	Lachrymal glands stop producing tears leading to blindness.
<b>Thiamine (Vitamin B<sub>1</sub>)</b>	Beri Beri	Extreme weakness, swelling, pain in legs, loss of appetite, enlarged heart, headache & shortness of breath
<b>Riboflavin (Vitamin B<sub>2</sub>)</b>	Ariboflavinosis	Blurred vision, burning of the eye & tongue, cracking of skin at angle of mouth
<b>Niacin (Nicotinamide)</b>	Pellagra	Tip & lateral margins of tongue, mouth & gums become red, swollen & develop ulcers
<b>Pyridoxine (Vitamin B<sub>6</sub>)</b>		
<b>Pantothenic Acid</b>		
<b>Biotin</b>		
<b>Cobalamin (Vitamin B<sub>12</sub>)</b>	Perinicious or Megaloblastic Anemia	Reduction of Haemoglobin due to disturbance in formation of RBC.
<b>Folic Acid</b>		
<b>Vitamin C (Ascorbic acid)</b>	Scurvy	Pain in joints, loss of weight, gums become spongy & bleed. Teeth loose & fragile.
<b>Vitamin D (cholecalciferol)</b>	Rickets Osteomalacia	Occurs in Children. Softness & deformities of bones. Bones susceptible to fracture.
<b>Vitamin E (Tocopherol)</b>		
<b>Vitamin K (Phylloquinone)</b>		
<b>Potassium</b>	Hypokalemia	Rise in heart beat rate. Kidney damage.
<b>Sodium</b>	Hyponatremia	Low blood pressure.
<b>Proteins</b>	Kwashiorkar	Potbelly due to retention of water by the cells (Oedema).

### Blood

### (a) Plasma (b) Blood Corpuscles

- ❖ Blood is a fluid connective tissue.
- ❖ The quantity of blood in the human's body is 7% of the total weight.
- ❖ This is a dissolution of base whose pH value is **7.4**.
- ❖ There is an average of 5-6 litres of blood in human body.
- ❖ Female contains half litre of blood less in comparison to male.
- ❖ Blood consists of two parts:- \_\_\_\_\_ plasma. \_\_\_\_\_

### Plasma

This is the liquid part of blood. 60% of the blood is plasma. Its 90% parts is water, 7% protein, 0.9% salt and 0.1% is glucose. Remaining substances are in a very low quantity.

Function of plasma - Transportation of digested food, hormones, excretory product etc. from the body takes place through

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Serum - When Fibrinogen & Protein is extracted out of plasma, the remaining plasma is called serum.

**Blood Corpuscles** (40% part of the blood)

This is divided into three parts:

- **Red Blood Corpuscles (RBC)**

Red Blood Corpuscles (RBC) of a mammal is biconcave. There is no nucleus in it. Exception - Camel and Lama. RBC is formed in Bone Marrow ( At the embryonic stage its formation takes place in liver.) Its life span is from 20 days to 120 days. Its destruction takes place in liver & spleen. Therefore, liver is called grave of RBC. It contains haemoglobin, in which haeme iron containing compound is found and due to this the colour of blood is red. Globin is a proteinous compound which is extremely capable of combining with oxygen and carbon dioxide. The iron compound found in haemoglobin, is haematin. The main function of RBC is to carry oxygen to all cells of the body and bring back the carbon dioxide. Anaemia disease is caused due to the deficiency of haemoglobin. At the time of sleeping RBC is reduced by 5% and people who are at the height of 4200 metres RBC increases by 30% in them.

- **White Blood Corpuscles (WBC) or Leucocytes**

In shape and constitution this is similar to Amoeba. Its formation takes place in Bone Marrow, lymph node and sometimes in liver

and spleen. Its life span is from 1 to 2 days. Nucleus is present in the White Blood Corpuscles. Its main function is to protect the body from the disease. The ratio of RBC and WBC is 600:1.

**Blood Platelets or Thrombocytes:**

- It is found only in the blood of human and other mammals.
- There is no nucleus in it.
- Its formation takes place in Bone marrow.
- Its life span is from 3 to 5 days.
- It dies in the Spleen.
- Its main function is to help in clotting of blood.

**Function of Blood**

- To control the temperature of the body and to protect the body from diseases.
- Clotting of blood.
- Transportation of oxygen, Carbon dioxide, digested food, conduction of hormones etc.
- To help in establishing coordination among different parts.

**Blood Group of Human**

- Blood group was discovered by Lansteiner in 1900.
- For this, he was awarded with Nobel Prize in the year 1930.
- The main reason behind the difference in blood of human is the Glyco protein which is found in Red Blood Corpuscles

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called antigen. Antigens are of two types- Antigen A and Antigen B.

- On the basis of presence of Antigen or Glyco Protein, there are four groups of blood in human:
- That contains Antigen A - Blood Group A.
- That contains Antigen B- Blood Group B.
- That contains both the Antigen A and B - Blood Group AB.
- That contains neither of the Antigens- Blood Group O.
- An opposite type of protein, is found in blood plasma. This is called antibody. This is also of two types- Antibody "a" and Antibody "b".
- Blood Group O is called the Universal Donor because it does not contain any antigen.
- Blood Group AB is called Universal Receptor because it does not contain any antibody

## Minerals and Deficiency Diseases

Minerals are specific kinds of nutrients that the body needs in order to function properly. A mineral deficiency occurs when the body doesn't obtain the required amount of a mineral. Minerals help in building strong teeth and bones, skin, hair, proper function of nerves, muscle contraction, maintain heart functions, etc.

Some important Minerals necessary for Human Body are:

### Calcium

Sources: Milk, dairy foods, cereals (Ragi), meat, vegetables, fruits (Sitaphals)

Properties: Component of bones and teeth, helps in blood clotting, Muscle contraction, Conduction of nerve impulses etc. Acts as cofactor of Myosin ATPase.

Deficiency: Defective bones and teeth, Tetany and rickets, Loss of muscle coordination

### Phosphorous

Sources: Milk, dairy foods, Cereals, eggs, fish, meat etc.

Properties: Formation of bones and teeth, Component of nucleic acids, energy molecules and coenzymes

Deficiency: Poor body growth, weak bones and teeth.

### Sodium

Sources: Table salt, vegetables

Properties: Maintains water balance, blood pressure and nervous system.

Deficiency: Improper muscle contraction; nervous depression; loss of Na<sup>+</sup> in urine, dehydration

### Potassium

Sources: Vegetables, molasses, banana, date etc

Properties: Osmotic balance; muscle contraction; nerve impulse conduction

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Deficiency: Nervous disorder; poor muscle control leading to paralysis

## **Magnesium**

Sources: Green leafy vegetables, soyabean etc

Properties: Cofactor for enzymes e.g. of hexokinase

Deficiency: Heart and vascular irregularities; dilated blood vessels, loss of muscle coordination.

## **Chlorine**

Sources: Common salt

Properties: Main anion of ECF, Acid- base balance

Deficiency: Vomiting and hypochloremic alkalosis

## **Iron**

Sources: Liver, eggs, molasses, cereals, pulses, leafy vegetables, apple, guava etc.

Properties: Formation of Hb so help in O<sub>2</sub> transport, Component of cytochromes of ETS, Cofactor of catalase enzyme.

Deficiency: Anaemia; skin problems

## **Iodine**

Sources: Sea foods, leafy vegetables, water, iodized salt etc.

Properties: Normal functioning of thyroid; component of thyroxin so controls BMR

Deficiency: Goiter, Cretinism, Myxoedema

## **Zinc**

Sources: Beet, cheese

Properties: Cofactor of carbonic anhydrase so helps in CO<sub>2</sub> transport, Vitamin A metabolism

Deficiency: Reduced respiration

## **Copper**

Sources: Liver, spleen, kidneys, peanuts, beet etc

Properties: Cofactor for enzymes e.g. oxidases and tyrosinase, Component of haemocyanin.

Deficiency: Anaemia

## **Fluorine**

Sources: Water, sea fish, cheese

Properties: Maintains enamel and prevents dental caries.

Deficiency: Dental caries.

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## Diseases Caused By Microorganisms

<b>Virus</b>	<b>Bacteria</b>	<b>Protozoas</b>	<b>Fungi</b>	<b>Worms</b>
Small Pox	Sore throat	Malaria	Ringworm	Taeniasis
Chicken Pox	Diphtheria	Amoebic dysentery	Athlete's Foot	Schistosomiasis
Common Cold	Pneumonia	Trypanosomiasis	Madura Toot	Bilharziasis
Influenza/Flu	Tuberculosis	Oriental Sore	Dhobie Itch	Ancylostormiasis
Measles	Plague	Kala Azar		Hook Worm
Mumps	Tetanus	Giardiasis or		Ascariasis
Encephalitis	Typhoid	Diarrhoea		Enterobiasis
Poliomyelitus	Cholera	Vaginitis		Pinworm disease
Rabies	Bacillary Dysentery			Filariasis
Dengue	Whooping Cough			Elephantiasis
Herpes	Gonorrhea			
AIDS	Leprosy			
	Botulism			

Trpanosomiasis is also known as sleeping sickness (tse-tse fly).  
Taeniasis is transmitted through eating pork.

## Plant Diseases

<b>Fungi</b>	<b>Bacterial Diseases</b>	<b>Viral Diseases</b>
Late blight of Potato	Paddy blight	Tobacco Mosaic
Downy Mildew	Brown rot of Potato	Bunchy top of Banana
Loose smut of Wheat	Ring rot of Potato	Leaf curl
Smut of Bajra	Tundu disease of wheat	Potato leaf roll
Bunt of rice	Citrus canker	
Coffee rust	Crown Gall of fruits	
Black/Brown rust		
Red rot of sugarcane		
Wilt of cotton		
Ergot of Bajra		
Foot rot of Paddy		

## Pollution Linked Diseases

<b>Heavy Metal</b>	<b>Human Impacts</b>
Mercury	Kidney damage, ulcers, death if in the form of methyl mercury, Minamata disease
Lead	Kidney damage, metabolic interference, central and peripheral nervous system toxicity, depressed biosynthesis of protein and red blood cells, irritability, anemia
Cadmium	Renal disease. Various cancers
Arsenic	Hyperkeratosis, hyperpigmentation, skin tumors and cancer, damage to gastrointestinal tract and liver
Aluminum	Linked to Alzheimer's disease, anemia, softening of bones, senile dementia

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## Hormones

Gland	Hormone	Effect
Pituitary/Hypophysis Anterior Lobe	Growth Hormone or Somatotrophic hormone (STH).	Growth of long bones, muscles.
	Thyroid Stimulating Hor. (TSH)	
	Adreno Corticotrophic hormone (ACTH)	Influences the production of corticosteroids by adrenal cortex involved in defending body against physiological stress.
	Follicle Stimulating hormone (FSH)	Growth & maturation of follicles in the ovary, production of female sex hormone Estrogen & maturation of spermatozoa in males.
	Luteinizing Hormone (LH)	Stimulates interstitial cells in the testis to produce testosterone. Causes ovulation. Release of estrogen & formulation of corpus luteum in female.
	Prolactin or Luteotrophic Hormone (LH)	Helps to maintain pregnancy. Stimulate mammary glands to secrete milk.
Middle Lobe	Melanophore stimulating Hormone (MSH)	Associated with melaonophyte which give skin its colour
Posterior Lobe	Vasopressin or Anti-diuretic Hormone	Controls water reabsorption in the kidney tubule.
	Oxytocin	Causes uterine contractions & active expulsion of milk during & after birth.
Hypothalamus	Releasing Hormone (RH) for each anterior pituitary hormone: GH-RH, TSH-RH, ACTH-RH, FSH-RH & likewise	Production of all the anterior pituitary hormone is controlled by messages from the hypothalamus via hypophyseal portal vessels.
Thyroid	Thyroxine	BMR. Influences heat production.
	Calcitonin	Calcium level in blood
Parathyroids	Parathormone	Raises blood calcium level
Adrenals	Aldosterone	Regulates sodium and potassium levels in the blood to control blood pressure
	Hydrocortisone	Plays key role in stress response; increases blood glucose levels and mobilizes fat stores; reduces inflammation
	Epinephrine or Adrenalin	Increases blood pressure, heart and metabolic rate, and blood sugar levels; dilates blood vessels. Also released during exercise
	Norepinephrine/ Noradrenalin	Increases blood pressure and heart rate; constricts blood vessels
Thymus	Thymosin	Development of white blood cells
Pancreas or Islets of Langerhans	Insulin	Lower the blood sugar level
	Glucagon	Increase the blood sugar level.
Ovaries	Estrogen	Secondary sexual characteristics.
	Progesterone	Prepares Endometrium (inner lining of Uterus) & maintains it during pregnancy

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## Genetic Diseases

1.	Albinism	Absence of pigment melanin in the skin. Cause by a recessive gene that blocks the conversion of amino acid tyrosine to melanin.
2.	Cri-du-chat syndrome	Caused by deformity of chromosome 5. Infants cry like mewling of cat, small head.
3.	Cystic Fibrosis	Results because of recessive autosomal gene. Cause abnormal pancreatic functions & generally leads to early death
4.	Down Syndrome	Also called Mongolism. Chromosome 21 occurs in triplicate (trisomy) rather than duplicate. Affected individuals carry 47 chromosomes are greatly retard mentally & physically.
5.	Edwards Syndrome	Trisomy of chromosome 18. Infants die before 6 months.
6.	Fabry's Disease	Caused by recessive X-linked gene that affects metabolism of glycosphingolipids. These lipids deposit in hear, kidneys & eyes.
7.	Galactosemia	Recessive autosomal gene causes defect in the enzyme utilizing the sugar galactose. Causes high level of galactose leading to cataracts & brain damage.
8.	Haemophilia	Sex linked recessive gene. Bleeding can be stopped by injecting a protein (factor VIII)
9.	Huntington's Disease	Caused by dominant autosomal gene which leads to progressive deterioration of the nervous system. Develops at an age of 30 to 40 years causing loss of control of limbs.
10.	Klinefelter Syndrome	Improper development of testes due to addition X chromosome (XXY). Permanent sterility.
11.	Lesch-Nyhan Syndrome	Sex linked recessive trait resulting into the development of involuntary movements, mental retardation & kidney damage.
12.	Marfan Syndrome	Autosomal dominant resulting in abnormalities of body parts especially eyes & fingers.
13.	Muscular Dystrophy	Sex linked recessive disease developing during 1-6 years. Patient becomes confined to wheel chair by 12 year of age. People die before 20.
14.	Patau Syndrome	Trisomy of chromosome 13. Die within 3 months of birth.
15.	Phenylketonuria (PKU)	Recessive autosomal gene results into lack of an enzyme essential for the metabolism of amino acid phenylalanine. As a result the amino acid accumulates in the brain causing damage. It detected soon it can be prevented by feeding the child on low Phenylalanine.
16.	Sickle Cell Anemia	Caused by abnormal haemoglobin molecule due to recessive gene in homozygous condition resulting in sickling of RBCs.
17.	Tay Sachs Disease	Caused by autosomal recessive gene. Leads to progressive mental degradation resulting in death by the age of 2-3 years.
18.	Thalassemia	Also called Cooley's Anaemia. Occurs mostly in children & is nearly fatal. Controlled by a recessive gene which causes severe anaemia.
19.	Turner Syndrome	Affected individuals are phenotypically females but have rudimentary sex organs & mammary glands. Results from lack of an X chromosome, that is the compliment of XO with 45 chromosomes (45, XO).
20.	Xeroderma Pigmentosum	Extremely sensitive to UV radiation. Sunlight causes lesions which frequently become cancerous.

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## Classification of Hormones

Amines	Peptide hormones	Steroids/ sterols	Lipids
Adrenaline	Acth Or Corticotropin)	Cortisol	Prostaglandins
Dopamine	Vasopressin	Aldosterone	Leukotrienes
Noradrenaline	Calcitonin	Testosterone	Prostacyclin
Melatonin	Corticotropin-Releasing Hormone (Crh)	Androstenedione	Thromboxane
Serotonin	Erythropoietin (Epo)	Oestrogen	
Thyroxine	Follicle-Stimulating Hormone (Fsh)	Estradiol	
Triiodothyronine	Gastrin	Progesterone	
	Glucagon	Progestins	
	Gonadotropin-Releasing Hormone (Gnrh)	Calcitriol	
	Growth Hormone-Releasing Hormone (GHRH)	(Sterol)	
	Growth Hormone (GH Or Hgh)		
	Insulin		
	Leptin		
	Luteinizing Hormone (LH)		
	Oxytocin		
	Parathyroid Hormone (PTH)		
	Prolactin (PRL)		

## Possible Combinations of Blood Groups

Male	Female	Blood group of Children not possible
A	A	B & AB
A	B	-
A	AB	O
A	O	B or AB
B	B	A, AB
B	AB	O
B	O	A, AB
AB	AB	O
AB	O	O, AB
O	O	A, B, AB

### Miscellaneous Facts:

1. Prokaryotes have no definite membrane bound nucleus. A cell wall is present only in plants & not in animal cells. Plasma membrane is composed of phospholipids. Enclosed within the plasma membrane is the cytosol in which are embedded the various organelles.
2. Endoplasmic Reticulum is a network of flattened membranes forming tunnels & generally have ribosome attached (Rough

ER) or otherwise (Smooth ER). Involved in protein & macro-molecule synthesis. Golgi complex is another system of membranes generally observed in the form of flattened sacs. It primarily acts as a processing center for complex macromolecules like glycoproteins.

3. Chloroplasts are centers of photosynthetic activity & found only in photosynthetic cells. They are bound by a double membrane, enclosing another system of membranes, the



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lamellae or thylakoids & the matrix (Stroma). Chlorophylls & carotenoids are localized in the thylakoids. Mitochondria have double membrane.

4. Peroxisomes function to get rid of the cell of toxic substances & are found in high number in liver.

Glyoxysomes contain oxidative enzymes including those for fat metabolism.

5. Each ribosome is made up of RNAs & proteins. Lysosomes are bags of hydrolyzing enzymes. A vacuole is surrounded by tonoplast. Animal cells have few small vacuoles or none at all. Centrioles help in organizing the mitotic spindle are generally absent in plant cells.

6. The individual molecules with their associated proteins are called chromosomes. These chromosomes consist of two chromatids. The two chromatids intersect at a knot-like structure called centromere.

7. The stages of mitosis are prophase, metaphase, anaphase & telophase. In mitosis the chromatids are separated & hence the numbers of chromosomes remain the same.

8. Meiosis involves two divisions, meiosis I & meiosis II. The prophase I of Meiosis I is divided into five substages: leptotene, zygotene, pachytene, diplotene & diakinesis. Then comes metaphase I, anaphase I, telophase I, prophase II, metaphase II, anaphase II & telophase II.

9. The chiasmata or crossover formation takes place during the pachytene stage. The distinctive feature of Anaphase I of meiosis I is that it involves the separation of the whole chromosomes & not chromatids as in case of mitosis. The second meiotic division is almost identical to the mitotic division except that

10. A particular virus has either DNA or RNA never both which is protected by a protein coat called capsid.

11. Plants consist of three types of simple tissue. The first, called parenchyma, is found throughout the plant and is living and capable of cell division at maturity. The cells of parenchyma tissue carry out many specialized physiological functions—for example, photosynthesis, storage, secretion, and wound healing. They also occur in the xylem and phloem tissues. Collenchyma, the second type of ground tissue, is also living at maturity and is made up of cells with unevenly thickened primary cell walls.

Collenchyma tissue is pliable and functions as support tissue in young, growing portions of plants.

Sclerenchyma tissue, the third type, consists of cells that lack protoplasts at maturity and that have thick secondary walls usually containing lignin. Sclerenchyma tissue is important in supporting and strengthening those portions of plants that have finished growing.

12. Complex tissues are xylem & phloem. Xylem is meant for the transport of water & mineral elements.

Phloem is meant for the transport of food material from the leaves to the consumption organs. The epidermis is the outermost layer & is primarily protective in function. The epidermis of leaves is interrupted by fine pores called stomata which are guarded by a pair of guard cells. The guard cells together with the adjacent epidermal cells constitute the stomata.

13. Eight essential amino acids are needed to maintain health in humans: leucine, isoleucine, lysine, methionine, phenylalanine, theonine, tryptophan, and valine.

14. The process of development of an embryo, & subsequently the whole plant from an unfertilized egg is called parthenogenesis.

15. There are three types of RNA: mRNA (carries message from the DNA for protein synthesis), rRNA (ribosomes attached) & tRNA (transfer of amino acids to the site of protein synthesis). All the three types of RNA are synthesized from DNA, one of whose strand act as a template. This process is called transcription. The process of decoding the transcribed information is called translation during which the genetic code is converted to language of proteins.

16. A nucleotide is a chemical compound that consists of a heterocyclic base, a sugar, and one or more phosphate groups. In the most common nucleotides the base is a derivative of purine or pyrimidine, and the sugar is pentose - deoxyribose or ribose. Nucleotides are the structural units of RNA & DNA.

Groups of three nucleotides, known as codons, code for the 20 amino acids that form the foundation of proteins. The triplet code results in 64 codons. UAA, UAG & UGA do not code for any amino acid & are called non sense codons. They are in fact the stop signals. AUG is likewise the start signal but it also codes for methionine if it falls in the middle. The code is universal & is identical in all organisms.

17. The indirect flow of information from DNA to proteins is called the Central Dogma. However HIV virus has a reverse transcriptase mechanism of RNA to DNA synthesis.

18. Adenine pairs with thymine & guanine with cytosine. Uracil is found in RNA only & Thiamine in DNA only. Except for the mature RBCs all human cells contain the complete genome. The human genome is estimated to contain 20,000-25,000 genes & 3.2 billion chemical nucleotides bases. Less than 2% of genome codes for proteins.

19. The outermost layer of the kidney is called the cortex. Beneath the cortex lies the medulla. Nephrons, extend between the

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cortex and the medulla. The primary structure of nephrons is the glomerulus, a network of extremely thin blood vessels called capillaries. The glomerulus is contained in a cuplike structure called Bowman's capsule, from which extends a narrow vessel, called the renal tubule. This tube twists and turns until it drains into a collecting tubule that carries urine toward the renal pelvis. Part of the renal tubule, called Henle's loop, becomes extremely narrow, extending down away from Bowman's capsule and then back up again in a U shape.

20. The right side of the heart is responsible for pumping oxygen-poor blood to the lungs, while the left side of the heart is responsible for pumping oxygen-rich blood to the body. The oxygen-poor blood feeds into two large veins, the superior vena cava and inferior vena cava, which empty into the right atrium of the heart. The right atrium conducts blood to the right ventricle, and the right ventricle pumps blood into the pulmonary artery. The pulmonary artery carries the blood to the lungs, where it picks up a fresh supply of oxygen and eliminates carbon dioxide. The blood, now oxygen-rich, returns to the heart through the pulmonary veins, which empty into the left atrium. Blood passes from the left atrium into the left ventricle, from where it is pumped out of the heart into the aorta.

21. Contraction of ventricles is known as systole & the muscular relaxation that follows

is diastole. The right atrioventricular valve is formed from three flaps of tissue and is called the tricuspid valve, while the left atrioventricular valve has two flaps and is called the bicuspid or mitral valve. The other two valves are located between the ventricles and arteries. They are called semilunar valves. The right semilunar valve is called the pulmonary valve. The left semilunar valve, between the left ventricle and aorta is called the aortic valve. The first heart sound Lub is caused by the closure of atrio-ventricular valves & Dub by closure of aortic & pulmonary valves.

22. Diabetes insipidus (DI) is characterized by excretion of large amounts of severely diluted urine due to deficiency of vasopressin & is not characterized by high sugar level. Diabetes Mellitus is caused by deficiency of insulin.

23. About 55 percent of the blood is composed of a liquid known as plasma. The rest of the blood is made of three major types of cells: RBCs (erythrocytes - 44% by volume), WBCs (leukocytes 1%), and platelets (thrombocytes).

24. There are several varieties of white blood cells, including neutrophils, monocytes, and lymphocytes. A foreign substance which, when introduced into the body, stimulates the production of an antibody is called an antigen.

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25. In classification the sequence is kingdom, phylum, class, order, family, genus & species. For eg. In Homo Sapiens, Homo is the genus & sapiens is the species.

26. Whittaker's classification which divides the organisms into five kingdoms is the most popular. The kingdoms are: Monera (blue green algae), Protista (Diatoms), Fungi, Plantae & Animalia.

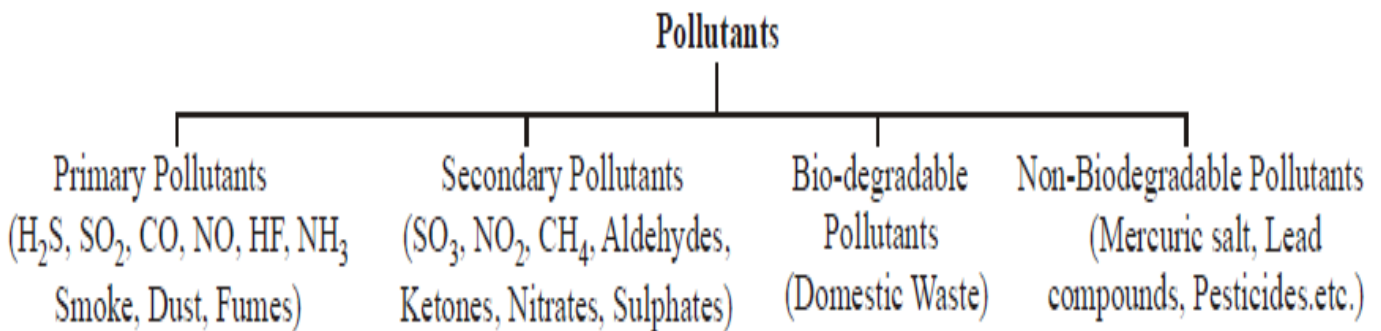
27. Amphibians & reptiles have 3 chambered hearts. However crocodiles have four chambered heart.

28. Interferon refers to any of a group of antiviral proteins produced by animals.

29. Lathyrism - prevalent in some areas of India and Africa, where grass pea (Lathyrus sativus) is consumed (used as an adulterant in flour). If used for 2-6 months it causes spastic paralysis of the legs.

### **Pollutant**

A pollutant is substance or energy introduced into the environment that has undesired effects, or adversely affects the usefulness of a resource. The pollutants may be inorganic, biological or radiological in nature.



### **Air Pollution**

#### **Major Air Pollutants**

The major air pollutants are following:

- (i) Carbon monoxide (CO)
- (ii) Sulphur dioxide (SO<sub>2</sub>)
- (iii) Oxides of nitrogen (NO<sub>2</sub> and NO )
- (iv) Smoke, dust
- (v) Ammonia
- (vi) Chlorine and hydrogen chloride
- (vii) Chlorinated hydrocarbons
- (viii) Mercaptans
- (ix) Zn and Cd

(x) Freon

**Photochemical pollutants:** The nitrogen dioxide by absorbing sunlight in blue and U. V. region decomposes into nitric oxide and atomic oxygen followed by a series of other reactions producing O<sub>3</sub>, formaldehyde, acrolein and peroxyacetyl nitrates.

#### **Smog**

It is a mixture of smoke and fog in suspended droplet form. It is of two types :

(a) **London smog or classical smog :** It is coal smoke plus fog.

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## (b) **Photochemical smog or Los Angeles smog**

The oxidised hydrocarbons and ozone in presence of humidity cause photochemical smog.

## **Acid Rain**

The oxides of C, N and S present in the atmosphere, dissolve in water and produce acids which lowers the pH of water below 5.5.

The acids are toxic to vegetation, react with marble and damage buildings.

## **Green House Effect**

The retention of heat by the earth and atmosphere from the sun and its prevention to escape into the outer space is known as green house effect. Global warming refers to an increase in average global temperature.

(i) Global warming would result in rise in sea level due to increased rate of melting of glaciers and floods.

(ii) Increase in infectious diseases like Malaria, Dengue etc.

## **Ozone Layer and its Depletion**

The ozone layer, existing between 20 to 35 km above the earth's surface, shield the earth from the harmful U. V. radiations from the sun. The U. V. radiations cause skin cancer, cataract of eye, and are harmful to vegetation. Depletion of ozone is caused by oxides of nitrogen. The presence of chlorofluorocarbons also increase the decomposition of O<sub>3</sub>.

## **Water Pollution**

The contamination of water by foreign substances which would constitute a health hazard and make it harmful for all purposes (domestic, industrial or agriculture etc.) is known as water pollution.

## **Sources of Water Pollution**

- (i) Domestic sewage
- (ii) Industrial waters
- (iii) Suspended particles
- (iv) Wastes from fertilizer

## **Control of Water Pollution**

- (i) Recycling of waste water
- (ii) Special techniques
- (iii) Waste-water reclamation

## **Aerobic and Anaerobic Oxidation**

The oxidation of organic compounds present in sewage in presence of good amount of dissolved or free oxygen (approx. 8.5 ml/l) by aerobic bacteria is called *aerobic oxidation*. When dissolved or free oxygen is below a certain value the sewage is called *stale* anaerobic bacteria bring out purification producing H<sub>2</sub>S, NH<sub>3</sub>, CH<sub>4</sub>, (NH<sub>4</sub>)<sub>2</sub>S etc. This type of oxidation is called *anaerobic* oxidation. The optimum value of D.O. for good quality of water is 4-6 ppm (4-6 mg/l). The lower the concentration of D.O., the more polluted is the water.

## **Biological Oxygen Demand (BOD)**

It is defined as the amount of free oxygen required for biological oxidation of the

organic matter by aerobic conditions at 20°C for a period of five days. Its unit is mg/l or ppm. An average sewage has BOD of 100 to 150 mg/l.

### Chemical Oxygen Demand (COD)

It is a measure of all types of oxidisable impurities (biologically oxidisable and biologically inert organic matter such as cellulose) present in the sewage. COD values are higher than BOD values.

### Soil or Land Pollution

The addition of substances in an indefinite proportion changing the productivity of the soil is known as soil or land pollution.

### Sources of Soil Pollution

- (i) Agricultural pollutants
- (ii) Domestic refuse
- (iii) Radioactive wastes
- (iv) Farm wastes

### Pesticides

The chemical substances used to kill or stop the growth of unwanted organisms are called pesticides.

### Chemotherapy

Branch of chemistry dealing with treatment of diseases by suitable chemicals.

### Analgesics

Drugs used for relieving pain.

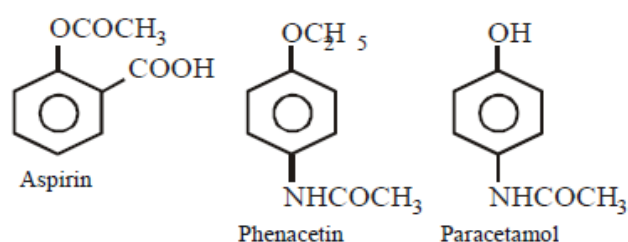
(a) Aspirin (2-acetoxy benzoic acid) is the most common analgesic. It has antipyretic (temperature lowering) properties also.

(b) These days, aspirin is used for the prevention of heart attack as it prevents clotting of blood.

(c) In case of severe pain, narcotics like morphine, codeine and heroin can also be used.

### Antipyretics

It brings down body temperature during high fever. e.g.-



### Antimalarials

These are drugs which cure malaria e.g-

**Quinine, Chloroquine.**

### Antiseptics and Disinfectants

#### Antiseptics

- prevents growth of microorganisms or may even kill them.

- **Not harmful for humans**

*Example:*

**(i) Dettol (chlorohexenol+ terpeneol)**

**(ii) Bithional**

**(iii) Salol**

#### Disinfectants

- kills and prevents growth of microorganisms.

- **Harmful for humans.**

*Examples:*

**(1% of solution of phenol)**

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## **Tranquilizers**

Used to treat mental diseases and stress. They act on central nervous system and reduce anxiety.

e.g.- Barbituric acid, luminal, seconal.

## **Antibiotics**

Chemicals which are produced by some specific micro-organism and are used to kill other micro-organism. e.g.- Penicillin, Streptomycin (for tuberculosis), Chloroamphenicol (for typhoid).

Broad spectrum antibiotics can kill all range of micro-organisms. e.g.- Tetracyclin, Sulphadrugs

These are derivative of sulphanilamide and have antibacterial powers.

## **Antihistamines**

Drugs used to treat allergy such as skin rashes. They are called so because allergic reactions are caused due to the liberation of histamine in the body.

(a) These drugs are also used for treating conjunctivitis (inflammation of conjunctiva) and rhinitis (inflammation of nasal mucosa).

(b) The commonly used antihistamines drugs are diphenyl hydramine, chlorpheniramine, promethazine and cetirizine.

## **Antacids**

Antacids are the drugs which neutralize excess acid in the gastric Juices and give relief from acid indigestion. They remove the excess acid and raise the pH to appropriate

level in stomach. These are mainly weak bases. *Examples*-  $Mg(OH)_2$ ,  $KHCO_3$

## **Antifertility Drug**

The drugs which are used to control the pregnancy are known as antifertility drugs or oral contraceptives. These are essentially a mixture of estrogen and progesterone derivatives. *Examples* - Ormeloxifene, mix pristone

## **Artificial Sweeteners**

The chemical compounds that are added to foods to make them sweet.

(a) Saccharin is the first artificial sweetener used as it is water soluble sodium or calcium salt.

(b) Nowadays aspartame is used as artificial sweetener, but it is unstable at cooking temperatures.

(c) Alitame, another sweetener is more stable than aspartame at cooking temperature.

## **Food Preservatives**

The chemical substances that are added to the food to prevent their decaying and to retain their nutritive value for long periods.

- Sodium benzoate is the most commonly used preservative.

## **Soaps and Detergents**

### **Soaps**

Sodium or potassium salts of long chain fatty acids, e.g., stearic oleic and palmitic acids. Soaps containing sodium salts are formed

by heating fat (*i.e.*, Glyceryl ester of fatty acid) with aqueous sodium hydroxide solution. This process is called **saponification**.

- Soaps do not work in hard water. Hard water contains  $\text{Ca}^{+2}$  and  $\text{Mg}^{+2}$  ions. These ions form insoluble calcium and magnesium soaps respectively when sodium or potassium soaps are dissolved in hard water. These insoluble soaps separate as scum in water and are useless as cleansing agent.

### **Synthetic Detergents**

Sodium salts of Alkylbenzene Sulphonic acids. They are better cleansing agents than soap. These are of three types:

(a) **Anion detergents** are those detergent which contain large part of anion.

(i) For preparing anionic detergent, long chain alcohols are first treated with concentrated  $\text{H}_2\text{S}$ , giving alkyl hydrogen sulphates. These are neutralized with alkali to give anionic detergent.

(ii) They are also effective in slightly acidic solutions. In acidic solution, they form alkyl hydrogen sulphate which is soluble in water whereas soaps form insoluble fatty acids.

(b) **Cationic detergents** are mostly acetates or chlorides of quaternary amines. These detergents have germicidal properties and are extensively used as germicides.

(c) **Non-ionic detergents** are esters of high molecular mass.

### **Cell and Tissue**

The cell is the basic living unit of all organisms. The simplest organisms consist of a single cell whereas humans are composed of trillions of cells. The cell theory proposed by J. M. Schleiden and T. Schwann, states that organisms are composed of cells and cell is the basic unit of life. Rudolf Virchow proposed that all cells arise by division of pre existing cells. Every cell is surrounded by a plasma membrane that forms a cytoplasmic compartment. The plasma membrane is selectively permeable and serves as a selective barrier between the cell and its surrounding environment.

### **Prokaryotic Cells:**

Prokaryotic cells are bounded by a plasma membrane but have little or no internal membrane organization. They have a nuclear area rather than a membrane-bounded nucleus. Prokaryotes typically have a cell wall and Ribosomes and may have propeller like flagella. Prokaryotes lack membrane bound organelles. Thus cell organelles like mitochondria, Golgi bodies, endoplasmic reticulum are all absent in prokaryotes.

### **Eukaryotic Cells**

Eukaryotic cells have a membrane-bounded nucleus and cytoplasm, which is organized



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into organelles; the fluid component of the cytoplasm is the Cytosol.

- Plant cells differ from animal cells in that they have *rigid cell walls, plastids, and large vacuoles*; cells of most plants lack Centrioles.

- Membranes divide the cell into membrane-bounded compartments; this allows cells to conduct specialized activities within small areas of the **cytoplasm**, concentrate molecules, and organize metabolic reactions.

A system of interacting membranes forms the endomembrane system.

**Cytoskeleton** is a dynamic internal framework made of Microtubules, microfilaments, and intermediate filaments.

- The cytoskeleton provides structural support and functions in various types of cell movement, including transport of materials in the cell.
- Cilia and flagella function in cell movement. Each consists of a 9 + 2 arrangement of microtubules.

### Functions of the Cell

(i) The cell is the smallest part to which an organism can be reduced that still retains the characteristics of life.

(ii) Cells produce and secrete various molecules that provide protection and support to the body.

(iii) All the movements of the body occur because of specific cells called muscle cells.

(iv) Cells produce and receive chemical and electrical signals that allow them to communicate with one another.

(v) Each cell contains a copy of the genetic information of the individual within the nucleus. Specialized cells (Gametic cells) are responsible for transmitting that genetic information to the next generation.

### Introduction to the Cell

Both living and non-living things are composed of molecules made from chemical elements such as Carbon, Hydrogen, Oxygen, and Nitrogen. The organization of these molecules into cells is one feature that distinguishes living things from all other matter. The cell is the smallest unit of matter that can carry on all the processes of life.

**Cell Theory** consists of three principles:

- a. All living things are composed of one or more cells.
- b. Cells are the basic units of structure and function in an organism.
- c. Cells come only from the replication of existing cells.

### Internal Organization

1. Cells contain a variety of internal structures called **organelles**.

2. An organelle is a cell component that performs a specific function in that cell.

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	<b>Prokaryotes</b>	<b>Eukaryotes</b>
	Lack a nucleus and have no membrane-bound organelles	Contain nucleus and membrane bound organelles
Typical organisms	bacteria	Protoctista, fungi, plants, animals
Typical size	~ 1-10 $\mu\text{m}$	~ 10-100 $\mu\text{m}$ (sperm cells) apart from the tail, are smaller)
DNA	circular	linear molecules (chromosomes) with histone proteins
Ribosomes	70S	80S
Cytoplasmatic structure	very few structures	highly structured by membranes and a cytoskeleton
Cell movement	Flagellae/cilia made of flagellin	flagellae and cilia made of tubulin
Mitochondria	none	1 - 100 (though RBC's have none)
Chloroplasts	none	in algae and plants
Organization	usually single cells	single cells, colonies, higher multicellular organisms with specialized cells
Cell division	Binary fission (simple division)	Mitosis (normal cell replication) Meiosis (gamete production)

## **Parts of the Eukaryotic Cell**

The structures that make up a Eukaryotic cell are determined by the specific functions carried out by the cell. Thus, there is no typical Eukaryotic cell. Nevertheless, Eukaryotic cells generally have three main components: A cell membrane, a nucleus, and a variety of other organelles.

### **Cell Membrane**

- This "Selectively Permeable" membrane regulates what passes into and out of the cell.

- The cell membrane is a fluid mosaic of proteins floating in a phospholipid bilayer.
- The cell membrane functions like a gate, controlling which molecules can enter and leave the cell.
- The cell membrane is constantly being formed and broken down in living cells.

### **Cytoplasm**

- Everything within the cell membrane which is not the nucleus is known as the cytoplasm.

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- Cytosol is the jelly-like mixture in which the other organelles are suspended, so cytosol + organelles = cytoplasm.

### **Nucleus**

- The nucleus contains the cell's chromosomes (human-46, fruit fly -6, fern - 1260) which are normally uncoiled to form a chromatinic network, which contain both linear DNA and proteins, known as **histones**. These proteins coil up (dehydrate) at the start of nuclear division, when the chromosomes first become visible.
- Whilst most cells have a single nucleus some cells (macrophages, phloem companion cells) have more than one and fungi have many nuclei in their cytoplasm – they are

### **coenocytic**

- The nucleus is surrounded by a double membrane called the *nuclear envelope*, which has many nuclear pores through which mRNA, and proteins can pass.
- Most nuclei contain at least one nucleolus.

The nucleoli are where ribosomes are synthesised. Ribosomes translate mRNA into proteins.

- When a nucleus prepares to divide, the nucleolus disappears.

### **Mitochondria**

- Mitochondria are found scattered throughout the cytosol, and are relatively large organelles (second only to the nucleus and chloroplasts).

- Mitochondria are the sites of aerobic respiration, in which energy from organic compounds is transferred to ATP. For this reason they are sometimes referred to as the **'Power house' of the cell**.

- Mitochondria are surrounded by two membranes, the smooth outer membrane serves as a boundary between the mitochondria and the cytosol & the inner membrane has many long folds, known as **cristae**.

- Mitochondria have their own DNA, and new mitochondria arise only when existing ones grow and divide. They are thus semi-autonomous organelles.

### **Ribosomes:**

- Ribosomes are not surrounded by a membrane.
- Ribosomes are the site of protein synthesis in a cell. They are the most common organelles in almost all cells.
- Some are free in the cytoplasm (Prokaryotes); others line the membranes of rough endoplasmic reticulum (rough ER).
- They exist in two sizes: 70s are found in all Prokaryotes, chloroplasts and mitochondria, suggesting that they have evolved from ancestral Prokaryotic organisms. They are free-floating. 80s found in all eukaryotic cells – attached to the rough ER (they are rather larger).

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- Groups of 80s ribosomes, working together, are known as a **polysome**.

## **Endoplasmic Reticulum:**

- The ER is a system of membranous tubules and sacs.
- The primary function of the ER is to act as an internal transport system, allowing molecules to move from one part of the cell to another. The **endoplasmic reticulum** (ER) is a network of folded internal membranes in the cytosol.
- **Rough ER** is studded along its outer surface with ribosomes that manufacture proteins.
- **Smooth ER** is the site of lipid synthesis and detoxifying enzymes.

## **Golgi Apparatus:**

- The Golgi apparatus is the processing, packaging and secreting organelle of the cell, so it is much more common in glandular cells.
- The Golgi apparatus is a system of membranes, made of flattened sac-like structures called **cisternae**.

## **Lysosomes:**

- Lysosomes are small spherical organelles.
- Lysosomes are the site of protein digestion – thus allowing enzymes to be re-cycled when they are no longer required. They are also the site of food digestion in the cell, and of bacterial digestion in phagocytes.
- Lysosomes are formed from pieces of the Golgi apparatus that break off.

- Lysosomes are common in the cells of Animals, Protoctista and even Fungi, but rare in plants.

## **Centriole:**

- This consists of two bundles of microtubules at right-angles to each other
- At the start of mitosis and meiosis, the centriole divides, and one half moves to each end of the cell, forming the spindle.
- The spindle fibres are later shortened to pull the chromosomes apart.

## **Plant Cell Structures:**

Most of the organelles and other parts of the cell are common to all Eukaryotic cells. Cells from different organisms have an even greater difference in structure.

Plant cells have three additional structures not found in animal cells:

- Cellulose cell walls
- Chloroplasts (and other plastids)
- A central vacuole.

## **Cellulose Cell Wall**

- One of the most important features of all plants is presence of a cellulose cell wall.
- Fungi such as Mushrooms and Yeast also have cell walls, but these are made of **chitin**.
- The cell wall is freely permeable (porous), and so has no direct effect on the movement of molecules into or out of the cell.
- The rigidity of their cell walls helps both to support and protect the plant.

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- Plant cell walls are of two types: a). Primary (cellulose) cell wall. b). Secondary (lignified) cell wall.

## **Vacuoles**

- The most prominent structure in plant cells is the large vacuole.
- The vacuole is a large membrane-bound sac that fills up much of most plant cells.
- The vacuole serves as a storage area, and may contain stored organic molecules as well as inorganic ions.
- The vacuoles of some plants contain poisons (eg tannins) that discourage animals from eating their tissues.
- Whilst the cells of other organisms may also contain vacuoles, they are much smaller and are usually involved in food digestion.

## **Chloroplasts (and other plastids)**

- A characteristic feature of plant cells is the presence of plastids that make or store food.
- The most common of these are chloroplasts – the site of photosynthesis.
- Each chloroplast encloses a system of flattened, membranous sacs called **thylakoids**, which contain chlorophyll.
- The thylakoids are arranged in stacks called **grana**.
- The space between the grana is filled with cytoplasm like **stroma**.

## **Comparison of Structures Between Animal and Plant Cells**

	<b>Typical Animal Cell</b>	<b>Typical Plant Cell</b>
Organelles	Nucleolus (within nucleus) Rough ER Smooth ER 80S Ribosomes Cytoskeleton Golgi apparatus Cytoplasm Mitochondria Vesicles Vacuoles Lysosomes Centrioles	Rough ER Smooth ER 80S Ribosomes Cytoskeleton Golgi apparatus Cytoplasm Mitochondrion Vesicle Chloroplast and other plastids
Additional structures	Flagellae Plasma membrane	Cellulose cell wall Plasmodesmata

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## Multicellular Organization

In a unicellular organism, one cell carries out all of the functions of life. In contrast, most cells in a multicellular organism are specialized to perform one or a few functions – more efficiently. Because of cell specialization, the cells of multicellular organisms depend on other cells in the organism for their survival.

## Tissue, Organs, and Organ Systems

1. In most Multicellular Organisms, we find the following organization:

- Cellular Level: The smallest unit of life capable of carrying out all the functions of living things.
- Tissue Level: A group of cells that performs a specific function in an organism.
- Organ Level: Several different types of tissue that function together for a specific purpose.
- Organ System Level: Several organs working together to perform a function. The different organ systems in a multicellular organism interact to carry out the processes of life.

2. Plants also have tissue and organs, although they are arranged somewhat differently from those of animals – e.g. vascular tissue.

3. The four plant organs are: Roots, Stems, Leaves and Flowers

## Colonial Organizations

- A colonial organization is a collection of genetically identical cells that live together in a closely connected group.
- Many of the cells of the colony carry out specific functions that benefit the whole colony.
- Colonial organisms (e.g. sponges, coral) appear to straddle the border between a collection of unicellular organisms and a true multicellular organism. They lack tissues and organs, but do exhibit the principle of cell specialization.

## Transport of Substances across the Membrane

The transport of substances across the plasma membrane can be of two types depending upon the expenditure of energy.

1. **Passive transport:** The transport of substances across the membrane which does not require expenditure of energy is called Passive transport. It is of two types-

(i) **Diffusion:** The process of movement of substances from the region of higher concentration to the region of lower concentration so as to spread the substance uniformly in the given space is known as diffusion.

**For example:** Transport of CO<sub>2</sub> and O<sub>2</sub> across the membrane.

(ii) **Osmosis:** Diffusion of water from a region of higher concentration to a region of

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lower concentration across the semi permeable membrane is called osmosis. **For example:** Movement of water across selectively permeable membrane.

## Types of Osmosis:

(a) **Endosmosis:** Movement of water inside a cell.

(b) **Exosmosis:** Movement of water out of the cell.

2. **Active transport:** The process of transport of molecules across the plasma membrane against the concentration gradient requires energy and is known as active transport. **For example:** The transport of glucose, amino acids and ions occurs through active transport.

## Tissues

- Group of cells having a common origin and performing similar functions are called tissues.

- A Meristematic tissue is a group of similar cells that are in a continuous state of division. These tissues are in general called

## Meristems.

- The Meristematic cells when lose their power of division differentiate into **Permanent tissues.** The cells of these tissues are either living or dead, thin walled or thick walled.

## Microorganisms

- Microorganisms are very tiny organisms which can be seen under microscope. Some

example of micro organisms are **bacteria, virus, protozoa, fungi and algae.**

- Microorganisms range in size from 0.015m to more than 100 micron.

- Microorganisms can be unicellular or Multicellular. Bacteria, Protozoans and some algae are unicellular while most of the algae and fungi are Multicellular.

- Microorganisms can be autotrophic or heterotrophic. Some bacteria, few fungi and viruses are heterotrophes while algae and some fungi are Autotrophes.

- Microorganisms can reproduce sexually, asexually or both.

## Viruses

Viruses term is a Latin word which means venom or poison. Viruses are minute microorganisms much smaller than bacteria (size ranges from 0.015 – 0.2 micron) and can be seen only with the help of an electron microscope. **M.W. Beijerinck** (1898) demonstrated that the extract of infected plants of tobacco causes infection in healthy plants and called the fluid as *contagium vivum fluidum*.

**W.M. Stanley** (1935) showed that viruses could be crystallised and crystals consist of proteins.

## Characteristics of Viruses

- They are not free living.

- They grow and multiply only inside other living cells.

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- Outside a living system, a virus is like a non-living substance. It neither respire nor reproduces outside the host.
- They are a link between living and non-living things.
- A virus is a nucleoprotein and the genetic material is infectious.
- The protein coat is called Capsid that protects the DNA/RNA.
- Antibiotics have no effect on viruses as they do not have a metabolism of their own.
- Viruses found in plants are known as plant viruses. Similarly, they are categorised as animal viruses or bacterial viruses or *Bacteriophages*.

## **Disease Causing Viruses (Harmful Viruses)**

Many human diseases like influenza, common cold, measles, mumps, chicken pox, rabies, etc., are caused by viruses. One of the most fatal disease caused by a **HIV** (Human Immunodeficiency Virus) virus is **AIDS** (Acquired Immuno Deficiency Syndrome). It spreads through sexual contact with an infected person. In 1971, T.O. Diener discovered very simple smallest infections agents called Viroids. They contain only RNA, Capsid is absent.

## **Bacteria**

- Bacteria have Autotrophic as well as Heterotrophic nutrition.
- Bacteria show both aerobic and anaerobic respiration.

- Saprophytic bacteria obtain their food from organic remains such as corpses; animal excreta, fallen leaves etc. e.g. *Pseudomonas*.
- Symbiotic bacteria form mutually beneficial association with other organisms. E.g. *Rhizobium* forms association with different legumes.
- *Escherichia coli* lives in human intestine and synthesises vitamin B and K.
- Parasitic bacteria draw their nourishment from other living organisms called hosts eg. *Vibrio cholerae* (causes cholera), *Salmonella typhi* (causes typhoid) etc.
- Bacteria reproduce asexually by binary fission under favourable conditions. The cell division is of simple type called amitosis. During unfavourable conditions, bacteria reproduce by endospore formation.
- Bacteria reproduces sexually by conjugation. It was first discovered by Lederburg and Tatum in *Escherichia coli*.
- Bacteria *Rhizobium* help in N<sub>2</sub> fixation in soil, they occur in root nodules of leguminous plants.

## **Cyano bacteria**

- They are also known as blue green algae. They made the earth's atmosphere oxygenic. They are autotrophs and many of them fix atmospheric nitrogen as Ammonia with the help of structure called heterocyst.
- Representatives of this group are *Anabaena*, *Oscillatoria*, *Nostoc*, *Spirulina* etc.



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Bacteria are not only harmful to us or to plants but these are very useful for human beings, animals and plant life.

1. Antibiotics are prepared from bacteria like streptomycin is prepared from *Streptomyces griseus*. Chloromycin is prepared from *S. venezuelae*. Terramycin is prepared from *S. rimosus*. Penicillin was the first antibiotic discovered by Alexander Fleming in 1929.

2. Some bacteria are called nitrifying bacteria as they convert nitrogen of ammonia (NH<sub>3</sub>) into nitrates.

3. Bacterium lactic acid (*Lactobacillus sp*) are found in milk, which convert lactose sugar of milk into lactic acid, because of which milk becomes sour.

4. Bacteria are useful in vinegar industry. Vinegar is made from sugar solution in the presence of *Acetobacter aceti*.

5. In Gobar Gas plants cow-dung as well as other excreta are collected and subjected to bacterial action. The bacterial degradation of cellulose releases inflammable gases consisting mainly of methane. The gas is used for domestic cooking.

## **Mycoplasma**

Simplest and smallest known microbes, next to virus, are the *Mycoplasmas*. Mycoplasmas are bacteria that lack cell wall. Due to absence of cell wall they are not affected by many common antibiotics. They do not have any particular shape and grow as

saprophytes or parasites causing diseases in plants and animals.

- Mycoplasmas are known to cause *pleuropneumonia* in cattle and witch's broom in plants.

## **Protozoa**

- Protozoa are a group of single celled eukaryotic organisms which are classified as animals. The mode of nutrition is heterotrophic and show motility. Some examples are: *Amoeba*, *Paramecium*, *Trypanosoma*, *Entamoeba* and *Plasmodium*.

Some protozoans like *Amoeba*, *Paramecium*, *Euglena* etc have contractile vacuoles for osmoregulation.

- Asexual reproduction is by binary fission (**e.g *Amoeba*, *Paramecium*, *Euglena***) or by multiple fission (e.g ***Plasmodium*** and ***Amoeba***)

- *Paramecium* is known as slipper animalcule.

- Sir Ronald Ross (1896) was the first to observe oocytes of *Plasmodium* in female *Anopheles* (mosquito).

- Laveran (1880) discovered that malaria is caused by a protozoan parasite, *Plasmodium vivax*.

## **Useful effects of Protozoa**

- Protozoa help considerably in the treatment of waste and sewage because they feed on fungi and bacteria which decompose organic matter.

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- Being simplest animal they are used as laboratory animals for research.
- *Entamoeba* lives in the large intestine of humans and feeds on the lining and causes amoebic dysentery (pain in the abdomen and repeated motions).
- *Trypanosoma* lives in the blood stream of human beings, cattle and wild animals cause a disease known as sleeping sickness.

## Fungi

- Fungi are non-green hence **heterotrophic** in their mode of nutrition. They may be saprophytes (growing on dead organic matter) or parasites (drawing food from living plants and animals as their hosts) or a few are symbiotic (living with co-host in symbiosis), as in lichens.
- Fungi are eukaryotes with cell walls containing chitin. Most fungi reproduce both sexually and asexually by means of spores. When a fungal spore lands in a suitable spot, it germinates.

Imperfect fungi (deuteromycetes) lack a sexual stage. Most reproduce asexually by forming conidia. A lichen is a symbiotic combination of a fungus and a phototroph (an alga or cyanobacterium).

## Economic importance of fungi

1. Mushrooms and Morels are edible fungi used as delicious vegetables all over the world. *Agaricus campestris* is common edible mushroom.

2. Some medicines are prepared from fungi. These medicines are penicillin, ergot, chaetomin and griseoflavin.

3. Alcohol and alcoholic drinks are produced by a process called fermentation of cereals by yeast *Saccharomyces*.

4. Yeast (*Saccharomyces cerevisiae*) is used in making bread, cakes, idli and dosa, etc. Yeast is rich in vitamin B (Riboflavin) and protein.

5. Some fungi are decomposers and are helpful in decomposing organic waste. This helps in recycling of nutrients in the biosphere.

- *Rhizopus stolonifer* is the common bread mould fungus.

- Some parasitic fungi cause diseases in plants. For example. *Puccinia* causes rust diseases in wheat, *Ustilago* causes smut disease in wheat.

- *Albugo* causes white rust in mustard family.

- *Aspergillus* causes a disease called aspergillosis in humans.

- *Aspergillus flavus* produces a toxin aflatoxin which is carcinogenic and can potentially contaminate food such as nuts.

## Algae

Algae are water loving green plants found growing in almost all water places. The algal growth floats on water surface and looks like foam or soap lather. It is called

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water bloom : For example *Microcystics*, *Anabaena*, *Oscillatoria*, etc.

**Green algae:** Algae are plants because they have chlorophyll, cellulosic cell wall and contain chlorophyll a, b and starch as reserve food. Examples are *Chlamydomonas*, *Volvox*, *Spirogyra*.

**Blue green algae (Cyanobacteria):** Contain phycocyanin (cyanin = blue) pigment in addition to chlorophyll. Examples are *Nostoc*, *Anabena*, *Oscillatoria*.

**Red algae:** Contain phycoerythrin (erythrin = red) pigment in addition to chlorophyll a and d and phycocyanin.

**Example :** *Polysiphonia*.

**Brown algae:** Include fucoxanthin, carotene and xanthophylls in addition to chlorophyll to give brown colour to the plants.

Examples are *Fucus* and *Laminaria*. Brown algae yields iodine.

**Diatoms:** Contain a golden brown pigment called diatoxanthin in addition to chlorophyll a and c. Unicellular algae may be oval, spherical or elongated in shape and are microscopic in size.

- Several algal forms grow on other plants (algae, angiosperms) as **Epiphytes**. For example *Oedogonium*, *Cladophora*, *Vaucheria*, etc.

Some blue-green algae grow as **Endophytes** inside other plants. For example *Anabaena* growing inside the leaf of *Azolla* (fern), *Nostoc* inside the thallus of *Anthoceros* (hornwort) and *Anabaena*, *Nostoc* and *Oscillatoria* inside the coralloid root of *Cycas*.

- Algae growing on the bodies of animals are described as **Epizoic**. For example *Cladophora crispata* grows on snail shell.

- Algae growing inside the body of animals are called **Endozoic**. For example *Chlorella* grows within the tissue of *Hydra*.

- *Cephaleuros virescens* grows as a parasite on tea leaves causing red rust disease of tea.

**Useful Algae:** 1. Algae are major source of food for organisms. A popular vegetable of Japan is prepared from *Laminaria*. *Chlorella* is an alga which contains more protein than the egg. Spirulina is also a good source of protein.

2. Agar is obtained from red algae. This product is used in laboratory for various experiments.

- *Laminaria digitata* and *Fucus* sp. are largely known for extraction of iodine hence used to treat goitre.

- Certain marine brown algae and red algae produce large amount of hydrocolloids (water holding substances). For example alginic acid extracted from *Laminaria*

### Life Processes

Plants and animals both have important parts called organs that enable them to live. Organs are complex structures that have a specific function.

### Respiration

Respiration is a process where the body breaks down glucose with the help of oxygen. It is a part of metabolic process where energy molecule is released while carbon dioxide and water are produced.

Energy contained in food is 'unlocked' or transferred to the organism by the process of respiration. Respiration takes place in the mitochondria of the cell.

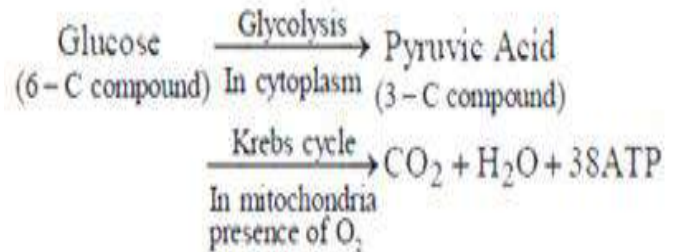
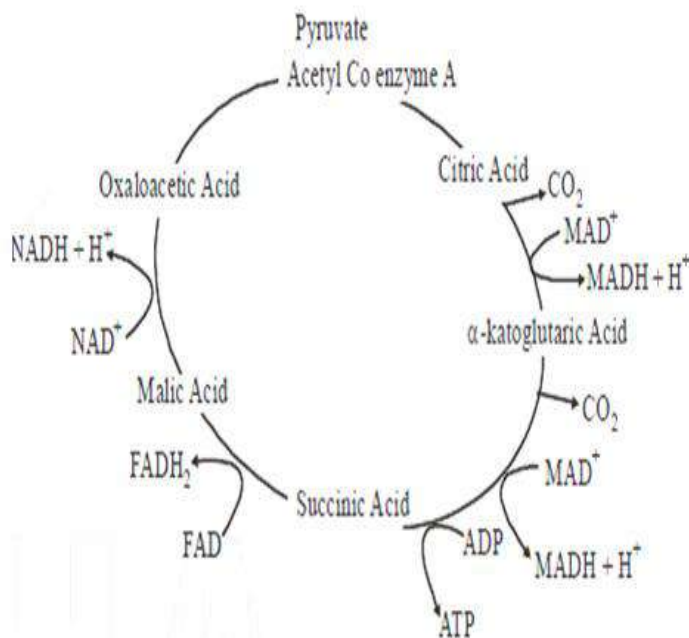
Respiration may be divided into two categories :

**(i) Aerobic respiration:** It is a process of cellular respiration that uses oxygen in order to break down respiratory substrate which

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then releases energy. Glycolysis occurs in cytoplasm of the cell. In this process, glucose undergoes partial oxidation to form two molecules of pyruvic acid.

This cycle takes place in mitochondria and only in presence of oxygen yielding NADH and FADH<sub>2</sub>.

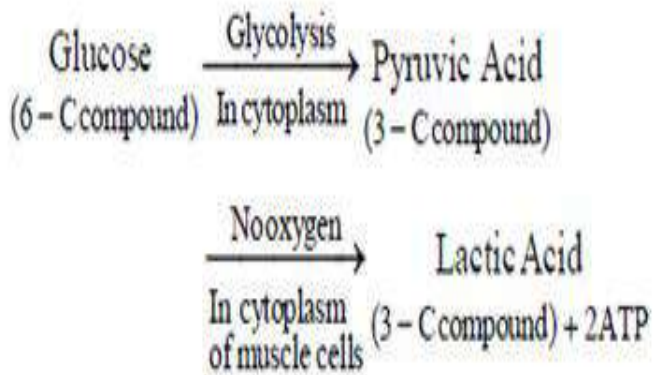


**(ii) Anaerobic respiration:** It is a process of cellular respiration that takes place in absence of oxygen, there is incomplete breakdown of respiratory substrate and little energy is released.

### Endocrine System in Human Beings

The chemical carrying the message is called hormone and the group of specialised cells which secrete these hormones is called endocrine glands.

**Krebs cycle or citric acid cycle :** It was discovered by Hans krebs in 1937. This is also known as tricarboxylic acid cycle (TCA cycle).



### Respiration in Animals

	Respiratory organs	Animals/Animal groups
I.	Skin	Earthworm, leech, frog.
II.	Gill or Bronchin or Ctenidia	“Annelids (Arenicola); Crustaceans (Prawn, Crab); Molluscs (Pila, Unio); Protochordates, Fishes, Amphibians.”
III.	Tracheas	Insects, Arachnids
IV.	Bucco-pharynx	Frog
V.	Lungs	Ambhībians, Reptiles, Birds and Mammals.

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## Respiratory Disorders

Disease	Characteristic	Prevention and cure
1. Bronchitis	Inflammation of Bronchitis Hyper plasia of sero-mucous glands and goblet cells. Regular coughing with thick greenish yellow sputum.	Avoid exposure to smoke, chemicals and pollutants. Take suitable antibiotics
2. Bronchial Asthama	Hyper sensitivity of Bronchiole. Coughing and difficulty in expiration	Avoid exposure to allergens
3. Emphysema	Inflammation of Bronchioles Lose of elasticity of alveolar sac	Avoid exposure to pollutant and avoid smoking
4. Pneumonia	Infection by Bacteria ( <i>Streptococcus pneumoniae</i> ) or some other bacteria or fungi	Vaccination and Antibiotics
5. Occupational lung disease	Exposure to harmful substances with such as gas, fires and dust, silica and asbestos	Minimise exposure to these chemicals. Use of protective wears and clothing by workers at work place, working in chemical factories.

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**Table-Endocrine System : Hormones and their actions**

S. No.	Endocrine gland	Location	Hormone (GH)	Action
1.	Pituitary (Master glands)	Base of fore brain, pea shaped	Growth hormones (GH), Anti-Diuretic Hormone (ADH) Adenocorticotrophic Hormone (ACTH) Thyroid Stimulating Hormone (TSH) Lutinizing Hormone (LH) Follicle Stimulating Hormone (FSH)	Regulates the growth of the body. Controls the amount of water reabsorbed by the kidney. Stimulates the synthesis and secretion of steroid hormones. Stimulates the synthesis and secretion of thyroxine hormone from the thyroid gland. glucocorticoids. Stimulates ovulation of fully mature follicles. (Follicle stimulating hormone stimulates ovary to produce female hormone).
2.	Pineal	In the brain	Melatonin	Melatonin helps in maintaining the normal rhythm of sleep-wake cycle, body temperature and also influences metabolism, pigmentation, menstrual cycle and defense capability.
3.	Thyroid	Neck of the lower extremity of larynx, butterfly shaped	Thyroxine	Regulates rate of growth and metabolism. Controls the metabolism of carbohydrates, proteins and fats and influences maintenance of water and electrolyte balance.
4.	Thymus	Behind breast bone	Thymosin	Helps in production of antibodies and differentiation of T-lymphocytes.
5.	Adrenal	A pair of cap shaped organs above each kidney	Cortisol Adrenalin and Noradrenalin	Involved in carbohydrate metabolism. Stress hormones, increase heartbeat, the strength of heart contraction and rate of respiration.
6.	Pancreas	Below the stomach, heterocrine gland	Insulin	Regulates sugar metabolism. Too little insulin leads to high sugar level in blood and weakness (a condition called diabetes).
7.	Ovary	Lie on the lateral walls of the pelvis	Estrogen (Progesterone)	Development of secondary sexual characters e.g. development of breasts in female. Supports pregnancy
8.	Testis	In the scrotum	Testosterone	Development of many masculine features such as growth of moustaches and beard.

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## Transportation

- ❖ The coordinated process of carrying out proper distribution of materials as oxygen, water, minerals and organic food among the cells is called **transportation**.
- ❖ Transport system in animals is called the **circulatory system**.

## Blood Circulatory System

There are two types of blood circulatory systems:

**(i) Open Circulatory System:** The blood enters and circulates in the interstitial spaces (space between the tissues). The blood vessels are open-ended as they open into the common cavities called the **haemocoel**, e.g. insects.

**(ii) Closed Circulatory System:** The blood always remains inside the blood vessels and never comes in direct contact with the cells.

## Blood

Blood is liquid connective tissue.

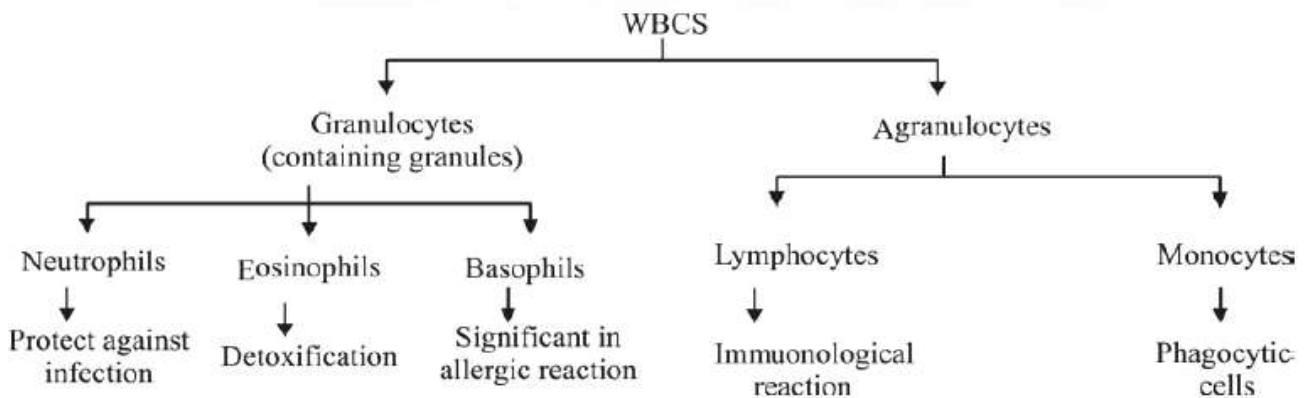
## Composition of Blood

**Plasma:** It is the pale yellowish fluid with a total volume of 2-3 litres in a normal adult. Its contents are 90% water and the rest 10% includes protein, inorganic ions and organic substances.

**Red Blood Cells (Erythrocytes):** These are red in colour, due to the presence of haemoglobin. They do not have a nucleus.

**White Blood Cells (Leucocytes):** They are responsible for the defense system in the body. WBCs are colourless, without haemoglobin

White Blood cells are categorised in the following types –



**Blood Platelets:** They facilitate blood clotting so as to prevent loss of body fluids.

## Heart

The human heart is a muscular, cone shaped organ about the size of a fist. Heart is situated behind the sternum, between the lungs in the thoracic cavity. The human heart is four chambered. In human beings the blood circulation is called **double circulation** because the blood passes twice through the heart during one round of circulation.

## Disorder of Circulatory System

**Hypertension:** Increase in the blood pressure. Normal b.p., must be 120/80 mm Hg. A continuous or sustained rise in the arterial blood pressure is known as hypertension

**Atherosclerosis:** It refers to the deposition of lipids (especially cholesterol) on the walls lining the lumen of large and medium.

**Arterio Sclerosis:** Calcium salts precipitate with cholesterol to harden the deposition and thickening of arteries. It may lead to rupture of wall, blood clot formation or thrombosis.

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Thrombosis may lead to heart attack and even death.

**Heart Failure:** Loose in effective blood pumping by heart. It is also called congestive heart failure.

**Cardiac Arrest:** Sudden damage of heart muscles, which cause stopping of heart beat. Also known as heart attack.

**Angina:** Also called Angina pectoris. It is caused due to unavailability of enough oxygen to the heart muscles.

## Nervous System

The nervous system is concerned with receiving stimuli from the external or internal

environment of the body, interpreting the stimuli and producing the appropriate response to these stimuli.

**Neuron** - The unit of nervous system. The neuron is a special cell which can receive and conduct impulses, sized arteries. This results in heart attack or stroke.

## Vitamin Malnutrition:

Vitamin form very little part of diet but are very important from functional point of view. Deficiency of one or more vitamins can be seen in the form of clear symptoms.

### 1. Vitamins and Health

Vitamin	Function	Food sources	Deficiency symptoms
<b>Water-Soluble Vitamins</b>			
Thiamine (vitamin B <sub>1</sub> )	Growth, fertility, digestion,	Pork, beans, peas, nuts,	Beriberi (neurological disorder)
Riboflavin (vitamin B <sub>2</sub> )	Energy use	Leafy vegetables, dairy products	Hypersensitivity of eyes to light
Folic acid	Manufacture of red blood cells, metabolism	dark green vegetables	Anemia, cancer
Cyanocobalamin (vitamin B <sub>12</sub> )	Manufacture of red blood cell, growth, cell maintenance	Meat, organ meats, fish, shellfish, milk	Pernicious anemia
Ascorbic acid (vitamin C)	growth, tissue repair, bone and cartilage formation	Citrus fruits, tomatoes, strawberries	Weakness, gum bleeding (scurvy)
<b>Fat-Soluble Vitamins</b>			
Retinol (vitamin A)	Night vision, new cell growth	Dairy products, egg yolk, vegetables, fruit	Night blindness, rough dry skin
Cholecalciferol (vitamin D)	Bone formation	Fish-liver oil, milk	Skeletal deformation (rickets)
Tocopherol (vitamin E)	Prevents certain compounds from being oxidized	Vegetable oil, nuts, beans	Anemia in premature infants
Vitamin K	Blood clotting	Egg yolk, green vegetables	Bleeding, liver problem

### 2. Bulk Minerals in the Human Diet

Mineral	Food sources	Functions in the human body
Calcium	Milk products, green leafy vegetables	Bone and tooth structure, blood clotting, hormone release, nerve transmission
Phosphorus	Meat, fish, eggs, poultry, whole grains	Bone and tooth structure
Sodium	Table salt, meat, fish, eggs, poultry, milk	Body fluid balance, nerve transmission, muscle contraction



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## 3. Trace Minerals important to Human Health

Mineral	Food sources	Functions in the human body
Fluorine	Water (in some areas)	Maintains dental health
Iodine	Seafood, iodized salt	Part of thyroid hormone
Iron	Meat, fish, shellfish, egg yolk, peas, beans, dried fruit, whole grains	Transport and use of oxygen (as part of haemoglobin and myoglobin), part of certain enzymes.
Zinc	Meat, fish, egg yolk, milk, nuts, some whole grains	Part of certain enzymes, nucleic acid synthesis

### Protein Malnutrition

Due to poverty, people can't include appropriate quantity of protein in their diets and suffer from malnutrition.

- Protein deficiency causes **Kwashiorkar** disease in children in which body swells due to inflammation. Patient does not feel hungry and becomes irritated. Skin becomes yellow, dry and fragile with black spots.

### Health & Hygiene

- According to World Health Organisation (WHO) health is defined as "a state of complete physical, mental and social well being and not merely the absence of disease.
- **Hygiene is defined as the science and practice of maintaining good health.** It requires caring of one's own body and the immediate surroundings. The major aspects of personal hygiene are cleanliness, physical exercise, rest, sleep and healthy habits.
- **Community and Personal health:** Community health can be defined as "**all the personal health along with the**

**environmental services for the importance of health of community."**

- **Disease may also be defined as morphological (structural), physiological (functional) or psychological disturbance in the body or body parts caused by some external agencies which may be non-parasitic (e.g. deficiency of nutrients) or may be parasitic (caused by viruses, bacteria, fungi, etc.).** Disease causing micro-organisms are known as **Pathogens.**

### Types of Diseases

Diseases are broadly classified into two categories, congenital (genetic) and acquired.

**(i) Congenital Diseases:** Congenital diseases are caused due to defective development of embryo or defective inheritance, e.g. haemophilia, colour blindness.

**(ii) Acquired Diseases:** These diseases develop after birth. Acquired diseases are of two kinds, *infectious* and *noninfectious*.

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## **(a) Infectious/Communicable Diseases:**

These diseases are caused by pathogens/infectious agents such as bacteria, viruses, fungi, protozoans, worms, etc. These diseases can spread from diseased person to healthy person by means of air (droplet method), water, food, insects, physical contact, etc. e.g., tuberculosis, malaria, diarrhoea, etc.

## **(b) Non-infectious/Non-communicable Diseases:**

They are diseases which remain confined to a person. They are neither present at birth nor spread from one person to another. The diseases are caused due to some specific factors. They may be caused due to **improper functioning of an organ** (short sightedness, hypertension, arthritis), hormonal imbalance (diabetes, dwarfism), allergy, cancer, inadequate diet (anaemia, goitre), etc.

## **Means of Spread**

Communicable diseases may be transmitted from the source of infection to susceptible individual in many different ways:

### **(i) Direct Transmission**

**(a) Direct contact:** Infection may be transmitted by direct contact from skin to skin, e.g., diseases transmitted by direct contact include leprosy, skin diseases and eye infections (like conjunctivitis)

**(b) Droplet infection:** Direct project of a spray of droplets of saliva during

coughing, sneezing, speaking and spitting, e.g., whooping cough, tuberculosis, diphtheria, common cold.

### **(ii) Indirect Transmission**

This embraces a variety of mechanisms including the traditional five F's – flies, fingers, fomites, food and fluid.

(a) Transmission of micro-organism through water and food (vehicle-borne transmission), e.g., acute diarrhoea, typhoid, cholera, polio, hepatitis A, food poisoning and intestinal parasites all are transmitted by water and food.

(b) Fomites include contaminated inanimate object. For example soiled clothes, towels, handkerchiefs, cups, spoons, toys. Diseases transmitted by fomites – diphtheria, eye and skin infection.

(c) **Vector borne transmission** occurs when the infectious agent is conveyed by an insect to a susceptible host, Mechanical transmission of the infectious agent through an insect occurs by houseflies. In some cases the infectious agent multiplies in the insect (biological transmissions) and then is transported to susceptible host. For example transmission of malaria by mosquito. Another way is dissemination of microbial agent by air to a suitable portal of entry, usually the respiratory tract. Dust is responsible for this kind of transmission.

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## General Preventive Measures

**(a) Safe drinking water:** Drinking water should be filtered to remove suspended particles and boiled, ozonized and treated with chlorine before drinking to avoid water borne diseases like typhoid, cholera, hepatitis etc.

**(b) Proper disposal of waste:** Garbage should not be dumped here and there rather it should be thrown in covered garbage cans and burnt or buried for disposal. Sewage carrying drains should be covered.

**(c) Control of vectors :** Growth and breeding of animals like mosquitoes, rats, flies, cockroaches should be controlled by keeping surroundings clean, spraying insecticides, removing stagnant water from populated areas.

## Immunity

It involves circulatory system. It is the strongest of the body's defence mechanisms.

**(a) Natural Immunity:** Natural immunity can be acquired by recovering from the attack of a disease. Once the body has suffered an infection and has learned to make antibodies against it, the body retains this ability even though it ceases making the antibodies. Thus when infection occurs again, the body quickly resumes making antibodies against it.

**(b) Acquired Immunity:** Transmitting mild form of microbes of a disease to a healthy person is vaccination. It gives an artificially

acquired form of active immunity. Vaccine acts as antigen which stimulates the inoculated person to produce antibodies which prevents healthy person from the disease against which he has been inoculated. The ability to make antibodies is retained for many years though not for life.

Children are regularly vaccinated against diphtheria, tetanus, whooping cough, polio and small pox. Vaccines for cold, influenza, measles and rabies have been developed. All vaccines whether they contain germs or their toxins are antigens, their main purpose is to stimulate the body to produce antibodies.

## Viral Diseases

### (a) Jaundice or hepatitis

Hepatitis or liver inflammation is a disease related to liver. The cause of this disease is *hepatitis* virus, it propagates through **contaminated water, food or injected needle**. Hepatitis may be of A, B, C, D, E or G type but A and B are more infectious. Incubation period for this disease is 15 to 80 days. High fever, cold, headache, nausea, vomiting and weakness are the symptoms. Dark yellow urine and light yellow faeces are main symptoms of this disease.

**(b) Rabies:** The cause of this disease is a *Rhabdo virus*. This disease propagates by **biting of infected dog, cat, wolf, monkey etc.** High fever, intense headache, contraction of throat and chest muscles with

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pain, excessive secretion of saliva and restlessness are the primary symptoms of the diseases. Since patient develops fear for water, the disease is also called as **Hydrophobia**.

**(c) Polio:** The cause of this disease is a *Enterovirus*. It is propagated through contaminated food, milk and water. Polio or poliomyelitis is a dangerous disease of children. Child suffers paralysis due to damage of central nervous system. **Oral polio** vaccine is the best preventive measure of polio.

**(d) Chicken Pox:** The cause of this disease is a Virus, known as *Varicella zoster*. It propagates through contact with a patient or scab. Patient suffers fever, headache and loss of appetite. Dark red spots appear on back and chest, soon these spots get filled up with water and convert into blisters. Blisters dry after some days and scabbing get started. This is the infectious stage of the disease.

**(e) Measles:** This is a highly infectious disease of children. It propagates through indirect contact or through air. The cause of this disease is *Rubella virus*. Patient gets sore throat due to cold. Red grains appear on face after 4-5 days and after wards spread on entire body. For prevention **MMR vaccination** should be done.

**(f) Dengue:** This is a dangerous disease caused by Dengue virus. It spreads by

mosquito *Aedes aegypti*. Main symptoms are high fever, headache, soreness of eyes and joints and pain in stomach due to convulsions. On growing intensity of disease bleeding starts from nose, mouth, and gums. Patient may vomit with or without blood.

**(g) Ebola virus Disease:** Ebola is a severe and often deadly disease caused by a virus called Ebola virus. It can occur in humans and other primates (monkey, chimpanzee and gorillas).

**Symptoms:** Fever, chills, severe headache, muscle pain, weakness, diarrhea, vomiting, bleeding and often death.

**Occurrence:** Ebola was discovered in 1976 near the Ebola River in the Democratic republic of the Congo. Since then several outbreaks have occurred in Africa. The 2014 outbreak is the largest. The countries affected in this recent outbreak include Guinea, Liberia, Sierra, Leone. In 2014 (October) WHO declared both Nigeria and Senegal free of Ebola virus transmission.

**Transmission:** Spread by direct contact with infected body fluids including but not limited to urine, saliva, sweat, feces, vomit, breast milk and semen. The virus can enter the body through a break in the skin or through mucous membranes, including the eyes, nose and mouth. It can also spread by contact with any surface, objects and materials that have been in contact with body fluids from a sick person such as

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clothing bandages, medical equipment, needles, syringes etc.

### **AIDS**

Full name is **Acquired Immuno Deficiency Syndrome**. It is a severe, life threatening disease, first recognized in 1981. The causative organism of this disease is (HIV-1 and HIV-2). "Human immuno deficiency virus" which is a '*Retro virus*'. HIV attacks the immune system by destroying CD4+ T cells, a type of white blood cell that is vital to fighting off infection. The destruction of these cells makes people vulnerable to other diseases and infections and may ultimately lead to death of the patient.

A person is diagnosed with AIDS when the count of CD4+ T cells goes below 200 cells per ml<sup>3</sup> of blood.

The virus is transmitted from an infected person to a healthy person mainly through sexual contact and exposure to blood or tissues, or transplacental transmission from an infected mother to the foetus. 1st case in 1981 America; 1st case in India 1986, Chennai.

**Symptoms:** Swollen lymph nodes, Decreased count of blood platelets causing hemorrhage and fever, severe damage to brain which may lead to loss of memory, ability to speak and even think.

**Treatment:** There is no specific treatment. Foetal infection can be reduced by using anti

-HIV drug to reduce transmission of virus to the foetus of pregnant mothers.

### **Drugs used**

(1) AZT (Azido thymidine)

(2) DD I (Dideoxyinosine)

These drugs inhibit the enzyme reverse transcriptase of HIV.

### **Diseases caused by BACTERIA**

**(a) Tuberculosis (T.B):** Tuberculosis (T.B) was first discovered by Robert Koch in 1882. It is an infectious disease which is communicated from one human being to another directly or indirectly. Tuberculosis may also be contracted from animals. It is caused by a bacterium called *Mycobacterium tuberculosis*. The bacterium releases a toxin called **Tuberculin**. In T.B., the patient feels sick and weak. There is a loss of appetite and weight. Typical fever pattern and night sweats are also common. Child must be vaccinated for B.C.G. within few hours after birth. Antituberculosis (ATT) and DOTS treatment methods are available.

**(b) Typhoid:** Typhoid is caused by the bacteria *Salmonella typhi* commonly found in intestine of man. Human infection is direct and the bacteria are spread through faecal matter by house flies, etc. Symptom of this disease is continuous increase in body temperature for a week. Second week temperature remains constant. Meanwhile red grains appear on stomach. Body temperature decreases during 3rd and 4th

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weeks. **TAB-vaccination** provides immunity for three years. **Oral Typhoid Vaccine** (OTV) is also available. Patient can take antibiotics drugs on advice of a doctor.

**(c) Tetanus:** It is fatal disease caused by bacterium *Clostridium tetani*. These bacteria grow on fertile soil, dung etc. and enter human body through wounds or cuts on body. The cause of the disease is a toxic secretion from bacteria known as *Tetanospasmin*.

Due to this cramps start on back, jaws and neck. In intense condition entire body contracts in shape of a bow. In the end patient can't respire due to cramps in neck muscles and dies painfully. For prevention **D.P.T.** vaccine dose is given to infants. To save infants from infection mothers should be vaccinated compulsorily.

### **DISEASE CAUSED BY PROTOZOA**

**Malaria:** Malaria is caused by a protozoan parasite *Plasmodium*. This spreads through the bite of an insect vector-female anopheles mosquito which feeds on human blood. (male anopheles mosquito feeds upon plant juices). Headache, nausea, muscular pains and high fever are the main symptoms of malaria. Malaria may also secondarily cause enlargement of spleen and liver.

Larvivorous fishes like *Gambusia*, *Minnows*, *Trouts* should be kept in large water bodies. These fishes feed on mosquito larvae and help us. Mosquito repellents can also be

used. Patient can be given drugs like *quinine*, *chloroquine*, *primaquine*, *peludrine* etc. on advice of a doctor.

**Antibiotic** Antibiotic is a substance produced by a living organisms which is toxic (poisonous) for other living organisms, specially for the germs (Bacteria). In the year 1928, Sir Alexander Fleming while studying bacteria in a culture being prepared in his laboratory found that bacteria did not grow around a green mould, *Penicillium notatum*, which was also present in the culture. This was the first antibiotic discovered and extracted and named as penicillin.

**Antiseptic:** Joseph Lister, an English surgeon found that pus formation in a wound is reduced or checked when it is immediately cleaned with carbolic acid. He named carbolic acid as antiseptic. He also introduced the system of boiling and washing surgical instruments with carbolic acid and cleaning hands with carbolic soap. This practice killed germs and it was termed as 'sterilization'. Later alcohol, chlorination and solution of potassium permanganate also came into use for sterilization.

**Vaccine:** It was British Physician, Edward Jenner who noticed that milkmaids often contracted mild infection of 'cow pox' and also found that once a maid has suffered from cow pox gets immune to cowpox and small pox. Jenner collected cow-pox fluid

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from one patient and pushed it into the blood of a healthy cowboy. The infected cowboy got ill for 2 to 3 days only and had become immune to small pox for life. The fluid from cow-pox was termed as vaccine (vacca meaning cow in latin). The process of injecting vaccine in a healthy person is termed as vaccination. Resistance to disease for the future is called immunisation.

### Types of vaccines

**First Generation Vaccines:** These vaccines are prepared by inactivating the whole pathogen. These vaccines have been

effectively used to control a number of diseases. **For eg:** Influenza, measles, rubella, cholera, polio

**Second generation Vaccine:** These vaccines use only the specific part (the antigen) of the pathogen. Antigenic polypeptides of pathogens are produced with recombinant DNA technology. **For eg:** Hepatitis B

**Third generation Vaccine:** These are the most recent vaccines called DNA vaccines in which either naked DNA is used directly or packaged in a recombinant virus or bacteria.

Vaccine	Protect against	Given at
5 in one vaccine	Diphtheria, tetanus, whooping cough Polio & Hib (Haemophilum influenzae)	2, 3, 4 months of age
Pneumococcal (PCV)	Pneumococcal infection	2, 4, & 12 - 13 months of age
Rotavirus	Rotavirus infection (childhood diarrhoea and sickness)	2 - 3 months of age
Meningitis C (Men C)	Meningitis C	3, & 12-13 months of age and a teenage booster at 13-15 years
MMR	measles, mumps and rubella	12-13 months & 3 years 4 months of age
4 in one preschool booster	Diphtheria, tetanus, whooping cough and polio	3 years 4 months of age.

### Biodiversity

Biodiversity is the term popularised by the sociobiologist Edward Wilson to describe the combined diversity at all the levels of biological organisation.

The most important of them are–

(i) **Genetic Diversity:** A single species might show high diversity at the genetic level over its distributional range. The genetic variation shown by the medicinal plant

*Rauwolfia vomitoria* growing in different Himalayan ranges might be in terms of the potency and concentration of the active chemical (reserpine) that the plant produces. India has more than 50,000 genetically different strains of rice, and 1,000 varieties of mango.

(ii) **Species Diversity:** The diversity at the species level. For example, the Western

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Ghats have a greater amphibian species diversity than the Eastern Ghats.

(iii) **Ecological Diversity:** At the ecosystem level, India, for instance, with its deserts, rain forests, mangroves, coral reefs, wetlands, estuaries, and alpine meadows has a greater ecosystem diversity than a Scandinavian country like Norway.

## **Biodiversity Conservation**

Biodiversity conservation may be in situ as well as ex situ. In in situ conservation, the endangered species are protected in their natural habitat so that the entire ecosystem is protected. Recently, 34 'biodiversity hotspots' in the world have been proposed for intensive conservation efforts. Of these, three (Western Ghats- Sri Lanka, Himalaya and Indo-Burma) cover India's rich biodiversity regions. Our country's in situ conservation efforts are reflected in its 18 biosphere reserves, 112 national parks, > 515 wildlife sanctuaries and many sacred groves. Ex situ conservation methods include protective maintenance of threatened species in zoological parks and botanical gardens, in vitro fertilisation, tissue culture propagation and cryopreservation of gametes.

## **Threatened Species Concept**

- The International Union for Conservation of Nature and Natural Resources (IUCN), have its head quarters at Morgis in Switzerland and maintains a Red Data Book that

provide a record of animals and plants which are known to be in danger.

- In India the Wildlife(Protection) Act, 1972 provides four schedules categorising the fauna of India based on their conservation status. Schedule 1 lists the rare and endangered species which are afforded legal protection. For the purpose of conservation species are categorized as below:

**Threatened (T):** The term is used in context with conservation of the species which can be anyone of the above 3 categories.

**Threatened = Endangered + Vulnerable + Rare**

**1. Endangered (E):** Those species which are in the immediate danger of extinction and whose survival is unlikely, whose number have been reduced to a critical level, if the casual factors continue to be operating.

**2. Vulnerable (V):** The species likely to move into the endangered category in the near future if the casual factors continue to operate. Their population is still abundant but are under threat throughout their range.

**3. Rare (R):** These are species with small population in the world. These are not at present endangered and vulnerable, but are at risk due to their less number. These species are usually localised within restricted geographical areas or habitats.



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## Biosphere Reserves

It is a specified protected area in which multiple use of the lands are permitted.

There are 3 zones of biosphere reserve.

1. **Core zone:** It lies at the centre where no human activity is allowed.
2. **The Buffer zone:** Where limited human activity is allowed.
3. **Manipulating zone or Transition zone:** Where a large number of human activities would go on.

**Note:** In India following 18 sites have been identified as potential biosphere reserves together with their locations

## Biosphere Reserve States

1. Nanda Devi - Uttaranchal
2. Nokrek - Meghalaya
3. Manas - Assam
4. Dibru Saikhowa - Assam
5. Dehang Debang - Arunachal Pradesh
6. Sunderbans - West Bengal
7. Gulf of Mannar - Tamil Nadu
8. Nilgiri - Kerala, Karnataka and Tamil Nadu
9. Great Nicobar - Andaman & Nicobar
10. Simlipal - Orissa
11. Kanchanjunga - Sikkim
12. Pachmarhi - Madhya Pradesh
13. Agasthyamalai - Kerala
14. Achankamar - Madhya Pradesh, Chattisgarh
15. Great Rann of Kutch (2008) - Gujarat
16. Cold desert (2009) - Himachal Pradesh

17. Seshachalam hills (2010) - Andhra Pradesh

18. Pauna (2011) - Madhya Pradesh

## National Parks and Main Sanctuaries In India

**National Parks:** In national parks both plants and animals are protected. There are 112 National Parks which occupy about 1.21% of the country's total surface area.

**Sanctuaries:** There are 515 wildlife Sanctuaries.

## India's Famous Tiger Reserve:

- \* Jim Corbett National Park - Nainital (Uttaranchal)
- \* Dudhwa National Park - Lakhimpur Kheri (U.P.)
- \* Kanha National Park - Mandala and Salghat (Madhya Pradesh)
- \* Indrawati National Park - Chattisgarh
- \* Simli National Park - Orissa

## Genetically Modified Crops:

- Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO).
- A transgenic crop is a crop that contains and expresses a transgene (genetically modified gene). This crop is known as *genetically modified crops or GM crops*.

## Two unique Advantages:

(i) Any gene (from any organism or a gene synthesised chemically) can be used for transfer, and

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(ii) The change in genotype can be precisely controlled since only the transgene is added into the crop genome. For example - Hirudin is a protein that prevents blood clotting. The gene encoding hirudin was chemically synthesized and transferred into *Brassica napus*, where hirudin accumulates in seeds. The hirudin is purified and used in medicine. A soil bacterium *Bacillus thuringiensis*, produces crystal [Cry] protein. This Cry protein is toxic to larvae of certain insects. The gene encoding cry protein is called cry gene. This Cry protein is isolated and transferred into several crops. A crop expressing a cry gene is usually resistant to the group of insects for which the concerned Cry protein is toxic.

### **Biofertilizers**

Micro-organisms (bacteria, fungi and cyanobacteria) employed to enhance the availability of nutrients like nitrogen (N), and phosphorus (P) to crops are called biofertilizers. Several microorganisms fix atmospheric nitrogen and make them available to plants.

**Examples** of nitrogen-fixing micro-organisms are bacteria and cyanobacteria (blue-green algae); some of these are free-living, while others form symbiotic association with plant roots. Rhizobia form root nodules in legume crops and some cyanobacteria (bluegreen algae) form symbiotic association with the fern **Azolla**.

The fungus and plant root association is called **mycorrhiza**. Some of these fungi are present on root surface only, whereas others enter into the roots as well. These fungi solubilise phosphorus, produce plant growth promoting substances and protect host plants from soil pathogens.

Biofertilisers are a low-cost input and they do not pollute the environment. They also reduce the dependence on chemical fertilisers and also help to use organic farming.

### **Achievements of Genetic Engineering**

The DNA recombinant technology or genetic engineering provides great benefits for advancement of science and society.

(1) A new system of medicine gene therapy, may develop to treat hereditary diseases such as haemophilia. Genetic disorder can be over come by introducing specific gene.

(2) Bacteria may be used as "living factories" for synthesizing vitamins, hormones and antibodies.

- Human insulin (Humulin) was first genetically engineered product produced by an American firm Eli Lilly - 5th July 1983.
- Charles Weismann of university of Zurich, obtained interferon through recombinant *E.coli* (1980) Microbes have been engineered to produce human growth hormone (HGH) for curing dwarfism.

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- Vaccines which are produced by genetic engineering e.g., for Hepatitis-B and Herpes virus.
- Nitrogen fixation genes may be transferred from bacteria to the major food crops to boost food production without using expensive fertilizers.
- Transgenic plant obtained through recombinant DNA technology. First transgenic plant was tobacco. It contains resistant gene against weedicide (Glyphosate).
- First transgenic animal was mouse containing gene for growth hormone.
- First introduced transgenic crop in India (2002) is Bt-cotton. It is resistant for boll worm (*Helicoperpa armigera* - Larva of insect). It is formed by transfer of pest resistant

gene from *Bacillus thuringiensis* (bt-2 gene encoding Bt-toxin). *Bacillus thuringiensis* produces a toxic protein called crystal protein (Cry-Protein) this protein is toxic for larva of certain insect. This protein kills the insect by inhibiting ion transport in midgut (bt 2 gene is called cry-gene)

- In pollution control, microbes have been engineered to break up the crude oil spills. **Dr. Ananda Mohan Chakraborti** introduced plasmid from different strains in to single cell of *Pseudomonas putida*. The result was new genetically engineered bacterium which would be used in cleaning oil spills called "**Super bug**" (oil eating bug)

### Applications of Recombinant DNA products

Medically useful recombinant products	Applications
Human insulin Human growth hormone Calcitonin Chorionic gonadotropin Blood clotting factor VIII/IX  Tissue Plasminogen activator (TPA) Erythropoietin	Treatment of insulin - dependent diabetes Replacement of missing hormone in short stature people. Treatment of rickets. Treatment of infertility. Replacement of clotting factor missing in patients with Haemophilia A/B. Dissolving of blood clots after heart attacks and strokes. Stimulation of the formation of erythrocytes (RBCs) for
Platelet derived growth factor Interferon Interleukin Vaccines	patients suffering from anaemia during dialysis or side effects of AIDS patients treated by drugs. Stimulation of wound healing Treatment of pathogenic viral infections and cancer Enhancement of action of immune system Prevention of infectious diseases such as hepatitis B, herpes, influenza, pertusis, meningitis, etc.

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## Application of Genetically Engineered Microbes

Microbes	Applications
<i>Escherichia coli</i> (gut bacterium)	Production of human insulin, human growth factor interferons, interleukin and so on.
<i>Bacillus thuringiensis</i> (soil bacterium)	Production of endotoxin (Bt toxin), highly potent, safe and biodegradable insecticide for plant protection.
<i>Rhizobium meliloti</i> (bacterium)	Nitrogen fixation by incorporating "nif" gene in cereal crops.
<i>Pseudomonas putida</i> (bacterium)	Scavenging of oil spills, by digesting hydrocarbons of crude oil.
Bacterial strains capable of accumulating heavy metal	Bioremediation (cleaning of pollutants in the environment).
<i>Trichoderma</i> (fungus)	Production of enzyme chitinase for biocontrol of fungal diseases in plants.

## Transgenics and their potential applications

Transgenic	Useful applications
Bt Cotton <i>Flavr Savr</i> (Tomato)	Pest resistance, herbicide tolerance, and high yield. Increased shelf-life (delayed ripening) and better nutrient quality
Golden Rice Cattles (Cow, sheep, goat) Pig	Vitamin A and Fe - rich Therapeutic human proteins in their milk Organ transplantation without risk of rejection

## CHEMISTRY

### Matter

In general it exists in 3 states i.e.,

- (i) Solid
- (ii) Liquid
- (iii) Gas.

Now-a-days there is a discussion on two more states of matter i.e., Plasma (Ionised gases containing super energetic and super excited particles and Bose-Einstein

condensates or BEC (a gas at super low temperatures with extremely low density).

### Boiling Point

The temperature at which liquid converts in to vapours is called its boiling point. Boiling point of water is 100°C. The boiling point increases in the presence of impurities. That's why boiling point of sea water is more than the boiling point of pure water (as the former contains impurity). It

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usually decreases at high altitudes, that's why at high altitudes, the boiling point of water is less than 100°C and more time is required to cook a food.

## Melting point

**Melting Point** It is a temperature at which a substance converts from its solid state to liquid state. Melting point of ice is 0°C; It decreases in the presence of impurity.

## Atom, Molecule and Element

Atom is the smallest particle of a matter that takes part in chemical reactions, but cannot exist in free state. Atom is made up of electrons, protons and neutrons. Protons and neutrons reside in the nucleus (at the centre of atom) whereas electrons revolve around the nucleus. Atoms combine to form molecules, the smallest part of matter which can exist in free state.

## Isotopes and Isobars

Isotopes have the same number of protons (i.e., atomic number), but different number of neutrons and mass number (atomic number + number of neutrons), e.g.,  ${}_1\text{H}^1$ ,  ${}_1\text{H}^2$ .

Isobars have the same mass number but different atomic number.

Example:  ${}_{18}\text{Ar}^{40}$ ,  ${}_{19}\text{K}^{40}$

## Dating Techniques

Radiocarbon dating is used to determine the age of carbon bearing materials like wood, animal fossils etc.

Uranium dating is used to determine the age of Earth, minerals and rocks.

## Battery

Battery is a device, used to convert chemical energy into electrical energy and is of two types

(i) Primary batteries (non-rechargeable) act as galvanic cell, e.g., dry cell, mercury cell etc.

(ii) Secondary Batteries: (rechargeable) Act as galvanic as well as voltaic cell Eg: lead storage battery, nickel cadmium battery etc.

## Corrosion

The oxidative deterioration of a metal surface by the action of environment is called corrosion, an electrochemical process. When iron is exposed to air, iron surface turns brown due to the formation of hydrated ferric oxide ( $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ ) which is also called rust, Silver - Surface turns black due to the formation of silver sulphide ( $\text{Ag}_2\text{S}$ )

## Renewable Non-renewable Natural Resources

Renewable resources are available in large excess, i.e., never ends, e.g., air, sunlight etc. Non-renewable resources are available in limited quantity and end, if used excessively, after a limited period of time. e.g., mineral, coal, petroleum, natural gas etc.

**Fuels:** The substance, which produce heat and light on combustion are called fuels.

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Fuel	composition	sources
Water gas	Carbon monoxide (CO) + hydrogen (H <sub>2</sub> )	By passing steam over red hot coke
Producer gas	Carbon monoxide (CO) + Nitrogen (N <sub>2</sub> )	By passing insufficient air over red hot coke
Coal gas	Hydrogen + methane + Ethylene + Acetylene + CO + Nitrogen	By fractional distillation
Natural gas	Methane (83%) + Ethane	From petroleum
Liquefied petroleum gas (LPG)	Butane (CH <sub>4</sub> ) 95%	From petroleum
Compressed natural gas (CNG)	Methane (CH <sub>4</sub> ) 95%	From petroleum
Biogas or Gobar gas	Methane (CH <sub>4</sub> ) + Carbon dioxide (CO <sub>2</sub> ) + Hydrogen (H <sub>2</sub> ) + Nitrogen (N <sub>2</sub> )	From organic wastes

## Physical and Chemical Changes

- Physical changes are the change, which only affect the physical properties like colour, hardness, density, melting point etc. of matter, but do not affect the composition and chemical properties of matter.
- A physical change is temporary, while a chemical change is **permanent**.
- Crystallisation, sublimation, 'boiling, melting, vaporisation, cutting of trees, dissolving sugar or salt in water etc. are physical changes.
- Chemical changes affect the composition as well as chemical properties of matter and result in the formation of a new substance.
- Burning of fuel, burning of candle and paper, electrolysis of water, photosynthesis, ripening of fruits etc, are examples of chemical changes.

## Coal

Coal is obtained by carbonization of vegetable matter and is available in different varieties:

- Peat- 60% C
- Lignite or Brown Coal – 70% C
- Bituminous – 60 to 80 % C
- Anthracite Coal – 90% C

**Flame** contains three parts

- Innermost Part- which is black due to the presence of unburned carbon particles- has lowest temperature.
- Middle part – is yellow due to incomplete combustion of fuel.
- Outermost part- which is blue due to complete combustion of fuel is the hottest and used by goldsmith to heat the gold.

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## Fire Extinguishers

- Water extinguishes fire because as it evaporates, the vapours surround the burning substance, cutting off the oxygen supply, thus inhibiting burning process.
- In case of electrical or oil (petrol) fires, water cannot be used as extinguisher. This is because water is a conductor of electricity and heavier than oil. Thus, oil floats over it and continues to burn.
- Carbon dioxide, which is generated by the reaction of baking soda with acid, is used to extinguish electrical or oil fires. Quality of petrol is measured in terms of octane number and that of diesel in terms of cetane number.

## Safety Matches

In safety matches, the stick consists of a mixture of antimony trisulphide and potassium chlorate at its one end. The box side contains a mixture of powdered glass and phosphorus.

## ACIDS, BASES AND SALTS

### Acids

- These are the substances, which have a sour taste and turn blue litmus red.
- These are good conductors of electricity in aqueous solution.
- Pickles are always kept in glass jars because the acid present in them reacts with metal to produce hydrogen gas.

### Bases

- These are the substances, which have a bitter taste and turn red litmus blue.
- They give different colours in acid and base solutions.

### Salts

- These are the products of neutralisation reactions between an acid and a base.
- pH is the measure of acidity/basicity.

## Inorganic and Organic Chemistry

### Carbon Dioxide

- It is an acidic oxide of carbon and is used by green plants for photosynthesis. It does not help in burning.
- Air and our breath contain carbon dioxide. Thus, when lime water is kept in air or we pass our breath into it, the lime water turns milky.

### Carbon Monoxide

It is a neutral oxide of air and has more affinity towards haemoglobin than oxygen (about 200 times more). That's why in the environment of carbon monoxide – which is a non-poisonous gas – people die for the need of oxygen.

- It is dangerous to sleep in an unventilated room with fire burning inside because the fire produces carbon monoxide and carbon dioxide gases.

### Plaster of Paris

- It is chemically calcium sulphate hemihydrate ( $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ ) and is prepared by heating gypsum – which is

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calcium sulphate dehydrate ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) at 373 K.

- On Mixing with water, plaster of Paris further sets into a hard solid, called gypsum. Thus, it is used to plaster fractured bones, for making toys, materials for decoration and for making surfaces smooth.

### Portland Cement

- It is a complex mixture of silicates and aluminates of calcium with small amount of gypsum. Raw materials used for the manufacture of Portland cement are limestone and clay.

- The composition of Portland cement is calcium oxide (50-60%), alumina (5-10%), and magnesium oxide (2-3%). Gypsum is added to cement to decrease its rate of setting.

- In cement, if lime is in excess, cement cracks during setting and if lime is less, cement is of weak strength.

- Mortar a mixture of sand, cement and water is used for joining bricks and plastering walls.

- Concrete—a mixture of gravel, sand, cement and water is used for flooring and making roads

- Reinforced Concrete Cement (RCC)—which is concrete with steel bars and wires is used for constructing roofs, bridges and pillars

### Glass

Glass—an amorphous solid or super-cooled liquid—contains maintz silica ( $\text{SiO}_2$ ).

### Different substances are added to obtain glass of different colours

Colour	Substance added
Red	Copper oxide ( $\text{CuO}$ )
Green	Chromium oxide ( $\text{Cr}_2\text{O}_3$ )
Blue	Cobalt oxide ( $\text{CoO}$ )
Brown	Iron oxide ( $\text{Fe}_2\text{O}_3$ )

### Heavy water

- Heavy water is water that contains heavy hydrogen or deuterium.

- Deuterium differs from the hydrogen usually found in water, protium, in that each atom of deuterium contains a proton and a neutron.

- Heavy water may be deuterium oxide,  $\text{D}_2\text{O}$  or it may be deuterium protium oxide,  $\text{DHO}$ . **Note:** Heavy water occurs naturally, although it is much less common than regular water. Approximately one water molecule per twenty million water molecules is heavy water.

### Hard Water

- The water in which soluble bicarbonates of calcium and magnesium are present, is called temporary hard water and in which soluble sulphates and chlorides of



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magnesium and calcium are present is called permanent hard water.

- The temporary hardness of water is removed by boiling or by adding calcium hydroxide,  $\text{Ca(OH)}_2$ —the Clark's process .The permanent hardness of water is removed by adding sodium carbonate ( $\text{Na}_2\text{CO}_3$ ), or calgon (sodium hexametaphosphate,  $\text{Na}_2[\text{Na}_4(\text{P}_3\text{O}_{10})]$ )

### Hardening of Oil (Hydrogenation)

Oil, an unsaturated fat when heated with nickel catalyst and hydrogen gets converted into a solid mass, called ghee, a saturated fat. This process is called hardening of oil and is carried out through hydrogenation in the presence of nickel as a catalyst.

### Some Important Ores of Metals

**Ores** - Those minerals from which the metals are extracted commercially and economically and with minimum effort are called Ores of Metals.

Name of Elements	Ores	Chemical Formulae
Aluminum (Al)	Bauxite Corundum Kryolite	$\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ $\text{Al}_2\text{O}_3$ $\text{Na}_3\text{AlF}_6$
Iron (Fe)	Hematite Magnetite IronPyrite Siderite	$\text{Fe}_2\text{O}_3$ $\text{Fe}_3\text{O}_4$ $\text{FeS}_2$ $\text{FeCO}_3$

Copper (Cu)	Copper Pyrite Copper Glance Malachite	$\text{CuFeS}_2$ $\text{Cu}_2\text{S}$ $2\text{CuCO}_3 \cdot \text{Cu(OH)}_2$
Zinc (Zn)	Zinc Blende Calamine	$\text{ZnS}$ $\text{ZnCO}_3$
Sodium (Na)	RockSalt Sodium Carbonate	$\text{NaCl}$ $\text{Na}_2\text{CO}_3$
Potassium (K)	Karnalite Salt Petre	$\text{KClMgCl}_6 \cdot \text{H}_2\text{O}$ $\text{KNO}_3$
Lead (Pb)	Galena Anglesite	$\text{PbS}$ $\text{PbCl}_2$
Tin (Sn)	Tin Pyrites Classiterite	$\text{Cu}_2\text{FeSnS}_4$ $\text{SnO}_2$
Silver (Ag)	Silver Glance	$\text{Ag}_2\text{S}$
Gold (Au)	Calverite Sybarite	$\text{AuTe}_2$ $\text{AgAuTe}_2$
Mercury (Hg)	Cinnabar Calomel	$\text{HgS}$ $\text{Hg}_2\text{Cl}_2$
Magnesium (Mg)	Dolomite Karnalite	$\text{MgCO}_3 \cdot \text{CaCO}_3$ $\text{KClMgCl}_6 \cdot 6\text{H}_2\text{O}$

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Phosphorous (P)	Phosphorite Floeropetite	$\text{Ca}_3(\text{PO}_4)_2$ $3\text{Ca}_3(\text{PO}_4)_2$
Calcium (Ca)	Lime Stone Dolomite	$\text{CaCO}_3$ $\text{MgCO}_3$

- Generally transition metals and their compounds are coloured.
- Zeolite is used to remove hardness of water.
- In cytochrome iron (Fe) is present.
- Selenium metal is used in photo electric cell.
- Gallium metal is liquid at room temperature.
- Palladium metal is used in aeroplane.
- Radium is extracted from pitchblende.
- World famous Eiffel Tower has steel and cement base.
- Actinides are radio-active elements.
- Cadmium rod is used in nuclear reactor to slow down the speed of neutron.
- Sodium peroxide is used in submarine and also to purify closed air in hospital.
- Co (Cobalt) is used in cancer treatment.
- Onion and garlic odour due to potassium.
- Oxides of metals are alkaline.
- Silver and copper are the best conductor of electricity.
- Gold and Silver are the most malleable metal.
- Mercury and iron produces more resistance in comparison to the other during the flow of electricity.
- Lithium is the lightest and the most reductant element.
- In fireworks, crimson red colour is due to presence of strontium (Sr). Green colour is

## FACTS ABOUT SOME METALS

- Zinc phosphide is used for killing rats.
- Wood furniture are coated with zinc chloride to prevent termites.
- Excess of copper in human beings causes disease called Wilson.
- Galvanised iron is coated with zinc.
- Rusting of iron is a chemical change which increases the weight of iron.
- Calcium hydride is called hydrolith.
- Calcium hydride is used to prepare fire proof and waterproof clothes.
- In flash-blub, magnesium wire is kept in atmosphere of nitrogen gas
- Titanium is called strategic metal because it is lighter than iron.
- Babbitt metal contains 89% Sn (Tin), Sb (Antimony) and 2% Cu (Copper).
- Chromium trioxide is known as chromic acid.
- Nichrome wire is used in electrical heater.
- Potassium carbonate ( $\text{K}_2\text{CO}_3$ ) is known as pearl ash.

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due to the

presence of Barium in fireworks.

- Barium sulphate is used in X-ray of abdomen as barium meal.
- Barium hydroxide is known as Baryta water.
- Osmium is the heaviest metal and the Platinum is the hardest.
- Zinc oxide is known as flower of zinc. It is also known as Chinese white and used as white paint.
- Silver chloride is used in photo chromatic glass.
- Silver iodide is used in artificial rain.
- Silver nitrate is used as marker during election. It is kept in coloured bottle to avoid decomposition.
- Silver spoon is not used in egg food because it forms black silver sulphide.
- To harden the gold, copper is mixed. Pure gold is 24 carat. Iron Pyrites ( $\text{FeS}_2$ ) is known as fool's gold.
- Mercury is kept in iron pot ,because it doesn't form amalgum with iron.
- In tube light there is the vapour of mercury and argon.
- Tetra-Ethyl lead is used as anti knocking compound.
- Lead-pipe is not used for drinking water because it forms poisonous lead hydroxide.
- Fuse wire is made up of lead and tin.
- Chlorofluoro carbon is known as Freon used as refrigerant

- Non-stick utensil is made up of Teflon.
- Chlorine is used to prepare PVC, insecticides herbicides etc. Bromine is used in ethylene bromide synthesis which is mixed with added petrol.
- In the preparation of AgBr which is used in photography.

## CHEMICAL COMPOUNDS AND USES

### **1. Compound Name: calcium carbonate**

Formula:  $\text{CaCO}_3$

Uses: Non-prescription drug for relief from acid indigestion and heartburn. Also considered a calcium supplement.

### **2. Compound Name: sodium chloride**

Formula:  $\text{NaCl}$

Uses: Used to season food (during food preparation and at the table), also used in the past as a method of food preservation.

### **3. Compound Name: Methane**

Formula:  $\text{CH}_4$

Uses: natural gas, fuel (also called Marsh Gas)

### **4. Compound Name: Aspirin**

Formula:  $\text{C}_9\text{H}_8\text{O}_4$

Uses: Pain Reliever

### **5. Compound Name: Potassium tartrate**

**Formula:  $\text{K}_2\text{C}_4\text{H}_4\text{O}_6$**

Uses: cream of tartar, cooking

### **6. Compound Name: Baking soda**

Formula:  $\text{NaHCO}_3$

Uses: cooking

### **7. Compound Name: Acetaminophen**

Formula:  $\text{C}_8\text{H}_9\text{NO}_2$

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Uses: Pain Reliever

### **8. Compound Name: Acetic acid**

Formula:  $C_2H_4O_2$

Uses: Active ingredient in vinegar

### **9. Compound Name: Caffeine**

Formula:  $C_8H_{10}N_4O_2$

Uses: stimulant in coffee, tea, some soda

### **10. Compound Name: Propane**

Formula:  $C_3H_8$

Uses: fuel for cooking

### **11. Compound Name: Sodium carbonate**

Formula:  $Na_2CO_3$

Uses: washing soda

### **12. Compound Name: Phosphoric acid**

Formula:  $H_3PO_4$

Uses: flavouring in soda

### **13. Compound Name: Ascorbic acid**

Formula:  $C_6H_8O_6$

Uses: Essential vitamin (vitamin C)

### **14. Compound Name: Ammonia**

Formula:  $NH_3$

Uses: fertilizer, household cleaner when dissolved in water

### **15. Compound Name: Ethylene glycol**

Formula:  $C_2H_6O_2$

Uses: antifreeze

### **16. Compound Name: Calcium carbonate**

Formula:  $CaCO_3$

Uses: antacid

### **17. Compound Name: Ethanol**

Formula:  $C_2H_5OH$

Uses: disinfectant, alcoholic beverages

### **18. Compound Name: Carbon dioxide**

Formula:  $CO_2$

Uses: carbonating agent in soda

### **19. Compound Name: Hydrochloric acid**

Formula:  $HCl$

Uses: production of batteries, photoflash bulbs and fireworks. It's even used to process sugar and make gelatin.

### **20. Compound Name: calcium oxide**

Formula:  $CaO$

Uses: Less common in modern homes than in the past. Glows when heated; was used in theatres before invention of electric lighting. Health risks on skin contact or inhalation.

### **21. Compound Name: Sucrose**

Formula:  $C_{12}H_{22}O_{11}$

Uses: Used in cooking.

Use as a sweetener.

### **22. Compound Name: potassium carbonate**

Formula:  $K_2CO_3$

Uses: Potash is the common name for various mined and manufactured salts that contain potassium in water-soluble form.

### **23. Compound Name: Plaster of Paris**

Formula:  $2CaSO_4 \cdot \frac{1}{2}H_2O$

Uses: used for casts to hold broken limbs in place, modelling casts, sculptures and in plasterboard walls and ceilings

### **24. Compound Name: Gypsum**

Formula:  $CaSO_4 \cdot 2H_2O$

Uses: Use to manufacture dry wall, plaster, joint compound.

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## **25. Compound Name: sodium bicarbonate**

Formula:  $\text{NaHCO}_3$

Uses: Used in baking where it reacts with other ingredients, releasing carbon dioxide ( $\text{CO}_2$ ), helping dough rise.

## **26. Compound Name: sulphuric acid**

Formula:  $\text{H}_2\text{SO}_4$

Uses: Used in lead-acid batteries for cars and other vehicles. Formerly it was known as vitriol.

## **27. Compound Name: hydrogen peroxide**

Formula:  $\text{H}_2\text{O}_2$

Uses: Used as a mouth wash (Personal Hygiene)

## **Separation of Mixtures**

### **Filtration**

It is used to separate an insoluble solid component of the mixture from the soluble component in a given solvent.

Eg: A mixture of naphthalene and urea is separated by dissolving it in water and filtering the solution.

### **Crystallization**

The salt obtained from the sea water is purified by this method.

### **Evaporation**

It is the process used to separate the volatile component from its non-volatile solute

Eg: When we heat the blue or black ink indirectly, evaporation of the solvent takes place and coloured dye is obtained as residue.

### **Centrifugation**

It is the process used to separate the cream from full-cream milk by the use of milk churner. Toned and double toned varieties of milk are obtained by this method

### **Sublimation**

It is used to separate sublimable volatile substances such as ammonium chloride,  $\text{NH}_4\text{Cl}$  from non-sublimable substance such as sodium chloride ( $\text{NaCl}$ ). Examples of sublimable substances are iodine, naphthalene, camphor.

### **Distillation**

It is used to separate

- Volatile component from non-volatile component and
- Liquids having sufficient difference in their boiling points. Eg. Chloroform (b.p. 334K) and aniline (b.p. 457K) are easily separated by distillation. It is used to prepare distilled water from ordinary water.

**Fractional Distillation** - It is used when difference in boiling points of the liquids is small. Industrially this process is used in refining of crude petroleum and manufacturing of alcoholic beverages such as Rum, Gin, Whisky etc.

**Steam Distillation** - It is used to purify those substances which are steam volatile and are immiscible with water. Eg. Aniline

**Vacuum Distillation** - It is used to purify those substances which decompose at or

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below their boiling points. Eg.- purification of glycerol

## Propellants

1.	Liquid Propellants	Liquid hydrogen, liquid ammonia, Hydrazine, nitromethane, methyl nitrate, hydrogen peroxide.
2.	Solid propellants	Polybutadiene, acrylic acid, nitroglycerine + nitrocellulose
3.	Hybrid propellants	$N_2O_4$ + Acrylic rubber.

## Extraction Process for various Elements

1.	Frasch Process	Sulphur
2.	Acheson process	Graphite
3.	Hall Herault	Aluminium
4.	Ostwald process	Nitric acid
5.	Bayer process	Extraction of Aluminium from ore
6.	Bessemer process	Steel from molten pig iron
7.	Patio process	Silver
8.	Dow process	Bromine
9.	Pidgeon process	Magnesium
10.	Fischer Tropsch process	Gasoline
11.	Azeotropic distillation	Absolute alcohol

## Types of Colloidal Systems

S	Dispersed Phase	Medium	Name	Example
1.	Solid	Solid	Solid Sol	Some coloured glasses
2.	Solid	Liquid	Sol	Muddy water
3.	Liquid	Solid	Gel	Cheese, butter, jellies
4.	Liquid	Liquid	Emulsion	Milk, Hair Cream
5.	Gas	Solid	Solid Foam	Pumice stone, foam rubber
6.	Gas	Liquid	Foam	Froth, whipped cream

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## Elements/Compounds & Their Uses

1.	Xenon	High speed photographic tubes. Electric valves & t.v. tubes
2.	Krypton	Incandescent bulb. Airfield lights because of characteristic red colour.
3.	Lithium	Deoxidizer and to remove unwanted gases during the manufacture of metals.
4.	Beryllium	X-ray (transparent) window. Moderator in nuclear reactions around the core.
5.	Neon	Neon lights. Cryogenics
6.	Hopsalite	Mixture of oxides of manganese, cobalt, copper & silver – Anti pollution
7.	Ammonia	Refrigerant, fertilizers
8.	Yttrium	Used in TVs to produce red colour
9.	Bismuth	Joined with iron to make it malleable
10.	Sodium	Street lamp
11.	Gadolinium	CDs. Aluminium is sometimes used to coat the disc.
12.	Cesium	Atomic clocks
13.	Tellurium	Tint glass (one way visibility used in cars).
14.	Technetium	Superconductor at -262 degree Celsius.
15.	Paraformaldehyde	Common disinfectant & contraceptives
16.	Potassium Dichromate	Used in breath analyzer for detecting alcohol. Safe limit is < .1 %.

## Dyes

1.	Nitro Dyes	Less important as the colours are not fast
2.	Azo Dyes	Azo (-N=N-) group is chromophore.
3.	Triphenylmethane dye	Malachite green
4.	Direct dyes	Mautius yellow, Naphthol yellow, Congo red etc
5.	Mordant dyes	Alizarin
6.	Vat dyes	Indigo

The quality of possessing colour is particularly noticeable in compounds containing well defined chemically unsaturated groupings. These groups are known as chromophores. Auxochromes are chemical radicals having the property of anchoring the desired dye effectively.

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## Alloys

1.	Brass	Copper (80%) & Zinc (20%)
2.	Bronze	Copper (90%) & Tin (1%)
3.	German Silver	Copper (60%), Zinc (20%) & Nickel (20%)
4.	Duralumin	Aluminium & Copper
5.	Alnico	Aluminium, Nickel, Cobalt & Iron
6.	Magnalium	Aluminium (95%) & Magnesium (5%)
7.	Babbit Metal	Tin, Antimony, Copper & Lead. Used in ball bearings to reduce friction.
8.	Invar	Iron & Nickel. Used in precision instruments
9.	Bell metal	Copper & tin.
10.	Gun Metal	Copper, Tin & Zinc
11.	Monel Metal	Nickel (67%), Copper & Iron.
12.	Pewter	Tin (80-90%), Copper & Lead
13.	Solder	Tin, Lead & Antimony.

## Some Important Man Made Materials

Chemistry has helped significantly in meeting human needs by providing chemical fertilizers, improved varieties of insecticides and pesticides to increase the yield of crops and fruits. It has given us a large number of life saving drugs. Also chemical industries manufacturing polymers, soaps, detergents, glass, ceramics etc.

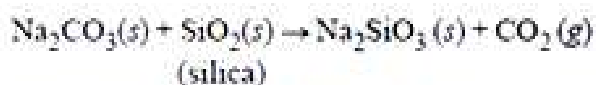
## Industrially Important Compounds

### 1. Glass

It consists of a mixture of two or more silicates.

#### Preparation of Glass:

**Common glass (or soft glass):** It is used to make bottles, glass wares etc. and is obtained by heating together silica (in the form of sand), sodium carbonate or sodium sulphate and chalk or lime stone (calcium carbonate). Some broken glass and a little coke are usually added. The glass so prepared consists of silicates of sodium and calcium.



**Hard glass:** For preparation of hard glass  $\text{K}_2\text{CO}_3$  is used in place of  $\text{Na}_2\text{CO}_3$ . It consists of a mixture of calcium and potassium silicates.

**Physical properties of Glass:** Hard, rigid, high viscosity, bad conductor of heat and electricity, brittle, etc.

**Blowing:** It is a method to cast the molten glass into different moulds. There are two different methods of glass blowing (i) Free blowing and (ii) Mould blowing

**Free blowing:** It involves the blowing of air to inflate the molten glass which is gathered at one end of the blow pipe to give the desired shape.

**Mould blowing:** This method was developed after the technique of free blowing. In this method, molten glass is inflated into a



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wooden or metal carved mould with the help of blow pipe which gives the molten glass the shape and design of the interior of the mould.

### **Chemical properties of glass**

(1) It is resistant to action of air and acids except hydrofluoric acid.

(2) It is alkaline in nature.

(3) It slowly reacts with water to form alkaline solution.

### **Types of Glass**

**(i) Silica glass:** For this type of glass the raw material used is 100% pure form of *quartz*. It is quite *expensive*. It is used in the manufacture of laboratory apparatus. It has low thermal expansion. Its softening point is very high and it is resistant to a wide variety of chemicals.

**(ii) Alkali silicate glass:** For it the raw materials used are sand and soda. It is also called **water glass** because it is soluble in water and used only as a solution. It is generally used to make gums and adhesives.

**(iii) Lead glass:** For this type of glass lead oxide is added to ordinary glass. The addition of lead oxide increases the density and also the refractive index. This type of glass is used for the manufacture of ornamental glass ware, decorative articles etc.

**(iv) Optical glass:** This type of glass is used in the manufacture of optical instruments like binoculars, spectacles, lenses, prisms, telescopes, microscopes etc. It is transparent

and can be ground into the required shape. It generally contains phosphorus, and lead silicates with little cerium oxide which absorbs UV radiations.

**(v) Processed glass:** The properties and applications of glass also depend upon the processing of glass.

Some types of processed glass and their applications are given here :

### **Processed glass Applications**

1. Laminated glass Used for doors and windows of automobiles. (It has high strength).

2. Fibre glass Used for reinforcing purpose (It has enough tensile strength)

3. Foam glass Used for civil construction and insulation purposes (it is light weight).

4. Opaque glass In it non-transparent glass filters the light entering into it. Thus provides an aesthetic look.

**(vi) Borosilicate Glass:** It contains silica and Boron oxide and small amount of oxides of sodium and aluminium. It is resistant to a wide variety of chemicals due to this property it is used in the manufacture of laboratory ware.

## **2. Fertilizers**

Fertilizers are chemical compounds which when added to the soil increase their fertility and directly supply the need of essential elements [N, P, K] of primary importance.

### Classification:

Chemical fertilizers are broadly classified into the following three types:

- (i) **Nitrogenous fertilizers:** Ammonium sulphate, urea etc.
- (ii) **Phosphatic fertilizers:** Super phosphate, ammonium phosphate
- (iii) **Potash fertilizers:** Potassium chloride, potassium sulphate.

### 3. Soaps and detergents

**Soap:** Fatty acid salts of sodium and potassium are known as soaps. These are prepared by the action of fatty acids with sodium hydroxide or potassium hydroxide.

Fatty acid + sodium hydroxide = Soap + glycerol.

**Detergents** are sodium salt of long chain sulphonic acids or alkyl hydrogen sulphate.

#### Advantages of detergents over soaps

- (i) Detergents can be used for laundering even with hard water as they are soluble even in hard water.
- (ii) Detergents possess better cleansing properties than soaps.

#### Disadvantages of detergents over soap:

- Detergents are prepared from hydrocarbons, while soaps are prepared from edible fatty oils. Thus they are non biodegradable.

### Saponification:

It is the process of making of soap by the hydrolysis of fats and oils with alkalis.

Both soaps and detergents are soluble in water and act as **surfactants** which reduce the surface tension of water to a great extent. This increases the water – fabric interaction as a consequence of which dirt particles, grease spots etc are washed away effectively. In other words soaps and detergents enhance the cleansing action of water.

**4. Portland Cement:** It was first discovered in England. It is essentially a mixture of lime stone and clay. It was called Portland cement because in presence of water it sets to a hard stone-like mass resembling with the famous Portland rock. The approximate composition of Portland cement is Calcium oxide (CaO) 62%

- Silica (SiO<sub>2</sub>) 22%
- Alumina (Al<sub>2</sub>O<sub>3</sub>) 7.5%
- Magnesia (MgO) 2.5%
- Ferric oxide (Fe<sub>2</sub>O<sub>3</sub>) 2.5%

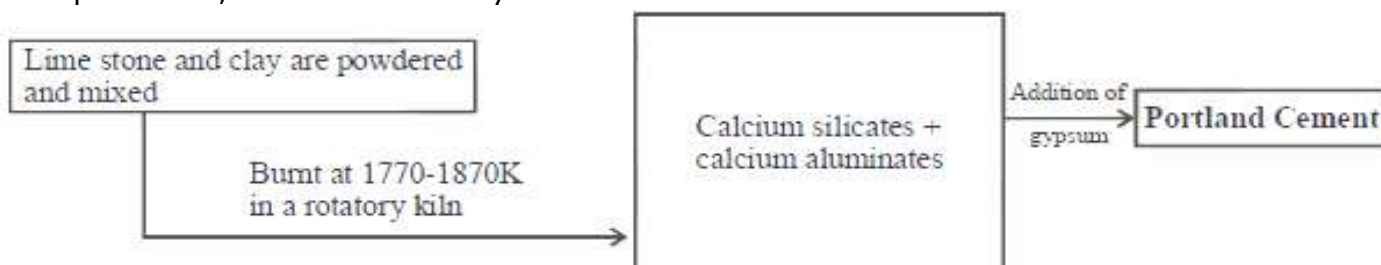
The above compounds are provided by the two raw materials, namely lime stone (which provides CaO) and clay (which provides SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and Fe<sub>2</sub>O<sub>3</sub>). In cement, almost entire amount of lime is present in the combined state as calcium silicate (2CaO. SiO<sub>2</sub> and 3CaO. SiO<sub>2</sub>) and calcium aluminates (3CaO. Al<sub>2</sub>O<sub>3</sub> and 4 CaO. Al<sub>2</sub>O<sub>3</sub>).

- Cement containing excess amount of lime cracks during setting; while cement containing less amount of lime is weak in strength.

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- Cement with excess of silica is slow-setting and that having an excess of alumina is quick-setting.
- Cement containing no iron is white but hard to burn.
- Cement is manufactured by two processes, viz. wet and dry. A small

amount (2–3%) of gypsum is added to slow down the setting of the cement so that it gets sufficiently hardened. Setting of cement is an exothermic process and involves hydration of calcium aluminates and calcium silicates.



### Important Biomolecules Vitamins

Vitamin generic descriptor name	Solubility	Deficiency disease	Overdose disease
Vitamin A	Fat	Nightblindness and Keratomalacia	Hypervitaminosis
Vitamin B <sub>1</sub>	Water	Beriberi, Wernicke-Korsakoff syndrome	Drowsiness of music relaxation with large doses
Vitamin B <sub>2</sub>	Water	Ariboflavinosis	
Vitamin B <sub>3</sub>	Water	Pellagra	Liver damage (doses > 2g/day) and other problems
Vitamin B <sub>5</sub>	Water	Paresthesia	Diarrhoea; possibly nausea and heartburn
Vitamin B <sub>6</sub>	Water	Anemia peripheral neuropathy nerve damage (dose > 100 mg/day)	Impairment of proprioception
Vitamin B <sub>7</sub>	Water	Dematitis, enteritis	
Vitamin B <sub>9</sub>	Water	Deficiency during pregnancy is deficiency, other effects	May mask symptoms of vitamin <sub>12</sub> associated with birth defects, such as neural tube defects
Vitamin B <sub>12</sub>	Water	Megaloblastic anemia	No known toxicity
Vitamin C	Water	Scurvy	Vitamin C megadosage
Vitamin D	Fat	Rickets and Osteomalancia	Hypervitaminosis D
Vitamin E	Fat	Deficiency is very rare; mild hemolytic anemia in newborn	Increased congestive heart failure seen in one large
Vitamin K	Fat	Bleeding diathesis	Increases coagulation in patients taking warfarin.

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## MISCELLANEOUS FACTS:

1. Water gas ( $\text{CO} + \text{H}_2$ ), Coal gas ( $\text{H}_2 + \text{CH}_4 + \text{CO}$ ), Producer gas ( $\text{CO} + \text{N}_2$ ), CNG (methane & ethane) & LPG (Butane + Propane), Natural gas (Methane 75%, Ethane 10%, propane 7% & butane 2%).

2. Acetic Acid ( $\text{CH}_3\text{COOH}$ ), Sodium bicarbonate ( $\text{NaHCO}_3$  - baking soda), Sodium hydroxide (Caustic Soda), Sodium Carbonate (washing soda), Sodium thiosulphate ( $\text{Na}_2\text{S}_2\text{O}_3$ ), Ethylene ( $\text{C}_2\text{H}_4$ ), Acetylene ( $\text{C}_2\text{H}_2$  - Fruit Ripener), Quicklime ( $\text{CaO}$ ), Slaked lime [ $\text{Ca}(\text{OH})_2$ ], Urea ( $\text{NH}_2\text{CONH}_2$ ), Carborundum ( $\text{SiC}$ - abrasive), Ferric oxide ( $\text{Fe}_2\text{O}_3$ ), Blue Vitriol (Crystalline  $\text{CuSO}_4$ ).

3. Sublimable compounds are naphthalene, iodine, ammonium chloride.

4. Avogadro's hypothesis states that at the same temperature & pressure, equal volumes of all gases contain equal number of particles. One gram molecular mass of all gases occupy 22.4 litres of volume.

5. Each shells are designated as K, L, M, N, O, P, Q & each subshell is further divided into sub shells (s,p,d,f).

6. Isotopes have same atomic number but different mass number. Isomers have same molecular formula but different structural formulae.

7. Atomic size decreases from moving left to right in a period because of the increase in the effective nuclear charge which pulls electrons inwards.

8. Electropositivity (tendency to form ions by losing electrons) increases down the group because of increasing atomic size & decreases across the period because of the decrease in atomic size.

Electronegativity (tendency to accept electrons) decreases down the group & increases across the period.

9. Oxidation is a process in which a substance loses electrons & in reduction electron is gained. Oxidising agents are  $\text{KMnO}_4$ , potassium dichromate, nitric acid, hydrogen peroxide. Reducing agents include Hydrogen sulphide, hydrogen, carbon, sulphur dioxide.

10. Some substance lose their water of crystallization without heating when exposed to atmosphere. This phenomenon is called efflorescence. In deliquescence, solid substances absorb water vapour from the atmosphere. A molar solution contains one mole of solute per litre of solvent. A normal solution is one that contains one gram equivalent of solute per litre of solvent. Formality is the number of formula weights in gm dissolved per litre of solution.

11. Compounds derived from benzene are called aromatic compound. Carnallite & Epsom salt are ores of magnesium. Amphoteric compounds show both acidic & basic properties.

12. Calcination is the process of heating of the ore in the absence of air & roasting vice versa. The ore usually contains rocky & siliceous matter called gangue. Flux ( $\text{CaO}$ ) is added to combine with gangue & form slag which is insoluble in metal & forms a separate layer.

13. Cast iron or Pig iron (2-5 % carbon), Wrought iron (Purest form - .25 % carbon), Steel (.25-2% carbon).

14. In colloid state the size of particles is such that it can pass through filter paper but not through animal or vegetable membrane. Tyndall effect is the dispersion of light beams by colloidal suspension.

15. Disparlure pheromone has been used against the Gypsy moth. Rodents like rats are killed using sodium monochloroacetate, sodium fluoroacetate, zinc phosphide or thallium sulphate. Alpha naphthylthiourea

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(ANTU) is an organic chemical used to kill rodents.

16. Dettol is a mixture of chloroxylenol & terpenol. Serpasil is a powerful tranquilizer obtained from the well known medicinal plant, Rauwolfia Serpentina & its chemical name is reserpine.

17. Antioxidants used in food include butylated hydroxyl toluene (BHT) & butylated hydroxyl anisole

(BHA) to prevent the ageing of food. Benzoic acid is commonly used as a food preservative.

18. About 15 lakh species of living organisms have been catalogued – 12 lakh animals & 3 lakh plants.

19. Buffers resist pH changes & include sodium acetate, acetic acid, sodium citrate, citric acid, boric acid. They are used in medicines like injections so as not to disturb the delicate pH of the body.

20. Bakelite is obtained from formaldehyde (H-CHO) & phenol (C<sub>6</sub>H<sub>5</sub>OH). It is a cross linked polymer. Polystyrene is made from the monomer styrene C<sub>8</sub>H<sub>8</sub>. Teflon stands for polytetrafluoroethylene (PTFE) & consists of the monomer tetrafluoroethylene (CF<sub>2</sub>=CF<sub>2</sub>). PVC is made of the monomer vinyl chloride (CH<sub>2</sub>=CHCl). PVA is made of the monomer vinyl acetate (CH<sub>2</sub>=CH-OCOCH<sub>3</sub>). Natural rubber is a polymer of isoprene. Cellophane is made up of glucose acetate.

21. Monosaccharides cannot be hydrolyzed into smaller molecules (E.g pentoses & hexoses).

Oligosaccharides yield 2-10 monosaccharide molecules on hydrolysis. Disaccharides are divided into reducing sugars (maltose, cellobiose & lactose) & non reducing sugar (sucrose). Sucrose is dextrorotatory. The term rayon is used to refer to all synthetic or manufactured fibers from cellulose.

22. Fibrous protein include keratin, collagen, myosin. Peptides are formed by interaction between amino groups & carboxyl groups of amino acids. Adenine & Guanine contain purine ring system & cytosine & thymine contain the pyrimidine ring system.

23. Boyle's Law: volume inversely proportional to pressure at constant temperature. Charles law: the volume of a gas is directly proportional to absolute temperature. Gas Equation:  $P_1V_1/T_1 = P_2V_2/T_2$  (combining Boyle's & Charles law).

24. Annealing is making a metal soft by heating to very high temperature & then cooling slowly. Hardening is making a metal brittle by heating to very high temperatures & cooling suddenly. Tempering is making metal elastic by heating to moderately high temperature & cooling slowly.

25. Ruby is a red form of corundum, which is Alumina (Al<sub>2</sub>O<sub>3</sub>) with traces of chromium. Emerald is made up of beryllium. Carbon tetrachloride is used in fire extinguishers. Sapphire is any gem other than ruby especially of blue colour due to traces of cobalt present in it.

26. Eugenics is the science of production of healthy offspring with the aim of improving the human genetic stock.

27. According to Aufbau principle, electrons fill orbitals starting at the lowest available energy states before filling higher states (e.g. 1s before 2s). The number of electrons that can occupy each orbital is limited by the Pauli Exclusion Principle. If multiple orbitals of the same energy are available, Hund's rule says that unoccupied orbitals will be filled before occupied orbitals are reused (by electrons having different spins).

28. Isotonic solutions have same osmotic pressure. Vinegar is acidic due to the presence of acetic acid. EDTA is the chemical compound ethylenediaminetetraacetic acid

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which is used as an anti-couglant. Dissolved oxygen should not be less than 4 mg/litre.

29. Alkalis are soluble in water & can neutralize acids. They turn red litmus blue. An acid turns blue litmus red. Hypo used in photography is sodium thiosulphate.

30. Invertase hydrolyses sucrose into glucose & fructose. Zymase ferments sugar into ethanol & carbon dioxide. Lactase hydrolyses lactose into constituent galactose and glucose monomers.

31. The pH of human blood is around 7.5. Ninhydrin, silver nitrate & fuming iodine are all used in fingerprinting.

32. Containers for carrying strong acids are made up of lead. Ethylene glycol is used as anti-freeze.

Gammexene is also known as Lindane & BHC (benzene hexachloride).

33. Acetone & methanol are produced by the destructive distillation of wood.

34. Molecular formula =  $n \times$  Empirical formula. For a feasible reaction  $\Delta G = -ve$ ,  $\Delta H = -ve$  &  $\Delta S = +ve$ . G is free energy, H is enthalpy & S is entropy.  $G = H - TS$ .

35. Flint glass (clear glass) consists of lead chromate. Invert sugar is a mixture of glucose & fructose In equal proportions.

36. Aqua regia consists of one part of  $HNO_3$  & three parts of HCl. Carbamate pesticide is prepared using methyl isocyanate.

37. The well known wonder drug against cancer 'Taxol' is extracted from the tree Yew. Zeolites are substances used as water softeners.

## Physics

### MEASUREMENT

Each base quantity is in terms of a certain basic, arbitrarily chosen but properly standardised reference standard called unit (such as metre, kilogram, second, ampere, kelvin, mole and candela). The units for the

fundamental or base quantities are called fundamental or base units

### SI Base Units

Basic unit	SI unit	Symbol
Lenght	Meter	m
mass	Kilogram	kg
Time	Second	s
Electric current	Ampere	A
Temperature	Kelvin	K
Amount of substance	Mole	mol
Luminous intensity	Candela	cd
Viscosity	Pascal second	Pa.s
Power of lens	Dioptre	D
Inductance	Henry	H
Loudness	phon	
Magnetic inductance	Tesla	T
Magnetic flux	Weber	Wb
Electric charge	Coulomb	C
Electric power	Watt	W
Capacitance	Farad	F
Frequency	Hertz	Hz
Electric power	Watt	W

**Angstrom:** An angstrom is a unit of length used to measure small things such as the wavelengths of light, atoms and molecules. Ten billion angstroms equal 1 meter  $1 \text{ \AA} = 10^{-10} \text{ m}$ .

Fermi: A unit of length used to measure nuclear distances =  $10^{-15}$  meter.

Some SI Derived Units:

- ❖ Velocity = m/s
- ❖ Acceleration = m/s<sup>2</sup>
- ❖ Force = kg m/s<sup>2</sup> (newton)
- ❖ Work = Nm (Joule)
- ❖ Power = Joule/s (watt)

**Miscellaneous Facts:**

- ❖ The distance traveled is given by area under the curve of velocity-time graph.

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- ❖ The value of  $G$  is  $6.67 \times 10^{-11} \text{ N-m}^2/\text{Kg}^2$ .
- Centripetal Force =  $mv^2/r$ .
- ❖ Kinetic Energy =  $\frac{1}{2} mv^2$ . Potential Energy =  $mgh$ .
- ❖ Temperature in Celsius =  $\frac{5}{9} (T_f - 32)$ . Bimetal strips are used in thermostat.
- ❖ The equatorial radius is greater than polar radius by 21.5 km. Centrifugal force is zero exactly at the poles. Newton's first law is regarding inertia. Second law states that the rate of change of momentum of a body is directly proportional to the applied force & takes place in the direction of the force.
- ❖ Force = mass x acceleration. Momentum = mass x velocity. Impulse = force x time.
- ❖ Work = Force x distance in the direction of force. Power = work done/ Time taken.
- ❖ Moment of a force = Force x Perpendicular distance of the line of action of force from the axis.
- ❖ Escape Velocity:  $GMm/r^2 = mv^2/r$ . Solving we get:  $v = \sqrt{GM/r}$ . Moreover the centripetal force is equal to the gravitational force. Therefore,  $mv^2/r = mg$ . Solving we get  $v = \sqrt{rg}$ ,  $g = GM/r^2$ . From the equation  $v = \sqrt{\frac{GM}{r}}$ , we see that  $v$  is, inversely proportional to the square root of  $r$ . Thus if a satellite moves from a higher orbit to a lower one, its speed increases. Since the earth rotates from west to east satellites are launched in a easterly direction to give them additional push.
- ❖ The substances in ascending order of density are aluminium, copper, lead, mercury, gold & platinum.
- ❖ Pressure is force/area. The pressure  $P$  at a depth  $h$  in a liquid of density  $\rho$ , is  $P = h\rho g$ .
- ❖ In a hydraulic press the fundamental is that the ratio of the weight & Area should be the same on both the sides when the opposite plates are at the same level. For e.g.  $10 \text{ N} / 5 = 80 \text{ N} / 40$
- ❖ When ice melts in water the level of water remains unchanged as the ice contracts.
- ❖ Stokes law for determining viscous force,  $F$  is  $F = 6\pi r\eta v$  where  $h$  is the coefficient of viscosity,  $r$  is the radius &  $v$  is the velocity. After a stage the object acquires critical velocity which is higher for heavier objects.
- ❖ Pressure in a fluid decreases with increased velocity of the fluid.
- ❖ Surface tension causes the hairs of a paint brush to contract when it is taken out of water. Also sprinkling kerosene on water reduces its surface tension. Capillarity causes water to rise in a glass tube but mercury to drop because of differential cohesion & adhesion.
- ❖ Latent heat of fusion is the heat required to convert a solid to liquid state.
- ❖ Velocity of a wave  $V = f\lambda$ , where  $f$  is frequency &  $\lambda$  is wavelength. The number of images formed in case of an inclined mirror =  $[(360^\circ - \theta) / \theta] - 1$ . Hence when angle is  $90^\circ$  three images will be formed.
- ❖ Concave/convex mirrors are made by depositing vaporized aluminium on a glass surface. A convex mirror & plane mirror always form virtual image. A concave mirror forms a virtual or real image
- ❖ Depending on the position of the object. When the object is at a distance lower than the focal length the image formed is larger & virtual. Hence concave mirrors are used in make-up mirror & by dentists. If an object is held close to a convex lens then the image formed is virtual & vice-versa. In case of a concave or diverging lens all images are virtual.
- ❖ Refractive index is the ratio of speed of light in vacuum to speed in that medium.
- ❖ The planets do not appear to twinkle due to lesser refraction of the light coming from them due to lower distance. Light can always pass from one medium to an optically denser

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medium but not vice versa due to total internal reflection.

❖ Violet light travels at the slowest speed & red the fastest in transparent medium. Rainbow is formed by dispersion & total internal reflection

❖ Red + Green = Yellow. Red + Blue = Magenta & Green + Blue = Cyan. Two colours which when mixed give white are known as secondary colours like blue & yellow.

❖ In eye accommodation is achieved by ciliary muscles. Hypermetropia is treated by converging lens & myopia by diverging lens. Power of a lens =  $1/\text{focal length}$ .

❖ A compound microscope has two short focal length converging or convex lens. The image seen in a microscope is inverted. An astronomical telescope has an objective of long focal length & an eye lens of short focal length. An astronomical telescope also produces an inverted image. In terrestrial telescope an extra lens is placed in between to produce an erect image of the object.

❖ In a CD rainbow like colours are produced due to diffraction & reflection & not due to interference.

❖ Sound waves below 16 Hz are infrasonic & above 20,000 Hz ultrasonic. The presence of water vapour increases the speed of sound. It travels faster on a hot day than cold day. On a warm day the air near the ground is warmer than the air above. This causes bending of sound away from the ground. The opposite happens on a cold day causing the sound to bend towards the earth. Thus on a cold day sounds can be heard over long distances.

❖ The angle which a suspended bar magnet makes with the horizontal is called the angle of dip of the place. It is zero at equator & 90° at poles.

❖ When a glass rod is rubbed with silk, the glass rod loses electrons & becomes positively charged & VV.

❖ Resistance of a conductor  $R = L/A$  where  $R$  is a constant called resistivity,  $L$  is length &  $A$  is area. Resistivity of a good conductor increases with temperature whereas for semiconductors it decreases.

❖ Positive ions collect at cathode & negative at anode.

❖ Heat produced by current  $H = I^2Rt$ , where  $I$  is current in amperes,  $R$  is resistance in ohms &  $t$  is time.

❖ An inverter converts DC into AC. In domestic AC supplies 220 V is the effective value. The peak value of voltage is 311 V. The frequency is 50 Hz. A Fuse is made of tin-lead alloy. A fluorescent tube contains mercury vapours at low pressure. Infra red signals are used in TV.

❖ Protons & neutrons are 1836 times heavier than electrons. The heaviest natural atom is that of Uranium. Artificial transmutation has been used to obtain elements beyond uranium. X rays are produced when accelerated electrons strike tungsten sheet. Number of protons is the atomic number & protons + neutrons form the mass number. For short distances nuclear forces are stronger than electrostatic repulsive forces.

❖ In fission Uranium<sub>235</sub> splits into Barium<sub>56</sub> & Krypton<sub>36</sub> & ejects 3 neutrons. Graphite or Heavy water is used as moderator. Boron or Cadmium is used as controlling rods.

❖ Bright spots which are actually clusters of stars & gaseous clouds are called Nebulae. Orion Nebula is one of them in the Milky Way. Major constellations are Orion (hunter), Cygnus (swan), Hydra, Hercules etc. Hydra is the largest with 68 stars visible to naked eye & Centaurus has 94 stars.

❖ Stars with mass less 1.4 times solar mass (Chandrasekhar Limit) converts into a white



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dwarf. Bigger than this converts neutron star (pulsar). Still bigger (mass greater than 5 times solar mass) end up as black holes.

❖ The layers of sun are photosphere (core), chromosphere (surface) & corona (sun's atmosphere).

❖ Ganymede, Callisto, & Titan are bigger than planet mercury. Uranus, Neptune & Pluto cannot be seen by naked eye. Ceres is the largest known asteroid.

❖ Kepler's first law states that each planet moves in an ellipse with the sun at one focus. Second law says that a line drawn from a planet to the sun sweeps out equal area in equal times. The third law states that

❖ the ratio of the square of the planets year (T) to the cube of the planet's mean distance (A) from the sun is same for all the planets.

❖ An OR gate gives a 1 if either of the input signals is 1. NOT gate generates a signal which is reverse of the original signal.

❖ TCP (transfer control protocol), URL (universal resource locator), XML (Extensible markup language).CGI (common gateway interface).

❖ One mile = 1.6 km. One nautical mile = 1.85 km. One gallon = 4.5 litres. 1 mm Hg = 133.3 pascal. One ounce (oz) = 31.1 grams. Parsec = 3.26 light years.

❖ Bessemer process is for making steel from cast iron.

❖ Isotones are nuclei having same number of neutrons but different number of protons. Isotopes have same number of protons but different neutrons. Isobars are nucleides with the same mass number.

❖ Positron is antiparticle of electron. Tachyons are particle supposed to travel at a super-luminal velocity.

❖ According to Ohm's law,  $V = IR$ , & power  $P = VI$  or  $P = I^2R$ .

❖ The earthing pin is longer to ensure that the gadget is earthed first & is thicker so that

even by mistake it cannot be inserted in the live hole of the socket.

❖ The f-number in a photographic camera is the focal length divided by the diameter of aperture.

## Measuring Instruments

Hydrometer	Measuring the density or relative density of liquids. Based on floatation principle
Magnetron	Produces microwave. Used in ovens
Actinometer	Used to measure intensity of electromagnetic radiation
Altimeter	Aneroid barometer for measuring altitude.
Bolometer	For measuring heat radiation
Dasymeter	Measuring density of gas
Galvanometer	Used for detecting small electric currents
Gyroscope	Determine orientation in aircraft, ships etc
Katharometer	Measuring thermal conductivity
Manometer	Measuring the pressure of a gas
Nethoscope	Determining the speed of celestial bodies
Rectifier	Converts AC into DC.
Tonometer	Measures pitch of sound
Venturimeter	Measures rate of flow of fluids
Udometer	Rain guage.

## WORK AND ENERGY

❖ Work: In physics work is defined if force applied on object displaces the object in direction of force. We define the work as Product of the force and displacement in the direction of applied force or Product of displacement and force in the direction of displacement.

❖  $W = \text{Force} \times \text{displacement}$

❖ Unit of Work: The SI unit of force is newton and the unit of length is a metre (m). So the SI unit of work is newton meter which is written as Nm. This unit (Nm) is also called joule (J), i.e. 1 joule = 1 newton. 1 metre

❖ Abbreviated, this is 1 J = 1 Nm

# GENERAL SCIENCE

❖ When a force of 1 newton moves a body through a distance of 1 metre in its own direction the work done is 1 Joule.

❖ Energy: Anything which has the capacity to do work is said to possess energy. This implies that work can be done only at the expense (cost) of energy i.e., to do work, we need to spend energy, whatsoever be its form.

❖ Unit of Energy : Same as that of work i.e., Joules(J)

❖ Relation between kinetic energy and momentum:  $p = \frac{k}{m}$  where  $p$  = momentum,  $k$  = kinetic energy,  $m$  = mass

❖ Power: The time rate of doing work is defined as power (P). If equal works are done in different times, power will be different. More quickly work is done, power will be more

**Power=**—

❖ Unit of Power: The unit of power is the joule per second and this is called the watt (W). When large amounts of power are involved, a more convenient unit is the kilowatt (kW) where 1 kW = 1000 W.

❖ **1 Megawatt =  $10^6$  watt**

❖ Power was also measured earlier in a unit called horse power. Even these days, the unit of horse power is in common use.

❖ **1 horse power = 746 watt**

❖ The unit kilowatt-hour means one kilowatt of power supplied for one hour. It is, therefore, the unit of energy.  $1 \text{ kWh} = (1000 \text{ J/s}) \times 60 \times 60 \text{ s} = 3.6 \times 10^6 \text{ J}$

## **MORE ABOUT SOLID, LIQUID AND GASES**

### **Surface Tension:**

❖ A molecule of the liquid near the surface is attracted by fewer molecules of the liquid (there is only air on one side) than molecule deep inside. Therefore, the molecule of the free surface has less attractive force than the deeper one, and so it is energetically

unfavourable for a liquid to have a surface. This property of liquid surface is called surface tension. When the water touches the glass, it 'rises up' the glass surface then forms a concave meniscus.

Mercury behaves in a different manner. Mercury molecules are attracted more strongly to other mercury molecules than they are attracted to glass molecules. Here, the cohesive force is stronger than adhesive force. That is why, when mercury touches the glass surface, it 'rises down' the glass forming a convex meniscus.

### **Pascal Law:**

❖ When pressure is applied to an enclosed fluid, it is transmitted equally to all parts of the fluid. This is called Pascal's law. Pascal's law holds, both for liquid and gases.

### **Buoyancy:**

❖ Every liquid exerts an upwards force on objects immersed in it. This upward force is called Buoyant force and this phenomenon is called Buoyancy.

❖ Archimedes' Principle states that the buoyant force is equal to the weight of this displaced liquid. The buoyant force exerted by a liquid, therefore, depends on the volume of the object immersed on it. When a body is wholly or partially immersed in a liquid, there is apparent loss in weight of the body, which is equal to the weight of the displaced liquid by the body.

❖ The rise or depression of liquids in small diameter tubes is called capillarity.

❖ The faster the air, the lower the pressure.

### **Different Temperature Scales:**

Name of the scale	Symbol for each degree	Lower fixed point (LFP)	Upper fixed point (UFP)	Number of divisions on the scale
Celsius	°C	0°C	100°C	100
Fahrenheit	°F	32°F	212°F	180
Kelvin	K	273.15	373.15	100

# GENERAL SCIENCE

		K	K	
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## Specific Heat Capacity:

The specific heat capacity of a substance is the amount of energy (in joule) that is needed to raise the temperature of 1 kg of the substance by 1°C.

Sp. heat of water = 1 cal /gm °C = 4200 J/kg °C.

Sp. heat of ice = 0.5 cal /gm °C.  
= 2100 J/kg °C.

## Latent Heat:

❖ The latent heat of a substance is that heat which changes the physical state of the substance but

❖ does not rise its temperature. Latent heat is of two types :

❖ Latent heat of melting

❖ Latent heat of vaporisation

❖ The amount of thermal energy required to change the state of substance is given by the following formula :

❖  $Q = m \times L$

❖ where, m = mass of the substance

❖ L = Latent heat of the substance

❖ Newton's Law of Cooling says that the rate of cooling of a body is proportional to the excess temperature of the body over the surrounding

## Sound:

Sound is a form of energy which produces a sensation of hearing in our ears.

## Frequency:

❖ The frequency of an oscillating particle is the total number of oscillations made by the pendulum/particle in one second.

❖ **Units:** Hertz (or) C/s

## Amplitude:

The maximum distance travelled by a pendulum towards any one side is from its initial position.

Sound is emitted by vibrating source and is transmitted through a material medium

producing sensation of hearing in our ears. The motion of a vibrating source sets up waves in the surrounding medium.

**Types of Waves:** On the basis of the requirement of medium, waves are of two types

(i) Mechanical waves

(ii) Electromagnetic waves

(i) **Mechanical Waves:**

❖ A mechanical wave is a periodic disturbance which requires a material medium for its propagation. The properties of these waves depend on the medium so they are known as elastic waves, such as sound waves, water waves, waves in stretched string. On the basis of motion of particles the mechanical waves are classified into two parts.

✓ Transverse wave

✓ Longitudinal wave

(a) **Transverse wave:** When the particles of the medium vibrate in a direction perpendicular to the direction of propagation of the wave, the wave is known as the transverse wave. For example, waves produced in a stretched string, waves on the surface. These waves travel in form of crests and troughs. These waves can travel in solids and liquids only.

(b) **Longitudinal wave:**

▪ As shown in figure, when the particles of the medium vibrate along the direction of propagation of the wave then the wave is known as the longitudinal wave. For example sound wave in air, waves in a solid rod produced by scrubbing. These waves travel in the form of compressions and rarefactions. These waves can travel in solids, liquids and gases.

▪ Amplitude (A) is defined as the maximum displacement.

▪ The frequency n of the wave is the reciprocal of its time period T, i.e.,  $n = \frac{1}{T}$

# GENERAL SCIENCE

- Wave velocity can be defined as the distance covered by a wave in one time period. Therefore,
- Wave velocity =  $\frac{\text{Distance}}{\text{Time}}$  =  $\frac{\text{Wavelength}}{\text{Time period}}$
- Wave velocity = Frequency  $\times$  Wavelength
- Thus, the wave velocity is the product of frequency and wavelength. It holds true for any periodic wave, both for transverse or longitudinal waves.

## Electromagnetic Waves

An accelerated charge produces a sinusoidal time varying magnetic field, which in turn produces a sinusoidal time varying electric field. The two fields so produced mutually perpendicular and are sources to each other. "The mutually perpendicular time varying electric and

Magnetic fields constitute electromagnetic waves which can propagate through empty space

### Radar:

❖ In this instrument radio waves of very short wavelength are used to locate the enemy aircraft or ship. A concave transmitter mounted on rotating platform sends radio waves in all directions. The radiowaves on striking the aircraft or ship are reflected back.

❖ The reflected radiowaves are received by concave receiver, which is mounted at a small angle with the transmitter. On receiving the radio waves, the position of enemy air-craft can be located on a monitor screen as a bright spot.

### Applications of Ultrasound:

❖ The ultrasound is commonly used for medical diagnosis and therapy, and also as a surgical tool.

❖ It is also used in a wide variety of industrial applications and processes. Some creatures use ultrasound for information exchange and for the detection and location of objects. Also some bats are found to use

ultrasound for navigation and to locate food in darkness or at a place where there is inadequate light for vision (method of search is called echolocation).

## LIGHT

❖ Light is that form of energy which enables people to 'see' things. For a person to see any object, light energy must enter the eye. This energy is converted into a 'picture' in a

❖ very complex process, but a simplified version is as follows:

❖ light enters the eye through a 'hole' in the iris, called the pupil,

❖ the crystalline lens focusses the light to form a real, inverted image on the retina, energy is collected by the rods and cones making up the retina.

❖ this energy is transmitted as electrical impulses via the optic nerve to the brain,

❖ the brain re-inverts the image and produces a 'picture'.

❖ Reflection : When light rays strike the boundary of two media such as air and glass, a part of light is turned back into the same direction. This is called reflection of light.

❖ Reflection = Specular reflection (on smooth surface) and Diffuse reflection (on rough surface)

## REFRACTION

Whenever a wave is bounced back into same medium at an interface reflection is said to have occurred. Transmission of a wave into the second medium at an interface is called refraction.

• Twinkling of stars, appearance of sun before actual sunrise and after actual sunset etc. are due to atmospheric refraction.

### Rainbow:

❖ Rainbows are generated through refraction and reflection of light in small rain drops. The sun is always behind you when you face a rainbow, and that the center of the circular arc of the rainbow is in the direction opposite

to that of the sun. The rain, of course, is in the direction of the rainbow i.e. rain drops must be ahead of you and the angle between your line-of-sight and the sunlight will be  $40^\circ - 42^\circ$ .

- ❖ Moon is seen red during total lunar eclipse
- ❖ Solar radiation will be refracted when passing through the earth's atmosphere. Therefore part of the sunlight can still reach the shadow of the earth. Besides, the earth atmosphere scatters most of the blue light, so there will be more red light reaching the moon. The red light will be reflected back to earth. That is the reason why you can see a red moon rather than total darkness.

### **Electricity:**

- ❖ The electrical devices we encounter most often in modern life such as computers, lights and telephones involve moving charges which we call electric currents.

- ❖ Electric Current: We define the electric current, or simply the current, to be the net amount of positive charge passing per unit time across any section through the conductor in the sense from the positive toward the negative terminal.

- ❖ The SI unit of current is the ampere (A), where  $1A = 1 C/s$  that is,  $1A$  of current is equivalent to  $1C$  of charge passing through the surface in  $1s$ . In practice, smaller units of current are often used, such as the milliamper (  $1mA = 10^{-3} A$  ) and the microampere ( $1\mu A = 10^{-6} A$  )

- ❖ If the charge on an electron is  $e$  and  $n$  electrons pass through a point in time  $t$  then the total charge passing through that point will be  $Q = ne$ . Therefore the current

- ❖  $I = \frac{ne}{t}$  where,  $e = 1.6 \times 10^{-19}$  coulomb.

### **Types of Current**

(a) **Direct current:** The current whose magnitude and direction does not vary with time is called direct current(dc). The various sources are cells, battery, dc dynamo etc.

(b) **Alternating current:** The current whose magnitude continuously changes with time and periodically changes its direction is called alternating current. It has constant amplitude and has alternate positive and negative halves. It is produced by ac dynamo. In India, AC supply is at 50 Hz.

**Resistance:** Opposition to electric current depends on the type of material, its cross-sectional area, and its temperature. It is technically known as resistance. (It can be said that conductors have low resistance and insulators have very high resistance.)

**Ammeter:** Determines the value of current flowing in the circuit. The resistance of ammeter is small and it is used in series with the circuit.

**Voltmeter:** Determines the potential difference between two points in the circuit. Its resistance is high and it is used in parallel with the resistance wire.

Ohm's law : According to Ohm's law "The current passing through a conductor is directly proportional to the potential difference at its ends, provided the physical conditions of the conductor remain unchanged."

Unit of Resistance  $R = \frac{V}{I} = \frac{\text{ohm}}{\text{ampere}} = \text{ohm}$

### **Fuse wire:**

- ❖ Fuse is a thin wire made an alloy of low melting point and low resistance. When the current exceeds the allowed limit in the circuit, the fuse wire melts due to the heating and the circuit gets disconnected, resulting into zero current in the circuit. Because of this the possibility of fire or accident is prevented. Separate fuses are used for different circuits in the houses. Fuse wire is always connected to the phase wire. Once the fuse wire is damaged, it is replaced for normal flow of current.

### **Capacitors and Capacitance**

# GENERAL SCIENCE

A capacitor or condenser is a device that stores electrical energy. It generally consists of two conductors carrying equal but opposite charges. The ability of a capacitor to hold a charge is measured by a quantity called the capacitance.

**Units:** Farad

## **Binding Energy**

Binding energy of a nucleus is the energy with which nucleons are bound in the nucleus. It is measured by the work required to be done to separate the nucleons an infinite distance apart from the nucleus, so that they may not interact with one another.

## **Nuclear Force**

It is the force acts in the nucleus between the nucleons and is responsible for binding the nucleon.

## **Radioactivity**

It is the spontaneous disintegration of the heavy nucleus of an atom (It occurs without external provocation). It is a process by which an unstable nuclei achieves stability.

## **Nuclear Reaction**

Nuclear reaction obeys following conservation laws :

Charge conservation

- ❖ Conservation of linear momentum
- ❖ Conservation of angular momentum
- ❖ Conservation of energy (Rest mass energy + K.E)

### ❖ **Nuclear Reaction is of two types:-**

#### **(a) Nuclear Fission**

(By Otto Hans and Fstrassmann) Nuclear fission is the disintegration of a heavy nucleus upon bombardment by a projectile, such that the heavy nucleus splits up into two or more segments of comparable masses with an enormous release of energy.

#### **(b) Nuclear Fusion**

Nuclear fusion is the fusion of two or more light nuclei to form a heavy nucleus with a release of huge amount of energy. The

nuclear fusion reaction, which is the source of the energy of sun/star are proton-proton cycle.

## **Uses of Electromagnetic Waves**

❖ The following are some of the uses of electromagnetic waves

❖ Radio waves are used in radio and T.V. communication systems.

❖ Microwaves are used in microwave oven.

❖ Infrared radiations are used (a) in revealing the secret writings on the ancient walls (b) in green houses to keep the plants warm (c) in warfare, for looking through haze, fog or mist as these radiations can pass through them.

❖ Ultraviolet radiations are used in the detection of invisible writing, forged documents, finger prints in forensic laboratory and to preserve the food stuffs.

❖ The study of infrared, visible and ultraviolet radiations help us to know through spectra, the structure of the molecules and arrangement of electrons in the external shells.

❖ X-rays can pass through flesh and blood but not through bones. This property of X-rays is used in medical diagnosis, after X-rays photographs are made. The study of X-rays has revealed the atomic structure and crystal structure.

❖ The study of g-rays provides us valueable information about the structure of the atomic nuclei.

❖ Super high frequency electromagnetic waves (3000 to 30,000 MHz) are used in radar and satellite communication.

❖ Electromagnetic waves (frequency 50 to 60 Hz) are used for lighting. These are weak waves having wavelength  $5 \times 10^6$  to  $6 \times 10^6$  m and can be produced from A.C. circuits

## **Emission of Electron**

Electrons from the metal surface are emitted by anyone of the following physical processes

# GENERAL SCIENCE

(i) Thermionic emission: The emission of electrons by suitably heating the metal surface.

(ii) Field emission: The emission of electrons by applying very strong field of the order of  $10^8 \text{ Vm}^{-1}$  to a metal.

(iii) Photo-electric emission: The emission of electrons when light of suitable frequency illuminates metal surface.

## **Propagation of Radio Waves through the Atmosphere**

It takes place in three ways:

(i) Ground wave propagation,

(ii) Sky wave propagation and

(iii) Space wave propagation.

### **(i) Ground wave propagation:**

When the radio wave travel directly from one point to another following the surface of the earth, it is called ground or surface wave. This type of transmission is possible only with waves of wavelengths above 200 m or frequencies below 1500 kHz.

### **(ii) Sky wave propagation:**

When a radiowave is directed towards the sky and is reflected by the ionosphere towards desired location on the earth, it is called sky wave. This method is useful for the transmission of waves of wavelengths less than 200 m or frequencies above 1500 kHz upto 30 MHz.

(iii) **Space wave propagation:** For the transmission of television signals (frequencies in the range 100-200 MHz), space wave propagation method is used, in which the wave travels directly from a high transmitting antenna to the receiving antenna.

Radio waves also known as electromagnetic waves which when radiated from transmitting antenna, travel through space to distant places where they are picked up by receiving antenna.

<b>Discovery</b>	<b>Scientist</b>
Electron	J.J Thomson
Proton	Rutherford
Neutron	James Chadwick
Atom	John Dalton
Atomic Structure	Neil Bohr & Rutherford
Laws of motion	Newton
Radio activity	Henry Becquerel
Radium	Madam Curie
Principle of relativity	Albert Einstein
Electromagnetic Induction	Michael Faraday
Raman Effect	C.V Raman
X-rays	Roentgen
Quantum theory	Max Planck
Photo electric effect	Albert Einstein
Law of electrostatics	Coulomb
Periodic table	Mendeleev
Thermionic Emission	Edison
Dynamite	Albert Nobel
Nuclear Reactor	Enrico Fermi
Law of Floatation	Archimedes
Wireless Telegram	Marconi

### **Important Terms**

- ❖ Nucleons: sub atomic particles in the nucleus of atom i.e. proton and neutrons.
- ❖ Isotopes: atoms of an element with the same atomic number but different mass number.
- ❖ Mass number: Sum of the number of protons and neutrons i.e. the total number of nucleons.
- ❖ Atomic number: The number of protons in the nucleus of an atom. This when subtracted from mass number, gives the number of neutrons.
- ❖ Isobars: atoms having the same mass number but different atomic numbers.
- ❖ Isotones: atoms having the same number of neutrons but different number of protons or mass number.
- ❖ Iso-electronic species: Atoms, molecules or ions having the same number of electrons.
- ❖ Quantum numbers: The term quantum number is used to label the various energy levels or orbits
- ❖ Principal quantum number: It represents a group of shells (n)

# GENERAL SCIENCE

- ❖ Subsidiary quantum number: It represents the subsidiary orbits within a shell. (l)
- ❖ Magnetic quantum number: Observed magnetism is determined by this number. (m)
- ❖ Spin quantum number: It can have only two values positive or negative  $\frac{1}{2}$ . (s)
- ❖ Pauli's exclusion principle: According to this principle, an orbital can contain a maximum of two electrons and these two electrons must be of opposite spin.
- ❖ Aufbau Principle: This principle states that in the ground state of an atom, the orbital with a lower energy is filled up before the orbital with a higher energy
- ❖ Hund's rule of maximum multiplicity: This rule states that the electron pairing in orbitals of same energy will not take place unless all the available orbitals of a given subshell contain one single electron.
- ❖ Absolute humidity – The ratio of water vapor in a sample of air to the volume of the sample.
- ❖ Absolute zero – The theoretical lowest possible temperature. More formally, it is the theoretical temperature at which entropy reaches its minimum value.
- ❖ Acceleration – The rate at which the velocity of a body changes with time.
- ❖ Acceleration due to gravity – The acceleration on an object caused by force of gravitation.
- ❖ Acoustics – The branch of physics dealing with the production, transmission and effects produced by sound.
- ❖ Adhesion – The tendency of dissimilar particles or surfaces to cling to one another.
- ❖ Albedo – The fraction of the total light incident on a reflecting surface, especially a celestial body, which is reflected back in all directions.
- ❖ Alpha particle – Consist of two protons and two neutrons bound together into a particle identical to a helium nucleus, which is classically produced in the process of alpha decay, but may be produced also in other ways and given the same name.
- ❖ Alternating current – A form of electric current in which the movement of electric charge periodically reverses direction.
- ❖ Ammeter – An instrument that is used to measure current.
- ❖ Ampere – A unit that describes the rate of flow of electricity (current).
- ❖ Amplitude – Height of a wave measured from its centre (normal) position. For example, the height of a water wave above the level of calm water.
- ❖ Anion – negatively charged ion
- ❖ Astrophysics – The branch of astronomy that deals with the physics of the universe, especially with "the nature of the heavenly bodies, rather than their positions or motions in space
- ❖ Atom – A basic unit of matter that consists of a dense central nucleus surrounded by a cloud of negatively charged electrons. The atomic nucleus contains a mix of positively charged protons and electrically neutral neutrons.
- ❖ Atomic mass unit – one-twelfth the mass of an atom of the isotope  $^{12}_6\text{C}$ .
- ❖ Atomic number – The number of protons found in the nucleus of an atom. Represented by the letter "Z," it is most often used to classify elements.
- ❖ Avogadro's Law - it states that volumes of gases which are equal to each other at the same temperature and pressure will contain equal numbers of molecules.
- ❖ Avogadro's Number – the number of molecules in exactly 12g of carbon-12, equaling  $6.023 \times 10^{23}$ .

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## **INDUS VALLEY CIVILIZATION**

### **(2500-1700 B.C)**

- Oldest among 4 civilizations; other 3 - Mesopotamia (Tigris & Euphrates), Egypt (Nile), China (Hwang Po)
- Belongs to Bronze age
- Flourished along the Indus River
- Harappan civilization was named by John Marshall
- Spread- Sind, Baluchistan, Afghanistan, West Punjab, Gujarat, Uttar Pradesh, Haryana, Rajasthan, J & K, Punjab, Maharastra

### **Town Planning**

- i. Grid system (streets cutting at right angle)
- ii. Town has 2 parts - Upper part/Citadel & lower part
- iii. Upper part-west side, public buildings, member of ruling class
- iv. Lower part-east, inhabited by commoners
- v. Underground drainage system - connected all houses to the street; equipped with 'manhole'
- vi. The great Bath (Mohenjadaro) - Religious Bath, Changing rooms alongside
- vii. The granaries (Harappa)- 6 in a row in the Citadel

viii. Houses- made of burnt bricks, 2 or more storeyed, tiled bathrooms, square courtyard

ix. Lamp posts existed

### **Agriculture**

- i. Wheat, Barley (at 'Lothal' & 'Rangpur' rice husks were found)
- ii. Used wooden plough (evidence Kalibangan) & stone sickles for harvesting
- iii. Well irrigation (evidence- Dholavira)
  - "Pasupati seal", fire baked clay used to make terracotta figurines
  - Gambling was their favourite timepass - 1<sup>st</sup> to produce cotton in the world (Greeks called 'Sindon' & evidence at Mohenjadaro)

**Domestication-** Animal rearing practiced, evidence from the discovery of the "Humped Bull"

- i. Camel bones at Kalibangan
- ii. Remains of horse at Surkotada

### **Trade**

- i. Barter system; coins not evident
- ii. Weights & measures made of limestone, steatite etc & are in multiples of 16
- iii. Foreign trade with - Mesopotamia/ Sumeria (Iraq), Central Asia, Persia, Afghanistan, Bahrain

# INDIAN HISTORY

iv. Sumerian text refers to trade with 'Meluha' (Indus); 'Dilmun'/Bahrain & 'Makan' (Makran coast)

were intermediate stations.

v. Coastal towns- Lothal, Surkotada, Suktangendor, Prabspattan, Bhatrao, Kalibangan, Dholavira, Daimabad

vi. Exports - Steatite beads (from Chanhudaro), Conch-Shell (from Lothal), Ivory products, Copper, Cotton Goods, Terracotta Figurines, Pottery, etc

## Art and Craft

i. Bead making, Pottery-both Plain (red) or Painted (red and black);

ii. Pots were decorated with human figurines, plants, animals & geometrical patterns & ochre was painted over it.

iii. Seals were made steatite; pictures of one-horned bull, buffalo, tiger, rhinoceros, goat & elephant.

## SAMHITAS:

### RIG VEDA

- Veda of praise; collection of hymns
- Oldest of all Vedas
- 1017 hymns/suktas after adding "Bihilya sukta" number is 1028
- Specialized by 'hotri'(invoker) type of priest
- 10 mandalas(collection of hymns)& 8

### SAMA VEDA

- Veda of melody/rhythmic compilation of hymns for rig veda
- "Book of chants" contains 1549 hymns meant to be sung at the 'soma' sacrifice
- Specialized by a special class of Brahmanas called 'udgatis'.
- Has very little original value

- Chief female deity - terracotta figure where a plant is shown growing out of the embryo of a woman represents mother goddess (earth goddess)

- Chief male deity - **Pasupati Mahadeva** sitting in yogic posture having 3 faces and 2 horns; surrounded by an elephant, a tiger, a rhino, a buffalo & 2 deers appear at his feet

- **Pipal tree** was worshipped

## THE VEDIC AGE

### VEDIC LITERATURE:

Meaning- branch of literature considered as "sruti" (sacred knowledge or divine revelation)

Sruti means knowledge from God and Smriti means knowledge from god through yogis.

Consists= samhitas, brahmanas, aranyakas, Upanishads

# INDIAN HISTORY

## Ashtaks

- Contains "Gayatri mantra"( addressed to solar deity savitri)
- Tenth mandala has the "Purushasukta" hymns was added later
- Eleventh mandala is completely devoted to "Soma"

- Origin of Indian music is traced to it

## YAJUR VEDA

- Book of sacrificial prayers; Rituals of yajnas.
- Specialized by 'adhvaryu'(performer) type of priest
- Its Mantras tells how the sacrifice were to be performed & what part the "adhvaryu"- brahmanas who performed the manual work in the arrangement of sacrifice were to play at the time of sacrifice
- Complied in 40 path
- Divided into Krishna(black) & shukla(white) yajurveda
- Has the earliest Indian prose

## ATHARVA VEDA

- Mantras for magic spells to ward off evils & Diseases
- populate ritualistic systems & superstitions
- associated with 'Saunikiya' & 'Paipad' community
- collection of 711/731/760 hymns
- not included in 'Trai'
- divided into 20 'kandas'
- Oldest text on Indian medicine

## BRAHMANAS:

- Deal with science of sacrifice & propagate the "karmamarga"
- The origins of Indian sciences like mathematics & astronomy are traced to these texts

## ARANYAKAS:

- Meaning- forest books, deal with mysticism & symbolism of sacrifice & priestly philosophy

- Most of this literature has been lost by us unfortunately

### **UPANISHADS:**

The Upanishadas are the texts with high philosophical connotations.

- Upanishads are also called Vedanta i.e. end of Vedas
- Brihadaranyaka is the oldest Upanishada. The concept of life after death, for the first time appears here
- The latest Upanishada was written during the reign of Akbar

### **6 Vedangas/Smiriti**

- ❖ Shiksha- phonetics
- ❖ Vyakarna-grammar
- ❖ Kalpa-rituals
- ❖ Chandas-metrics
- ❖ Nirukta-etymology
- ❖ Jyotisha-astronomy

### **EARLY VEDIC(BC1500-BC1000):**

- When rig veda was compiled Aryans came through Khyber and bolan passes & lived in sindhu. They settled in 'sapta sindhu'(land of 7 rivers) in Punjab
- kula/family- kulapas(head)  
grama/village- gramani  
vis- vispati  
jana/tribe- rajan/tribal chief

- Tribal assemblies- vidata, sabha, samiti, gana; in later vedic sabha & samiti only prevailed.

- Satapatha brahmana

- ❖ Rajasuya (consecration) - confers supreme power to king
- ❖ Asvamedha (horse sacrifice) - establish supremacy over his neighbours
- ❖ Vajapeya (chariot race) - establish supremacy over his own people

- Trade- through barter but used cows & nishka as medium of exchange; later vedic-satamana & krishanla in addition to nishka(gold ornaments of fixed value)

- Varna system-10<sup>th</sup> mandala of rig veda mentions 4 fold division of the society(initially warriors/kshatriyas,priests/brahmanas,trade rs&farmers/vaishyas & in the end of rig vedic period added sudras who did menial works)

- Ashramas/stages of life- came in later vedic period; 'JABALA upanishad' mentions 4 stages

- ❖ Brahmacharia-student life
- ❖ Grihastha-life of the house holder
- ❖ Vanaprastha-partial retirement
- ❖ Sanyasin-complete retirement/ascetic life

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- Economy- cattle rearing & agriculture; iron used to make tools & instruments
- Food – wheat, barley, meat, milk, curd, vegetable, fruits; drank intoxicating drinks 'soma' & 'sura'
- Religion –
  - a) Indira (purandhara)- most important god, role as war lord& considered to be rain god
  - b) Agni(fire god)- 200 hymns addressed to this god; agni helped indra in the destruction of Purs & was the god of priest.
  - c) Varuna (water god)- uphold the 'rta' / natural order; god of ethics
  - d) Soma- god of plants

Apart from this important gods, there are 33 totally-maruts (storm spirit), female deity Aditi (goddess of eternity), Usha (goddess of the dawn) , Prithvi (earth goddess)

## **LATER VEDIC (BC 1000-BC 600):**

Literature of the later Vedic period can be categorized into six heads:

1. Vedangas
2. Smritis
3. Mahakavyas
4. Puranas
5. Upvedas

## 6. Dharshanas

- The three texts associated with different kind of rituals are:
  - a. Shrauta Sutras/Shulva Sutras – deal with the sacrifices
  - b. Grihya Sutras – deal with family ceremonies
  - c. Dharma Sutras – deal with Varnas, Ashramas & other.
- There are mainly two Epics:
  - I. The Ramayana written by Valmiki, it is known as Adi Kavya. At present, it consists of 24,000 shlokas i.e. verses.
  - II. The Mahabharata composed by Ved Vyasa is the oldest epics of the world. At present, it consists of 1,00,000 shlokas i.e. verses. Bhagavad Gita is extracted from Bihshma Parvan of Mahabharata and Shanti Parvan is the largest parvan of the Mahabharata.
- The Upavedas i.e the auxiliary Vedas were traditionally associated with the Vedas.
  - Ayur veda-medicine
  - Silpa veda-sculpture
  - Gandharva veda-music
  - Dhanur veda-warfare

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## MAJOR HARAPPAN SITES & THEIR EXCAVATIONS

Sites	Excavators	Region/River	characteristic
1.Harappa (1921)	Daya Ram Shani	Pakistani Punjab (Ravi River Bank)	Grid system, 6 granaries, Coffin burial & factorial burial, cemetery of Alien People
2. Mohenjadaro (1922)	R.D. Banerjee	Sind now Pakistan (Indus Bank)	Great bath, bearded man in steatite & a bronze dancing girl, mother goddess with a plant growing from her womb
3. Sutkagendor (1927)	Stein, R.L	Baluchistan on dast river	Evidence of horse, trade point between Harappa & babylon
4.Chanhudaro (1931)	M.G.Majumdar, Mackey	Sind - Indus bank	City has no citadel, evidence of copper/bronze tools of carts with seated drivers, beads & bangles factory
4. Kalibangan (1953)	A. Ghosh	Rajasthan - Ghaggar bank	Evidence of 7 fire altars & camel bones, wooden furrow,burials (rectangular/circular), houses with well
5. Lothal (1953)	S.R.Rao	Gujarat	Evidence of horse terracotta ,instrument for measuring angles pointing to modern compass, 1st man made port in the world & a dock, joint burial
6.Banawali (1974)	R.S. Bisht	Hissar district of Haryana	Evidence of Barley, pre Harappa & Harappa phase
7.Surkotada (1964)	J.P. Joshi	Bhuj District of Gujarat	Evidence of Bones of horses, bead making shops
9.Dolavira (1985-1990)	R.S. Bisht	Gujarat- Rann of Kutch	Largest site, 3 parts of city, unique water management

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10.Rangpur (1953)	M.S.vats	Gujarat – bank of mahar	Rice was cultivated
11.Alamgirpur (1958)	Y.D.sharma	Hindon in Ghaziabad	Impression of cloth on a trough is discovered
12. Ropar (1953)	Y.D. Sharma	Punjab –sutlej bank	Evidence of burying a dog below human burial; rectangular mud brick chamber
13.Balakot (1963-1976)	George F.Dales	Arabian sea	Mounds rise to the height of about 9.7m & are spread of 2.8 sq.hectare

## Mahajanapadas

**Mahajanapadas** is a combination of three words

- Maha-Great
- Jana-People
- Padas-Foothold

So Mahajanapadas were Great footholds of people of various tribes.

This was also the time when the name BHARAT-VARSH was coined for the whole indian subcontinent.

This vast land of roughly 3000 kms was split into 16 major mahajanapadas around the 6th century B.C.E and, they were divided into two categories as follows:

Monarchy:

11 of these Mahajanapadas were ruled by kings or monarchs. The kings in these states had the supreme authority.

- ❖ **Anga** (Kolkata and Bangladesh)
- ❖ **Kashi** (Varanasi/Benaras)
- ❖ **Kosala**, (East Uttar Pradesh)
- ❖ **Chedi**, (Central Madhya Pradesh)
- ❖ **Vatsa**, (southern Uttar Pradesh)
- ❖ **Matsya**, (Eastern Rajasthan and Western Madhya Pradesh)
- ❖ **Shursen**, (Indian Punjab)
- ❖ **Ashmak**, (Central India-Eastern Maharashtra)
- ❖ **Avanti**, (Western and southern Madhya Pradesh)
- ❖ **Gandhar** (Peshawar and northern Pakistan Punjab )
- ❖ **Magadha** (Bihar and Bengal)

## Republics:

The remaining 5 were Republic countries.

These republican states had a '**Gana-Parishad**' or an Assembly of senior and



# INDIAN HISTORY

responsible citizens. This, Gana-parishad had the supreme authority in the state.

All the administrative decisions were taken by this Parishad were taken by this Parishad.

- **Vriji** (North Eastern Uttar Pradesh)
- **Malla**, (Northern West Bengal and Western Assam)
- **Kuru** (Haryana and Delhi)
- **Panchal** (Uttarakhand and Western Uttar Pradesh)
- **Kamboj** (Northern Baluchistan and North West Frontier Province of Pakistan)

Of all these, Avanti, Kosala, Gandhar, Vatsa and Magadha were the biggest and their role was very important all the forth comings.

## **Kosala:**

- Shravasti, Kushavati, Saket, and Ayodhya were the famous cities of Kosala.
- Ayodhya was the State capital.
- The Kosala king Prasenajit was - a contemporary of Gautama Buddha. Kosala and Magadha went to war during his reign.
- The independent state of Kosala did not last -long after Prasenajit.

## **Vatsa:**

- Kaushambi of the present day Bihar, was the capital of Vatsa.
- Vatsa was famous for its fine cotton cloth.

- The Vatsa king Udayana was very brave.
- He was the follower of Gautama Buddha.
- The independent status of- Vatsa was soon lost after king Udayana.

## **Avanti:**

- The kingdom of Avanti comprised the area around the present day Ujjain in Madhya Pradesh.
- Pradyota, the king of Avanti, was a very ambitloys ruler.
- He was constantly engaged in conflicts with Kosala, Vatsa and Magadha.
- In this constant warfare, the Magadha state ultimately proved superior.

## **Magadha:**

- Expansion of the Magadha kingdom started during the reign of King Bimbisara.
- He annexed the kingdoms of Kashi, Madra and Anga to Magadha.
- There is a reference in the Buddhist works to 80,000 village in Bimbisara's kingdom.
- The capital of his kingdom was Rajagriha, the present day Rajgir in Bihar. The city of Rajagriha and King Bimbisara's palace were built by an architect named Mahagovinda.

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<b>JAINISM</b>	<b>BUDDHISM</b>
<ul style="list-style-type: none"> <li>• Founder- Vardhamana Mahavir</li> <li>• Prominence under the 24<sup>th</sup> thirthankar Mahavir(540 B.C – 468 B.C)</li> <li>• Belong to Jantrika Kshatriya clan</li> <li>• Birth place Kundagram(in Vaishali)</li> <li>• Father - Siddharth; Mother - Trishala (Sister of Lichchavi Prince Chetak of Vaishali)</li> <li>• Wife - Yashoda(Cousin)</li> <li>• Left home at the age of 30 &amp; wandered for 12 yrs.</li> <li>• Got Kaivalya at the age of 42 under a sall tree in Jrimbhiragrama</li> <li>• Died at Pavapuri</li> <li>• Rishavdeva -1<sup>st</sup> thirthankar</li> <li>• 23<sup>rd</sup> –Parshvanath(many teaching belong to him;200yrs before Mahavir)</li> <li>• Did not believe that god created this world while not denying the existence of god</li> </ul>	<ul style="list-style-type: none"> <li>• Founder – Gautam Buddha(563-483 B.C)</li> <li>• His original name - Siddhartha</li> <li>• Belong to Shakya Kshatriya clan</li> <li>• Father - Suddhodhana(ruler of Kapilavastu)</li> <li>• Mother – Maya (died in Child Birth) &amp; Step Mother - Aunt Goutami</li> <li>• Wife - Yasodhara(cousin) ; Son-Rahul</li> <li>• His charioteer - Channa; Horse – Kanthaka Left home at the age of 29 &amp; performed his 'Great Going Forth'/'Mahabiniskramana</li> <li>• Nirvana/ Enlightenment at 35yrs at uruvela under papal tree</li> <li>• 1<sup>st</sup> sermon called 'Dharmachakra pravartana' to his 5 disciples at sarnath</li> <li>• Died at Kusinagar(U.P) at 486 B.C</li> </ul>
<ul style="list-style-type: none"> <li>• 3 Gems/ Triratna</li> <li>. Right knowledge</li> <li>. Right belief</li> <li>. Right action</li> <li>• 5 doctrines</li> <li>. Ahimsa- non-violence</li> <li>. Satya-truth</li> <li>. Asatya-non stealing</li> <li>. Aparigraha-non possession</li> <li>. Brahmacharya-celibacy</li> </ul>	<ul style="list-style-type: none"> <li>• 4 noble truth</li> <li>. Life is full of sorrow</li> <li>. Desire is the cause of sorrow</li> <li>. Sorrow can be ended by giving up desire</li> <li>. The eight fold path is the way to end sorrow</li> <li>• 8 fold paths- right belief, right speech, right living, right memory, right effort, right thought, right action, right meditation</li> <li>• Sangam-organisation of monks</li> </ul>

# INDIAN HISTORY

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| <ul style="list-style-type: none"> <li>• Kings who followed- Chandragupta Maurya, Kalingathu Karavellen, Koon Pandian, Mahendravarma Pallava I.</li> <li>• Contributions to architecture-             <ul style="list-style-type: none"> <li>• Dilwara temple at Mount Abu, Rajasthan</li> <li>• Kajiraho temple of jains at Chittoor, Ranakpur</li> <li>• Sculptures at Udaiyagiri, Hathigumpa, Girnar, Saravanabelagola, Kazhugumalai.</li> </ul> </li> <li>• 1<sup>st</sup> Council - Pataliputra; Jainism divided to Svetambars (white clad) &amp; Digambars(who remained naked &amp; did not recognized the 12 Angas/Jain Literature). The 12 angas replaced 14 purvas</li> <li>• 2<sup>nd</sup> Council - 512 A.D at Vallabhi presided by devardhigani; resulted in the compliation of 12 Angas &amp; 12 Upangas.</li> <li>• Adopted Prakrit(language of common people)</li> <li>• Religious Literature- Ardhmagadhi</li> <li>• Sillapathikaram, Nannool, Chivagacinthamani, Vallayapathi were written by Jain monks</li> <li>• Contributed to growth of Kannada</li> </ul> | <ul style="list-style-type: none"> <li>• Kings followed-Ashoka, Ajatasatru, Sabakami, Mogaliputta, Vasumitra</li> <li>• Monuments -Jataka Tales (describes history of Buddhism) depicted at Gaya, Sanchi, Burhut, Ajanta &amp; Ellora cave paintings at maharashtra describes the fame of Buddha, gandhara art.</li> <li>• Chaityas - Prayar halls of Buddhist monks</li> <li>• Viharas-monastries</li> <li>• Tripitakas/Buddhist literature, in pali it is called three baskets - Vinayapitaka, Suttapitaka, Abhidammappitaka;</li> <li>• Manimekalai &amp; Kundalakesi are Buddhist literatures</li> <li>• 1<sup>st</sup> Council- at Satparni, Rajagriha (483 B.C); presiding priest is Mahakassapa' king-Ajatashatru; Upali recited the <i>Vinaya Pittaka</i> (rules of Buddhist order) &amp; Anand recited <i>Suttapitaka</i>(collections of Buddha's sermons).</li> <li>• 2<sup>nd</sup> Council- at vaishali(383 B.C); Priest-Sabakami; King- Kalasoka; Split of Buddhist order into <i>Sthaviravadins/Theravadins</i> &amp; <i>Mahasanghikas</i></li> <li>• 3<sup>rd</sup> Council- at Pataliputra(250 B.C); Priest-Mogaliputta; King-Ashoka; Establishment of Sthaviravada school as an orthodox school; Tissa(codification of Abhidhamma pitaka,deals with philosophy as Upagupta) of Buddhism in Pali</li> <li>• 4<sup>th</sup> Council- at Kundalvana, Kashmir;</li> </ul> |
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# INDIAN HISTORY

Priest- Vasumitra; King-Kanishka; Buddhist divided into Mahayana & Hinayana.

## Mauryan Empire

### Ashoka and the Mauryan Empire

- The Mauryan dynasty was founded by **Chandragupta Maurya** in 320 BC (after defeating the incumbent Nanda dynasty).
- He established the first territorial empire in ancient India, covering most of the Indian sub-continent. He was assisted by his political adviser, **KAUTALYA**, who also set out the rules for the administration of the country.
- The most famous king of the Mauryan dynasty was Ashoka, the grandson of Chandragupta Maurya. After Kalinga War, Ashoka embraced Buddhism and emerged as one of the most important and influential of all Buddhist patrons.
- His patronage extended to the construction of monasteries (**VIHARAS**) and prayer walls (**CHAITYAS**) for Buddhist followers, construction of stupas, (at **Sanchi**, for example) and other religious structures at Sarnath and Amaravati.
- Ashoka also spread the message of Buddhism through missions sent to Sri Lanka and northwestern India.

- The mission to Sri Lanka included his son, Mahinda, who carried with him a sapling from the Bodhi tree, under which Buddha attained Enlightenment. **Pataliputra, Kausambi, Ujjain** and **Taxila** were the most important cities in the Mauryan times.
- The maintenance of a huge army was the most striking feature of Chandragupta's administration.
- Ashoka is the first Indian king to speak directly to the people through his inscriptions.
- Ashokan inscriptions are the earliest specimens of **Prakrit** language in India.
- After the Kalinga War, Ashoka abandoned the policy of physical occupation (**Bherighosha**) in favour of a policy of cultural conquest (**Dhammaghosha**).
- Ashoka appointed a class of officers known as The '**Rajukas**', who were vested with judicial power.
- Ashoka appointed 'dharma-mahamatras' for propagating 'Dhamma' among various social groups.
- According to Arthashastra of Kautilya, the Mauryas appointed 27 superintendents

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(**adhyakshas**) mostly to regulate the economic activities.

- For the first time in Mauryan period, slaves were engaged in agricultural works on a large basis.

- '**Samaharta**' was the highest officer in charge of assessment and the '**Sannidhata**' was the chief custodian of the state treasury and the store house.

- The punch-marked silver coins formed the imperial currency of the Mauryas. These coins carried the symbols of peacock, hill and crescent.

- Fragments of stone pillars and stumps, indicating the existence of a 80-pillared Hall, have been discovered at **Kumrahar**, on the outskirts of **Modern Patna**.

- **Bhaga** or the land tax was the main item of revenue. It was levied at the rate of one-sixth to one-fourth of the produce.

- **Pushyagupta** built a dam for creating a reservoir of water near **Girnar** in **Saurashtra**. This was known as **Sudarshana todaga** (water tank). Pushyagupta was one of the governors of Chandragupta.

- **Samsthadhyaksha** looked after the markets.

- **Rajapanya** was the term used for the state produced goods.

- **Akaradhyaksha** was the superintendent of mines.

- **Gahapati** was the term used for the head of rich land-owning family.

- Sita lands were the lands owned and controlled directly by the state.

- The ancient Indian texts hold that there were seven components of state in ancient times. These seven components were called '**Saptangas**' (seven limbs) - **Swami** (king), **Mitra** (friends), **Danda** (army), **Kosa** (treasury), **Amatya** (minister), **Janapada** (territory) and **Durga** (fort). The **Arthashastra** gives the king primacy among the seven components.

- The **Girnar Rock Edicts** of Ashoka mention the function of the council of ministers (**Mantriparishad**). **Rock Edict III and Rock Edict VI** also mention the rights and obligations of mantriparishad.

- Laying down the criteria for selection of ministers in the mantriparishad, the Arthashastra says that **Sarvopadasudha** (purest of all) person should be appointed a minister.

- The Arthashastra mention 18 Tirthas (Departments) in the Mauryan administration.

- The head of the urban (city) administration was called nagariaka. He was assisted by

# INDIAN HISTORY

two subordinate officials - **Gopa** and **Sthanika**.

- Gopa looked after the registration of births and deaths in the Mauryan Empire.
- The police in Mauryan administration was known as **Rakshi**.
- During the Mauryan rule, there were six branches of the army: Infantry, Cavalry, Elephants, Chariots, Transport, and Admiral of the Fleet. Each branch was looked after by a committee of five members.
- At the village level, the '**Gramika**' looked after judicial administration.
- In Mauryan times, the gamblers had to part with five percent of their winnings to the state.
- The head of the provincial administration was the '**Kumara**' (Royal Prince). He governed the province as the king's representative. Ashoka had been the 'Kumara' of Ujjain and Taxila before becoming the king. The '**Kumara**' was assisted by mahamatyas - called **Mahamatras**.
- Ashokan Edicts mention four provincial capitals. **Toshali** in the east, **Ujjain** in the west, **Suvarnagiri** in the south and **Taxila** in the north.

- Pradeshta was the highest official at the district level. He was assisted by **Rajukas** and **Yuktas**.
- The yukta was a junior district official who gave secretarial assistance to **Pradeshta** and **Rajuka**.
- The Pillar Edict IV is entirely addressed to the Rajukas.
- Megasthenes divided Indian society into seven categories.
- Bindusara asked **Antiochus I** of Syria to send him figs, wine and philosophers.
- Ashokan inscriptions were composed mainly in Prakrit language.
- Rock-cut architecture in India made a beginning during Ashoka's reign.

## **CHANDRAGUPTA MAURYA**

1. The Mauryan empire was founded by Chandragupta Maurya.
2. It is believed that Chandragupta Maurya was born to a sudra woman, Mura.
3. According to Buddhist tradition Chandragupta Maurya belonged to the Maurya Kshatriya clan.
4. Chanakya (Kautilya) wrote the Arthashastra, which contains treatises on economics, politics, foreign affairs, administration, military arts, war, and religion.

# INDIAN HISTORY

5. Chandragupta Maurya defeated **Seleucus Nicator** in **305 B.C.** Seleucus Nicator sent his ambassador Megasthenes to the court of Chandragupta Maurya. Megasthenes wrote Indica which gives detail information of the Mauryan society under the rule of Chandragupta Maurya. Seleucus had to surrendered a large territory **Paropamisade (Kamboja and Gandhara), Arachosia (Kandhahar) and Gedrosia (Baluchistan)**. Seleucus Nicator also married his daughter to Chandragupta Maurya. In return Seleucus received 500 war elephants.

6. According to Jain text Chandragupta Maurya converted to Jainism.

7. Chandragupta Maurya spent his last days at **Sravanabelagola** involved in **Salekna (Jain tradition following fast unto death)**

## **BINDUSARA**

1. **Bindusara** was the son of **Chandragupta Maurya** and his queen **Durdhara**.

2. Greek writers refer him as **Amitraghata**.

3. Bindusara extended this empire to the southern part of India.

4. Bindusara didn't conquer the friendly Dravidian kingdoms of the Cholas, the Pandyas, and Cheras

5. Apart from these southern states, Kalinga (modern Odisha) was the only kingdom in India that didn't form the part of Bindusara's empire.

6. Kalinga was later conquered by his son Ashoka, who served as the viceroy of Ujjain during his father's reign.

7. Ambassador **Deimachus** of Seleucid Empire visited the court of Bindusara.

8. Bindusara followed the **Ajivika sect**.

9. Bindusara sent his son Ashoka to quell a rebellion in Taxilla.

## **ASHOKA**

1. Ashok Vardhan Maurya was the son of Bindusara. He was also known as Ashoka or Ashoka The Great.

2. As a young prince, Ashoka was a brilliant commander who crushed revolts in Ujjain and Taxila.

3. Ashoka's conquest of **Kalinga (262-261 B.C.)** against **Raja Ananta Padmananda** proved to be the pivotal event of his life. Although Ashoka's army succeeded in defeating Kalinga forces of royal soldiers and civilian units, an estimated 100,000 soldiers and civilians were killed in the war.

4. Destruction and fallout of Kalinga war changed Ashoka's attitude towards non-violence. He embraced Buddhism and renounced war.

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5. He sent out Buddhist missionaries to travel around Asia and spread Buddhism to other countries.

6. **The Lion Capital of Ashoka, which was erected around 250 B.C. is now the National Emblem of India.**

7. Third Buddhist Council was held in 250 B.C. under the patronage of King Ashoka. **SANGAM AGE**

The Sangam Age constitutes an important chapter in the history of South India. According to Tamil legends, there existed three Sangams (Academy of Tamil poets) in ancient Tamil Nadu popularly called **Muchchangam**.

These Sangams flourished under the royal patronage of the **Pandys**.

**First Sangam** --- held at then Madurai, was attended by gods and legendary sages but no literary work of this Sangam was available.

**Second Sangam**--- was held at Kapadapuram but the all the literary works had perished except Tolkappiyam.

**Third Sangam**--- at Madurai was founded by Mudathirumaran. It was attended by a large number of poets who produced voluminous literature but only a few had survived. These Tamil literary works remain

useful sources to reconstruct the history of the Sangam Age.

Sangam Literature includes Tolkappiyam, Ettutogai, Pattuppattu, Pathinenkilkanakku, and the two epics about Silappathigaram and Manimegalai.

**TOLKAPPIYAM:** authored by Tolkappiyar is the earliest of the Tamil literature. It is a work on Tamil grammar but it provides information on the political and socioeconomic conditions of the Sangam period.

**ETTUTOGAI:** Also called Eight Anthologies consist of eight works – Aingurunooru, Narrinai, Aganaooru, Purananooru, Kuruntogai, Kalittogai, Paripadal and Padirrupattu.

**PATTUPPATTU:** Ten Idylls consist of ten

works – Thirumurugarrupadai, Porunararrupadai, Sirupanarrupadai, Perumpanarrupadai, Mullaippattu, Nedunalvadai, Maduraikkanji, Kurinjippattu, Pattinappalai and Malaipadukadam.

Both Ettutogai and Pattuppattu were divided into two main groups – Aham (love) and Puram (valour). **PATHINENKILKANAKKU:** contains eighteen works mostly dealing with ethics and morals. The most important among them is Tirukkural authored by Thiruvalluvar. Silappathigaram written by Elango Adigal and Manimegalai by Sittalai



Sattanar also provides valuable information on the Sangam polity and society.

#### **OTHER SOURCES:**

In addition to the Sangam literature,

- the Greek authors like Megasthenes, Strabo, Pliny and Ptolemy mention the commercial contacts between the West and South India.

- The Asokan inscriptions mention the Chera, Chola and Pandya rulers on the south of the Mauryan empire.

- The Hathikumbha inscription of Kharavela of Kalinga also mentions about Tamil kingdoms.

- The excavations at Arikamedu, Poompuhar, Kodumanal and other places reveal the overseas commercial activities of the Tamils.

#### **PERIOD OF SANGAM LITERATURE**

The most probable date of the Sangam literature has been fixed between the third century B.C. to third century A.D. on the basis of literary, archaeological and numismatic evidences. **POLITICAL HISTORY**

The Tamil country was ruled by three dynasties namely the Chera, Chola and Pandyas during the Sangam Age. The political history of these dynasties can be traced from the literary references.

#### **1. CHERAS:**

- ruled over parts of modern Kerala
- capital was Vanji
- important seaports were Tondi and Musiri.

- The **Pugalur inscription** of the first century A.D refers to three generations of Chera rulers.

- Padirupattu also provides information on Chera kings

- Perum Sorru Udhiyan Cheralathan, Imayavaramban Nedum Cheralathan and Cheran Senguttuvan were the famous rulers of this dynasty

- **Cheran Senguttuvan** belonged to 2nd century A.D. His younger brother was Elango Adigal, the

author of Silappathigaram. Among his military achievements, his expedition to the Himalayas was remarkable. He defeated many north Indian monarchs. Senguttuvan introduced the Pattini cult or the worship of Kannagi as the ideal wife in Tamil Nadu. The stone for making the idol of Kannagi was brought by him after his Himalayan expedition. The consecration ceremony was attended by many princes including Gajabhagu II from Sri Lanka.

# INDIAN HISTORY

## 2. CHOLAS:

- extended from modern Tiruchi district to southern Andhra Pradesh.
- capital was first located at Uraiyur and then shifted to Puhar.
- **Karikala** was a famous king of the Sangam Cholas.
- Pattinappalai portrays his early life and his military conquests. In the *Battle of Venni* he defeated the mighty confederacy consisting of the Cheras, Pandyas and eleven minor chieftains. This event is mentioned in many Sangam poems.
- *Vahaipparandalai* was another important battle fought by him in which nine enemy chieftains submitted before him. Karikala's military achievements made him the overlord of the whole Tamil country. Trade and commerce flourished during his reign period. He was responsible for the reclamation of forest lands and brought them under cultivation thus adding prosperity to the people. He also built **Kallanai** across the river Kaveri and also constructed many irrigation tanks.

## 3. PANDYAS:

- ruled over the present day southern Tamil Nadu
- capital was Madurai.

- earliest kings of the Pandyan dynasty were Nediyan, Palyagasalai Mudukudumi Peruvaludhi and Mudathirumaran. There were two Neduncheliyans. The first one was known as *Aryappadai Kadantha Neduncheliyan* (one who won victories over the Aryan forces). He was responsible for the execution of Kovalan for which Kannagi burnt Madurai. The other was *Talaiyalanganattu Cheruvenra* (He who won the battle at Talaiyalanganam) Neduncheliyan. He was praised by Nakkirar and Mangudi Maruthanar. He wore this title after defeating his enemies at the *Battle of Talaiyalanganam*, which is located in the Tanjore district. By this victory Neduncheliyan gained control over the entire Tamil Nadu.

- **Maduraikkanji** written by *Mangudi Maruthanar* describes the socio-economic condition of the

- Pandya country including the flourishing seaport of Korkai. The last famous Pandyan king was Uggira Peruvaludhi. The Pandyan rule during the Sangam Age began to decline due to the invasion of the Kalabhras.

### Minor Chieftains

The minor chieftains played a significant role in the Sangam period. Among them Pari, Kari, Ori, Nalli, Pegan, Ay and

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Adiyaman were popular for their philanthropy and patronage of Tamil poets. Therefore, they were known as **Kadai Yelu Vallalgal**.

**SANGAM POLITY:** Hereditary monarchy was the form of government during the Sangam period. The king had also taken the advice of his minister, court-poet and the imperial court or *avai*.

## **Titles:**

Chera kings- *Vanavaramban, Vanavan, Kuttuvan, Irumporai and Villavar*

Chola kings- *Senni, Valavan and Killi*

Pandya kings- *Thennavar and Minavar*.

Each of the Sangam dynasties had a royal emblem –

- carp for the Pandyas,
- tiger for the Cholas
- bow for the Cheras.

The king was assisted by a large body of officials who were divided into five councils. They were ministers (amaichar), priests (anthanar), military commanders (senapathi), envoys (thuthar) and spies (orarr). The military administration was also efficiently organized during the Sangam Age. Each ruler had a regular army and their respective Kodimaram (tutelary tree). Land revenue was the chief source of state's income while custom duty was also imposed

on foreign trade. The Pattinappalai refers to the custom officials employed in the seaport of Puhar. Booty captured in wars was also a major income to the royal treasury.

## **SANGAM SOCIETY**

Tolkappiyam refers to the five-fold division of lands.

- Kurinji (hilly tracks)–chief deity was Murugan – chief occupation, hunting and honey collection.
- Mullai (pastoral)–chief deity Mayon (Vishnu) –chief occupation, cattle-rearing and dealing with dairy products.
- Marudam (agricultural) – chief deity Indira – chief occupation, agriculture.
- Neydal (coastal) – chief deity Varunan – chief occupation fishing and salt manufacturing.
- Paalai (desert) – chief deity Korravai – chief occupation robbery.

Tolkappiyam also refers to *four castes namely arasar (ruling class), anthanar (played a significant role in the Sangam polity and religion), vanigar(trade and commerce) and vellalar(agriculturists)*.

Other tribal groups like Parathavar, Panar, Eyinar, Kadambar, Maravar and Pulaiyar were also found in the Sangam society. Ancient primitive tribes like Thodas, Irulas, Nagas and Vedars lived in this period.

# INDIAN HISTORY

## RELIGION:

The primary deity of the Sangam period was **Seyon or Murugan**, who is hailed as Tamil God. The worship of Murugan was having an ancient origin and the festivals relating to God Murugan was mentioned in the Sangam literature. He was honoured with six abodes known as Arupadai Veedu. Other gods worshipped during the Sangam period were Mayon (Vishnu), Vendan (Indiran), Varunan and Korravai. The *Hero Stone or Nadu Kal* worship was significant in the Sangam period. The Hero Stone was erected in memory of the bravery shown by the warrior in battle. Many hero stones with legends inscribed on them were found in different parts of Tamil Nadu. This kind of worshipping the deceased has a great antiquity.

## FINE ARTS

Poetry, music and dancing were popular among the people of the Sangam age. Liberal donations were given to poets by the kings, chieftains and nobles. The royal courts were crowded with singing bards called *Panar and Viraliyar*. They were experts in folk songs and folk dances. The arts of music and dancing were highly developed. A variety of *Yazhs and drums* are referred to in the Sangam literature. Dancing was

performed by Kanigaiyar. *Koothu* was the most popular entertainment of the people.

## POSITION OF WOMEN

Women poets like Avvaiyar, Nachchellaiyar, and Kakkaipadiniyar flourished in this period and contributed to Tamil literature. The courage of women was also appreciated in many poems. *Karpu or Chaste life* was considered the highest virtue of women. Love marriage was a common practice. The practice of Sati was also prevalent in the higher strata of society. The class of dancers was patronized by the kings and nobles.

## ECONOMY

- Cotton clothes as thin as a cloud of steam or a slough of a snake; great demand in the western world for the cotton clothes woven at **Uraiyur**.
- Both internal (based on Barter System) and foreign trade was well organized and briskly carried on in the Sangam Age.
- External trade was carried between South India and the Greek kingdoms.
- The port city of **Puhar** became an emporium of foreign trade, as big ships entered this port with precious goods. Other ports of commercial activity include **Tondi, Musiri, Korkai, Arikamedu and Marakkanam**.

# INDIAN HISTORY

• Plenty of gold and silver coins issued by the Roman Emperors like Augustus, Tiberius and Nero were found in all parts of Tamil Nadu. They reveal the extent of the trade and the presence of Roman traders in the Tamil country.

The main exports of the Sangam age were cotton fabrics, spices like pepper, ginger, cardamom, cinnamon and turmeric, ivory products, pearls and precious stones. Gold, horses and sweet wine were the chief imports.

## **Post Mauryan Kingdom (185 BC- 319 AD)**

1. Native Successors of Mauryas

**Sung dynasty:** 185 BC- 73 BC

**Kanva dynasty:** 73 BC- 28 BC

**Satavahana dynasty:** 60 BC- 225 AD

**Cheti dynasty:** 1st Century BC

2. Foreign Successors of Mauryas

**The Indo-Greeks:** 2nd Century BC

**The Sakas:** 1st Century BC- 4th Century

AD **The Parthians:** 1st Century BC- 1st Century AD

**The Kushans:** 1st Century AD- 3rd Century AD

**Sunga Dynasty: 185 BC-73 BC**

○ Sunga dynasty was established by **Pushymitra Sunga**, a Brahmin Commander

in chief of last Mauryan ruler named **Brihadratha** in 185 BC

○ Pushyamitra was succeeded by his son **Agnimitra**, the hero of **Kalidasa's** drama '**Malvikagnimitra**'

○ After Agnimitra, series of weak rulers such as **Vasumitra, Vajramitra, Bhagabhadra, Devabhuti**, followed leading to the decline of the dynasty.

○ **Patanjali**, author of the '**Mahabhasya**', was born at **Gonarda** in Central India. Patanjali was the priest of 2 Asvamedha Yajnas, performed by Pushyimitra Sunga.

○ In arts, the **Bharhut Stupa** is the most famous monument of the Sunga period.

○ The fine gateway railing which surrounds the Sanchi stupa, built by Ashoka constructed during the Sunga period.

○ Other examples of Sunga art: **Vihar, Chaitya and Stupa of Bhaja (Poona), Amaravati Stupa, Nasika Chaitya** etc.

**Kanva Dynasty: 73 BC- 28 BC**

○ In 73 BC, **Devabhuti**, the last ruler of the Sunga dynasty, was murdered by his minister **Vasudeva**, who usurped the throne and founded the **Kanva dynasty**.

○ The Period of Kanva rule came to an end in 28 BC

# INDIAN HISTORY

## **Satavahana Dynasty: 60 BC- 225 AD**

**[Capital- Pratishana/Paithan (Maharashtra)]**

O The most important of the native successors of the Mauryas in the Deccan and Central India were the Satvahanas.

O **Simuka** (60 BC- 37 BC) was the founder of the Satvahana dynasty.

O **Satakarni I**, its 3rd ruler, raised its power and prestige by conquests.

O Hala, its 17th ruler, was the author of '**Gathasaptasati**' or '**Sattasai**' in **Prakrit**. O **Gunadhya**, the author of '**Vrihat Katha**' (in Prakrit), was the contemporary of Hala. O

**Pulamavi III**, its 30th ruler, was the last Satavahana ruler.

O The Official language of the Satavahana was Prakrit.

O Satavahanas were finally succeeded by the **Ikshvakus** in 3rd Century AD

## **Cheti / Chedi Dynasty of Kalinga: 1st Century BC**

O The history of Kalinga after the death of Ashoka is shrouded in obscurity. A new dynasty, known as the Cheti or Chedi dynasty, rose in the region probably in the 1st century BC

O **Kharavela**, the 3rd ruler of dynasty was a follower of **Jainism**. He was liberal patron of

Jain monks for whose residence he constructed caves on the Udayagiri hill, near Bhubaneshwar in Odissa.

## **The Indo-Greeks: 2<sup>nd</sup> Century BC**

O Indo-Greeks (Bactrian Greeks) were the 1st foreign rulers of North-western India in the Post-Maurya period.

O The most famous Indo-Greek ruler **Menander** (165 BC-145 BC), also known as **Milinda**.

O The Indo-Greek rule is important in the history of India because of the large number of coins which they issued.

O The Indo-Greeks were the 1<sup>st</sup> rulers in India to issue coins which can definitely be attributed to the kings.

O They were 1<sup>st</sup> to issue gold coins.

O They introduced Hellenism i.e. Greek features in art giving rise to **Gandhar School** in the North-western India.

## **The Sakas: 1st Century BC-4th Century AD**

O The **Sakas**, also known as **Scythians**, replaced the Indo-Greeks in India.

O The most famous Saka ruler in India was **Rudradaman** (130 AD- 150 AD). He repaired **Sudharsana lake**.

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O Other important Saka ruler in India were **Nahapana**, **Ushavadeva**, **Ghamatika**, **Chashtana** etc

O In about 58 BC, a king of Ujjain-Vikramaditya is supposed to have fought effectively against the Sakas. An era called **Vikrama Samvat** is reckoned from 58 BC **The Parthians: 1st Century BC- 1st Century AD**

O Originally the **Parthians (Pahlavas)** lived in Iran, they replaced the Sakas in North-western India, but controlled an area much smaller than the Sakas.

O The most famous Parthian king was **Gondaphernes** in whose reign St.Thomas is said to have come to India for the propagation of Christianity.

**The Kushans: 1st Century AD- 3rd Century AD**

O The Kushans were one of the five Yeuchi clans of Central Asia.

O The 1st Kushan dynasty was founded by **Kadphises I/Kujul kadhphises**. The 2nd king was **Kadphises II/Vema Kadhphises**.

O The 2nd Kushan dynasty was founded by **Kanishka**. Its kings extended the Kushan power over upper India. Their capitals were at **Peshawar (Purushapura)** and **Mathura**

O The most famous Kushan ruler was **Kanishka** (78 AD-101 AD), also known as '**Second Ashoka**'. He started an era in 78 AD which is now known as the Saka era and is used by the Government of India.

O Kanishka was a great patron of **Mahayana Buddhism**. In his reign 4th Buddhist council was held in **Kundalavana, Kashmir** where the doctrines of the **Mahayana** form of Buddhism were finalized.

O The last great Kushan ruler was **Vasudeva I**.

O The Kushan controlled famous silk routes starting from China, passing through their empire on to Iran and Western Asia. This route was a source of great income to the Kushans.

O In 46-47 AD, **Hippalus**, a greek sailor, discovered the monsoon sea-route to India from West-Asia.

**3 School of Sculpture of Post Mauryas: 1. Amaravati School - (150 BC – 400 AD):**

Satavahanas

2. **Gandhar School - (50 BC- 5th Century AD):** Saka Kushans

3. **Mathura School - (150 AD- 300 AD):** Saka Kushans

**Gupta Period**

- Samudra Gupta is known as the Indian Napoleon.

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- The Gupta era started in AD 320.
- The royal seal of the Guptas bore the emblem of the 'Garudas'.
- The official language of the Guptas was Sanskrit.
- The narrative scenes of the Ajanta painting of this period mainly relate to stories from the Jataka.
- The poet Harisena's inscription - known as **Prayagaprasati** and engraved on the Ashokan pillar at Allahabad - speaks of Samudra Gupta's accession and conquests.
- According to Prayagaprasati, 12 rulers from Dakshinapatha (South India) were defeated by Samudra Gupta.
- Gupta kings adopted titles like, **Parambhatlaraka, Paramdaivata, Chakravarti, Parmeshwar**, etc.
- **Pratihara** in the Gupta age regulated ceremonies and granted the necessary permits for admission to the royal presence. Dutakas were associated with the task of implementing land gifts to Brahmans and others.
- **Uparikara** was a tax levied on cloth, oil, etc. **Sulka**, a commercial tax, was imposed on the organization of traders. The king had a right to forced labour (Visthi), Bali, and many other types of contributions.
- The Gupta empire was divided into **Desas**, or **Rashtras**, or **Bhuktis**. The Bhuktis were governed by Uparikas (provincial governors) who were appointed directly by the king.
- The Bhukti or province was divided into **Vishayas** (districts) under an officer called **Ayuktaka** and in other cases a Vishayapati appointed by the Uparika.
- The head of the city merchants was called nagarsresthi, while the caravan leader was known as **Sarthavaha**.
- **Pustapalas** were the district level officials whose work was to manage and keep records.
- Village under **Gramapati** or **Gramadhyaksha** was the lowest unit of administration.
- Gupta inscriptions from Bengal mention different categories of villages such as **Gramikas, Kutumbis** and **Mahattaras**.
- Lands under cultivation were usually called kshetra, while those not under cultivation were variously called as **khila, aparahata**, etc.
- Nivartana was the term used for a measure of land but, in the inscriptions of Bengal, terms like **Kulyavapa** and **Dronavapa** are used for measuring land.
- Irrigation through **Ghati-Yantra**, also known as **Araghatta**, became more popular



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in the Gupta age. In Ghati-Yantra, a number of pots were tied to a chain. The chain and the pots were rotated to reach down the water of the hull so that pots would continuously fill with water and empty the hull.

- Ordinary cultivators of the Gupta period were known by various terms such as **Krishihala**, **Karshaka**, or **Kinass**. They had low social and economic status.
- **Kshauma** and **Pattavastra** were different varieties of silk cloths produced in the Gupta age.
- Brahman settlements in the Gupta period were known as '**Brahmadiyas**', '**Agraharas**', etc.
- An inscription of the fifth century AD from the **Mandasor (Malwa)** refers to a guild of silk weavers who had migrated from South Gujarat and had settled in the Malwa region.
- Various '**Jatis**' (castes) originated in the Gupta age through 'Varna-Samkara' or inter-marriages between various varnas.
- '**Vratya Kshatriyas**' or Semi-Kshatriyas were the terms used for various Pre-Gupta ruling families.
- The empire of the Guptas, feudatories of the **Kushans** in Uttar Pradesh, arose on the ruins of the Kushan Empire. After the end of Kushan power around AD 230, central India

fell under the rule of the Murundas, possibly the kinsmen of the Kushans. The **Murundas** were defeated by the **Guptas** in AD 275.

- Harisena was the court poet of **Samudra Gupta**.
- **Atarika Rajyas** was the term used for forest kingdoms situated in the Vindhya region.
- The victory of **Chandra Gupta II** over **Western Malwa** and **Gujarat** gave the Gupta ruler the western sea coast, which was famous for trade and commerce.
- Chandra Gupta II, who adopted the title of **Vikramaditya**, made **Ujjain** his second capital.
- **Skanda Gupta** is credited with effectively stemming the march of the **Hunas** into India, but his successors could not cope with the Huna invaders who excelled in horsemanship and used stirrups made of metal.
- **Yasodharman** of Malwa successfully challenged the authority of the Guptas and set up, in AD 532, pillars of victory commemorating his conquest of almost the whole of Northern India.
- Following the end of the Gupta rule in the sixth century, **Maukharis**, with their capital at Kannauj, rose to power in Bihar and Uttar Pradesh.

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- Land tax in the Gupta period varied from one-fourth to one-sixth of the produce.
- **Kumaramatyas**, appointed in the home provinces and paid in cash, were the most important officers in the Gupta Empire.
- In the urban administration, organised professional bodies were given considerable share.
- The grant of fiscal and administrative concessions to priests and officers was an important feudal development that surfaced under the Guptas. Religious functionaries were granted (Land free of tax forever) and they were authorized to collect from the peasants all taxes that could have otherwise gone to the king. Royal agents, retainers, etc. could not enter the granted villages.
- The Guptas issued the largest number of gold coins, called '**dinars**' in Gupta administration, in ancient India.
- There were two main factors for the proliferation of numerous sub-castes in Indian society during the Gupta period: (i) assimilation of foreign invaders, mainly as **kshatriyas**, into the Indian society; and (ii) absorption of many tribal peoples into brahmanical society through the process of land grants.
- The position of **shudras** improved in this period. They were allowed to perform certain domestic sites and worship a new God, **Krishna**.
- The first example of '**Sati**' appears from Eran (Madhya Pradesh) in the Gupta times in AD 510.
- The status of women, particularly those belonging to upper '**varnas**', declined during the Gupta period.
- Bhagavatism or Vaishnavism overshadowed Mahayana Buddhism by the times of the Guptas.
- Samudra Gupta is represented on his coins playing 'Vina'.
- There are 33 lines in Harisena's '**Prayagaprasasti**' .
- The Gupta period is called the Golden Age of ancient India.
- **Samudra Gupta** granted permission to the Buddhist king of Ceylon, **Meghavarman**, to build a monastery at **Bodh Gaya**.
- **Chandra Gupta II** married with the Naga princess, **Kubernaga**, and allowed his daughter Parbhavati to marry with Rudrasena II, a Vakataka king.
- The **Mehrauli Iron Pillar** Inscription near **Qutub Minar**, Delhi, enumerates the exploits of Chandra Gupta II.
- The Gupta Empire extended from north Bengal in the east to **Kathiawar** in the west

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and from **Himalayas** in the north to **Narmada** in the South.

- **Ajanta, Ellora** and **Bagh** are the famous centers of Gupta paintings.

- The Gupta era heralded the two important styles in temples - **Nagara** (North India) and **Dravida** (South India). Another style is **Vesera** (Combination of both styles) followed in modern Karnataka region.

- An over two-meter high bronze image of the Buddha belonging to the Gupta period has been recovered from Sultanganj (Bihar).

- The best specimens of Hindu sculpture during the Gupta period are found in the **Deogarh** (Madhya Pradesh) temple.

- The chief characteristics of Gupta art are refinement, simplicity of expression and religious virtuosity.

- The Indian notational system was called Hindsa by the Arabs who took it to the west.

- **Aryabhata** is credited with calculating the value of 'n' and the length of a solar year.

- **Vagabhatta** was a renowned physician of the time.

## CHANDRAGUPTA I

1. Chandragupta-I was the son of **Ghatotkacha**.

2. Chandragupta-I enhanced his power by marrying **Kumara Devi**, a Lichchhavi princess—the main power in Magadha.

3. Chandragupta-I was the real founder of Gupta dynasty. He expanded his kingdom by conquering much of **Magadha, Prayaga** and **Saketa**.

4. He assumed the title of **Maharajadhiraja**.

5. **Patliputra** was the capital of Gupta dynasty.

## SAMUDRAGUPTA

1. Samudragupta was the son of Chandragupta-I.

2. The Gupta dynasty was enlarged enormously by Samudragupta.

3. Due to his bravery and generalship, the historian **V. A. Smith** quoted him as **Napoleon of India**.

4. On some coins of Gupta era Samudragupta was shown as playing the musical instrument Veena.

5. Important scholars in the court of Samudragupta were Harishena, Vasubandhu and Asanga.

6. The **Prayag Prashasti** (also known as **Allahbad pillar inscription**) composed in Sanskrit by Harisena gave information about Samudragupta's achievement.

7. Samudragupta was a great patron of art and music. He assumed the title of **Kaviraja**.

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8. Samudragupta was a firm believer in Hinduism and is known to have worshipped **Lord Vishnu**.

9. Samudragupta allowed Sri Lanka's Buddhist king **Meghavarman** to build a monastery at **Bodh Gaya**.

## **CHANDRAGUPTA II**

1. Chandragupta-II was the son of Samudragupta.

2. After Samudragupta's death, **Ramagupta** succeeded him but his elder brother Chandragupta-II killed him and married his wife **Dhruvadevi**.

3. Chandragupta-II defeated **Rudrasimha III**, the Saka king and annexed his kingdom and assumed the title of **Vikramaditya**.

4. Chandragupta-II was the first ruler to issue silver coins. He also issued copper coins.

5. Patliputra continued to be the capital of Gupta dynasty. Ujjain was made second capital of Gupta dynasty.

6. Court of Chandragupta-II was adorned by **Nine Gems (Navratnas)** including Kalidasa, Amarsimha, Varahmihira, Dhanvantri, etc.

7. Chinese traveller Fa-hein came during the reign of Chandragupta-II.

## **KUMARAGUPTA or SHAKRADITYA**

1. Kumaragupta-I was the son of Chandragupta-II. He succeeded

### **Chandragupta-II.**

2. Kumaragupta-I adopted the title of **Mahendraditya**.

3. During the later year of his reign the Gupta Empire was threatened by the rebellion of Pushyamitras of central India and invasion of the Hunas. However, Kumaragupta-I was successful in defeating both threats and performed **Ashvamedha** (horse sacrifice) to celebrate his victory.

4. Kumaragupta-I issued new coins with images of **Lord Kartikeya**.

5. Kumaragupta-I founded the **Nalanda University**.

6. Kumaragupta-I was followed by his son Skandagupta. Skandagupta faced the Hunas effectively. Skandagupta repaired Sudharsana lake for the second time (Only Gupta ruler to do so).

7. The continuous attacks of the Hunas weakened the Gupta dynasty. Skandagupta died in 467 A.D. After his death, the Gupta dynasty began to decline.

# INDIAN HISTORY

Univeristy	Place	Dynasty/Ruler	Facts
Pushpagiri School	Odisha	Sunga dynasty	Hiuen Tsang - Chinese traveller visited this school during Harshavardhana period
Nalanda University	Bihar	Kumara Gupta	Many scholars from Sri Lanka, Korea, Japan, China, Tibet, Turkey, Persia and Indonesia came to study.
Taxila or Takshashila University	Ghandar(Modern Pakistan)	Taksha Khanda	Panini, Kautilya, Charaka, Jivaka, Jotipala were students of this university
Vikramasila University	Bihar	Dharmapala	It was a centre for Vajrayana and employed Tantric preceptors

## DELHI SULTANATE

**INTRODUCTION:** The Delhi Sultanate were the Persian-speaking dynasties of Turkic and Afghan origin, which were controlling India from 1210 to 1526. Many of these dynasties ruled from Delhi. This includes the Slave dynasty (1206-90), the Khilji dynasty (1290-1320), the Tughlaq dynasty (1320-1413), the Sayyid dynasty (1414-51), and the Lodi dynasty (1451-1526). Later on, after India fell to the Mughals, there was again a brief period when Humayun son of the Mughal Babur and father of Akbar the Great, was deposed by the Pathan Suri dynasty who enjoyed a short rule then, before Humayun was reinstated in 1555.

## Mamluk, or Slave dynasty (1206 - 1290):

The Mamluk Dynasty or Slave Dynasty, directed into India by Qutb-ud-din Aibek, a Turkic general of Central Asian birth, was the first of five unrelated dynasties to rule India's Delhi Sultanate from 1206 to 1290. **Qutb-ud-din Aibak (1206 - 1210):**

Qutb was born of Turkic parents in Turkistan. With his headquarters at Delhi, Qutb subjugated areas between the Ganges (Ganga) and Yamuna (Jumna) rivers. He then turned his attention the Rajputs who were still resisting Ghūrid domination. He built the Quwwat-ul-Islam mosque in Delhi and the Adhai-Din-Ka-Jhonpra mosque in

# INDIAN HISTORY

Ajmer. He started the construction of Qutb Minar in memory of sufi saint Qutb-ud-din Bakhtiar Kaki which was completed by his successor, Iltutmish. He died of injuries received in a polo match. He was buried in Lahore near the Anarkali Bazaar.

## **Aram Shah (1210–1211):**

There were no fixed rules governing the succession in the Sultanate, Aram being selected by Turkish amirs at Lahore. Aram was ill-qualified to govern a kingdom. The Chihalgani soon conspired against him and invited Shams-ud-din Iltutmish, then Governor of Badaun, to replace Aram. **Shams ud din Iltutmish (1211–1236):** Shams ud-din Iltutmish founded the Delhi Sultanate and much strengthened the power of the slave dynasty and of Islam in the India, although his kindred and heirs were not as politically gifted, with no ruler comparable to him in the area until the time of Ghiyas ud din Balban.

## **Rukn ud din Firuz (1236):**

As the new coronated ruler he had the following qualities ; physical aristocracy, courteous behaviour and resolved consciousness. He was a self endowed person and spent his major amount of time resolving in music. Taking advantage of his vulnerability as a king his mother Shah

Turkan embraced the entire power of the throne to herself. As a person Shah Turkan was a tyrannical ruler on her command many people of the Kingdom were killed.

## **RAZIA SULTANA (1236 - 1240):**

She was the first female ruler. She refused to be addressed as Sultana because it meant "wife or consort of a Sultan.

## **Muiz ud din Bahram (1240 - 1242):**

He was put on throne in 21 apr 1240 at Lal mahal. During this period of unrest that he was murdered by his own army in 1242 (died 15 May 1242).

## **Ala ud din Masud (1242 - 1246):**

He was considered "incompetent and worthless." By 1246, the chiefs became upset with his increasing hunger for more power in the government, and replaced him with Nasir ud din Mahmud (1246–66), grandson of Iltutmish and son of Nasiruddin Mahmud. The Mongols was plundered Lahore in 1246.

## **Nasir ud din Mahmud (1246 - 1266):**

Mahmud was known to be very religious, spending most of his time in prayer and copying the Koran. After Mahmud's death in 1266, Balban (1266–86) rose to power as because Mahmud had no children .

## **Ghiyas ud din Balban (1266 - 1286):**

He reduced the power of the treacherous nobility and heightened the stature of the sultan. In spite of having only few military achievements, he was the most powerful ruler of the sultanate between Shamsuddin Iltutmish and Alauddin Khilji. In spite of having only a few military achievements, Ghiyas ud-din made civil and military reforms that earned him the position of the strongest ruler.

**Muiz ud din Qaiqabad (1286 - 1290):**

He was the son of Bughra Khan the then Independent sultan of Bengal, as well as grandson of Ghiyas ud din Balban (1266–87).He was only 17 years old at the time.

**Shamsuddin Kayumars (1290):** Kayumars was the son of Muiz ud din Qaiqabad (1286– June 1290), the tenth sultan of Mamluk dynasty.His father was murdered by a Khilji noble.Jalal ud din Firuz Khilji assumed the throne after murdering Kayumars, ending the Mamluk Dynasty of Delhi.

**Khilji (Khalji) dynasty (1290 - 1320):**

They led by their powerful ruler, Alauddin khiljai, they are noted in history for repeatedly defeating the warring Mongols.

**Jalal ud din Firuz Khilji (1290–1296):**

Jalaluddin built his capital at Kilughari, a few miles from the city of Delhi, and completed

the unfinished palace and gardens of Sultan Qaiqabad. On 13 July 1290 Jalal-ud-Din Firuz was enthroned in the palace of Kalughari.He was made a slave from there.

**Ala ud din Khilji (1294 - 1316):**

His attack on Chittor in 1303 CE to capture the queen of Chittor, Rani Padmini, the wife of Rawal Ratan Singh and the subsequent story have been immortalised in the epic poem Padmavat, written by Malik Muhammad Jayasi in the Awadhi language in the year 1540.He was the most powerful ruler of the dynasty.

**Qutb ud din Mubarak Shah (1316 - 1321):**

Qutb-ud-din, at the age of 18, was originally appointed regent to his younger six-year-old brother, the king. Within two months, Qutb-ud-din blinded his brother and ascended the throne. Qutb-ud-din Mubarak Shah was the weakest ruler of the dynasty.

**Tughlaq dynasty (1321 - 1398):**

The Tughluqs were a Muslim family of Turkic origin. Their rule relied on their alliances with Turkic, Afghan, and other Muslim warriors from outside South Asia.

**Ghiyath al-din Tughluq (1321-1325):** He founded the Tughluq dynasty and reigned over the Sultanate of Delhi from 1320 to 1325. Ghiyas's policy was harsh against

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Mongols. He had killed envoys of the Ilkhan Oljeitu and punished Mongol prisoners harshly. In 1324, Tughlaq turned his attention towards Bengal, currently in the midst of a civil war. After victory, he placed Nasiruddin on the throne of West Bengal as a vassal state, and East Bengal was annexed.

## **Muhammad binTughluq (1325–1351):**

Muhammad Tughlaq was a scholar of logic, philosophy, mathematics, astronomy, physical sciences and calligraphy. He was also interested in medicine and was skilled in several languages Persian, Arabic, Turkish and Sanskrit. He deliberately killed his father Ghiyasudden Tughlaq to ascend the throne of Delhi.

## **Firuz Shah Tughluq (1351 - 1388):**

For the first time in the History of Delhi Sultanate a situation was confronted wherein no body was ready to accept the reigns of power. With much difficulty the camp followers convinced Firuz to accept the responsibility. Tughlaq was forced by rebellions to concede virtual independence toBengal and other provinces.

## **Ghiyas ud din Tughluq II (1388 - 1389):**

Tughluq Khan dispatched troops towards the foot of the hill of Sirmur. Muhammad Shah ibn Feroze Shah after a brief battle took

shelter in the fort of Nagarkot, and Tughluq Khan's army returned to Delhi without pursuing him any further due to the difficulties of the venture & terrain. In 1389 they surrounded the Sultan and Khan Jahan, his vizier and, put them to death and hung up their heads over the gate of the city; the duration of the reign of Tughluq Khan, was five months and eighteen days

## **Nasiruddin Mahmud Shah (1399–1413):**

Nasir-ud-Din Mahmud Shah Tughluq was the last sultan of the Tughlaq dynasty to rule the Islamic Delhi Sultanate.During his reign in 1398, Amir Timur the Chagtai ruler invaded India. He carried away with him a large booty from Delhi and the surrounding area. Soon after the invasion, the Tughlaq dynasty came to an end.The succeeding sultan of the Delhi Sultanate was Khizr Khan, the first of the Sayyid dynasty.

## **Sayyid (Syed) Dynasty (1414 - 1451):**

After a period of chaos, when no central authority prevailed, the Sayyids gained power in Delhi. They remained a vassal of the Timuroids of Central Asia.Their 37-year period of dominance witnessed the rule of four different members of the dynasty.

## **Khidr khan (1414-1421):**

He used to be the governor of Multan under the Tughlaq ruler, Firoz Shah Tuglaq. He was



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known to be an able administrator. In 1417, Khizr Khan obtained permission from Shah Rukh to have his own name also suffixed to that of Shah Rukh. In 1418, Har Singh revolted again but he was defeated completely by Taj-ul-Mulk.

**Mubarrak Shah II (1421 - 1435):** Mubarak Shah was, the son of Khizr Khan. He came to the throne in 1421. He was a man of great vision, but the nobles were against him and kept revolting. **Muhammad Shah IV (1435 - 1445):** Muhammad Shah was a nephew of Mubarak Shah. He ruled from 1434-1443.

**Aladdin Alam Shah (1445 - 1451):**

Alam Shah was a weak ruler. In 1451 he surrendered Delhi to Bahlul Lodi and went to Budaun where He spent rest of his life.

**Lodi (Lodhi) dynasty (1451 - 1526):** Lodi dynasty was a Ghilzai Afghan dynasty, who ruled over the Delhi Sultanate during its last phase.

**Bahlul Khan Lodi (1451-1489):**

He was rewarded with the title of Islam Khan and in 1419 appointed the governor of Sirhind. Bahlul. In 1443, Bahlul attacked Delhi but he did not succeed. In 1479, Sultan Bahlul Lodi defeated and annexed Sharqi dynasty based at Jaunpur. Bahlul did much to stop rebellions and uprisings in his

territories, and extended his holdings over Gwalior, Jaunpur and upper utter Pradesh. **Sikandar Lodi (1489-1517):** The second and most successful ruler of the Lodi dynasty of the Delhi sultanate, he was also a poet of the Persian language and prepared a diwan of 9000 verses. He expanded Lodi territory into the regions of Gwalior and Bihar. He made a treaty with Alauddin Hussain Shah and his kingdom of Bengal. In 1503, he commissioned the building of the present-day city of Agra. Agra was founded by him.

**Ibrahim II (1517-1526):**

He was the last ruler of the Lodi dynasty, reigning for nine years between 1517 until being defeated and killed at the battle of Panipat by Babur's invading army in 1526, giving way to the emergence of the Mughal Empire in India. It is estimated that Babur's forces numbered around 25,000–30,000 men and had between 20 to 24 pieces of field artillery. Ibrahim Lodi had around 30,000–40,000 men along with at least 100 elephants. After the end of Lodhi dynasty, the era of Mughal rule commenced .

**[Note: (1526 -1540) Mughal rule after the First battle of Panipat ]**

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## **Suri, or Sur dynasty (1540 - 1555):**

The Sur Empire (Pashto) was an empire established by a Muslim dynasty of Pashtun origin who ruled a large territory in Northern part of South Asia for nearly 16 years, between 1540 to 1556, with Delhi serving as its capital.

## **Sher Shah Suri (Farid Khan Suri) (1540 - 1545):**

He was the founder of the short-lived Pashtun Suri, or Sur, kingdom in the Indian subcontinent, with its capital at Delhi. Sher Shah was a good general and administrator. He introduced a new currency, a silver coin known as 'Rupia'. He reduced custom duties and built an excellent connection of roads, including Grand Trunk Road in Bihar. Sher Shah was a secular ruler who practised tolerance and welfare.

## **Islam Shah (1545 - 1553):**

Islam Shah's coinage are silver Rupees and copper paisas. A few gold coins are known but their status in some cases are uncertain.

## **Muhammad Adil shah (1553 - 1554):**

Muhammad lost both Delhi and Agra and made his headquarters further east, probably at Chunar or Qanauj. His coins shows mint places like Jhusi, in Allah district and Prayag (old name of Allahabad) and some even from Jaunpur.

**Firuz Shah (29 April - 2 May 1554):** Only a single extremely rare copper paisa coin is known on Firuz Shah dated AD 960.

## **Ibrahim III (1554 - 1554/5):**

He defeated the army of Adil Shah and captured Delhi. After this he assumed the regal title of Ibrahim Shah Suri and it was not possible for Adil to defeat him. Ibrahim Shah's silver coins are known, but extremely rare from Agra and Banaras. Copper coins are known as mintless.

## **Sikander Shah (1554/5 - 1555):**

He was the governor of Lahore before declaring independence from Delhi in 1555. Most of Sikandar Shah Suri's coin are rare, mostly dated AD 962. A silver rare Rupee from Lahore mint is dated AH 961 and AD 962. One or two type of silver Rupees are also known to be struck at Agra. Several types of copper coins are known, including fractions, all of which are mintless.

**[Note: 1555: Return to Mughal Rule after brief interregnum]**

## **Religious movements in the Fifteenth and**

## **Sixteenth centuries**

## **Bhakti and Sufi movements:-**

In both, the elements of intellectuality went hand in hand with that of devotion and in both ritualism and ceremonialism were not as

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important as the search of and love for one Supreme Reality.

Love and liberalism were the keynotes of the Sufi and Bhakti movement.

## **I. SUFISM:-**

The various Sufi saints had come to settle down in India in the eleventh-twelfth centuries, the earliest and the most well known being *Sheikh Muinuddin Chisti*, who made Ajmer his home when Prithviraj Chauhan(III) was still ruling over there.

### **The Sufi Movement had two fold aims:**

1. To make their own spiritual progress and

2. To serve the mankind.

Sufism, which started as a reform movement, laid emphasis on free-thinking, liberal ideas and toleration. They believed in the equality of all human beings and brotherhood of man. Their concept of universal brotherhood and the humanitarian ideas of the Sufi saints attracted the Indian minds. A movement similar to Sufism, called the Bhakti cult, was already afoot in India on the eve of the Muslim conquest of the country. The liberal-minded Sufis were, therefore, welcomed in India. The Sufi movement proved very helpful in bridging the gap between the followers of the two

religions and in bringing the Hindus and the Muslims together.

The Sufi movement gained impetus during the reign of Akbar who adopted a liberal religious policy under the influence of the Sufi saints.

- *Abul Fazal* had mentioned the existence of 14 Silsilahs in India. A close link that existed between the *leader or Pir* and his *murids or disciples* was a vital element of the Sufi system.

- The Sufism reached India in the 12th century A.D. Its influence grew considerably during the thirteenth and fourteenth centuries. In India, Chisti and Suhrawardi Silsila were most prominent.

- Chisti order was founded in India by *Khwaja Moinuddin Chisti*. His dargah at Ajmer became a centre of veneration for both the Muslims and Hindus. After his death in 1236 A.D., his devotees continued to celebrate an annual Urs festival at Ajmer. But the most famous Sufi saint of the Chisti order was Nizamuddin Auliya. He led a simple austere life and lived in Delhi. By his vast learning, religious knowledge, and tolerant attitude to all religions, he earned devotion of both the Hindu and Muslim masses.

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- The Sufi Movement in India helped in establishing peace and amity among the Hindus and Muslims.

## **Impact of Sufism**

- The liberal ideas and unorthodox principles of Sufism had a profound influence on Indian society. The liberal principles of Sufi sects restrained orthodox.
- Muslims in their attitude and encouraged many Muslim rulers to pursue tolerant attitude to their non-Muslim subjects.
- Most Sufi saints preached their teachings in the language of common man that contributed greatly to the evolution of various Indian languages like Urdu, Punjabi, Sindhi, Kashmiri and Hindi. The impact of Sufi Movement was deeply felt on some renowned poets of the period, like *Amir Khusrau* and *Malik Muhammad Jayasi* who composed poems in Persian and Hindi in praise of Sufi principles. By his vast learning, religious knowledge, and tolerant attitude to all religions, he earned devotion of both the Hindu and Muslim masses.
- The Sufi Movement in India helped in establishing peace and amity among the Hindus and Muslims.

## **II. Bhakti Movement:-**

The Bhakti Movement was a reform movement in Hinduism. It occupies a significant

position in bringing about harmony and normal relationships between the Hindus and Muslims.

- The development of the Bhakti cult first began in South India in the 7th-8th century in order to bridge the gulf between the Shaivas and the Vaishnavas.
- It stood for intense personal devotion and complete self-surrender to God.
- It believed in the unity of godhead, brotherhood of man and equality of all religions.
- *The roots of the Bhakti Movement can be traced to the Upanishads, the Puranas and the Bhagvad Gita. Shankaracharya* is reputed to have been the first and principal exponent of this reform movement.
- Amongst the leaders of the Bhakti movement, *Ramananda, Kabir, Ramanuja, Sri Chaitanya, Nanak* etc. were prominent. After the advent of Islam, the necessity of making Hinduism a living active force in the life of the common people was felt deeply. Islam with its liberal outlook, equality of status among its followers, and concept of one God, posed great threat to Hindu society

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that was suffering from ritualism, rigid caste system, evils of untouchability and multiplicity of gods and goddesses.

In this situation many lower class Hindus were attracted by the catholic outlook of Islam in these respects. They were also tempted to adopt Islam which could afford them better status in society and a less cumbersome religion. But at this critical juncture the preachers of Bhakti Movement tried to bring harmony among various religions. They often condemned the Hindu Caste System. Though the Bhakti cult had a long tradition, it was during this time that the cult grew to a new dimension.

## Features of Bhakti Movement

- Its proponents preached the 'unity of the god-head' and emphasized that 'devotion to God' and faith in him led to salvation.

- It also laid stress on equality of all human beings and universal brotherhood.
- The other tenets of the Bhakti cult were purity of heart and honest behaviour.
- The basic features of this cult thus had many similarities with those of Sufism. This helped greatly in checking the growth of Islam in India.

## Impact of Bhakti Movement

The Bhakti movement became popular among the common masses as its teachings were preached in the form of hymns in various popular languages. In this accessible form, Bhakti ideas were spread among wide strata of the population and the hymns frequently became folk songs.

## Important Foreign Travelers/Envoys to India

1-**Megasthenes** (302-298 B.C.): An ambassador of Seleucus Nicator, who visited the court of Chandragupta Maurya. He wrote an interesting book India in which he gave a vivid account of Chandragupta Maurya's reign.

2-**Fa-Haien** (405-411 A.D): He came to India during the reign of Chandragupta II Vikramaditya. The object of his visit was to see the holy places of Buddhism and to collect Buddhist books and relics. He was the first Chinese pilgrim to visit India.

3-**Hiuen-Tsang** (also spelt Yuan Chwang) (630-645 A.D): He came to India during the reign of

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Harsha.

4-**Itsing** (671-695 A.D): A Chinese traveller, he visited India in connection with Buddhism. His work Biographies of eminent Monks, provides us useful information about the social, religious and cultural life of the people of this country.

5-**Al-Masudi** (957 A.D): An Arab traveller, he has given an extensive account of India in his work Murujul Zahab.

6-**Al-beruni** (1024-1030 A.D.): His real name was Abu Rayhan Mahamud and he came to India along with Mahmud of Ghazni during one of his India raids. He travelled all over India and wrote a book Tahqiq-l- Hind. The book dealt with the social, religious and political conditions in India.

7-**Marco Polo** (1292-1294 A.D.): A Venetian traveller, he visited South India in 1294 A.D. His work The Book of Sir Marco Polo gives an invaluable account of the economic history of India.

8-**Ibn Bututa** (1333-1347 A.D.): A Morrocan traveller, he visited India during the reign of Muhammad-bin- Tughlaq. His book Rihla (the Travelogue) throws a lot of light on the reign of Muhammad-bin-Tughlaq and the geographical, economic and social conditions in India.

9-**Niccolo Conti** (1420-1421 A.D.): A Venetian traveller, he gives a comprehensive account of the Hindu Kingdom of Vijayanagar.

10-**Abdur Razzaq** (1443-1444 A. D.): He was a Persian traveller who came to India and stayed at the court of the Zamorin at Calicut. He has given a vivid account of the Vijayanagar empire, especially of the city. He describes the wealth and luxurious life of the king and the nobles.

11- **Athanasius Nikitin** (1470-1474 A.D): It was a Russian merchant, who visited south India in 1470. He describes the condition of the Bahmani kingdom under Muhammad III (1463-82).

12-**Duarte Barbosa** (1500-1516 A.D.): He was a Portuguese traveller. He has given a valuable narrative of the government and the people of the Vijayanagar empire.

13-**Domingos Paes** 11520-1522 A.D): He was a Portuguese traveller who visited the court of

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Krishnadeve Raya of the Vijayanagar Empire.

14-**Fernao Nuniz** (1534-1537 A.D): A Portuguese merchant who visited the Vijayanagar empire. He wrote the history of the empire from its earliest times to the closing years of Achyuth deva Raya's reign.

15- **John Huygen Van Linschoten** (1583 A.D): He was a Dutch traveler, who has given a valuable account of the social and economic life of South India.

16-**William Hawkins** (1608-1611 A.D.): He was an English ambassador of the British King James I to court of Jahangir (1609).

17- **Sir Thomas Roe** (1615-1619 A.D.): He was an ambassador of James I, King of England, at the court of Jahangir, the Mughal emperor.

18-**Francisco Pelsaert** (1620-1627 A.D.): He was a Dutch traveller who stayed at Agra and gave a vivid account of the flourishing trade at Surat, Ahmedabad, Bombay, Cambay, Lahore, Multan, etc.

19- **Peter Mundy** (1630-34 A.D): He was an Italian traveller to the Mughal empire during the reign of Shah Jahan. He gives valuable information about the living standard of the common people in the Mughal Empire.

20-**Jean Baptist Tavernier** (1638-1663 A.D.): He was a French traveller who visited India six times. His account covers the reign of Shah Jahan and Aurangzeb.

21-**Niccolao Manucci** (1656-1708 A.D.): He was an Italian traveller, who worked in the court at the service of Dara Shikoh.

## MUGHAL EMPIRE

<b>Babur:</b> (1526-1530)	<ol style="list-style-type: none"><li>1. Babur was the founder of Mughal dynasty in India.</li><li>2. He laid the foundation of Mughal dynasty by defeating <b>Ibrahim Lodhi</b> in the <b>first battle of Panipat</b> in <b>1526</b>.</li><li>3. Babur defeated <b>Rana Sanga</b> of Mewar in the Battle of Khanwa in <b>1527</b>.</li></ol>
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	<ol style="list-style-type: none"><li>4. He was a direct descendant of Taimur, from the Barlas clan, through his father, and a descendant of Genghis Khan through his mother.</li><li>5. His real name was Zahir-ud-Din Muhammad.</li><li>6. Babur wrote his memoirs <b>Baburnama (Tuzuk-i-Baburi)</b> in <b>Turkish</b> language.</li><li>7. He introduced gun powder in India.</li></ol>
<b>Humayun:</b> (1530–1556)	<ol style="list-style-type: none"><li>1. Humayun was the eldest son of the Emperor Babur.</li><li>2. He became the second ruler of the Mughal empire after succeeding his father in 1530.</li><li>3. He ruled the country for 10 years but later in 1540 he was defeated by <b>Sher Shah Suri</b> in the <b>battle of Kannauj</b> and was forced to leave India.</li><li>4. 12 years later in 1555 Humayun regain the throne by defeating <b>Sikander Suri</b>, the successor of Sher Shah Suri.</li><li>5. His half-sister <b>Gulbadan Begum</b> wrote his biography <b>Humayun-nama</b>.</li><li>6. Humayun was killed in an accidental fall from his library staircase in 1556.</li><li>7. Humayun's tomb was built in Delhi by Humayun's first wife Bega Begum in 1569. It was declared a UNESCO World Heritage Site in 1993.</li></ol>
<b>Akbar:</b> (1556–1605)	<ol style="list-style-type: none"><li>1. He was the third and greatest ruler of the Mughal Dynasty in India.</li><li>2. He was coronated when he was just 14 years old.</li><li>3. His able minister <b>Bairam Khan</b> helped the young emperor expand and consolidate Mughal empire in India.</li><li>4. Bairam Khan represented Akbar in the <b>second battle of Panipatin 1556</b> and defeated <b>Hemu Vikramiditya</b>.</li><li>5. Akbar built <b>Buland Darwaza</b> at <b>Fatehpur Sikri</b> to to commemorate his victory of Gujarat.</li><li>6. Akbar's forces headed by Raja Man Singh and Asaf Khan defeated Rana Pratap in the <b>battle of Haldighati</b> in 1576.</li><li>7. He built <b>Ibadat Khana (House of Worship)</b> at Fatehpur Sikri.</li><li>8. In 1581 Akbar promulgated the <b>Din-i-Ilahi</b> or <b>Tauhid-i-Ilahi</b> to establish national religion which would be acceptable to the Hindus and Muslims alike.</li><li>9. <b>Raja Todarmal</b> was the minister for revenue in the court of Akbar. Land revenue system prevalent during this period was known as <b>Todar Mal Bandobast</b> or <b>Zabti System</b>.</li><li>10. He introduced the <b>Mansabdari System</b> for organizing the army and the nobles.</li><li>11. Akbar ruled the country for nearly 50 years and died in 1605 and was buried outside of Agra at Sikandra.</li><li>12. <b>Abul Fazal</b> wrote <b>Akbar Nama</b>, a biographical account of Akbar.</li><li>13. First Britisher <b>John Mildenhall</b> came to India.</li></ol>



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<p><b>Jahangir:</b> (1605-1627)</p>	<ol style="list-style-type: none"><li>1. His real name was <b>Nur-ud-din Mohammad Salim</b>.</li><li>2. He was the fourth Emperor of Mughal dynasty who ruled from <b>1605</b> until his death in <b>1627</b>.</li><li>3. He was the eldest surviving son of Mughal Emperor Akbar.</li><li>4. The art of <b>Mughal painting</b> reached great heights under Jahangir's reign</li><li>5. In 1611, Jahangir married Mehr-un-Nisaa, the young widow of a Mughal officer, Sher Afgan. A beautiful, witty and strong woman, she soon became Jahangir's favorite queen and assumed the title of <b>Nur Jahan</b>, 'Light of the World'.</li><li>6. His greatest failure was the loss of <b>Kandahar</b> to <b>Persia</b> in 1622.</li><li>7. He executed the fifth of the ten Sikh gurus, <b>Arjun Dev</b>, for giving aid and comfort to Khusrau, Jahangir's rebellious son.</li><li>8. <b>Captain Hawkins</b> and <b>Sir Thomas Roe</b> visited his court.</li></ol>
<p><b>Shahjahan:</b> (1628-1658)</p>	<ol style="list-style-type: none"><li>1. He was the fifth Emperor of Mughal dynasty.</li><li>2. He was the son of Emperor Jahangir and his Hindu Rajput wife, Taj Bibi Bilqis Makani.</li><li>3. His rule is considered the <b>Golden Age</b> of the Mughal Empire.</li><li>4. He built <b>Tajmahal</b> and <b>Moti Masjid</b> at Agra, and <b>Jama Masjid</b> and <b>Red Fort</b> at Delhi.</li><li>5. Other important buildings of Shah Jahan's rule were the <b>Diwan-i-Aam</b> and <b>Diwan-i-Khas</b> in the Red Fort Complex in Delhi</li><li>6. As he apparently lay dying in 1658 there was a brutal war of succession among his four sons (<b>Dara, Aurangzeb, Shuja and Murad</b>) but Aurangzeb came out victorious.</li><li>7. Aurangzeb put him under house arrest in Agra Fort for 8 years where he died at the age of 74.</li></ol>
<p><b>Aurangzeb:</b> (1658-1707)</p>	<ol style="list-style-type: none"><li>1. His full name was Abul Muzaffar Muhi-ud-Din Mohammad Aurangzeb.</li><li>2. He was the sixth Emperor of Mughal dynasty.</li><li>3. He was the third son and sixth child of Shah Jahan and Mumtaz Mahal.</li><li>4. He was strictly adhered to Islam and made sure that his empire followed the same. He destroyed many Hindu temples and forced many non-Muslims to convert into Islam.</li><li>5. He spread the extent of Mughal Empire to the entire Indian sub continent barring the southernmost tip of India.</li><li>6. In 1675, he ordered the execution of ninth Sikh Guru <b>Tegh Bahadur</b> because of his objection to Aurangzeb's forced conversions.</li><li>7. He died in Ahmednagar in 1707 at the age of 88.</li><li>8. He was also known as <b>Alamgir</b> (Conquerer of the World).</li></ol>

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## Indian Writers and their Books

Writers	Books
Pt. Vishnu Sharma	Panchatantra
Vishakhadatta	Mudra Rakshasa
Panini	Ashtadhyayi
Shudrak	Mrichhakatikam
Kalidasa	Raghuvansham, Kumarsambhavam, Meghdootam, Abhigyanshakuntalam
Vatsyayana	Kama Sutra
Kalhana	Rajtarangini
Plini	Natural History
Kautilya	Arthashastra
Dandi	Avanti Sundari, Dashkumaracharitam
Ved Vyas	Bhagwat Gita, Mahabharata
Ashwaghosh	Buddha Charitam
Jayadev	Geet Govind
Bana Bhatt	Kadambari
Bhavabhuti	Malti Madhav
Amar Singh	Amar Kosh
Firdausi	Shahnama
Abul Fazal	Ain-i-Akbari, Akabarnama
Surdas	Sahityalahari, Sursagar
Kabirdas	Bijak, Ramayani, Sabar
Gulbadan Beghum	Humanyunama
Al-Beruni	Kitab-ul-Hind

## Later Mughals (1707 – 1857)

**Decline Of The Mughal Empire:** After Aurangzeb, the Mughal empire rapidly declined.

### Important Causes for the decline:

1. Aurangzeb's Rajputa, Deccan and religious policies.
2. Weak successors who were incompetent both as administrators and generals.
3. Wars of succession.
4. Factionalism among nobility after Aurangzeb.
5. Jagirdari crisis.
6. Growth of Maratha and regional powers in Bengal, Hyderabad, Avadh, Mysore etc.

# INDIAN HISTORY

**7.** Foreign invasions by **Nadir Shah** (1739) and **Abdali**.

**8.** British conquest of India.

Ruler	Period	Important Facts
Bahadur Shah I	1707-1712	Original name- <b>Muazzam</b> , Assumed Title- <b>Shah Alam I</b> . He was the first and the last of the later Mughal rulers to exercise real authority.
Jahadar Shah	1712-1713	Ascended the throne with the help of <b>Zulfikar Khan</b> (Abolished Jaziya).
Farrukh Siyar	1713-1719	Ascended the throne with the help of <b>Sayyid</b> brothers- <b>Abduall Khan</b> and <b>Hussain Khan</b> .
Muhammad Shah	1719-1748	In 1738-39, <b>Nadir Shah</b> raided India and took away <b>Thakht-i-Taus</b> (the peacock throne) and Kohinoor diamond.
Ahmed Shah	1748-1754	<b>Ahmad shah Abdali</b> (General of Nadir shah) marched towards Delhi and Mughals ceded Punjab and Multan.
Alamgir II	1754-1759	<b>Ahmad shah</b> occupied Delhi. Later, Delhi was plundered by Marathas
Shah Jahan III	1759-1760	Muhi-ul-Milat, the grandson of Kam Baksh was placed on the throne as Shah Jahan III by Imad-ul- Mulk. He was deposed by the Marathas who captured Delhi in 1760.
Shah Alam II	1759-1806	<b>Nazib Khan</b> became very powerful in Delhi so much so that he could not enter Delhi for 12 years. He was defeated in the Battle of Buxar in 1764
Akbar II	1806-1837	Pensioner of East India Company. He conferred the title "Raja" on Ram Mohan Roy
Bahadur Shah II	1837-1857	<b>Last Mughal Emperor</b> who was made premier during 1857 revolt.  He was fond of poetry and had the title of ' <b>Zafar</b> '. He was deported to Rangoon (Burma, now Myanmar) in 1858 where he died in 1862

# INDIAN HISTORY

## **Administration:**

✓ Mughal empire was divided into **Subas** which were further sub-divided into **Sarkar**, **Pargana** and **Gram**.

✓ However, it also had other territorial units as **Khalisa** (royal land), **Jagirs** (autonomous rajyas) and **Inams** (gifted lands, mainly waste lands).

✓ There were 15 Subas (provinces) during Akbar's reign, which later increased to 20 under Aurangzeb's reign.

✓ **Akbar** introduced **Mansabdari** system. The term **Mansab** indicates the rank of its holder. Mansabdari was both civil and military.

✓ The Mughal Mansab was dual i.e. **Zat** (personal rank and pay status) and **Sawar** (number of horsemen to maintain).

✓ Mansabdars were of 3 categories: **Mansabadars**, **Amirs** and **Amir-i-umda**

✓ According to pay mode they were of 2 types: **Naqdi** (paid through cash) and **Jagirdar** (paid through Jagirs).

✓ Jahangir added **Duaspah Sih-aspah** system i.e. one's sawar rank can be raised without raising his zat rank.

✓ Shahjahan added **Jama-Dami** or **Mahana Zagir** (Monthly Scale) system. It ultimately caused Jagirdari and agrarian crisis, which was a major cause of **decline of Mughals**

✓ There were several methods of revenue collection in practice viz. **Kankut**(estimate), **Rai**(yield per unit area) and **Zabti** (based on the yields of crops).

✓ **Dahsala Bandobast** or **Zasti**: A standard method of collection based on rates of crops determined after 10 years assessment. **Todal Mal** pioneered it.

✓ **Madad-i-maash** or **Suyur ghal** or **Inam** were land grants to people of favour / religious assignment.

<b>Administrative Unit</b>	<b>Incharge</b>
<b>Suba</b> (Province)	Sipahsalar/Subedar/Nizam- The Head Executive Diwan- Incharge of revenue department
<b>Sarakar</b> (District)	Fauzdar- Administrative Head Amal/Amalguzzar- Revenue collection

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<b>Pargana</b> (Taluka)	Siqdar- Administrative Head Amin, Qanungo- Revenue Officials
<b>Gram</b> (Village)	Muqaddam- Headman, Patwari- Accountant

## Miscellaneous facts about Mughal Culture:

✓ Babur built two mosques, one at Kabulibagh in Panipat and the other at Sambhal in Rohilkand.

✓ **Humayun's tomb** was built by his widow **Haji Begum**.

✓ An unusual building at Fatehpur Sikri is **Panch Mahal**. Panch Mahal has the plan of Buddhist Vihara.

✓ The **Mariam's Palace, Diwan-i-khas** at Sikri are Indian in their plan.

✓ **Buland Darwaja** (built after Gujarat victory), formed the main entrance to Fatehpur Sikri.

✓ **Salim Chisti's tomb** (redone in Marble by Jahangir) is the **1<sup>st</sup>** Mughal building in the pure marble. **Palace of Birbal, Palace of Tansen** are also inside the Fatehpur Sikri.

✓ **Akbar** also began to build his own tomb at **Sikandara** which was later completed by Jahangir.

✓ The architecture of Fatehpur Sikri is known as Epic in red sand stone.

✓ Nurjahan built **Itimad-ud-daula / Mirza Ghiyas Beg's marble tomb** at Agra

(noticeable for the **1<sup>st</sup>** use of **pietra dura** technique –floral designs made up of semiprecious stones)

✓ **Jahangir** built **Moti Masjid** in Lahore and his mausoleum at **Shahdara** (Lahore).

✓ Mosque building activity reached its climax in **Taj Mahal**. Shahjahan also built the **Jama Masjid**.

✓ Some of the important buildings built by **Shah Jahan** at Agra are **Moti Masjid** (only mosque of marble), **Khaas Mahal, Mussman Burz** (Jasmine Palace where he spent his last year in captivity) etc.

✓ He laid the foundations of **Shahjahanabad** in 1637 where he built the **Red Fort** and **Takht-i-taus (Peacock throne)**.

✓ Only building by Aurangzeb in the Red fort is **Moti Masjid**.

✓ Only monument associated with Aurangzeb is **Bibi ka Makbara** which is the tomb of his wife **Rabbia-ud-daura** in Aurangabad.

✓ Aurangzeb also built the **Badshahi Masjid** in Lahore.

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✓ **Humayun** had taken into his service two master painter **Mir Syed Ali** and **Abdus Samad**.

✓ **Daswant** and **Basawan** were two famous painters of Akbar's court.

✓ **Abdul Hassan, Ustad Mansur** and **Bishandas** were three famous painters of Jahangir's court.

## Titles given by the Mughal Ruler

Title	Person	Field	Ruler
<b>Jagat Guru</b>	Harivijay Suri	Jain religion	Akbar
<b>Zari Kalam</b>	Mohammad Hussain	Literature	Akbar
<b>Raj Kavi</b>	Faizi	Literature	Akbar
<b>Kavi Priya</b>	Birbal	Literature	Akbar
<b>Nadi-ul-Asra</b>	Ustad Mansur	Painting	Jahangir
<b>Nadir-uz-Zaman</b>	Abdul Hassan	Painting	Jahangir
<b>Guna Samudra</b>	Lal Khan	Music	Shahjahan
<b>Raj Kavi</b>	Kalim	Literature	Shahjahan
<b>Mahakaviray</b>	Sundardas	Literature	Shahjahan

## Literature of Mughal Period

Book	Author	Contents
<b>Tuzuk-i-Baburi</b>	Babur	Describes military tactics and administrative organisation during Babur's reign
<b>Qanun-i-Humayun</b>	Khwand Amair	Describes Humayun's administration, festivities and buildings of that period
<b>Humayun Nama</b>	Gulbadan Begum	Biography of Humayun
<b>Akbar Nama</b>	Abul Fazi	Gives a history of Akbar's reign
<b>Tabaqat-i-Akbari</b>	Khvajah Nizamuddin Ahmad Baksh	A History Of India From The Early Musalman Invasions To The Thirty-sixth Year Of The Reign Of Akbar
<b>Tuzuk-i-Jahangiri</b>	Jahangir	Memoirs of his own reign

<b>Iqbalnama-i-Jahangiri</b>	Muhammad khan	History of Jahangir's reign
<b>Alamgir-nama</b>	Munshi Mirza Muhamma Kazin	Gives an account of Aurangzeb's first 10 years of rule
<b>Massir-i-Alamgiri</b>	Saqi Mustaid Khan	Official history of Aurangzeb's reign written after his death
<b>Ain-i-Akbari</b>	Abul Fazl	History of Akbar's reign
<b>Muntakhab-ul-Tawarikh</b>	Badauni	History of Akbar's rule
<b>Tawarikh-i-Alfi</b>	Mulla Daud	History of Akbar's rule
<b>Nuriyya-i-Sultaniyya</b>	Abdul Haq – Jahangir Period	Theory of Kinship during Mughal period
<b>Waqat-i-Hyderabad</b>	Nimat Khan Ali	Aurangzeb's Golconda conquest
<b>Futuh-at-i-Alamgiri</b>	Ishwar Das	Aurangzeb's history
<b>Nuskha-i-Dilkusha</b>	Bhimsen Saxena	Analysis of Aurangzeb's rule and character
<b>Khulasat-ul-Tawarikh</b>	Sujan Raj Khatri	History of Aurangzeb's rule
<b>Padshah Namah</b>	Abdul Hamid Lahori	History of Shah Jahan's reign
<b>Shahjahan Namah</b>	Inyat Khan	History of Shah Jahan's reign
<b>Hamlai- Haidri</b>	Muhammad Rafi khan	History of Aurangzeb's rule
<b>Namah-e-Alamgiri</b>	Aquil Khan Zafar	History of Aurangzeb's rule
<b>Sirr-i-Akbar</b>	Dara Shikoh	Urdu translation of Upanishad
<b>Safinat-ul-Auliya</b>	Dara Shikoh	Biographies of Sufi saints
<b>Raqqat-e-Alamgiri</b>	Aurangzeb	A compendium of his lens
<b>Hasmat-ul-Arifin</b>	Dara Shikoh	Religious ideas discussed

**MARATHA EMPIRE (1674-1720):**

**SHIVAJI 1674-1680:**

- Born at Shivneri Fort in 1627.

- Shivaji inherited the **Jagir of Poona** from his father in 1637.

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- After the death of his guardian, **Dadaji Kondadev** in 1647, he assumed full charge of his Jagir.

- Afzal khan was deputed by Adil shah to punish Shivaji, but the later **Afzal khan** was killed by Shivaji in 1659.

- **Shaista khan**, governor of Deccan, was deputed by Aurangzeb to put down the rising power of Shivaji in 1660. Shivaji lost Poona suffered several defeats till he made a bold attack on Shaista khan (1663) and plundered **Surat** (1664) and later Ahmadnagar.

- In 1674 Shivaji was coronated at capital Raigarh and assumed the title of **Haindava Dharmodharak**.

- After that Chhatrapati Shivaji continued the struggle with Mughals and Siddis. He conquered Karnataka during 1677-80.

## **Shivaji's Ashtapradhan:**

- Most of the administrative reforms of Shivaji were based on Malik Ambar's reforms.

- Assessment of land revenue was based on measurement. The Kathi of Malik Ambar was adopted as the unit of Measurement.

- Land revenue was fixed 33% of the gross produce initially and 40% of the gross produce after reforms.

- Chauth was 25% of the land revenue was paid to the Marathas so for not being subjected to Maratha raids.

- Sardesh was an additional levy of 10% on those of lands of Maharashtra over which the Maratha claimed hereditary rights, but which formed part of the Mughal Empire.

## **Sambhaji (1680-1689):**

- **Sambhaji**, the elder son of Shivaji, defeated **Rajaram**, the Younger son of Shivaji, in the war of succession.

- He provided Protection and support to **Akbar II**, the rebellious son of Aurangzeb.

- He was captured at **Sangameswar** by a Mughal Noble and Executed.

## **Rajaram (1689-1700):**

- He Succeeded the throne with the help of the Ministers at Rajgarh.

- He fled from **Rajgarh** to Jinji in 1689 due to a Mughal invasion in which Rajgarh was captured along with Sambhaji's wife and son Shahu by the Mughals.

- Rajaram died at **Satara**, which had become the capital after the fall of **Jinji** to Mughal in 1698.

- Rajaram created the new post of **Pratinidhi**, thus taking the total number of ministers to nine.



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## **Tarabai (1700-1707):**

- Rajaram was succeeded by his minor son Shivaji II under the Guardianship of his mother Tarabai.
- Tarabai continued the struggle with Mughals.

## **Shahu (1707-1749):**

- Shahu was released by the Mughal emperor Bahadur Shah.
- Tarabai's army was defeated by Shahu in the battle of Khed (1700), and Shahu occupied Satara.
- But the Southern part of the Maratha kingdom with its capital Kolhapur continued to be under the control of the descendants of Rajaram.
- Shahu's reign saw the rise of Peshwas and transformation of the Maratha Kingdom into an empire based on the principle of confederacy.

## **Balaji Viswanath (1713-1720): The First Peshwa**

- He began his career as a small revenue official and was given the title of Sena Karte by Shahu in 1708.
- He became Peshwa in 1713 and made the post the most important and powerful as well as hereditary.
- He concluded an agreement with the Syed Brothers-King Maker (1719) by which

the Mughal emperor Farrukh Siyar recognized Shahu as the king of the Swarajya.

## **MARATHA CONFEDERACY (1720-1818):**

### **Baji Rao I: 1720-40:**

- Baji Rao, the eldest son of Balaji Viswanath, succeeded him as Peshwa at the young age of 20.
- He was considered the greatest exponent of guerrilla tactics after Shivaji and Maratha power reached its zenith under him.
- After defeating and expelling the Siddis of Janira from the mainland (1722), he conquered Bassein and Salsette from the Portuguese (1739).
- He also defeated the Nizam-ul-Mulk near Bhopal and concluded the Treaty of Dohra Sarai by which he got Malwa and Bundelkhand from the latter (1738).
- He led innumerable successful expeditions into North India to weaken the Mughal empire and to make the Marathas the Supreme power of India.

### **Balaji Baji Rao (1740-1761):**

- Popularly known as Nana Saheb, he succeeded his father at the age of 20.
- After the death of Shahu (1749), the management of all state affairs was left in his hands.

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- In an agreement with the Mughal emperor Ahmad shah, the Peshwa was to protect the Mughal empire from internal and external enemies (like Ahmad shah Abdali) in return for chauth(1752).
- Third battle of Panipat(Jan 14,1761) resulted in the defeat of Marathas by Ahmad shah Abdali and the death of Viswa Rao and Sadashiv Rao Bhau.This event shocked the Peshwa Balaji Rao and after six month he also died.This Battle ended the Maratha power.
- Successor of Balaji Baji Rao:Madhav Rao (1761-72), Narayan Rao(1772-73) ,Sawai Madhav Rao(1773-95) and Baji Rao II(1795-1818)

## Anglo-Maratha Wars:

### First Anglo-Maratha War (1775-82):

- Favouring the cause of Raghunath Rao(Raghoba) for Peshwaship,English

### Important Battles

S. No	YEAR	BATTLE	PLACE	WINNER	LOSER	REMARKS
1.	326 B.C.	Battle of Hydaspas	Hydaspes	Alexander	Porus	
2.	261 B.C.	Kalinga War	Kalinga	Asoka	Kalinga	
3.	712 A.D.	Invasion of Sind				Mohammed-bin-Qasim invades from the west

(Hastings)came in conflict with the Marathas.On being defeated , the British had to sign the humiliating Convention of Wadgaon(1779).

- British later signed Treaty of Salbai (1782), renouncing the cause of Raghoba.

### Second Anglo-Maratha War (1803-06):

- The Maratha Peshwa signed the Subsidiary Alliance Treaty of Bassein(1802)
- The Maratha confederacy, which did not like the idea challenged the British power but were defeated by the British.

### Third Anglo-Maratha War (1817-18):

- Lord Hastings was determined to proclaim British paramountcy in India.He moved against Pindaris transgressed the sovereignty of the Maratha Chief and the War began.
- The Marathas were decisively defeated

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4.	1191 A.D.	First Battle of Tarain	Tarain (Near Thanesar)	Prithviraj Chauhan	Mohammed Ghori	
5.	1192 A.D.	Second Battle of Tarain	Tarain (Near Thanesar)	Ghori	Prithviraj Chauhan	Mohammad got the opportunity to enter Indian lands.
6.	1194 A.D.	Battle of Chandwar	Chandwar (Jamuna river close to Agra)	Ghori	Jaichandra (King of Kannauj)	Mohammad further extended his empire in India by defeating a large kingdom.
7.	1526 A.D.	First Battle of Panipat	Panipat	Babar	Ibrahim Lodhi	By this victory Babur got opportunity to expand his small principality into big empire
8.	1527A.D.	Battle of Khanwa	Khanwa	Babar	Rana Sanga	
9.	1529 A.D.	Battle of Ghagra (or) Gogara	Ghagra	Babar	The Afghans	
10.	1539 A.D.	Battle of Chausa	Chausa	Sher Shah Suri	Humayun	
11.	1540 A.D.	Battle of Kannauj (or Bilgram)	Kannauj	Sher Shah Suri	Humayun	Agra was occupied by Sher shah

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12.	1556 A.D.	Second Battle of Panipat	Panipat	Bairam Khan (For Akbar)	Hemu	
13.	1576 A.D.	Battle of Haldighati	Haldighati	Akbar	Rana Pratap of Mewar	
14.	1615 A.D.	Mewar submitted to the Mughals				Peace treaty signed between Jahangir and Rana Amar Singh of Mewar
15.	1658 A.D.	Battle of Dharmatt and Samugarh		Aurangzeb	Dara Shikoh	
16.	1665 A.D.	Seige of Purandar		Raja Jai Singh	Shivaji	Treaty of Purandar signed
17.	1737 A.D.	Battle of Bhopal	Bhopal	Baji Rao	Mohammed Shah	
18.	1739 A.D.	Battle of Karnal	Karnal (Punjab region)	Nadir Shah	Mohammed Shah	
19.	1757 A.D.	Battle of Plassey	Plassey	Robert Clive	Siraj-ud-daula, the Nawab of Bengal	British win a major battle in India and later they ruled India.
20.	1760 A.D.	Battle of Wandiwash	Wandiwash	English	French	

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21.	1761 A.D.	Third Battle of Panipat	Panipat	Ahmed Shah Abdali	Marathas	
22.	1764 A.D.	Battle of Buxar	Buxar	Hector Munro	Combined armies of Nawab Mir Qasim (Bengal), Nawab Shuja-ud-daulah (Awadh)& Mughal emperor Shah Alam	
23.	1767-69 A.D.	First Anglo Mysore War	South India	Hyder Ali-Kingdom of Mysore	British East India company	
24.	1766-69 A.D.	First Anglo Maratha War	Pune	Marathas	British	
25.	1780-84 A.D.	Second Anglo Mysore War	South India			Hyder Ali dies. Treaty of Mangalore is signed
26.	1789-92 A.D.	Third Anglo Mysore War	South India	Maratha Empire, Nizam of Hyderabad and British East India company	Kingdom of Mysore	Tipu Sultan defeated. Treaty of Serirangapatna m is signed.
27.	1799 A.D.	Fourth Anglo Mysore War	South India	British east India company	Kingdom of Mysore	Tipu Sultan is defeated and killed
28.	1803-06 A.D.	Second Anglo	Central India	British	Maratha Empire	Treaty of Deogan

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		Maratha War				(1803) Treaty of Surji-Anjangaon (1803) Treaty of Rajghat (1805)
29.	1817-19 A.D.	Third Anglo Maratha War	Maharashtra and neighbour countries	British	Maratha Empire	
30.	1824-26 A.D.	First Anglo Burmese War	Burma, East Bengal, Assam, Manipur, Cachar, Jaintia	British	Burmese	<ul style="list-style-type: none"> <li>• Treaty of Yandabo</li> <li>• Beginning of British rule in Burma</li> </ul>
31.	1839-42 A.D.	First Anglo Afghan War	Afghanistan	British East India Company	Emirate of Afghanistan-Dost Mohammad	
32.	1845-46 A.D.	First Anglo Sikh War	Punjab	British	Sikh Empire	
33.	1848-49 A.D.	Second Anglo Sikh War	Punjab	British win		Punjab annexed by the British
34.	1852 A.D.	Second Anglo	Lower Burma	British		

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		Burmese War				
35.	1865 A.D.	Third Anglo Burmese War	Burma	British win		Burma is annexed
36.	1919-21 A.D.	Third Anglo Afghan War	North west frontier of India and Afghanistan	British India	Emirate of Afghanistan	Ended in an Armistice. Durand line established.

## European Penetration in India

### **Portuguese and Dutch:**

- There has been trade relations between India and the west from ancient times itself. But in 1453, the Ottoman Turks captured Constantinople and this brought the regular trade routes under the control of the Turks. This urged the Europeans to search for new trade routes, especially by sea.
- In **1492**, **Columbus** from Spain set out to reach India, and discovered America instead.
- Later, in **1498**, **Vasco Da Gama** of Portugal discovered a new trade route, travelling around Africa and reaching **Calicut**.
- The **Portuguese** were the **1<sup>st</sup>** to establish colonies in India. Due to their superiority on the seas, they could easily maintain their positions against the powerful land forces in India. Also since they were mainly

concentrated in south India, they did not have to face the might of the Mughal empire.

- In **1602**, the **Dutch East India company** was formed, and they were empowered by their government to make war, conclude treaties, acquire territories and build fortresses.

### **English and French**

- Later, in **1599**, an **English company** was formed by a group of merchants to trade with the east, known as **Merchant Adventurers**. It was given the permission and exclusive rights to trade with the east, by the queen in 1600.
- **Jahangir** gave Captain **Hawkins** the royal *farmen* to set up factories on the western coast.
- Later, **Sir Thomas Roe** obtained the *Farman* to establish factories in all parts of the Mughal empire.

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- Bombay too passed into their hands as dowry given by the Portuguese. The conflicts with the Dutch were settled by giving up all claims to Indonesia, while the English got India.
- The conditions in the south were apt for the English. They started from **Madras**, by building a fort there, called **Fort St. George**.
- The problems broke out when the English sacked **Hugli** and declared war on the emperor. They failed miserably. This was the first lesson they learnt. From then on, they relied on flattery and humble entreaties, waiting for their chance.
- In **1698**, *Fort William* was built and Calcutta was founded. **Madras**, **Bombay** and **Calcutta** soon grew up to be flourishing centres of trade.
- The **French**, under **Dupleix**, who had come to India by then had already started interfering in the affairs of the local princes using their well-equipped army. In **1742**, war had broken out in Europe between France and England.
- Following the *death of the nizam* in 1748, his son **Nasir Jung** took over the crown. He was challenged by Musaffar Jung, a grandson of the nizam. Similar situations were in the Carnatic, where **Chanda Sahib** was conspiring against the nawab Anwarudeen.
- The **French** took the sides of both the rebels, and won both of their claims for them, killing Anwarudeen and Nasir Jung.
- The **English**, naturally took the side of the fallen, under **Muhammad Ali**, a son of Anwarudeen. The wars were then won by the English side under the able generalship and cunning of **Robert Clive**.
- Finally, the French recalled Dupleix from India, according to their treaty in 1754. Later, in 1796, the French were completely destroyed at the battle of **Wandiwash**. Thus, the **English** remained **the sole masters** of India.
- The *Farman* granted to the British by the emperor enabled them to conduct free trade in Bengal. In 1756, the grandson of Alivardi Khan, **Siraj-ud-Daulah** came to the throne, he demanded the English that they should trade on the same basis as the Indian merchants.
- Matters took a turn for the worse when the English refused and strengthened their fortifications. This led to the **Battle of Plassey** in **1757**, in which **Siraj-ud-Daulah** was treacherously **defeated** by the cheating by Mir Jaffar and Rai Durlabh. This brought the British immense prestige and revenue.



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○ Later, when **Mir Jaffar** couldn't keep up with the tribute promised to the British, they installed **Mir Qasim** on the throne. He was clever and knew that both revenue and an army was required to stand against the British. And finally, he abolished all the duties on internal trade. This **angered** the British, and they defeated **Mir Qasim** in the **Battle of Buxar** in 1764.

## **British Conquest of India**

### **Conquest of Maharashtra:**

○ **Peshwa Madhava Rao**, who succeeded his father **Peshwa Balaji Rao** in 1761 and who ranks among the great Peshwas, maintained unity among the Maratha chiefs and nobles and very soon recovered the power and prestige of the Maratha which they lost in the **third Battle of Panipat**. He came into contact with the English and was conscious of their military efficiency, but he did not attach much value to them and regarded them as an insignificant factor in the Indian politics.

○ The British became conscious of the Marathas in the fulfillment of their ambition of building an empire in India and, therefore, were keen to weaken their power at the earliest opportunity. They got their opportunity very soon after the death and

Peshwa Madhava Rao in 1775 to 1782, known as the **First Anglo-Maratha War**.

### **Second Anglo-Maratha War:**

○ After the creation of the Madras Presidency in 1801, the only major Indian power left outside the sphere of British control were the Marathas, whose internal affairs further deteriorated within a span of 20 years after the First Anglo-Maratha War.

○ The internal squabbles of the Marathas led to a new round of hostilities between the English and the Marathas. This resulted in the Second -Anglo-Maratha War (1803-05).

○ Wellesley's aggressive policy of interference in the internal affairs of the Marathas was an important factor.

○ Wellesley, who became the Governor-General in 1798, felt it imperative to bring as many Indian states as possible under British control. One of the important methods which he used to achieve his political aims was the Subsidiary Alliance.

○ Under this system:

1. The ruler of the allying Indian States was compelled to accept the permanent stationing of a British force within his territory and also to pay a subsidy for its maintenance.

2. A British resident was posted at the court.

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3. Indian ruler could not employ any European in his service without the approval of the British.

4. He could not negotiate with any other Indian ruler without consulting the Governor-general.

5. The British undertook to defend the ruler from his enemies.

6. Also promised non-interference in internal affairs of the allied state.

- Among the last capable Maratha chiefs were **Mahadji Sindhia, Ahilya Bai Holkar, Tukoji Holkar and Peshwa Madhava Rao II**, who died in 1794, 1795, 1796 and 1797 respectively.

- Nana Phadnis, the chief minister to the Peshwa, served the Maratha state zealously after the murder of Peshwa Narayan Rao, but later his ambition to keep the power of the state to himself harmed the interest of the Marathas.

### **Third Anglo Maratha War:**

- The second Anglo-Maratha War had no doubt shattered the power of the Maratha chiefs but not their spirit. The English had to fight another war, known as the Third Anglo Maratha War(1817-1818).

- The Governor-General, Lord Hastings, struck back with characteristic vigor. The consequences of this war sealed the fate of

the Marathas once for all. The Peshwa was dethroned and pensioned off at Bithur near Kanpur. His territories were annexed and the enlarged Presidency of Bombay was brought into existence.

- However, in order to satisfy Maratha pride, the small kingdom of Satara was created out of the Peshwa's lands and given to the descendant of Chatrapatti Shivaji who ruled it as a complete dependent of the British.

### **Conquest of Sindh:**

- The conquest and annexation of Sindh by the British was partly due to the commercial advantages of River Indus.

- It was also caused by the growing Anglo-Russian rivalry in Europe and Asia and the consequent British fears that Russia might attack India through Afghanistan or Persia.

- Sindh was opened to British trade by a treaty signed in 1832 between the Amirs of Sindh and the British.

- Sindh was finally, annexed in 1843 after a brief campaign by Sir Charles Napier.

### **British Colonialism in India:**

- The British colonial rule in India is generally divided into three stages:

- First stage - (1757-1813) represents the mercantile phase.

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- Second stage - (1813-1860) represents the free trade phase.
- Third stage - (1860 onwards) represents the finance capital phase.

## **Mercantalism:**

- \* During the mercantile phase the aim of all activity was to accumulate wealth. In order to pursue a favorable trade, the British company started aggressive policies in India.
- \* The government passed the Regulating Act and the Pitt's India Act to gain more and the direct control over the affairs of the company.
- \* The financial bleeding of India started with the British gaining huge money over Indian territories. New revenue settlements were imposed upon the agrarian structure. The

fought several wars, crushed many princely States and brought them under the colonial authority.

## **Free Trade:**

- \* By the dawn of the 19th century, the British became an industrial power following Industrial Revolution in England. It was in need of raw material to feed its industries.
- \* The special feature of this policy was that it was a one way traffic wherein British goods entered India virtually free while Indian products entering Britain faced high tariffs.
- \* The protective policy towards British trade was thoroughly guarded, leaving India-made products to face stiff competition.

## **Important Nationalist Movements**

<b>Name of the Movement/ Organization and Place</b>	<b>People associated with it</b>	<b>Nature and objectives, and media efforts</b>
<b>Brahmo samaj</b> (earlier Atmiya Sabha); <b>Calcutta</b> (late 18 <sup>th</sup> - early 19 <sup>th</sup> century)	<b>Raja Rammohan Roy</b> (1772-1833)- the founder; <b>Debendranath Tagore</b> - later formed Adi Brahmo Samaj; <b>Keshav Chandra Sen</b> - later associated with Brahmo samaj of India( secessionists from this	Propagated monotheism, opposed incarnation, meditation, sacrifices, existence of priests, idolatry, superstition, sati; sought for reforms in Hindu society. Journals brought out by <b>Rammohan Roy</b> : <i>Sambad Kaumudi</i> , <i>Mirat-ul-Akbar</i> ; <b>Debendranath Tagore</b> : <i>Tattva Bodhini Patrika</i> ;

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	group formed Sadharan Brahmo Samaj)	<b>Keshub Chandra Sen</b> – <i>Indian Mirror</i> ; <b>Sadharan Brahmo Samaj</b> – <i>Tattva Kaumudi, The Indian Messenger, The Sanjibari, The Navyabharat and Prabasi.</i>
Young Bengal Movement (1826-1831)	<b>Henry Louis Vivian Derozio</b> (founder), Rasikkrishna Mullick, Tarachand Chuckervati, Krishanmohan Banerjee	Opposed the vices in society; believed in truth, freedom and reason; brought out the <i>Jnanavesan</i> ( <i>journal</i> ) and established the society for the Acquisition of General Knowledge (Derozio edited <i>Hesperus, the Calcutta Library Gazette</i> and was associated with <i>India Gazette</i> )
Dharma Sabha; Calcutta	<b>Radhakant Deb</b> (1794-1876) founder	Emerged to counter Brahmo samaj, aimed at protection of orthodoxy, condemned radical and liberal reforms, helped in the spread of western education
<b>Wahabi Movement</b> (Rohilkhand- spread in Kabul, NWFP, Bengal, the Central Provinces; Sittana in NWFP- headquarters from 1850 onwards ( 19 <sup>th</sup> century- founded in 1820; suppression by the British by 1870)	<b>Syed Ahmed of Rai Bareilly</b> (founder); Vilayat Ali, Shah Muhammed Hussain, Farhat Hussain ( all from Patna); Inayat Ali	Popularised the teachings of Waliullah; opposed the British and fought against the Sikhs; stressed role of individual conscience in religion.
Namdhari or Kuka Movement (among Sikhs);	<b>Bhai Balak Singh and Baba Ram</b>	For Political and social reforms among the Sikhs.

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NWFP and Bhaini (Ludhiana district, Punjab) (1841-1871)	<b>Singh</b> (founders)	
<b>Students Literary and Scientific Society</b> (1848)		Debated popular science and social questions
<b>Paramhans Mandali</b> (1849)		Emphasised unity of godhead; against caste rules
<b>Rahanumai Mazdayasanan Sabha</b> (religious reform association for Parsis-1851)	<b>S.S.Bengali , Naoroji Furdonji, Dadabhai Naoroji</b> and others	To improve the social condition of the Parsis and restore the purity of Zoroastrianism. Their journal was <b>Raft Gofar( truth teller)</b>
<b>The Deoband School of Islamic Theology at Saharanpur,UP-1866</b>	<b>Muhammad Qasim Nanaytavi</b> (1832-80) and <b>Rashid Ahmad Gangohi</b> (founders), <b>Maulana Abul Kalam Azad, Mahmud-ul-Hasan, Shibli Numani</b>	Revivalist movement whose religious teachings encompassed a liberal interpretation of Islam; for moral religious upliftment; did not take to western influences in education; opposed syed Ahmed Khan's views to some extent; welcomed the formation of the Indian National Congress
<b>Prarthana Samaj;</b> Bombay-1867	<b>Atmaram Pandurang</b> (founder), <b>Govind Ranade</b> (chief mentor), <b>R.G.Bhandarkar</b>	Worship and reform of society through emphasis on monotheism, uplift of women, abolition of caste discrimination and religious orthodoxy.
<b>Indian Reform Association;</b> Calcutta-1870	<b>Keshav Chandra Sen</b>	To create public opinion against child marriages; for uplift of social women; to legalise Brahma type of marriage.
<b>Arya Samaj;</b> at Bombay-1875	<b>Dayanand Saraswati</b> (originally Mula Shankar-	Asserted Hindu faith over religions; within a revivalist framework,

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	founder)	denounced rites, Brahmins' supremacy, idolatry, superstitions; Dayanand Anglo Vedic (DAV) schools were established.
<b>Aligarh Movement</b> (the Aligarh School grew into the Muhamadan Anglo-oriental college in 1877 and later the Aligarh Muslim University(1875-year of founding the Aligarh School)	<b>Syed Ahmed Khan</b> (1817-1898- founder of Aligarh School)	Religious reform through emphasis on principle of enquiry in religion, favoured scientific and rational outlook, recognized Western education, aimed at social reform; <b>Sir Syed Ahmed</b> founded a <i>scientific society</i> (1864), <i>Tahzib-al-akhlaq</i> (1870)-urdu journal
<b>Deccan Education Society;</b> Pune-1884	<b>M.G.Ranade,</b> <b>V.G.Chibdonkar,</b> <b>G.G.Agarkar</b> (founders)	For contributing to education and culture in western India; established Ferguson college, Pune in 1885
<b>Seva Sadan;</b> Bombay-1885	<b>Behramji M.Malabari</b>	Against child marriages, forced widowhood; to help socially exploited women
Indian National Social conference, Bombay-1887	M.G.Ranade, Raghunath Rao	Social reform
Deva Samaj; Lahore-1887	Shiva Narain Agnihotri	Religious ideas closer to those of Brahma samaj; favoured a social code of conduct that was against bribe-taking, gambling, alcohol consumption and having non-vegetarian food.
Madras Hindu Association; madras -1892	Veerasalingam Pantulu	Social purity movement; against devadasi system and oppression of widows.
Ramakrishna mission;	Vivekananda (originally	Sought to revive Hinduism based on

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Bengal (centres at Belur and Mayavati became focal points-1897)	Narendranath Dutta), 1863-1902 (its founder); Ramakrishna Paramhansa (1834-1886)	ancient India's religious texts and concepts (of Vedanta,etc); against caste restrictions, oppression, superstition in Hinduism, aimed to uplift women and overhaul the education system.
Bharat Dharma Mahan-Mandala; Benaras-1902	Madan Mohan Malaviya, Deen Dayal Sharma, Gopal Krishna Gokhale (founders)	Orthodox Hindus' (sanatandharini's) organization that opposed the Arya samaj's teachings.
The Servants of India Society; Bombay-1905	Gopal Krishna Gokhale	Famine relief and improving tribals' condition in particular.
Poona Seva sadan-1909	G.K. Devadhar and Ramabai Ranade	Economic uplift; employment for women
Nishkam Karma Math (Monastery of Disinterested work); Pune-1910	Dhondo Keshav Karve	Educational progress of women; improving widow's condition. Founded a women's university in pune- now in Bombay
Seva samiti; Allahabad 1914	Hridayanath Kunzru	Improving the status of the suffering classes through social service, education
The Indian Women's Association; Madras(1917)	Annie Besant	Upliftment of Indian Women; Annual Conference (All India Women's conferences) were held.

### PEASANT MOVEMENTS

Indigo Revolt by Bengal Indigo cultivators led by Degambar and Bishnu Biswas(1859-1860; Nadia district)	Against terms imposed by European indigo planters; Indigo Commission was set up in 1860 to view the situation
Champaran Satyagraha	Against the tinkathia system imposed by the European indigo planters; the champaran

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	Agararian Act abolished the tinkathia system
Kheda Satyagraha by Peasants of Kheda, led by Gandhi (1918, Gujarat)	Against ignored appeal for remission of land revenue in case of crop failures; the demands were finally fulfilled
Bardoli Satyagraha by the Kunbi- Patidar land-owning peasants and untouchables, supported by Mehta brothers, Sardar Vallabhai Patel(1928; Surat, Gujarat)	Against Oppression by upper castes and hike in revenue by 22% by the Bombay Government; the revenue was brought down to 6.03%
Eka Movement by members of Pasi and Ahir castes (1921-22; Hardoi, Barabanki and Sitapur districts)	Against hike in rents.

## CASTE MOVEMENTS

SatyaSodhak movement, Satyashodhak Samaj, founded by Jyotiba Phule(1873; Maharashtra)	Against brahminic domination and for the emancipation of low castes, untouchables and widows
Aravippuram movement, led by Shri Narayana Guru(1888; Kerala)	For the rights of the depressed classes (especially the Ezhavas or Iravas of Kerala); the Shri Narayana Dharma Paripalana Yogum was set up in 1902-1903
Justice Party Movement led by Dr.T.M.Nair, P.Tyagaraja Chetti and C.N.Mudalair on behalf of intermediate castes(1916;Madras)	Against domination of Brahmins in government service, education and political field; the South Indian Liberation Federation (SILF) was formed in 1916; the efforts yielded in the passing of 1930 Government Order providing reservations to groups
Nair Movement led by C.V.Raman Pillai, K.Rama Krishna Pillai and M.Padmanabha Pillai(1891;Kerala)	Against domination of Brahmins; the malayali memorial was formed by Raman Pillai in 1891 and Nair Service Society by Padmanabha Pillai



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	was set up in 1914
Self-respect Movement led by E.V.Ramaswami Naicker or Periyar(1925;Tamilnadu)	Against caste bias by Brahmins; <i>Kudi arasu</i> journal was started by Periyar in 1910
The Depressed Classes (Mahars) movement led by B.R.Ambedkar(1924; Maharastra)	For the upliftment of the Untouchables; founded the Depressed Classes Institution in 1924, a Marathi fortnightly Bahisakrit Bharat in 1927, the samaj samta sangh in 1927, the Scheduled caste Federation in 1942 to propagate their views.
Congress Harijan Movement(1917 onwards)	For elevating the social status of the lower and backward classes; All-India Anti-Untouchability League was established in 1932; the weekly Harijan was founded by Gandhi in 1933
Kaivartas' Movements by Kaivartas who later became the Mahishyas(1897 onwards;Midnapore, Bengal)	Founded the Jati Nirdharani Sabha(1897) and the Mahishya Samiti(1901)

## THE REVOLT OF 1857

The revolt of 1857 is an important landmark in the history of India which occurred during the governor generalship of **Lord Canning**. **CAUSES OF THE REVOLT:**

### CAUSES OF THE REVOLT:

The revolt of 1857 was a combination of political, economic, socio-religious and military causes.

#### POLITICAL:

Policies such as "**Effective Control**", "**Subsidiary alliance**", "**Doctrine of lapse**" (**Avadh** was annexed in 1856 on charges of mal-administration & **Satara, Jhansi,**

**Nagpur** and **Sambhalpur** were annexed by the Doctrine of lapse.

#### ADMINISTRATIVE CAUSES:

Rampant Corruption in the company's administration (especially Police, Petty officials and lower law courts) and the absentee sovereignty character of British rule imparted a foreign and alien look to it in the eyes of Indians.

#### ECONOMIC:

Heavy taxation, forcible evictions on non-payment of debt dues, annexation of Indian states by the Company cut off the

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major source of patronage, discriminatory tariff policy against indian products and destruction of traditional handicrafts that hit peasants and artisans.

## **Socio Religious:**

British socio-religious reforms like abolition of Sati, support to widow remarriage and women's education hurted the sentiments of orthodox and conservative -people. Government's decision to Tax mosque and temple lands and Religious Disabilities Act, 1856 (like change of religion did not debar a son from inheriting the property of his heathen father).

## **Military:**

Discrimination of Indian soldiers racially and in matters of promotion and privileges. Sepoys were like "Peasant in Uniforms". (New recruits had to travel across the sea to reach Burma during War time, crossing the sea was forbidden as per Hindu beliefs, i.e., General service Enlistment Act. The highest post for an Indian was that of the Subedar.

## **Immediate cause:**

The reports about the mixing of bone dust in atta (flour) and the introduction of **Enfield rifles** in which the cartridges had to be bitten off before loading and were said to

have a greased cover made of beef and pig fat sparked off the revolt.

## **THE BEGINNING AND SPREAD THE REVOLT:**

On march 29,1857 an Indian sepoy of 34<sup>th</sup> native infantry, **Mangal Pandey**, killed two British officers **Hugeson** and **Baugh** on parade at **Barrackpore**. The Indian soldiers present, refused to obey orders to arrest Mangal Pandey. However, he was later on arrested and executed on April 6.

The mutiny really started at **Meerut**. On 9<sup>th</sup> may 1857, Sepoys who refused to use the greased cartridges were dismissed and sentenced to 10years imprisonment. The soldiers along with other groups of civilians went on a rampage shouting '**Maro Firangi Ko**'. On May 10<sup>th</sup> they broke into jails, murdered Europeans, burnt their houses and marched towards Delhi after sunset.

The appearance of marching soldiers next morning (11th may) in Delhi was a signal to the local soldiers, who in turn revolted, seized the city and proclaimed the 82 year old **Bahadur Shah 'Zafar' as Shahenshah-i-Hindustan** (Emperor of India). Within a month of the capture of Delhi, the revolt spread to different parts of the country.

<b>CENTRE</b>	<b>BEGINNING DTAE</b>	<b>ENDING DATE</b>	<b>INDIAN LEADER</b>	<b>BRITISH SUPPRESSOR</b>
DELHI	11 May,1857	20 sep,1857	Bahadur shah II 'Zafar' and General Bakht Khan(commanding general)	John Nicholson

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KANPUR	4 June,1857	6 Dec,1857	Nana saheb and his loyal commander Tantiya Tope	Colin Campbell
LUCKNOW	4 June,1857	21 Mar,1858	Begum Hazart Mahal	Colin campbell
JHANSI	4 June,1857	18 June,1858	Rani Laxmibai (A.K.A. Manikarnika)	Huge Rose
ALLAHABAD	5 June,1857	March 1858	Liyahat Ali	Colonel Neil
BIHAR	Aug 1857	Dec 1858	Kunwar singh and Amar singh	William Taylor and Vincent Eyre

**NOTE:**

1. After the suppression of revolt, **Bahadur shah II** was deported to Rangoon, where he died in 1862. His sons were butchered. **Nana Saheb** defeated at **Kanpur**, escaped to Nepal in early 1859, never to be heard of again. **Begum Hazrat Mahal** was compelled to hide in Nepal; **Tantia Tope** escaped into the jungles of central India, was captured and executed on 15<sup>th</sup> April, 1859; **Rani laxmi bai** died in the battle field 1858; **Kunwar singh**, Khan Bahadur Khan, Bakht Khan were all dead. **Kunwar Singh** was wounded and died on 24<sup>th</sup> April 1858.

2. Sir Huge Rose described **Laxmi Bai** as 'the best and bravest military leader of the rebel'.

3. Other Important Leaders: **Khan Bahadur Khan (Bareilly)**, **Maulavi Ahmadullah (Faizabad)**, **Azimullah Khan(Fatehpur)**, **Devisingh (Mathura)**, **Kadam singh (Merrut)**.

4. English authority was fully re-established in India by the end of 1859.

**CAUSES OF FAILURE:**

The Revolt of 1857 was unsuccessful but it is a heroic effort to eliminate the foreign rule. The main causes were:

1. Limited territorial and social base.
2. Lack of complete nationalism – Scindias, Holkars, Nizam and others actively helped the British.

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3. Lack of coordination between sepoys, peasants, zamindars and other classes and lack of a central leadership.
4. Lack of coherent ideology and a political perspective.
5. Crucial support of certain sections of Indian public to British Authorities.

## **SIGNIFICANCE:**

The important element in the revolt lay in Hindu-Muslims unity. People exhibited patriotic sentiment without any touch of communal feelings. No doubt it has began as mutiny of soldiers but soon turned into a revolt against British rule in general.

## **Nature of the revolt of 1857:**

Not quite the first war of independence but sowed the seeds of nationalism and quest for freedom from alien rule. There are two main views about the nature of the Revolt of 1857:

1. It was described as "**Sepoy Mutiny**" by Syed Ahmed Khan, Munish Jeevan Lal and Durgadas Bandyopadhyaya (contemporary Historians); Stenley (Secretary of state for India), John Lawrence, John Seeley, Malletson, R.C Mazumdar.
2. It was described as **National struggle/War of independence** by Benjamin Disraeli, Karl Marx, V.D Savarkar, K.M Pannikar, Ishwari Prasad, A.L. Shrivastva, Tarachand.

<b>BOOK</b>	<b>YEAR</b>	<b>AUTHOR</b>
The First Indian War of Independence 1857-1859	1857	Karl Marx & Friedrich Engels
Causes of Indian Revolt	1873	Sayed Ahmad Khan
The India War of Independence	1909	V.D.Savarkar
The Sepoy mutiny and the Rebellion of 1857	1957	R.C.Mazumdar
Civil Rebellion in India mutinies	1957	S.B.chowdary
Rebellion,1857:A Symposium	1957	P.C.Joshi
1857	1957	S.N.Sen

## **Impact of the Revolt of 1857:**

1. In August 1858, the British parliament passed an act, which put an end to the rule of the company. The control of the British

government in India was transferred to the British Crown. The assumption of the Government of India by the Sovereign of Great Britain was announced by Lord

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Canning at a durbar at Allahabad in the "Queen's Proclamation" issued on November 1, 1858.

2. A minister of the British Government, called the **Secretary Of The State** for India, was made responsible for the governance of India.

3. The British Governor-General of India was now also given the title of **Viceroy**, who was also the representative of the monarch.

4. Marked the end of British Imperialism and the Princely states were assured against annexation. Doctrine of Lapse was withdrawn.

5. After the revolt, the British pursued the policy of 'divide and rule'.

6. Far-reaching changes were made in the administration and increase of white soldiers in the army.

7. Total expenses for the suppression of the revolt were thrown on the Indian people.

8. The revolt soon become a symbol of challenge to the mighty British empire in India and remained a Shining star for the rise and growth of the Indian national movement.

## Indian National Congress

### HISTORY

- Formed in 1885 by A.O.Hume (Englishman and a Retired Civil Servant).
- First session in Bombay under W.C.Banerjee in 1885 (72 delegates attended it) at **Tejpal University**.
- In the first two decades (1885 - 1905), quite moderate in its approach.
- But the repressive measures of the British gave rise to extremists within Congress like Bipin Chandra Pal, Bal Gangadhar Tilak and Lala Lajpat Rai (Lal, Bal, Pal).

### IMPORTANT SESSIONS:

<b>1882-1885</b>	Bombay,Allahabad	W.C.Banerjee	First session of congress,attended by 72 delegates;objectives of the Congress outlined
<b>1886</b>	Kolkata	Dada Bhai Naoroji	Attended by 436 delegates;witnessed the member of National Congress and National Conference
<b>1887</b>	Madras	Badruddin Tayabji	First session to be presided by a Muslim.Attended by 607 delegates; appeal

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			made Muslims to join hands with other national leaders.attended by 1248 delegates
<b>1888</b>	Allahabad	George Yule	
<b>1889</b>	Bombay	William Wedderburn	
<b>1890</b>	Kolkatta	Pheroz Shah Mehta	
<b>1891</b>	Nagpur	P.Ananda Charlu	
<b>1892</b>	Allahabad	W.C.Bannerji	
<b>1893</b>	Lahore	Dadabhai Naoroji	
<b>1894</b>	Madras	Alfred Webb	
<b>1895</b>	Poona	Surendranath Bannerji	
<b>1896</b>	Kolkata	Rahimtulla M Sayani	The National Song, Vande Mataram was sung for the first time.
<b>1898</b>	Madras	A.M.Bose	
<b>1902</b>	Ahmedabad	Surendranath Banerji	
<b>1905</b>	Benaras	Gopala Krishna Gokhale	Expressed resentment against the partition of Bengal
<b>1906</b>	Kolkatta	Dadabhai Naoriji	The word 'Swaraj' mentioned for first time
<b>1907</b>	Surat	Rashbihari Ghosh	The INC split into two, one consisting of Moderates, led by Gokhale and the other consisting of Extremists, led by Tilak
<b>1908</b>	Madras	Rashbihari Ghosh	Constitution of the Congress drawn
<b>1909</b>	Lahore	Madan Mohan Malaviya	Expressed disapproval over formation of separate electorates on the basis of

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			religion(Indian Councils Act,1909)
<b>1910</b>	Allahabad	William Wedderburn	
<b>1911</b>	Kolkatta	Pandit Bishan Narayan Das	The National Anthem, Jana Gana Mana was sung for the first time
<b>1916</b>	Lucknow	Ambica Charan Mazumdar	The First time Joint session with Muslim league in which the historic Lucknow pact was signed. Even World War I happened.
<b>1917</b>	Kolkatta	Mrs Annie Besant	First session to be presided by a Lady.
<b>1918</b>	Delhi	Madhan Mohan Malviya	
<b>1919</b>	Amritsar	Motilal Nehru	Strongly condemned the Jallianwalla massacre;and boosted the Khilafat Movement
<b>1924</b>	Belgaum	M. K. Gandhi	Only session Gandhiji being a president
<b>1925</b>	Kanpur	Sarojini Naidu	First session to be presided by an Indian lady.
<b>1927</b>	Madras	M.A.Ansari	The Independence Resolution adopted;resolved to boycott the Simon Commission
<b>1929</b>	Lahore	Pt Jawaharlal Nehru	The decision to launch a civil disobedience movement to achieve complete independence and to observe 26 Jan as Independence Day was taken. Nehru became the president for the first time.
<b>1931</b>	Karachi	Vallabhai Patel	Endorsement of Gandhi-Irwin pact,resolution on Fundamental Rights and National Economic Programme passed
<b>1938</b>	Haripura	Subash Chandra Bose	National Planning Commission set up under the chairmanship of Jawaharlal Nehru
<b>1946</b>	Meerut	Acharya JB	Last pre-independence session of the INC

		Kripalani	
<b>1948</b>	Jaipur	Dr Pattabi Sitaramayya	First session after Independence

**Dada Bhai Naoroji:**

He was the first Asian to be a British MP. He was even the founder of the Indian National Congress along with A.O Hume and Dinshaw Edulji Wacha. He was the **Grand Old Man of India**. Naoroji published his famous indictment of British exploitation of India, **Poverty and Un-British Rule in India**. This book guaranteed his position in the very front rank of the Indian nationalist movement.

**Annie Besant:**

She founded a weekly newspaper '**Commonweal**' in January 1914 for her political work. In June 1914 she purchased the 'Madras Standard' and renamed it 'New India'.

**Motilal Nehru:**

Motilal Nehru chaired the famous Nehru Commission in 1928, that was a counter to the all-British Simon Commission. Nehru Report the first constitution written by Indians only, conceived a dominion status for India. It was endorsed by the Congress Party, but rejected by more nationalist Indians who sought complete independence. The report was rejected by the Muslim leadership of India, specially MA Jinnah, who warned majority Hindu leadership of "**Short Sightedness And Oppressiveness Of Commission**".

**Vallabhai Patel:**

He is popularly known by two names, the '**Iron Man of India**' and '**Bismarck of India**'. For his leadership activities and the ability to lead thousands of people, he was given the forename '**Sardar**'. He was instrumental in the founding the Indian Administrative Service and the Indian Police Service and is therefore known as the '**Patron Saint**' of India's services. He successfully completed the uphill task of unifying the princely states of India to join the Indian union. He persuaded the princes of 565 states to accede to India.

**Subash Chandra Bose:**

He found the "**Forward block party**" in 1939 and **Indian National Army** in 1942.

**Madhan mohan malviya:**

He started the '**Leader**', an English daily in October 1909. He also started the '**Maryada**' a Hindi monthly in 1910 and another Hindi monthly, in 1921. He was the Chairman of the Board of Directors of the '**Hindustan Times**' from 1924 to 1946. He was the President of the All India Seva Samiti from 1914 till 1946.



# INDIAN HISTORY

## INDIAN NATIONAL MOVEMENT

1885	The first meeting of the Indian National Congress, Bombay
1905	The first partition of Bengal
1906	Formation of the Muslim League
1920	Mahatma Gandhi leads the Congress; Non-cooperation Movement
1922	Civil Disobedience Movement
1928	Simon Commission comes to India: Boycott by all parties
1929	Lord Irwin promises Dominion Status for India
1930	Civil Disobedience Movement continues; Salt Satyagraha: Gandhi's Dandi March; First Round Table Conference
1931	Second Round Table Conference; Irwin-Gandhi Pact
1932	Third Round Table Conference
1934	Civil Disobedience Movement ends
1935	The Government of India Act receives Royal Assent
22 Dec	Observed as 'Deliverance Day' from Congress rule by the Muslim League.
1940	Lahore Resolution of the Muslim League demands for a separate state for the Muslims of India
<b>1942</b>	Subhas Chandra Bose forms the Indian National Army
30 Mar 1942	Cripps proposals published
8-9 Aug 1942	Congress launches 'Quit India movement' and is declared an unlawful organisation; Gandhi and all members of the Congress Working Committee are arrested
<b>1945</b>	First trial of the Indian National Army men opened
Dec-Jan 1945	General Elections in India
<b>1946</b>	
23 Mar-29 Jun	Cabinet Mission visits India
29 Jul	Muslim League passes resolutions retracting its acceptance of the Cabinet Mission plan and calling upon Muslims to observe 16 August as 'Direct Action Day'
16 Aug	'Direct Action Day'
<b>1947</b>	
24 March	Mountbatten sworn in as Viceroy and governor-General
3 June	Mountbatten, Nehru, Jinnah and Baldev Singh give a broadcast on the Plan over All India Radio
4 July	Indian Independence Bill is published
9 July	Mountbatten advises Attlee of his decision to accept the Governor-Generalship of India
18 July	Indian Independence Bill receives Royal Assent

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11 August	Jinnah elected President of the Constituent Assembly of Pakistan
14 - 15 August midnight	Power transferred
15 August	Jinnah sworn in as Governor-General of Pakistan; Mountbatten sworn in as Governor-General of India; Independence Day Celebrations in Delh

## **Government of India Act 1858:**

Queen Victoria issued a proclamation on November 1, 1858, placing India under direct government of the Crown, whereby:

- (a) A viceroy was appointed in India
- (b) Princes were given the right to adopt a son (Abolition of Doctrine of Lapse)
- (c) Treaties were honoured
- (d) Religious freedom was restored and equality treatment promised to Indians

The Proclamation was called the '**Magna Carta of Indian Liberty**'. The British rule in India was strongest between 1858 and 1905. The British also started treating India as its most precious possession and their rule over India seemed set to continue for centuries to come. Because of various subjective and objective factors which came into existence during this era, the feeling of Nationalism among Indians started and grow.

## **Indian National Congress (1885):**

Although the British succeeded in suppressing the 1857 Revolt, they could not stop the growth of political awareness in India. The Indian National Congress was

founded in December 1885. It was the visible embodiment of the national awakening in the country. Its founder was an Englishman, **Allan Octavian Hume**, a retired member of the Indian Civil Service. The Indian leaders, who cooperated with Hume in launching the Congress, were patriots of high character. The first President of the Congress was **W.C. Bannerjee**.

The aims of the Congress were: promotion of friendship and cooperation amongst the nationalist political workers from the different parts of the country; the eradication of racial, creed or provincial prejudices and promotion of national unity; formulation of popular demands and their presentation before the Government; and, most important of all, the training and organisation of public opinion in the country.

## **Partition of Bengal (1905):**

On December 30, 1898, **Lord Curzon** took over as the new Viceroy of India. The partition of Bengal came into effect on October 16, 1905, through a Royal Proclamation, reducing the old province of

# INDIAN HISTORY

Bengal in size by creating a new province of East Bengal, which later on became **East Pakistan** and present day **Bangladesh**. The government explained that it was done to stimulate growth of underdeveloped eastern region of the Bengal. But, actually, the main objective was to '**Divide and Rule**' the most advanced region of the country at that time.

## **Muslim League (1906):**

In 1906, All India Muslim League was set up under the leadership of **Aga Khan, Nawab Salimullah of Dacca and Nawab Mohsin-ul-Mulk**. The League supported the partition of Bengal, opposed the Swadeshi Movement, and demanded special safeguards for its community and a separate electorates of Muslims. This led to communal differences between Hindus and Muslims.

## **Swadeshi Movement (1905):**

The Swadeshi movement has its genesis in the anti-partition movement which was started to oppose the British decision to divide Bengal. With the start of the Swadeshi movement at the turn of the century, the Indian National Movement took a major leap forward.

The Indian National Congress took up the Swadeshi call in **Benaras Session, 1905**, presided over by **G.K. Gokhale**, supported the Swadeshi and Boycott Movement of

Bengal, Militant Nationalism spearheaded by **Bal Gangadhar Tilak, Bipin Chandra Pal, Lala Lajpat Rai, and Aurobindo Ghosh** was, however, in favour of extending the movement of the rest of India and carrying it beyond the programme of just Swadeshi and boycott of goods to full-fledged political mass struggle.

## **Morley-Minto Reforms (1909)**

Morley-Minto Reforms were introduced in 1909 during the period when **Lord Minto** was the GovernorGeneral of India. The reforms envisaged a separate electorate for Muslims besides other constitutional measures. The government thereby sought to create a rift within the Congress on the one hand by winning the support of the moderates, and on the other, to win favour of Muslims against Hindus. To achieve the latter objective, the reforms introduced the system of separate electorates under which Muslims could only vote for Muslim candidates. This was done to encourage the notion that the political, economic and cultural interests of Hindus and Muslims were separate and not common. Indian political leaders were however dissatisfied by these reforms.

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## **Lucknow Pact (1916):**

An important step forward in achieving Hindu-Muslim unity was the Lucknow Pact 1916. Anti-British feelings were generated among the Muslims following a war between Britain and Turkey which opened way for Congress and Muslim League unity. Both the Congress and the Muslim League held sessions at Lucknow in 1916 and concluded the famous Lucknow Pact. The Congress accepted the separate electorates, and both organizations jointly demanded dominion status for the country.

Hindu-Muslim unity weakened the British attitude and forced the government to announce its future policy. In 1916 a British policy was announced whereby association of Indians was increased and there was to be a gradual development of local self-governing institutions.

## **Home Rule Movement (1915-1916):**

Dr. Annie Besant, inspired by the Irish rebellion, started a Home Rule Movement in India in September 1916. The movement spread rapidly and branches of the Home Rule League were established all over India.

**Bal Gangadhar Tilak** wholeheartedly supported this movement. Rejoined forces with Dr. Besant and persuaded the Muslim League to support this programme.

## **The Gandhian Era (1918-1947):**

Mahatma Gandhi dominated the Indian political scene from 1918-1947. This period of the Indian National Congress is also referred to as the Gandhian Era. It was the most intense and eventful phase of India's freedom struggle. Mahatma Gandhi provided the leadership of the highest order and his philosophy of non-violent **Satyagraha** became the most potent weapon to drive out the British from the Indian soil.

## **Khilafat Movement (1920):**

**The Caliph, Sultan of Turkey**, was looked upon by the Muslims as their religious head. During the First World War, when the safety and the welfare of Turkey were threatened by the British thereby weakening the Caliph's position, Indian Muslims adopted an aggressive anti-British attitude. The two brothers, **Mohammed Ali and Shaukat Ali** launched an anti-British movement in 1920 - the Khilafat Movement for the restoration.

## **The Rowlatt Act (1919):**

While trying to appease Indians, the British Government was following a policy of repression. Throughout the **First World War**, repression of freedom fighters had continued. The revolutionaries had been hunted down, hanged or imprisoned. The Government now decided to arm itself with

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more powers in order to suppress the freedom fighters. In **March 1919**, it passed the **Rowlatt Act**. This Act authorised the government to detain any person without trial. The Rowlatt Act came like a sudden blow. The Indians had been promised extension of democracy during the war. They felt humiliated and were filled with anger when they found that their civil liberties were going to be curtailed still further. Unrest gripped the country and a powerful agitation against the Act started. During this agitation, Gandhiji took command of the nationalist movement. March and April 1919 witnessed a remarkable political awakening in the country. There were hartals, strikes and demonstrations at various places. The slogans of Hindu-Muslim unity filled the air.

## **Jallianwalla Bagh Massacre (1919):**

The Government was bent on suppressing the mass agitation. In Bombay; Ahmedabad, Calcutta, Delhi and at other places demonstrators were lathi-charged and fired upon. Gandhiji gave a call for a general hartal on April 6, 1919. The call was responded to with great enthusiasm. The Government decided to resort to repression to suppress the agitation. At this time the British Government committed one of the worst political crimes in modern history. An

unarmed but a large crowd had gathered in **Jallianwalla Bagh, Amritsar (Punjab) on April, 13, 1919** for a meeting. General Dyer ordered his troops to open fire on them without warning. This massacre of unarmed people (hundreds died and thousands were wounded) in an enclosed place from which there was no exit, was followed by a reign of terror in several districts under martial law. To enquire this massacre, **Hunter Commission** was formed in **1920**.

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

With the Congress support of the Khilafat movement, Hindu-Muslim unity was achieved which encouraged Gandhiji to launch his non-violent, non-cooperation movement. At the Calcutta Session in September 1920, the Congress resolved in favour of the non-violent, non-cooperation movement and defined Swaraj as its ultimate aim. The movement envisaged: (i) Surrender of titles and honorary officers; (ii) Resignation from nominated offices and posts in the local bodies; (iii) Refusal to attend government darbars and official functions and boycott of British courts by the lawyers; (iv) Refusal of general public to offer themselves for military and other government jobs, and boycott of foreign goods, etc. The non-cooperation movement

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also saw picketing of shops selling foreign cloth and boycott of the foreign cloth by the followers of Gandhiji.

### **Chauri Chaura Incident (1922):**

The Congress session held at Ahmedabad in December 1921 decided to launch a Civil Disobedience Movement while reiterating its stand on the non-violent, noncooperation movement of which Gandhiji was appointed the leader. Before Gandhiji could launch the Civil Disobedience Movement, a mob of countrymen at **Chauri Chaura, a place near Gorakhpur in U.P.**, clashed with the police which opened fire. In retaliation the mob burnt the police-station and killed 22 policemen. This compelled Gandhiji to call off the **Civil Disobedience Movement** on February 12, 1922. Despite this Gandhiji was arrested and sentenced to **six years imprisonment**. The Chauri Chaura incident convinced Gandhiji that the nation was not yet ready for the mass-disobedience and he prevailed upon Congress Working Committee in **Bardoli** on February 12, 1922 to call off the Non-Cooperation Movement.

### **Swaraj Party (1922):**

Gandhiji's decision to call off the agitation caused frustration among masses. His decision came in for severe criticism from his colleagues like **Motilal Nehru, C.R. Das**

**and N.C. Kelkar**, who organized the Swaraj Party. The foundations of the '**Swaraj Party**' were laid on January 1, 1923, as the '**CongressKhilafat-Swarajya Party**'. It proposed then an alternative programme of diverting the movement from widespread civil disobedience programme to restrictive one which would encourage its member to enter into legislative councils (established under **Montford Reforms** of 1919) by contesting elections in order to wreck the legislature from within and to use moral pressure to compel the authority to concede to the popular demand for self-government.

### **Simon Commission (1927):**

Under the 1919 Act, a statutory commission was to be appointed by the British Government at the end of ten years from the passing of the Act to inquire into the working of the system of government in the country and to recommend further reforms. Thus the commission was scheduled to be appointed in **1929**. It was actually appointed **two years earlier in 1927**. The commission consisted of seven members of the British Parliament. It was headed by **Sir John Simon**. As all its members were British, the Congress decided to boycott it. The Commission arrived in India in Feb. 1928. It was greeted with black flags and hostile

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demonstrations everywhere it went. In one such demonstration at Lahore, Lala Lajpat Rai was seriously injured in a wanton police lathi-charge on the demonstrators. Lalaji died soon after from wounds received during the demonstration.

## **Dandi March (1930):**

Also called the '**Salt Satyagraha**'. To achieve the goal of complete independence, Gandhiji launched another civil disobedience movement. Along with **79** followers, Gandhiji started his famous march from **Sabarmati Ashram** on March 20, 1930, for the small village Dandi to break the Salt Law. While Gandhiji was marching to **Dandi**. Congress leaders and workers had been busy at various levels with the hard organizational tasks of enrolling volunteers and members, forming grassroot Congress Committees, collecting funds, and touring villages and towns to spread nationalist messages.

On reaching the seashore on April 6, 1930, he broke the Salt Law by picking up salt from the seashore. By picking a handful of salt, Gandhiji inaugurated the Civil Disobedience Movement, a movement that was to remain unsurpassed in the history of the Indian National Movement for the countrywide mass participation it unleashed. The movement became so powerful that it

sparked off patriotism even among the Indian soldiers in the Army. The **Garhwal** soldiers refused to fire on the people at **Peshawar**.

## **Gandhi-Irwin Pact (1931):**

Early in 1931 two moderate statesmen, **Sapru** and **Jayakar**, initiated efforts to bring about rapprochement between Gandhiji and the government. **Six meetings with Viceroy Lord Irwin** finally led to the signing of a pact between the two on March 5, 1931, whereby the Congress called off the movement and agreed to join the Second Round Table Conference. The terms of the agreement included the immediate release of all political prisoners not convicted for violence, the remission of all fines not yet collected, the return of confiscated land not yet sold to third parties, and lenient treatment of all the government officials who had resigned.

Gandhiji and other leaders were released from jail as Irwin agreed to release most political prisoners and to return the properties that had been seized by the governments. The government also conceded the right to make the salt for consumption of villages along the coast, and also the right to peaceful and non-aggressive picketing. The Congress on its part, agreed

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to discontinue the Civil Disobedience Movement and to participate in the next Round Table Conference.

## **The Government of India Act, 1935:**

The **Simon Commission** report submitted in 1930 formed the basis for the Government of India Act 1935. The new Government of India Act received the royal assent on August 4, 1935.

The Act continued and extended all the existing features of the Indian constitution. Popular representation, which went back to 1892, dyarchy and ministerial responsibility, which dated from 1921, provincial autonomy, whose chequered history went back to eighteenth century presidencies, communal representation, which first received recognition in 1909, and the safeguards devised in 1919, were all continued and in most cases extended. But in addition there were certain new principles introduced. It provided for a federal type of government. Thus, the act:

- (a) Introduced provincial autonomy
- (b) Abolished dyarchy in provinces I
- (c) Made ministers responsible to the legislative and federation at the centre

The Act of 1935 was condemned by nearly all sections of Indian public opinion and was

unanimously rejected by the Congress. The Congress demanded instead, the convening of a Constituent Assembly elected on the basis of adult franchise to frame a constitution for an Independent India.

## **Quit India Movement (1942):**

On August 8, 1942, the Congress in its meeting at Bombay passed a resolution known as '**Quit India**' resolution, whereby Gandhiji asked the British to quit India and gave a call for '**Do or die**' to his countrymen. On August 9, 1942, Gandhiji was arrested but the other leaders continued the revolutionary struggle. Violence spread throughout the country, several government officers were destroyed and damaged, telegraph wires were cut and communication paralyzed. The movement was, however, crushed by the government.

## **Cabinet Mission Plan (1946):**

The struggle for freedom entered a decisive phase in the year 1945-46. The British Prime Minister, **Lord Atlee**, made a declaration on March 15, 1946, that British Cabinet Mission would visit India to make recommendations regarding constitutional reforms to be introduced in India. The Cabinet Mission which constituted of **Lord Lawrence, Sir Stafford Cripps and A.V. Alexander** visited India and met the representatives of



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different political parties but a satisfactory solution to the constitutional difficulties could not be found. The Mission envisaged the establishment of a Constituent Assembly to frame the Constitution as well as an interim government. The Muslim League accepted the plan on June 6, 1946, while maintaining its rights of striving for a separate Muslim state. The Congress also partially accepted the plan.

## **Interim Government (1946):**

On September 2, 1946, an interim government was formed. Congress members led by Pandit Jawaharlal Nehru joined it but the Muslim League did not as it withdrew its earlier acceptance of the Cabinet Mission Plan.

## **Formation of Constituent Assembly (1946):**

The Constituent Assembly met on December 9, 1946, and **Dr. Rajendra Prasad** was elected its President. The Muslim League did not join the Assembly.

## **Mountbatten Plan (1947):**

In March 1947, Lord Mountbatten replaced **Lord Wavell**. He announced his plan on June 3, 1947. It offered a key to the political and constitutional deadlock created by the refusal of the Muslim League to join the Constituent Assembly formed to frame the

Constitution of India. Mountbatten's formula was to divide India but retain maximum unity. The country would be partitioned but so would be **Punjab and Bengal**, so that the limited Pakistan that emerged would meet both the Congress and the League's position to some extent. The League's position on Pakistan was conceded in that it would be created, but the Congress position on unity would be taken into account to make Pakistan as small as possible. He laid down detailed principles for the partition of the country and speedy transfer of political powers in the form of dominion status to the newly formed dominions of India and Pakistan. Its acceptance by the Congress and the Muslim' League resulted in the birth of Pakistan.

## **The Indian Independence Act, 1947:**

The Bill containing the provisions of the Mountbatten Plan of June 3, 1947, was introduced in the British Parliament and passed as the Indian Independence Act, 1947. The Act laid down detailed measures for the partition of India and speedy transfer of political powers to the new government of India and Pakistan.

## **Partition of India (1947):**

In accordance with the Indian Independence Act, 1947, India was partitioned on August

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15, 1947 into India and Pakistan. The Act made India and Pakistan independent dominions. Bloodshed and violence marked the exodus of refugees. The state of Kashmir acceded to the Indian Union, after the raiders were helped by Pakistan, in October 1947. **Lord Mountbatten was appointed the Governor-General of free India and M.A. Jinnah the first Governor-General of Pakistan.**

## **Important Associations and Conspiracies**

### **Anushilan Samiti**

Established by Pramathanath Mitra it became one of the most organised revolutionary associations, especially in the Eastern Bengal where the Dhaka Anushilan Samiti had several branches and carried out major activities. Jugantar was initially formed by an inner circle of the Kolkata Anushilan Samiti. **Jugantar:**

Barin Ghosh was the main leader. Along with 21 revolutionaries including Bagha Jatin, he started to collect arms and explosives and manufactured bombs. The attempted murder of district Judge Kingsford of Muzaffarpur by Khudiram Bose and Prafulla Chaki (30 April 1908) initiated a police investigation that led to the arrest of many of the revolutionaries.

### **Jatindranath Mukherjee (Bagha Jatin) in 1910**

Bagha Jatin was one of the top leaders in Jugantar. He was arrested, along with several other leaders, in connection with the Howrah conspiracy case. Jugantar, along with other revolutionary groups, and aided by Indians abroad, planned an armed revolt against the British rulers during the First World War. After the First World War Jugantar supported Gandhi in the Non-Cooperation Movement and many of their leaders were in the Congress. Still, the group continued its revolutionary activities, a notable event being the Chittagong armoury raid.

### **Uttar Pradesh**

### **Hindustan Socialist Republican Association**

Bhagat Singh, Sukhdev Thapar, and Shivaram Rajguru

Hindustan Republican Association (HRA) was established in October 1924 in Kanpur, Uttar Pradesh by revolutionaries' like Ramprasad Bismil, Jogesh Chatterjee, Chandrashekhar Azad, Yogendra Shukla and Sachindranath Sanyal. The aim of the party was to organise armed revolution to end the colonial rule and establish a Federal Republic of the United States of India. The Kakori

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train robbery was a notable act of mutiny by this group. The Kakori case led to the hanging of Ashfaqullah Khan, Ramprasad Bismil, Roshan Singh, Rajendra Lahiri. The Kakori case was a major setback for the group. However, the group was soon reorganised under the leadership of Chandrashekhar Azad and with members like Bhagat Singh, Bhagwati Charan Vohra and Sukhdev on 9 and 10 September 1928- and the group was now christened Hindustan

## **Socialist Republican Association (HSRA)**

In Lahore on 17 December 1928, Bhagat Singh, Azad and Rajguru assassinated Saunders, a police official involved in deadly lathi-charge on Lala Lajpat Rai. Bhagat Singh and Batukeshwar Dutt threw a bomb inside the Central Legislative Assembly. The Assembly Bomb Case trial followed. Bhagat Singh, Sukhdev Thapar and Shivaram Rajguru were hanged on 23 March 1931.

## **Maharashtra**

### **Kotwal Dasta**

Veer Bhai Kotwal alias Veer Bhai Kotwal during Quit India Movement formed group of underground mercenaries called "Kotwal Dasta", a parallel government in the Karjat taluka of Thane district. They were about 50 in numbers including farmers and voluntary

school teachers. They decided to cut down the electric pylons supplying electricity to Mumbai city. From September 1942 through November 1942 they felled 11 pylons, paralyzing the industries and railways.

## **South India**

The uprising against the British was evidenced at Halagali (Mudhol taluk of Bagalkot district). The prince of Mudhol, Ghorpade, had accepted British overlordship. But the Bedas (hunters), a martial community, were seething with dissatisfaction under the new dispensation. The British proclaimed the Disarming Act of 1857 whereby men possessing fire arms had to register them and secure a license before 10 November 1857. Babaji Nimbalkar, a soldier thrown out of job from Satara Court, had advised these people not to lose their hereditary right to own arms.

One of the leaders of the Bedas, Jadgia, was invited by the administrator at Mudhol and was persuaded to secure a license on 11 November, though Jadgia had not asked for it. The administrator's expectation that others would follow Jadgia was belied. So he sent his agents to Halagali on 15 and 20 November and again on 21. But the entreaties of the agents did not succeed, and the agents sent on 21 November were

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attacked by Jadgia and Baalya, another leader, and they were forced to return. Another agent sent on 25 November was not allowed to enter the village.

Meanwhile, the Bedas and other armed men from the neighbouring villages of Mantur, Boodni and Alagundi assembled at Halagali. The administrator reported the matter to Major Malcolm, the Commander at the nearby army headquarters, who sent Col. Seton Karr to Halagali on 29 November.

The insurgents, numbering 500, did not allow the British to enter Halagali. There was a fight during the night. On 30 November, Major Malcolm came with 29<sup>th</sup> Regiment from Bagalkot. They set fire to the village and many insurgents died, including Babaji Nimbalkar. The British, who had a bigger army and better arms, arrested 290 insurgents; and of those 29 were tried and 11 were hanged at Mudhol on 11 December, and six others, including Jadagia and Baalya were hanged at Halagali on 14 December 1857. No prince or jagirdar was involved in this uprising, but it was the common soldiers. Violent revolutionary activities never took firm root in South India. The only violent act attributed to the revolutionaries was the assassination of Collector of Tirunelveli (Tinnevely). On 17 June 1911,

the Collector of Tirunelveli, Robert Ashe, was killed by R. Vanchi Aiyer, who subsequently committed suicide, which was the only instance of a political assassination by a revolutionary in South India.

## **Outside India**

### **India House**

The India House was an informal Indian nationalist organization that existed in London between 1905 and 1910. Initially begun by Shyamji Krishna Varma as a residence in High gate, in North London, for Indian students to promote nationalist views and work, the house became a centre for intellectual political activities, and rapidly developed to be an organization that became a meeting ground for radical nationalists among Indian students in Britain at the time, and of the most prominent centres for revolutionary Indian nationalism outside India. The Indian Sociologist published by the house was a noted platform for anti-colonial work and was banned in India as "seditious literature".

The India house was the beginnings of a number of noted Indian revolutionaries and nationalists, most famously V.D. Savarkar, as well as others of the like of V.N. Chatterjee, Lala Har Dayal, V.V.S. Iyer, M. P. T. Acharya who were, over the next decades,

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key members of revolutionary conspiracies in India as well as the founding fathers of Indian Communism. The house came to be the focus of Scotland Yard's work against Indian seditionists, as well as the focus of work for the nascent Indian Political Intelligence Office. India house ceased to be potent organisation after its liquidation in the wake of the assassination of William Hutt Curzon Wyllie by a member of the India House by the name of Madan Lal Dhingra. This event marked the beginnings of London Police's crackdown on the activities of the house and a number of its activists and patrons, including Shyamji Krishna Varma and Bhikaji Cama moved to Europe from where they carried on works in support of Indian nationalism. Some Indian students, including Har Dayal, moved to the United States. The network that the House founded was key in the nationalist revolutionary conspiracy in India during World War I.

## **Gadar Party**

Gadar party was a predominantly Sikh organization that started operating abroad in 1913 with the view to do-away with the British rule in India. The party collaborated with revolutionaries inside India and helped them get arms and ammunition. Lala Hardayal was a prominent leader of the

party and promoter of the Gadar newspaper. The Komagata Maru incident in 1914 inspired several thousand Indians residing in the USA to sell their businesses and rush home to participate in the anti-British activities in India. The party had active members in India, Mexico, Japan, China, Singapore, Thailand, Philippines, Malaya, Indo-China and Eastern and Southern Africa. During World War I, it was among the chief participants of the Hindu German Conspiracy.

## **Berlin Committee**

The "Berlin committee for Indian independence" was established in 1915 by Virendra Nath Chattopadhyaya, including Bhupendra Nath Dutt & Lala Hardayal under "Zimmerman plan" with the full backing of German foreign office.

Their goal was mainly to achieve the following four objectives:

- 1: Mobilize Indian revolutionaries abroad.
- 2: Incite rebellion among Indian troops stationed abroad.
- 3: Send volunteers and arms to India.
- 4: Even to organized an armed invasion of British India to gain India's independence and sent British back to home.

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## **Pre World War I**

### **Alipore bomb conspiracy case**

A wing of the Cellular Jail, Port Blair

Several leaders of the Jugantar party including Aurobindo Ghosh were arrested in connection with bomb-making activities in Kolkata. Several of the activists were deported to the Andaman Cellular Jail.

### **Howrah gang case**

Most of the eminent Jugantar leaders including Bagha Jatin alias Jatindra Nath Mukherjee who were not arrested earlier, were arrested in 1910, in connection with the murder of Shamsul Alam. Thanks to Bagha Jatin's new policy of a decentralised federated action, most of the accused were released in 1911.

### **Delhi-Lahore conspiracy case**

The Delhi Conspiracy case, also known as the Delhi-Lahore Conspiracy, hatched in 1912, planned to assassinate the then Viceroy of India, Lord Hardinge, on the occasion of transferring the capital of British India from Calcutta to New Delhi. Involving revolutionary underground in Bengal and headed by Rash Behari Bose along with Sachin sanyal, the conspiracy culminated on the attempted assassination on 23 December 1912 when a home-made bomb was thrown

into the Viceroy's Howdah when the ceremonial procession moved through the Chandini Chowk suburb of Delhi. The Viceroy escaped with his injuries, along with Lady Hardinge, although the Mahout was killed. In the aftermath of the event, efforts were made to destroy the Bengali and Punabi revolutionary underground, which came under intense pressure for some time. Rash Behari successfully evaded capture for nearly three years, becoming actively involved in the Ghadar conspiracy before it was uncovered, and fleeing to Japan in 1916.

The investigations in the aftermath of the assassination attempt led to the Delhi Conspiracy trial. Although Basant Kumar Biswas was convicted of having thrown the bomb and executed, along with Amir Chand and Avadh Behari for their roles in the conspiracy, the true identity of the person who threw the bomb is not known to this day.

## **World War I**

### **Indo-German Conspiracy**

The Indo-German Conspiracy, also referred to as the Hindu-German Conspiracy or the Ghadar conspiracy (or Ghadr conspiracy), was formulated during World War I between Indian Nationalists in India, United States and Germany, the Irish Republicans, and the

German Foreign office to initiate a Pan-Indian rebellion against the Raj with German support between 1914 and 1917, during World War I. The most famous amongst a number of plots planned to foment unrest and trigger a Pan-Indian mutiny in February 1915, in the British Indian Army from Punjab to Singapore, to overthrow The Raj in the Indian subcontinent. This conspiracy was ultimately thwarted at the last moment as British intelligence successfully infiltrated the Ghadar movement and arrested key figures. The failed Singapore mutiny remains a famous part of this plot while mutinies in other smaller units and garrisons within India were also crushed.

World War I began with an unprecedented outpouring of loyalty and goodwill towards the United Kingdom from within the mainstream political leadership, contrary to initial British fears of an Indian revolt. India contributed massively to the British war effort by providing men and resources. About 1.3 million Indian soldiers and labourers served in Europe, Africa, and the Middle East, while both the Indian government and the princes sent large supplies of food, money, and ammunition. However, Bengal and Punjab remained hotbeds of anti colonial activities. Terrorism

in Bengal, increasingly closely linked with the unrests in Punjab, was significant enough to nearly paralyse the regional administration. With outlines of German links with the Indian revolutionary movement already in place as early as 1912, the main conspiracy was formulated between the Ghadar Party in United States, the Berlin Committee in Germany, Indian revolutionary underground in India, Sinn Féin and the German Foreign Office through the consulate in San Francisco at the beginning of World War I. A number of failed attempts were made at mutiny, among them the February mutiny plan and the Singapore mutiny. This movement was suppressed by means of a massive international counter-intelligence operation and draconian political acts (including the Defence of India act 1915) that lasted nearly ten years. Other notable events that formed a part of the conspiracy include the Annie Larsen arms plot, the Mission to Kabul that also attempted to rally Afghanistan against British India. The Mutiny of the Connaught Rangers in India, as well as by some accounts, the Black Tom explosion in 1916 is also considered minor events linked to the conspiracy.

The Indo-Irish-German alliance and the conspiracy were the target of a worldwide

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intelligence effort by the British intelligence agencies which was ultimately successful in preventing further attempts and plans, and in the aftermath of the Annie Larsen affair, successfully directed the American intelligence agencies to arrest key figures at the time she entered World War I in 1917. The conspiracy led to the Lahore conspiracy case in India and the Hindu German Conspiracy Trial in the USA, of which the latter at the time was one of the longest and most expensive trials in that country. Largely subdued and suppressed by the end of the war, the movement posed a significant threat to British India during World War I and its aftermath, and was a major factor guiding The Raj's India policy.

## **Tehrek e Reshmi Rumal**

During the war, the Pan-Islamist movement also attempted to overthrow the Raj, and came to form a close liaison with the Indo-German Conspiracy. Out of the Deoband movement arose the Tehrek-e-Reshmi Rumal. The Deobandi leaders attempted to begin a pan-Islamic insurrection in British India during World War I by seeking support from Ottoman Turkey, Imperial Germany, Afghanistan. The plot was uncovered by Punjab CID with the capture of letters from Ubaidullah Sindhi, one of the

Deoband leaders then in Afghanistan, to Mahmud al Hasan another leaders then in Persia. The letters were written in Silk cloth, hence the name of the Silk Letter Conspiracy.

## **Between the wars**

### **Chittagong armoury raid**

Surya Sen led Indian revolutionaries to raid the armoury of police and auxiliary forces and to cut all communication lines in Chittagong on 18 April 1930. After successfully completing the raid, revolutionaries establish Provincial National Government of India, after this in deadly clash with Government troops in Jalalabad Hill, revolutionaries scattered themselves in small groups and Some revolutionaries were soon killed or arrested in a gun-fight with the police. Scores of Government officials, policeman were also killed. Pritilata Waddedar led the attack on European club in Chittagong in 1932. Surya Sen was arrested in 1933 and was hanged on 8 January 1934.

### **Central Assembly Bomb Case (1929)**

Bhagat Singh and Batukeshwar Dutt threw a bomb in the assembly house along with leaflets stating their revolutionary philosophy – 'to make the deaf hear'. Bhagat Singh, Sukhdev and Rajguru were hanged and



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several others faced the verdict of imprisonment. Batukeshwar Dutt outlived all his comrades and died in July 1965 in Delhi. All of them cremated in Ferozpur (Punjab, India).

Baikuntha Shukla, the great nationalist was hanged for murdering Phanindrananth Ghosh who had become a government approver which led to hanging of Bhagat Singh, Sukhdev and Rajguru. He was a nephew of Yogendra Shukla. Baikunth Shukla was also initiated into the independence struggle at a young age taking active part in the 'Salt Satyagraha' of 1930. He was associated with revolutionary organisations like the Hindustan Seva Dal and Hindustan Socialist Republican Association. The execution of the great Indian revolutionaries Bhagat Singh, Rajguru and Sukhdev in 1931 as a result of their trial in the 'Lahore conspiracy case' was an event that shook the entire country. Phanindra Nath Ghosh, hitherto a key member of the Revolutionary Party had treacherously betrayed the cause by turning an approver, giving evidence, which led to the execution. Baikunth was commissioned to plan the execution of Ghosh as an act of ideological vendetta which he carried out successfully on 9 November 1932. He was arrested and tried for the killing. Baikunth was convicted and hanged in Gaya Central

Jail on 14 May 1934. He was only 28 years old.

On 27 February 1931, Chandrasekar Azad died in a shootout when cornered by the police.

It is unclear of the eventual fate of the Association, but the common understanding is that it disbanded with the death of Chandrashekar Azad and the hanging of its popular activists: Bhagat Singh, Sukhdev and Rajguru.

## **Dalhousie Square Bomb Case**

A bomb was thrown on the Calcutta Police Commissioner, Charles Tegart on 25 August 1930.

## **Kakori train robbery**

Chandrasekhar Azad, Ramprasad Bismil, Jogesh Chatterjee, Ashfaqullah Khan, Banwari Lal and their accomplices participated in the robbery of treasury money that was being transported by train. The looting took place between Kakori station and Alamnagar, within 40 miles (64 km) of Lucknow on 9 August 1925. Police started an intense man-hunt and arrested a large number of rebels and tried them in the Kakori case. Ashfaqullah Khan, Ramprasad Bismil, Roshan Singh, Rajendra Lahiri were hanged, four others were sent to the Cellular Jail in Port Blair, Andaman for life and seventeen others were sentenced to long terms of imprisonment.

Name	Activity
Khudiram Bose	The Muzaffarpur killing
Chandra Shekhar Azad	Kakori Conspiracy
Ram Prasad Bismil	Kakori Conspiracy
Bhagat Singh	Central Assembly Bomb Case 1929

# INDIAN HISTORY

Udham Singh	Shooting in Caxton Hall
Hemu Kalani	Sabotage of Railway Track
Ashfaqulla Khan	Kakori Conspiracy
Sachindra Bakshi	Kakori Conspiracy
Manmath Nath Gupta	Kakori Conspiracy
Vasudev Balwant Phadke	Deccan Rebellion
Anant Laxman Kanhere	Shooting of British Officer Jackson
Krishnaji Gopal Karve	Shooting of British Officer Jackson
Ganesh Damodar Savarkar	Armed movement against the British
Vinayak Damodar Savarkar	Father of Hindu Nationalism
Bagha Jatin	The Howrah-Sibpur conspiracy case, Hindu-German Conspiracy
Batukeshwar Dutt	Central Assembly Bomb Case 1929
Sukhdev Thapar	Central Assembly Bomb Case 1929
Shivaram Hari Rajguru	Murder of a British police officer, J. P. Saunders
Roshan Singh	Kakori Conspiracy, Bamrauli Action
Pritilata Waddedar	Pahartali European Club attack
Jatindra Nath Das	Hunger strike and Lahore conspiracy case
Durgawati Devi (Durga Bhabi)	Running the bomb factory 'Himalayan Toilets'
Bhagwati Charan Vohra	Philosophy of Bomb
Madan Lal Dhingra	Curzon Wylie's assassination
Alluri Sitarama Raju	Rampa Rebellion

## **World War II**

The scenario changed with the years. The British were thinking to quit India and religious politics came into play. The basic political background of revolutionary ideas seemed to evolve in a new direction. The organised revolutionary movements can be said to have nearly ceased by 1936, apart from some stray sparks, like the killing of Sir Michael O'Dwyer, generally held responsible for the Amritsar Massacre, on 13 March 1940, by Udham Singh in London.

During the Quit India movement of 1942, several other activities took place in different parts of India. However, those were discrete

occurrences and hardly any large scale planned terrorism took place that could shake the British administration. Meanwhile, Subhas Chandra Bose was organising an Indian National Army outside India and leading the army towards India, while at the same time the Congress was negotiating with the British. Finally India was independent on 15 August 1947, virtually by non-violence against the British but with much of bloodshed, rioting and violence among the countrymen (and near-future neighbours) during the partition, which was quite shocking to the past revolutionaries and also to Gandhi.

# INDIAN HISTORY

## **Governor Generals of Bengal**

### **1. Warren Hastings (1772-1785)**

- ❖ First Governor General of Bengal
- ❖ Introduce **Dual Government of Bengal** to an end by the **Regulating Act, 1773.**
- ❖ Deprived Zamindars of their judicial power Civil and Criminal court were established.
- ❖ Maintenance of records was made compulsory.
- ❖ Introduced "Quinquennial Settlement" for Land Revenue.
- ❖ Supreme Court was established and First CJI was **Elijah Impey.**
- ❖ Also known as **Father of Judicial Reforms** in India
- ❖ Great patron of oriental learning
- ❖ Founded the **Asiatic Society of Bengal** with **William Jones** in **1784.**
- ❖ He wrote introduction to the English translation of 'The Gita' by **Charles Wilkins.**
- ❖ Impeachment proceedings started against him when he returned on the charges of taking bribe.
- ❖ After a trial of 7 years, he was finally acquitted.

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

- ❖ **Permanent Settlement of Bengal** (also called **Zamindari System**)

❖ Separate the revenue administration from the judiciary

❖ **Police Reforms:** Each district was divided into 400 sq. miles and placed under a police superintendent.

❖ The **Civil service** was brought into existence.

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

- ❖ Sir John Shore followed a policy of non-intervention in the affairs of the native states
- ❖ Prohibition of female infanticide.

### **4. Lord Wellesley (1798-1805) – Tiger of Bengal**

- ❖ Adopted the policy of **Subsidiary Alliance** - a system to keep the Indian rulers under the control of British and to make them a paramount power.
- ❖ The states that accepted this policy were **Nizam of Hyderabad, the ruler of Mysore, the Raja of Tanjore, the Nawab at Awadh, the Peshwa, the Bhonsle Raja of Berar, the Scindia, the Rajputs of Jodhpur, Jaipur, etc.**

❖ Formed **Madras Presidency** annexation of the Kingdoms of Tanjore and Carnatic.

### **5. George Barlow (1805-1807)**

- ❖ He followed a policy of non-intervention and the only important event of his reign was the mutiny at Vellore in 1806.

# INDIAN HISTORY

## 6. Lord Minto 1 (1807-1813)

❖ Concluded the **treaty of Amritsar** with **Maharaja Ranjit Singh (1809)**.

❖ **Charter Act 1813** was passed

## 7. Lord Hastings (1813-1823)

❖ Gorkhas in a war from 1814 to 1816 and the **Treaty of Saguali** was signed in 1816.

❖ **Bengal Tenancy Act** was passed in 1822 by which the cultivators had hereditary right of possession of the land as long as they paid the rent.

❖ First Tea(Assam) and Coffee(West Bengal) plantation was done. Introduced **Ryotwari** System.

❖ Formed Bombay Presidency by the 3<sup>rd</sup> Maratha War.

❖ The first Vernacular paper was published called '**Samachar Darpan**' in the year **1823**

## 8. Lord Amherst (1823-1828)

❖ The **First Burmese war** started in (1824 – 1826).

❖ The treaty of Yandaboo was concluded in 1826 was of great advantage for the British as they could now penetrate deep into North east.

❖ Barrackpore Mutiny happened(1824).

## Governor Generals of India

### 1. Lord William Bentinck (1828-1835)

❖ Carried out the social reforms like **Prohibition of Sati** (1829) and **Elimination of Thugs** (1830)

❖ Made **English** as the medium of higher education in the country (on **Macaulay** recommendation)

❖ Suppressed female infanticide and child sacrifice.

❖ **Charter Act 1833** was passed made him the **First Governor General of India**.

❖ Before that, his designation was Governor General of Bengal.

### 2. Sir Charles Metcalfe (1835-1836)

❖ Abolished all restrictions in vernacular press (called **Liberator of the Press**).

### 3. Lord Auckland (1836-1842)

❖ The most important event of his reign was the **First Afghan War** (1839-1842) which proved to be a disaster for the English.

### 4. Lord Ellenborough (1842-1844)

❖ His period witnessed the end of the Anglo Afghan relations, annexation of Sind in 1843.

❖ Abolished Slavery in 1843.

### 5. Lord Hardinge I (1844-1848)

❖ **First Sikh war** 1845-1846 concluded with **Treaty of Lahore** 1846

# INDIAN HISTORY

## 6. Lord Dalhousie (1848-1856)

❖ Introduced the **Doctrine of Lapse** and captured Satara (1848), Jaipur and Sambhalpur (1849), Udaipur (1852), Jhansi (1853) and Nagpur (1854).

❖ Opened the **First Indian Railway** in **1853**(From **Bombay to Thane**).

❖ Laid out the **telegraph lines** in **1853**(First was From **Calcutta to Agra**).

❖ Established the **postal system** on the modern lines through the length and breadth of the country, which made communication easier.

❖ Started the **Public Works Department**.

❖ Many bridges were constructed and work on **Grand Trunk Road** was started.

❖ The harbors of Karachi, Bombay and Calcutta were also developed.

❖ Made **Shimla** as the **summer capital**.

❖ Started **Engineering College** at **Roorkee**.

❖ Encouraged science, forestry, commerce, mineralogy and industry.

❖ In **1854**, '**Wood's Dispatch**' was passed, which provided for the properly articulated system of education from the primary school to the university.

❖ Due to **Ishwar Chandra Vidyasagar's** efforts, remarriage of widow was legalized by **Widow Remarriage Act, 1856**.

## Viceroy of India

### 1. Lord Canning (1856-1862)

❖ The last Governor General and the **First Viceroy of India**

❖ Mutiny took place in his time.

❖ On November 1858, the rule was passed to the crown.

❖ Withdrew **Doctrine of Lapse**.

❖ The University of **Calcutta, Bombay** and **Madras** were established in **1857**.

❖ **Indian Councils Act** was passed in **1861**.

### 2. Lord Elgin (1862-1863)

❖ **Wahabi movement** broke out. They were defeated in 1863.

❖ Inauguration of High Court judiciary in Bengal.

❖ Transfer of Indian navy to admiralty.

❖ Ambala campaign of NWFP.

❖ Amalgamation of the Supreme Court and Sadr courts into High Courts.

### 3. Lord Lawrence (1864-1869)

❖ Telegraphic communication was opened with Europe.

❖ **High court** was established at Calcutta, Bombay and Madras in **1865**.

❖ Expanded canal work and railways.

❖ Created the **Indian Forest Department**.

### 4. Lord Mayo (1869-1872)

❖ Started the **process of financial decentralization** in India.

❖ Established the **Rajkot College** at **Kathiawar** and **Mayo College at Ajmer** for the Indian Princes.

❖ For the first time in Indian history, a **census** was held in 1871.

❖ Organised the **Statistical Survey of India**.

❖ He was the only Viceroy to be murdered in office by a **Pathan** convict in the **Andamans in 1872**.

### 5. Lord Northbrook (1872-1876)

❖ In 1872 **Kuka revolt** took place.

❖ In 1873 the **Simla Conference** and famine took place in Bihar.

❖ Trial of **Gaekwad of Baroda**

# INDIAN HISTORY

❖ Visit of **Prince of Wales** in 1875.

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

❖ Known as the **Viceroy of reverse characters.**

❖ Organised the Grand '**Delhi Durbar**' in **1877** to decorate Queen Victoria with the title of '**Kaiser-I-Hind**'.

❖ **Arms Act (1878)** made it mandatory for Indians to acquire license for arms.

❖ Passed the infamous **Vernacular Press Act (1878).**

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

❖ Liberal person, who sympathized with Indians.

❖ Repealed the **Vernacular Press Act (1882).**

❖ Took steps to improve primary and secondary education (on **William Hunter Commission's recommendations**).

❖ **Factory Act I (1881)**, aimed at prohibiting child labour.

❖ Passed the Bill (1883) which enabled Indian district magistrates to try European Criminals. But this was withdrawn later.

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

❖ **Third Burmese War** in 1885

❖ Indian National Congress (**1885**) was formed during his tenure.

## **9. Lord Lansdowne (1888-1894)**

❖ **Factory Act II (1891)** granted a weekly holiday and stipulated working hours for women and children, although it failed to address concerns such as work hour for men.

❖ Categorization of Civil Service into Imperial, Provincial and Subordinate.

❖ **Indian Council Act 1892** was passed.

❖ Appointment of **Durand Commission** to define the line between **British India and Afghanistan.**

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

❖ The **Bubonic Plague** that started at **Bombay** in 1896, Great famine of 1896-1897

❖ **Lyall Commission** was appointed.

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

❖ Passed the **Indian University Act 1904** in which official control over the Universities was increased.

❖ **Partition of Bengal (October 16, 1905)** into two provinces - **Bengal (proper), East Bengal and Assam.**

❖ Appointed a **Police Commission** under **Sir Andrew Frazer** to enquire into the police administration of every province.

❖ The risings of the frontier tribes in **1897-98** led him to create the **North Western Frontier Province (NWFP).**

❖ Passed the **Ancient Monuments Protection Act (1904)**, to restore India's culture heritage. Thus the **Archaeological Survey of India** was established.

❖ Passed the **Indian Coinage and Paper Currency Act (1899)**. Extended railways to a great extent

## **12. Lord Minto (1905-1910)**

❖ Various acts were passed to curb the revolutionary activities.

❖ Extremists like **Lala Lajpat Rai** and **Ajit Singh** (in May, 1907) and **Bal Gangadhar Tilak** (in July, 1908) were sent to **Mandalay jail in Burma.**

❖ The **Indian Council Act of 1909** or the **minto-morley Reforms** was passed.

# INDIAN HISTORY

## 13. Lord Hardinge (1910-1916)

- ❖ Held a durbar in December, 1911 to celebrate the coronation of **King George V**.
- ❖ Partition of Bengal was cancelled (1911)
- ❖ Capital shifted from **Calcutta to Delhi** (1911).
- ❖ A bomb was thrown at him, but he escaped unhurt (Dec.13, 1919).
- ❖ **Gandhiji** came back to India from **South Africa** (1915).
- ❖ Annie Besant announced the **Home Rule Movement**

## 14. Lord Chelmsford (1916-1921)

- ❖ **August Declaration of 1917**, whereby control over the Indian Government would be gradually transferred to Indian people.
- ❖ The Government of India Act in 1919 (**Montague-Chelmsford**) was passed.
- ❖ Rowlatt Act of 1919, Jallianwala Bagh Massacre (April13, 1919), Non-Cooperation Movement (1920).
- ❖ An Indian Sir **S.P. Sinha** was appointed as the Governor of Bengal.
- ❖ A **Women's University** was founded at **Poona in 1916**.
- ❖ **Saddler Commission** was appointed in **1917** to envisage **new educational policy**.

## 15. Lord Reading (1921-1926)

- ❖ Rowlatt act was repealed along with the Press act of 1910.
- ❖ Suppressed non-cooperation movement.
- ❖ **Prince of Wales** visited India in November, 1921.
- ❖ **Moplah rebellion** (1921) took place in **Kerala**.
- ❖ **Ahmadabad session** of 1921.
- ❖ Formation of Swaraj Party.
- ❖ **Vishwabharti University** started functioning in **1922**.

- ❖ Communal riots of 1923-25 in Multan, Amritsar, Delhi, etc.

❖ **Swami Shradddhanand** a great nationalist and a leader of the Arya Samajists, was murdered in communalorgy.

## 16. Lord Irwin (1926-1931)

- ❖ **Simon Commission** visited India in 1929.
- ❖ Congress passed the **Indian Resolution in 1929**.
- ❖ Dandi March (March5, 1930).
- ❖ First Round Table Conference held in England in 1930.
- ❖ **Gandhi-Irwin Pact** (March5, 1931) was signed and Civil Disobedience Movement was withdrawn.
- ❖ Martyrdom of **Jatin Das** after 64 days hunger strike (1929).

## 17. Lord Willingdon (1931-1936)

- ❖ Second Round Table Conference in London in 1931.
- ❖ **Communal Award** (August16, 1932) assigned seats to different religious communities.Gandhiji went on an epic fast in protest against this division.
- ❖ Third Round Table Conference in 1932.
- ❖ Poona Pact was signed.
- ❖ Government of India Act (1935) was passed.

## 18. Lord Linlithgow (1936-1944)

- ❖ Government of India Act enforced in the provinces.
- ❖ Congress ministries formed in 8 out of 11 provinces.
- ❖ The Muslim League observed the day as '**Deliverance Day**' (**22December**).
- ❖ **Churchill** became the **British PM** in May, 1940. He declared that the **Atlantic Charter** (issued jointly by the UK and US,

# INDIAN HISTORY

stating to give sovereign rights to those who have been forcibly deprived of them) does not apply to India.

❖ Outbreak of **World War 2 in 1939.**

❖ **Cripps Mission in 1942, Quit India Movement plan (May 16, 1942).**

**19. Lord Wavell (1944-1947)**

❖ **Shimla Conference on June 25, 1945** with Indian National Congress and Muslim League, failed.

❖ Elections to the constituent assembly were held and an Interim Government was appointed under Nehru.

❖ First meeting of the constituent assembly was held on December 9, 1946.

**20. Lord Mountbatten (March 1947-August 1947)**

❖ Last viceroy of British India and the **First Governor General of Free India.**

❖ Partition of India decided by the **June 3 plan.**

❖ **Indian Independence Act** passed by the British Parliament on July 4, 1947 by which India became independence on August 15, 1947.

❖ Retired in June 1948 and was succeeded by **C. Rajgopalachari.**

**21. C. Rajgopalachari (1947-1950)**

❖ The first and last Indian Governor General of Independent India.

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# INDIAN POLITY

## **POLITY**

### **Making of the Indian Constitution**

1. The constituent assembly was formed on the recommendation of the Cabinet Mission which visited India in 1946.
2. The Constituent Assembly met for the first time in New Delhi on 9 December, 1946 in the Constitution Hall which is now known as the Central Hall of Parliament House.
3. Mr. Sachchidanand Sinha was elected provisional chairman of the assembly.
4. Dr Rajendra Prasad later became the permanent chairman of the constituent assembly.
5. On 13 December, 1946, Pandit Jawaharlal Nehru moved the Objectives Resolution which resolved to proclaim India as an Independent Sovereign Republic and to draw up for her future governance a Constitution.
6. The Constituent Assembly took almost three years (two years, eleven months and seventeen days to be precise) to complete its historic task of drafting the Constitution for Independent India.
7. The Constituent Assembly held eleven sessions covering a total of 165 days.
8. India is governed in terms of the Constitution, which was adopted on 26 November, 1949, which was the last day of

the Eleventh session of the Constituent Assembly.

9. This date finds mention in the Preamble to the Indian Constitution thus IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

10. The honourable members appended their signatures to the constitution on 24 January, 1950.

11. The Constitution of India came into force on 26 January, 1950. On that day, the Constituent Assembly ceased to exist, transforming itself into the Provisional Parliament of India until a new Parliament was constituted in 1952.

### **THE PREAMBLE**

❖ The Indian Constitution starts with the preamble which outlines the main objectives of the Constitution. It reads:

❖ **"WE, THE PEOPLE OF INDIA**, having solemnly resolved to constitute India into a **SOVEREIGN, SOCIALIST, SECULAR, DEMOCRATIC, REPUBLIC** and to secure all its citizens."

❖ JUSTICE- social economic and political.

❖ LIBERTY- of thought, expression, belief, faith and worship.

# INDIAN POLITY

❖ EQUALITY- of status and of opportunity, and to promote among them all.

❖ FRATERNITY assuring the dignity of the individual and 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 HIS CONSTITUTION".

❖ Idea of preamble borrowed from Constitution of US.

❖ The words 'SOCIALIST', 'SECULAR' and 'UNITY' &'INTEGRITY' were added by the 42nd Amendment in 1976.

❖ Preamble is not justifiable.

## **SALIENT FEATURES OF THE CONSTITUTION:**

❖ The Constitution of India is a written document. It is the second lengthiest and the most comprehensive of all the written Constitution of the world.

❖ The Constitution, as originally adopted, had 22 Parts, 395 Articles and 9 Schedules.

❖ The Indian Constitution is partly rigid and partly flexible.

❖ The Constitution declares India as a Sovereign, Democratic and Republic.

❖ The Constitution established the Parliamentary form of Government both at the Centre and the States.

❖ The Constitution of India is the supreme law of the country.

❖ The Constitution has established India as a Socialist and Secular country.

❖ The Constitution provides for single citizenship in India.

❖ The Constitution declares certain fundamental rights of the individual.

❖ The Constitution introduces the principle of Universal Adult Franchise.

❖ The Constitution has made provision to provide an independent and impartial Judiciary. The Supreme Court acts as the guardian of the Constitution and is the highest court of appeal.

❖ The Constitution has conferred on the Judiciary the power of Judicial Review.

❖ The Constitution of India is federal in nature with unitary features.

❖ The Constitution recognises the President as the Constitutional head of the Union.

❖ The Constitution of India has provided Directive Principles of State Policy to be followed by the Government to secure a truly welfare state.

❖ Although the Constitution has declared India as a Union of States but no State can declare itself separate from the Indian Union.

# INDIAN POLITY

## ❖ BORROWED FEATURES OF CONSTITUTION

Sources	Features Borrowed
<b>1. Government of India Act of 1935</b>	Federal Scheme, Office of governor, Judiciary, Public Service Commissions, Emergency provisions and administrative details.
<b>2. British Constitution</b>	Parliamentary government, Rule of Law, legislative procedure, single citizenship, cabinet system, prerogative writs, parliamentary privileges and bicameralism.
<b>3. US Constitution</b>	Fundamental rights, independence of judiciary, judicial review, impeachment of the president, removal of Supreme Court and high court judges and post of vice-president.
<b>4. Irish Constitution</b>	Directive Principles of State Policy, nomination of members to Rajya Sabha and method of election of president.
<b>5. Canadian Constitution</b>	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.
<b>6. Australian Constitution</b>	Concurrent List, freedom of trade, commerce and intercourse, and joint sitting of the two Houses of Parliament.
<b>7. Weimar Constitution of Germany</b>	Suspension of Fundamental Rights during Emergency.
<b>8. Soviet Constitution( USSR, now Russia)</b>	Fundamental duties and the ideal of justice (social, economic and political) in the Preamble.
<b>9. French Constitution</b>	Republic and the ideals of liberty, equality and fraternity in the Preamble.
<b>10. South African Constitution</b>	Procedure for amendment of the Constitution and election of members of Rajya Sabha.
<b>11. Japanese Constitution</b>	Procedure established by Law.

## PARTS DESCRIBED IN THE CONSTITUTION

# INDIAN POLITY

Part I	The Union and its territory Art. 1 to 4
Part II	Citizenship Art. 5 to 11
Part III	Fundamental Rights Art. 12 to 35
Part IV	Directive Principles Art. 36 to 51
Part IVA	Fundamental Duties Art. 51A
Part V	The Union Art. 52 to 151
Part VI	The States Art. 152 to 237
Part VII	Repealed by Const. (7th Amendment) Act, 1956
Part VIII	The Union Territories Art. 239 to 242
Part IX	The Panchayats Art. 243 to 243O
Part IXA	The Municipalities Art. 243P to 243ZG
Part IXB	The Co-operative Societies Art. 243ZH to 243ZT
Part X	The Scheduled and Tribal Areas Art. 244 to 244A

## IMPORTANT ARTICLES IN THE INDIAN CONSTITUTION

Article 12-35	Specify the Fundamental Rights available
Article 36-50	Specify the Directive Principles of state policy
Article 51A	Specifies the Fundamental Duties of every citizen
Article 61	<p><b>Procedure for impeachment of the President</b></p> <p>(1) When a President is to be impeached for violation of the Constitution, the charge shall be preferred by either House of Parliament</p> <p>(2) No such charge shall be preferred unless</p> <p>(a) the proposal to prefer such charge is contained in a resolution which has been moved after at least fourteen days notice in writing signed by not less than one fourth of the total number of members of the House has been given of their intention to move the resolution, and</p> <p>(b) such resolution has been passed by a majority of not less than two thirds of the total</p>

# INDIAN POLITY

membership of the House

(3) When a charge has been so preferred by either House of Parliament, the other House shall investigate the charge or cause the charge to be investigated and the President shall have the right to appear and to be represented as such investigation

(4) If as a result of the investigation a resolution is passed by a majority of not less than two thirds of the total membership of the House by which the charge was investigated or cause to be investigated, declaring that the charge preferred against the President has been sustained, such resolution shall have the effect of removing the President from his office as from the date on which the resolution is so passed

Article 80	Specifies the number of seats for the Rajya Sabha
Article 81	Specifies the number of seats for the Lok Sabha
Article 343	Hindi as official language

Article 356	Imposition of President's Rule in states
Article 368	Amendment to the Constitution
Article 370	Special status to Kashmir
Article 395	Repeals India Independence Act and Government of India Act, 1935

## **IMPORTANT CONSTITUTIONAL AMENDMENTS:**

1. First Amendment 1951: Added Ninth Schedule.
2. Seventh Amendment 1956 Necessitated on account of reorganization of States on a linguistic basis.
3. Eighth Amendment 1959 Extended special provisions for reservations of seats for SCs, STs and Anglo - Indians in Lok Sabha and Leg.Assemblies for a period of 10 years from 1960 to 1970.
4. The Ninth Amendment 1960 Gave effect to transfer certain territories to Pakistan following the 1958 Indo - Pak agreement.
5. The Tenth Amendment 1961 Incorporated Dadra & Nagar Haveli as a UT.
6. Twelfth Amendment 1962 Incorporated Goa, Daman & Diu as a UT.

## INDIAN POLITY

7. Thirteenth Amendment 1962 Created Nagaland as a State.

8. Fourteenth Amendment 1963 Pondicherry, Karaikal, Mahe and Yanam, the former French territories were included in the schedule as UT of Pondicherry.

9. Eighteenth Amendment 1966 Reorganized Punjab into Punjab, Haryana and UT of Chandigarh.

10. Twenty first Amendment 1967 Included Sindhi as the Fifteenth Regional language.

11. twenty second Amendment 1969 Created a sub – state of Meghalaya within Assam.

12. Twenty third Amendment 1969 Extended the reservation of seats for SC / ST and nomination of Anglo – Indians for a further period of 10 years (till 1 980).

13. Twenty sixth Amendment 1971 Abolished the titles and special privileges of former rulers of princely states.

14. Twenty seventh Amendment 1971 Established Manipur and Tripura as States and Mizoram and Arunachal Pradesh as UTs.

15. Thirty first Amendment 1973 Increased the elective strength of LS from 525 to 545.The upper limit of representatives of States went up from 500 to 525.

16. Thirty sixth Amendments 1975 Made Sikkim a State.

17. Thirty eighth Amendment 1975 Provided that the President can make a declaration of emergency, and the promulgation of ordinances by the President, Governors and the Administrative Heads of UTs would be final and could not be challenged in any court.It also authorized the President to declare different kinds of emergencies.

18. Thirty ninth Amendment 1975 Placed beyond challenge in courts, the election to Parliament of a person holding the office of PM or Speaker and election of the President and Prime Minister.

19. Forty second Amendment 1976 Provided supremacy of Parliament and gave primacy to Directive Principles over Fundamental Rights. It also added 10 Fundamental Duties. New words – Socialist, Secular and Unity and Integrity of the Nation, were added in the preamble.

20. Forty fourth Amendment 1978 The Right to Property was deleted from Part III. Article 352 was amended to provide 'Armed Rebellion' as one of the circumstances for declaration of emergency.

21. Forty fifth Amendment 1985 Extended reservation for SC / ST by another 10 years (till 1990).

22. Fifty second Amendment 1985 Added the Tenth Schedule (regarding anti – defection).

## INDIAN POLITY

23. Fifty third Amendment 1986 Mizoram was made a state.

24. Fifty fifth Amendment 1986 Conferred statehood to Arunachal Pradesh.

25. Fifty sixth Amendment 1987 Hindi version of the Constitution of India was accepted for all purposes.

The UT of Goa, Daman and Diu was divided and Goa was made a State. Daman and Diu remained as a UT.

26. Sixty first Amendment 1989 Reduced the voting age from 21 to 18 years for the LS as well as Assemblies.

27. Sixty first Amendment 1989 Also extended reservation of seats for SC / ST till 2000 AD.

28. Seventy first Amendment 1992 Konkani, Manipuri and Nepali were included in the VIII Schedule.

29. Seventy third Amendment 1993 (Panchayati Raj Bill) Provided among other things Gram Sabha in Villages, constitution of panchayats at the village and other levels, direct elections to all seats in panchayats and reservation of seats for the SC and ST and fixing of tenure of 5 years for panchayats.

30. Seventy fourth Amendment 1993 (Nagarpalika Bill) Provides for, among other things, constitution of three types of

municipalities, reservation of seats in every municipality for the SC and ST, women and the backward classes.

31. Eighty second Amendment 2000 Reinstalled the provision of reservation of SC and STs in matters related to promotion. Besides, the qualifying marks for passing an examination for them have also been lowered.

32. Eighty fourth Amendment 2001 Extended freeze on Lok Sabha and State Assembly seats till 2026.

33. Eighty sixth Amendment 2002 makes education a fundamental right for children in the age group of 6 – 14 years.

34. Eighty seventh Amendment 2003 made the 2001 census the basis for delimitation of constituencies of the Lower House of Parliament (Lok Sabha) and State assemblies (Vidhan Sabhas).

35. Ninety first Amendment 2003 Amended the Anti – Defection Law and also made a provision that the number of ministers in the Central & State Govts, cannot be more than 15% of the strength of Lok Sabha & respected Vidhan Sabha.

36. Ninety second Amendment 2003 Bodo, Maithili, Santhali and Dogri added into the VIII Schedule.



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## PRESIDENT:

### Election of the President:

1. The President is elected by electoral college consisting of (i) the elected members of both Houses of Parliament, and (ii) the elected members of the Legislative Assemblies of the State. **[Article 54]**  
*(States include the National Capital Territory of Delhi and the Union Territory of Pondicherry)*
2. The election of the President shall be held in accordance with the system of proportional representation by means of the single transferable vote and the voting at such election shall be by secret ballot.
3. There shall be uniformity in the scale of representation of the different states at the election of the President. **[Article 55]**

### Tenure of the President:

- The President holds office for a term of five years from the date on which he enters upon his office, provided that-
1. the President may, by writing under his hand addressed to the Vice-President, resign his office;
  2. the President may, for violation of Constitution be removed from office by impeachment in the manner provided in **Article 61**;
  3. the President shall, notwithstanding the expiration of his term, continue to hold office until his successor enters upon his office. Any resignation addressed to the Vice-president shall forthwith be communicated by him to the Speaker of the House of the People (Lok Sabha). **[Article 56]**
  4. The oath of office to the President is administered by the Chief Justice of India and in his absence, by the senior most judge of the Supreme Court available.
  5. An election should be held to fill the vacancy of Presidential post before the expiration of President's term. **[Article 62(1)]**
  6. When a vacancy occurs in the Presidents office due to his death, resignation or removal or otherwise, the Vice-president acts as the President until a new

# INDIAN POLITY

	<p>President is elected.</p> <p>7. An election to fill such vacancy should be held within six months from the date of occurrence of such vacancy.</p> <p>8. A person can be re-elected to the post of the President.</p>
<b>Eligibility:</b>	<p>No person shall be eligible for election as President unless he-</p> <ol style="list-style-type: none"><li>1. is a citizen of India,</li><li>2. has completed the age of thirty five years,</li><li>3. is qualified for election as a member of the House of the People, and</li><li>4. must not hold 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 Government. <b>[Article 58]</b></li></ol> <p><i>The President shall not be member of either House of Parliament or a House of the Legislature of any State. <b>[Article 59]</b></i></p>
<b>Salary:</b>	<ol style="list-style-type: none"><li>1. The President is entitled to such salary, allowances and privileges as may be determined by Parliament by law.</li><li>2. He is entitled to use his official residences as free of rent.</li><li>3. His salary and allowances are charged on the Consolidated Fund of India.</li><li>4. The salary and allowances of the President shall not be diminished during his term of office.</li></ol>
<b>Impeachment:</b>	<ol style="list-style-type: none"><li>1. President may be impeached from his office for violation of the Constitution.</li><li>2. Either Lok Sabha or Rajya Sabha may prefer impeachment charges and a <b>14 days</b> written notice may be given signed by not less than <b>one-fourth</b> of the total membership of the House.</li><li>3. The resolution of the charges for impeachment of the President should be passed by at least <b>two-thirds</b> of the total membership of the House.</li><li>4. If after investigation of the charge it is declared that the charge preferred against the President has been sustained, such resolution shall have the effect of removing the President from his office from the date on which such resolution is passed.</li></ol>
<b>Protection</b>	<p>The following protection is given to the President of India-</p>

# INDIAN POLITY

## given to the President of India:

1. **He is not answerable to any court** for the exercise and performance of the powers and duties of his office or for any act done or purporting to be done by him in the exercise and performance of those powers and duties: Provided that his conduct may be brought under review by any court, tribunal or body appointed or designated by either House of Parliament for the investigation of a charge under **Article 61**.

2. **No criminal proceedings** whatsoever can be instituted or continued against him in any court during his term of office.

3. **No process for arrest or imprisonment** shall issue from any court during his term of office.

4. **No civil proceedings** in which relief is claimed against him can be instituted during his term of office in any court in respect of any act done or purporting to be done by him in his personal capacity whether before or after he entered upon his office as President, until the expiration of two months next after notice in writing has been delivered to him. **[Article 361]**

## VICE PRESIDENT:

### Election:

1. The Vice-President is elected indirectly.
2. He is elected by the members of an electoral college consisting of the members of both Houses of Parliament in accordance with the system of proportional representation by means of the single transferable vote.
3. The voting at such election is by secret ballot.
4. The Vice-President shall not be a member of either House of Parliament.
5. For resolving disputes and doubts relating to the election of the Vice-President the Supreme Court has the final and exclusive jurisdiction.

### Eligibility:

- No person shall be eligible for election as Vice-President unless he-
1. is a citizen of India,
  2. has completed the age of thirty five years,
  3. possess the qualification for membership of Rajya Sabha,
  4. must not hold any office of profit under the Government of India or the

# INDIAN POLITY

	Government of any State or under any local or other authority subject to the control of any of the said Government
<b>Tenure of the Vice-President:</b>	<ol style="list-style-type: none"> <li>1. The Vice-President holds office for a term of five years from the date on which he enters upon his office.</li> <li>2. He may be writing under his hand and addressed to the President resign his office.</li> <li>3. The Vice-President can be removed from his office by a resolution of Council of States passed by a majority of all the then members of the Council of States and agreed to by the House of the People.</li> <li>4. The Vice-President can be re-elected.</li> </ol>
<b>Functions:</b>	<ol style="list-style-type: none"> <li>1. He is the ex-officio Chairman of Rajya Sabha.</li> <li>2. He presides over the sessions of the Rajya Sabha and has the right of casting vote in the case of an equality of votes.</li> <li>3. In the event of the occurrences of any vacancy in the office of the President by reason of his death, resignation or otherwise, the Vice-President shall act as President until a new President is elected and enters upon his office.</li> <li>4. When the President is unable to discharge his functions owing to absence, illness or any other cause, the Vice-President shall discharge his functions until the date on which the President resumes his duties.</li> <li>5. When the Vice-President acts as the President, he gets the emoluments of the President and enjoys all the powers and immunities of the President.</li> </ol>

## **COUNCIL OF MINISTERS:**

### **Constitution of Council of Ministers:**

1. As per provisions in the Constitution, there must be a Council of Ministers with the Prime Minister as the head to aid and advice the President who shall in the exercise of his functions, act in accordance with such

advice.

2. The Prime Minister is appointed by the President and other Ministers are also appointed by the President on the advice of the Prime Minister. The Minister hold office during the pleasure of the President.

3. The Council of Ministers is formed as soon

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as the Prime Minister is sworn in.  
4. A Minister who for any period of six consecutive months is not a member of either house of Parliament shall at the expiration of the period cease to be a Minister.

5. Although the Constitution provides that the President appoints the Prime Minister, his choice is limited. A person cannot be a Prime Minister who does not command majority in the House of the People (Lok Sabha). Thus, the President has to appoint a person as Prime Minister who commands majority in the House of the People.

6. The Council of Ministers is collectively responsible to the House of the People (Lok Sabha).

7. A member of the Rajya Sabha can also be appointed the Prime Minister.

8. At Present there are three types of Minister- (i) Cabinet Minister (ii) Minister of State, and (iii) Deputy Minister.

## **[Article 76] Powers and Functions:**

1. The main function of the Council of the Ministers is to aid and advice the President.
2. The Council of Ministers determines the legislative programme of the Union and uses its initiative in the introduction and passage of Government legislation.
3. The Council of Ministers prepares the

budget of the Union Government and moves demand for grants.

4. The foreign policy of India is formulated by the Council of Ministers and the emergency powers of the President are mostly exercised by the Ministers.

## **The duties of the Prime Minister for furnishing information to the President-**

It is the duty of the Prime Minister -

1. to communicate to the President all decisions of the Council of Ministers relating to the administration of the affairs of the Union and proposals for legislation.

2. to furnish such information relating to the administration of the affairs of the Union and proposals for legislation as the President may call for, and

3. if the President so require, to submit for the consideration of the Council of Ministers any matter on which a decision has been taken by a Minister but which has not been considered by the Council of

## **[Article 78]**

### **LOK SABHA:**

#### **Lok**

#### **Sabha:**

1. Lok Sabha is composed of representatives of the people chosen by direct election on the basis of the adult suffrage.
2. The maximum strength of the House envisaged by the

# INDIAN POLITY

<p>Constitution is 52 which is made up by-</p> <p>(i) 530 members chosen by direct election from territorial constituencies in the States, and</p> <p>(ii) 20 members to represent the Union Territories, and</p> <p>(iii) not more than 2 members of the Anglo-Indian Community to be nominated by the President, if, he is of the opinion that the community is not adequately represented in the Lok Sabha.</p> <p>3. The total elective membership is distributed among the States in such a way that the ratio between the number of seats allotted to each State and the population of the State is, so far as practicable, the same for all States.</p> <p>4. The normal tenure of the Lok Sabha is 5 years but it may be dissolved earlier by the President.</p> <p>5. The life of the Lok Sabha can be extended by the Parliament</p>	<p>beyond the five year term, when a proclamation of emergency under Article 352 is in force.</p> <p>6. But the Parliament cannot extend the normal life of the Lok Sabha for more than one year at a time (no limit on the number of times in the Constitution).</p>
<p><b><u>Eligibility of the members:</u></b></p>	<p>No person shall be eligible for election unless he-</p> <ol style="list-style-type: none"> <li>1. is a citizen of India,</li> <li>2. has completed the age of twenty five years,</li> <li>3. is not holding any office of profit,</li> <li>4. is not of unsound mind or insolvent, and</li> <li>5. has registered as voter in any Parliamentary constituency.</li> </ol>
<p><b>Other Important Information on Lok Sabha and Lok Sabha Speaker:</b></p>	
<p>1. Presiding Officer of the Lok Sabha is the Speaker. The Speaker is elected in the very first meeting of the Lok Sabha following general elections.</p>	
<p>2. Speaker of the Lok Sabha is elected for a period of 5 years.</p>	

# INDIAN POLITY

3. Speaker of the Lok Sabha is chosen from amongst the members of the Lok Sabha.

4. The Speaker of the Lok Sabha continues in office even after the dissolution of the Lok Sabha till a newly elected Lok Sabha meets.

5. The Salary of the Speaker of the Lok Sabha is charged on the Consolidated Fund of India.

6. In absence of the Speaker, the Deputy Speaker acts as Speaker and in the absence of both a committee of six member selected by the Speaker will act as Speaker according to their seniority.

7. Speaker of the Lok Sabha tenders his resignation to the Deputy Speaker.

8. After giving a 14 days notice the majority of the total membership of the Lok Sabha can remove the Speaker.

9. Speaker of the Lok Sabha decides whether a bill is a money bill or not.

10. Speaker of the Lok Sabha maintains discipline and decorum in the house and can punish a member for their unruly behaviour by suspending them.

11. Speaker of the Lok Sabha permits the moving of various kinds of motions and resolutions like the motion of no confidence, motion of adjournment, motion of censure, etc.

12. The date of election of Lok Sabha

Speaker is fixed by the President.

13. The first meeting after the election when the Speaker and the Deputy Speaker are selected by members of the Parliament is held under the senior most member of Parliament called Protem Speaker.

## **RAJYA SABHA:**

### **Rajya Sabha:**

1. The maximum strength of the Rajya Sabha envisaged by the Article 80 of the Constitution is 250 which is made up by-  
(i) 12 members nominated by the President, and

(ii) 238 representative of the States and of the Union Territories, and

2. The present strength of Rajya Sabha, however, is 245, out of which 233 are representatives of the States and Union territories of Delhi and Puducherry and 12 are nominated by the President.

3. The members nominated by the President are persons having special knowledge or practical experience in respect of such matters as literature, science, art and social service.

### **Allocation of Seats:**

1. The Fourth Schedule to the Constitution provides for allocation of seats to the States and Union Territories in Rajya Sabha.

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2. The allocation of seats is made on the basis of the population of each State.

## **Representation of States:**

The representatives of each State in the Rajya Sabha shall be elected by the elected members of the Legislative Assembly of the State in accordance with the system of proportional representation by means of the single transferable vote.

## **Representation of Union Territory:**

The representative of the Union Territories in the Rajya Sabha shall be chosen in such manner as Parliament may by law prescribe.

**Eligibility:** Article 84 of the Constitution lays down the following qualifications for membership of Parliament-

1. he must be a citizen of India,
2. he must be not less than 30 years of age, and
3. he must possess such other qualifications as may be prescribed in that behalf by or under any law made by Parliament.

## **Other Important Information:**

1. There are no seats reserved for Scheduled Castes and Scheduled Tribes in Rajya Sabha.
2. The members of Rajya Sabha are elected for a term of 6 years and one-third of its members retire every 2 years.

3. Vice-President is the ex-officio Chairman of Rajya Sabha. He presides over the proceedings of the Rajya Sabha.

4. If Rajya Sabha passes a resolution by a majority of not less than two-thirds of the members present and voting declaring that it is necessary or expedient in the national interest to create one or more **All India Services** common to the Union and the States, Parliament becomes empowered to create by law such services.

## **Panchayati Raj – Part IX – Articles 243 to 243 O**

Grass root level democracy or rural local self government or three tier government = **Panchayati Raj**. Decentralized the power to the grass root level from the Centre for development in rural areas.

## **Evolution of Panchayat Raj:**

- **Balwant Rai Mehta Committee – 1957**
- **Nagaur district, Rajasthan** was the first state to adopt Panchayati Raj in 1959 while Tamil Nadu adopted two-tier system and West Bengal adopted four-tier system.
- In Rajasthan-Andhra Pradesh = Panchayat Samiti was powerful whereas in Maharashtra-Gujarat = Zila Parishad was powerful and some states adopted Nyaya Panchayat to look after petty civil and criminal cases.



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- **Ashok Mehta Committee** – 1978
- **Hanumantha Rao Committee** – 1984 – Collectors should be coordinator at the district level for all developmental and planning activities.
- **G.V.K.Rao Committee** - 1985 – Major role of Panchayat in development administration and reduction of the role of District Collector.
- **L M Singhvi Committee** – 1986 – For 'Revitalisation of Panchayati Raj Institutions for Democracy and Development' during Rajiv Gandhi period as initiative of "Garibi Hatao".
- During **P V Narasimha Rao** government, Panchayat Raj bodies were constitutionalised. Thus in 73<sup>rd</sup> Constitutional Amendment Act, 1992 a bill was passed and it came into force on 24<sup>th</sup> April, 1993. So that all states except few adopted the three tier system.
- A new 11<sup>th</sup> Schedule was added in this amendment and it deals with article 243-G. This schedule contains 29 functional items.

## Facts:

- **Gram Sabha** is the foundation of Panchayat raj system.
- No person shall be disqualified on the ground that he is less than 25 years of age if he has attained the age of 21 years.

• The act does not imply to the states of Jammu and Kashmir, Nagaland, Meghalaya and Mizoram and certain other areas. These areas include (a) the scheduled areas and the tribal areas in the states; (b) the hill area of Manipur for which a district council exists; and (c) Darjeeling district of West Bengal for which Darjeeling Gorkha Hill Council exists.

• Parliament has enacted the '**Provisions of the Panchayats(Extension to the Schedule Areas)Act', 1996(PESA)**.

• At present, there are nine states having **Fifth Schedule Areas(Article 244)**. They are: Chattisgarh, Gujarat, Himachal Pradesh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha and Rajasthan. There are ten tribal areas in four states of Assam, Meghalaya, Tripura and Mizoram.

## Important Articles Related to Panchayats at a Glance

Article No.	Subject-matter
<b>243D</b>	Reservation of seats
<b>243G</b>	Powers, authority and responsibilities of panchayats
<b>243K</b>	Elections to the panchayats

## Municipalities – Part IX A – Articles 243P to 243ZG

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As by the 74<sup>th</sup> Constitutional Amendment Act, 1992, Municipalities came into force in India for Urban local government.

**The major events in this context are as follows:**

(i) In 1687-88, the first municipal corporation in India was set up at Madras.

(ii) In 1726, the municipal corporations were set up in Bombay and Calcutta.

(iii) Lord Mayo's Resolution of 1870 on financial decentralisation visualized the development of

Local self-government institutions.

(iv) Lord Ripon's Resolution of 1882 has been hailed as the 'Magna Carta' of local self government.

He is called as the father of local-self government in India.

(v) The Royal Commission on decentralisation was appointed in 1907 and it submitted its report

in 1909. Its chairman was Hob house.

(vi) Under the dyarchical scheme introduced in Provinces by the Government of India Act of 1919, Local self-government became a transferred subject under the charge of a responsible Indian minister.

(vii) In 1924, the Cantonments Act was passed by the Central legislature.

(viii) Under the provincial autonomy scheme introduced by the Government of India Act of 1935, Local self-government was declared a provincial subject.

Previously, during Rajiv Gandhi period, 65<sup>th</sup> Constitutional Amendment Bill (i.e., Nagarpalika Bill) was introduced in Lok Sabha but lapsed in Rajya Sabha.

**Three types of Municipalities:**

- Nagar Panchayat – Transition area from rural to urban area
- Municipal council – For smaller area
- Municipal corporation – For larger area

**Articles Related to Constitutional Bodies at a Glance**

Article No.	Constitutional Bodies
<b>76</b>	Attorney-General of India
<b>148</b>	Comptroller and Auditor-General of India
<b>165</b>	Advocate-General of the State
<b>243-I</b>	State Finance Commission
<b>243-K</b>	State Election Commission
<b>243ZD</b>	District Planning Committee
<b>243ZE</b>	Metropolitan Planning Committee
<b>263</b>	Inter-State Council
<b>280</b>	Finance Commission
<b>307</b>	Inter-State Trade and Commerce Commission

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<b>315</b>	Union Public Service Commission and State Public Service Commission
<b>324</b>	Election Commission
<b>338</b>	National Commission for Scheduled Castes
<b>338A</b>	National Commission for Scheduled Tribes
<b>339</b>	Scheduled Areas and Scheduled Tribes Commission
<b>340</b>	Backward Classes Commission
<b>344</b>	Official Language Commission and Official Language Committee of Parliament
<b>350B</b>	Special Officer for Linguistic Minorities

economic paradigm and comprise sectorial experts and states' representative.

- The NITI Aayog will comprise the following:

- ✓ Chairperson: Prime Minister
- ✓ Vice-Chairperson: To be appointed by the Prime Minister

- ✓ Members: Full-time
- ✓ Part-time members: Maximum of 2 from leading universities research organizations and other relevant institutions in an ex-officio capacity. Part time members will be on a rotational basis.

- ✓ Ex Officio members: Maximum of 4 members of the Union Council of Ministers to be nominated by the Prime Minister.

- ✓ Chief Executive Officer: To be appointed by the Prime Minister for a fixed tenure, in the rank of Secretary to the Government of India.

- ✓ Secretariat as deemed necessary.

## **2. National Development Council:**

- NDC was established in August 1952 by an executive resolution of Government of India on recommendation of first five year plan.

- It is neither a constitutional body nor a statutory body.

- Consists of Prime minister, all Union cabinet ministers, Chief ministers,

## **NON CONSTITUTIONAL BODIES**

### **1. NITI Aayog**

- India's Planning Commission will be renamed "Niti Ayog" (National Institution for Transforming India) as part of a plan to restructure the institution that the government believes has run its course. The name, replacing "Yojana (planning)" with "Niti (policy)" will be announced in an amended resolution for the new plan body. The Planning Commission had suggested to a group chaired by Prime Minister Narendra Modi that its replacement body should be structured to meet the need of changing

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CMS/administrators of UT's and members of Planning Commission.

- Secretary of Planning Commission acts as the secretary to the NDC.

NDC is the highest body next to Parliament because Draft Five-year Plan prepared by Planning Commission should be submitted before NDC for its approval and then it goes to Parliament approval and then emerges as official Plan and is published in the official gazette.

### **3. National Human Rights Commission:**

- It is a statutory body and no constitutional body established in **1993** under **Protection of Human Rights Act, 1993** and was **amended in 2006**.
- It consists of chairman (retired chief justice of India) and four other members (serving or retired judges of Supreme Court, High Court and two persons with practical experience in Human rights).
- Chairman and members are appointed by President on recommendation of Prime Minister, Speaker of Lok Sabha, Deputy Chairman of Rajya Sabha, leaders of Opposition in both the Houses and Central Home minister. Further, a sitting judge of the Supreme Court or a sitting chief justice of High court can be appointed only after consultation with CJI.

- The chairman and members hold office for a term of five years or until they attain the age of 70 years, whichever is earlier.

- Only the president can remove the chairman or any other member.

### **4. State Human Rights Commission:**

- It is also a statutory body established along with **National Human Rights Commission**.
- They can inquire only when human rights in **State List and Concurrent List** are violated.

### **5. Central Information Commission:**

- CIC was established in 2005 under the provisions of the **Right to Information Act(2005)**
- It is not a constitutional body and it has independent powers which looks into the complaints made to it and decide the appeals pertaining to offices, financial institutions, public sector undertakings etc., under Central Government and the UTs.
- It consists of Chief Information Commissioner and not more than ten Information Commissioners appointed by the President on the recommendation of a committee consisting of Prime Minister as Chairperson, Leader of Opposition in Lok Sabha and Union Cabinet Minister nominated by the Prime Minister.

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- They should not be a member of Parliament or Member of the Legislature of any state or UT and should not hold any office of profit and politically connected to any party.
- The Chief Information Commissioner and an Information Commissioner hold office for a term of 5 years or until they attain the age of 65 years, whichever is earlier and they are not eligible for reappointment.
- Only the President of India can remove the Chief Information Commissioner and Information Commissioner of India however the President has to refer the matter to the Supreme Court for enquiry.
- Their salaries, allowances are similar to Election Commissioner.

### **State Information Commission:**

- Along with Central Information Commission, this was also established under

### **Right to Information Act, 2005**

- It is not a constitutional body and it has independent powers which looks into the complaints made to it and decide the appeals pertaining to offices, financial institutions, public sector undertakings etc., under state Government.

Commission / Body	
Central Information Commission	Ministry of Personnel
Finance Commission	Ministry of Finance
Union Public Service Commission	Ministry of Personnel
Inter State Council	Ministry of Home Affairs
Staff Selection Commission	Ministry of Personnel
National Commission for SCs	Ministry of Social Justice & Empowerment
National Commission for STs	Ministry of Tribal Affairs
Central Vigilance Commission	Ministry of Personnel
Zonal Councils	Ministry of Home Affairs
Central Bureau of Investigation	Ministry of Personnel
National Investigation Agency	Ministry of Home Affairs
Commissioner for Linguistic Minorities	Ministry of Minority Affairs
National Commission for Protection of	
Child Rights	Ministry of Women and Child

National Commissions / Central Bodies and the Related Ministries	Falls Under
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	Development
National Commission for Backward Classes	Ministry of Social Justice & Empowerment
Central Commissioner for Disabled Persons	Ministry of Social Justice & Empowerment
Central Social Welfare Board	Ministry of Women and Child Development
North Eastern Council	Ministry of Development of the North Eastern Region
Central Administrative Tribunal	Ministry of Personnel
National Commission for Minorities	Ministry of Minority Affairs
National Human Rights Commission	Ministry of Home Affairs
National Commission for Women	Ministry of Women and Child Development

- Previously it was a neither a constitutional body nor a statutory body but recently in 2003, it was made a statutory body.
- In 2004, the Government of India authorized the CVC as the “Designated Agency” to receive written complaints for disclosure on any allegation of corruption or misuse of office and recommend appropriate action.
- It is a multi-member body consisting of Central Vigilance Commissioner (Chairperson) and not more than two vigilance commissioners appointed by the President by warrant under his hand and seal on the recommendation of a three member committee consisting of the prime minister, Union minister of Home affairs and the Leader of the Opposition in the Lok Sabha.
- They hold office for a term of four years or until they attain the age of 65 years and they are not eligible for reappointment.
- Only the President can remove the Central Vigilance Commissioner or any Vigilance commissioner.

## **7. Central Vigilance Commission:**

- The **CVC** is the main agency for preventing corruption in the Central government established in **1964** by an executive resolution recommended by the **Santhanam Committee on Prevention of Corruption**.

## **8. Central Bureau of Investigation:**

**CBI** was set up in **1963** by a resolution of the Ministry of Home Affairs and later was transferred to the **Ministry of Personnel** and now it enjoys the status of an attached

office. Also **Special Police Establishment** setup in **1941** was merged to CBI.

- It was recommended by **Santhanam Committee on Prevention of Corruption (1962-1964)**.

- CBI is not a statutory body but derives its powers from the **Delhi Special Police Establishment Act, 1946** and it is the main investigating agency of Central Government to prevent corruption and maintain integrity in administration by assisting **CVC**.

- It is headed by a Director who is assisted by a special director or an additional director and a number of Joint Directors, Deputy Inspector Generals, Superintendents of Police and all other usual ranks of police personnel.

- The Director of CBI as Inspector-General of Police, Delhi Special Police Establishment is responsible for the administration of the organization.

- **Prevention of Corruption Act, 1988**.

- The Director of CBI is provided security of two-year tenure in office by the CVC Act, 2003.

- He is appointed by Central government on the recommendation of a committee consisting of the Central Vigilance Commissioner as chairperson, the Vigilance Commissioners, the Secretary to the

Government of India in-charge of the ministry of Home Affairs and the Secretary (Coordination and Public Grievances) in the Cabinet Secretariat.

- CBI Academy is located in Ghaziabad, Uttar Pradesh and started functioning in 1996. Earlier training were given in CBI Training Centre, New Delhi. Other Regional training centres are at Kolkata, Mumbai and Chennai.

### **9. Lokpal and Lokayuktas:**

The success of democracy and realization of socio-economic development depends on the extent to which citizens' grievances are redressed. Therefore, in different parts of the world, institutional devices were created. They are

- The Ombudsman System
- The Administrative Courts System
- The Procurator System

**Sweden** was the first to create an ombudsman in the world in **1809**. "**Ombud**" refers to a person who acts as the representative or spokesman of another person. He is appointed by the legislature to handle complaints against administrative and judicial action.

**New Zealand** is the first commonwealth country to adopt ombudsman system in **1962**.

The Ombudsman in **India** is called **Lokpal/Lokayukta**. In **France**, it is called **Administrative Courts** and in socialistic countries like **former USSR, China, Poland, Hungary, Czechoslovakia and Romania** called as **"Procurator System"**.

**Lokpal:**

- The Administrative Reforms Commission (ARC) of India(1966-1970) recommended the setting up of two special authorities designated as "Lokpal" and "Lokayukta".
- According to ARC, Lokpal would be appointed by the President after consulting with CJI, the speaker of Lok Sabha and Chairman of Rajya Sabha.
- It was a not possible from the recommendations for the Lokpal to be established but in 2011, a new comprehensive Lokpal and Lokayuktas bill was established in which Lokpal at centre and Lokayukta at the state level was possible.

**Lokayukta:**

- Even though Lokpal is still being debated, Lokayuktas have been established in many states.
- The first state to create Lokayukta was **Maharashtra in 1971**.
- Till now, 18 states and 1 Union Territory (Delhi) have established Lokayukta.
- States which have not created the institution are Arunachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura and West Bengal.
- Rajasthan, Karnataka, Andhra Pradesh and Maharashtra call lokayukta as upalokayukta.
- Bihar, Uttar Pradesh and Himachal Pradesh have created only the lokayuktas.
- Some states like Punjab and Orissa have officials as Lokpal.
- The term of office for Lokayukta is of 5 years or 65 years of age and not eligible for reappointment.

<b>STATES</b>	<b>CAPITALS</b>	<b>LANGUAGES</b>
<b>Andhra Pradesh</b>	Hyderabad (founded in the year 1591 by Mohammed Quli Qutub Shah)	Telugu and Urdu.
<b>Arunachal Pradesh</b>	Itanagar	Apatani, Bangni, Tagin, Hills Miri, Galo, Adi.
<b>Assam</b>	Dispur	Assamese, Bodo.



## INDIAN POLITY

<b>Bihar</b>	Patna (earlier known as Patliputra)	Hindi, Urdu, Maithili, Bhojpuri, Magadhi.
<b>Chattisgarh</b>	Raipur	Chhattisgarhi and Hindi.
<b>Goa</b>	Panaji (Christianity is one of the dominant religions followed in the region)	Konkani and Marathi.
<b>Gujarat</b>	Gandhinagar	Gujarati.
<b>Haryana</b>	Chandigarh (also the capital of Punjab)	Haryanvi and Hindi.
<b>Himachal Pradesh</b>	Shimla	Hindi and Pahari.
<b>Jharkhand</b>	Ranchi	Santhali, Mundari, Kurukh, Khortha, Hindi, Bengali, Oriya.
<b>Jammu &amp; Kashmir</b>	Srinagar(Summer) & Jammu (Winter)	Urdu, Kashmiri, Ladakhi.
<b>Karnataka</b>	Bengaluru	Kannada.
<b>Kerala</b>	Thiruvananthpuram (Sri Padmanabhaswamy Temple dedicated to Lord Vishnu is the symbol of Thiruvananthpuram)	Malayalam.
<b>Madhya Pradesh</b>	Bhopal	Hindi.
<b>Maharashtra</b>	Mumbai (earlier known as Bombay)	Marathi.
<b>Manipur</b>	Imphal (Loktak Lake, the biggest freshwater lake in North-Eastern India is in Imphal)	Manipuri.
<b>Meghalaya</b>	Shillong (Shillong was originally Assam's capital from 1874 to January 1974)	Khasi, Garo, English.

## INDIAN POLITY

<b>Mizoram</b>	Aizwal	Mizo.
<b>Nagaland</b>	Kohima	English, Konyak, Angami.
<b>Orissa</b>	Bhubaneshwar	Oriya.
<b>Punjab</b>	Chandigarh (also the capital of Haryana)	Punjabi.
<b>Rajasthan</b>	Jaipur (also known as Pink City)	Hindi, Rajasthani.
<b>Sikkim</b>	Gangtok	Nepali, Bhutia, Lepcha, Limbu, Hindi, English.
<b>Tamil Nadu</b>	Chennai (earlier known as Madras)	Tamil.
<b>Tripura</b>	Agartala (it lies on the bank of Haora River)	Bengali and Kokborok.
<b>Uttar Pradesh</b>	Lucknow (also known as City of Nawabs)	Hindi.
<b>Uttarakhand</b>	Dehradun	Kumaoni, Garhwali.
<b>West Bengal</b>	Kolkata (earlier known as Calcutta)	Bengali.

<b>UNION TERRITORY</b>	<b>CAPITAL</b>	<b>LANGUAGE</b>
<b>Delhi (National Capital Territory)</b>	Delhi	Hindi and English.
<b>Andaman &amp; Nicobar Islands</b>	Portblair	Bengali, Hindi, Tamil, Nicobarese and Telugu.
<b>Chandigarh</b>	Chandigarh (designed by Le Corbusier)	Hindi, Punjabi.
<b>Dadra and Nagar Haveli</b>	Silvassa	Bhili, Bhilodi, Hindi, Gujarati.
<b>Daman &amp; Diu</b>	Daman (lies on the Gujarat Coast)	Gujarati, Marathi.
<b>Lakshadweep</b>	Kavaratti	Malayalam.

# INDIAN POLITY

<b>(smallest Union Territory)</b>		
<b>Pondicherry</b>	Pondicherry	Malyalam, Telugu, Tamil, French.

## DEFINITIONS

The draft of a legislative proposal	Bill
Bill passed by both the Houses of Parliament and assented to by the President	Act
A member of the House of the People (Lok Sabha)	Member
A member other than a Minister	Private Member
Annual Financial statement of the estimated receipts and expenditure of the Government of India for a financial year	Budget
A Form in which estimates of expenditure from the Consolidated Fund, included in the annual financial statement and required to be voted upon in the Lok Sabha, are submitted in pursuance of Article 113 of the Constitution.	Demand for Grant
A bill containing only provisions dealing with all or any of the matters specified in sub - clauses (a) to (g) of Clause (1) of Article 110 of the Constitution. (Such a bill cannot be introduced without the recommendation of the President and it also cannot be introduced in the Rajya Sabha	Money Bill
A 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 by Lok Sabha and moneys charged on the Consolidated Fund for the services of a financial year or a part thereof.	Appropriation Bill
A motion for reduction of a demand for grant by or to a specified amount. Cut motion can be of three types - Disapproval of policy cut, Economy cut and Token cut	Cut motion
A grant made by Lok Sabha in advance in respect of the estimated	Vote on Account

## INDIAN POLITY

expenditure of the Government of India for a part of a financial year pending the voting of Demands for Grants for the financial year. A Motion for Vote on Account is dealt with in the same way as if it were a demand for grant.	
Termination of a sitting of a House without any definite date being fixed for the next sitting	Adjournment <i>sine die</i>
The termination of a session of the House by an order made by the President under article 85(2) (a) of the Constitution.	Prorogation
The first hour of a sitting of the House normally allotted for asking and answering of questions	Question Hour
The minimum number of members required to be present at a sitting of the House or the Committee for valid transaction of its business. The quorum to constitute a sitting of the House is one - tenth of the total number of members of the House and in respect of a Committee it is one - third of the total number of members of the Committee .	Quorum
A self - contained independent proposal submitted for the approval of the House and drafted in such a way as to be capable of expressing a decision of the House.	Resolution
The vote cast by the Speaker or the Chairman in the case of an equality of votes on a matter	Casting vote

### IMPORTANT WRITS IN THE INDIAN CONSTITUTION:

Type of Writ	Meaning of the word	Purpose of issue
Habeas Corpus	You may have the body	To release a person who has been detained unlawfully whether in prison or in private custody.
Mandamus	We Command	To secure the performance of public duties by lower court, tribunal or public authority.

# INDIAN POLITY

Certiorari	To be certified	To quash the order already passed by an inferior court, tribunal or quasi judicial authority.
Prohibition	To forbid	To prohibit an inferior court from continuing the proceedings in a particular case where it has no jurisdiction to try.
Quo Warranto	What is your authority?	To restrain a person from holding a public office which he is not entitled.

## IMPORTANT AGE LIMITS

The President	35 years	---
The Vice-President	35 years	---
Lok Sabha Speaker	25 years	---
Deputy Speaker of Lok Sabha	25 years	---
Chief Justice of India	---	65 years
Other Judges of the Supreme Court	---	65 years
Members of Lok Sabha	25 years	---
Members of Rajya Sabha	30 years	---
Attorney General of India	---	65 years
Comptroller and Auditor General of India	---	65 years
Chairman, U.P.S.C.	---	65 years
Members, U.P.S.C.	---	65 years
Governor	35 years	---

Chief Minister	25 years	---
Members of Legislative Assembly	25 years	---
Members of Legislative Council	30 years	---
Advocate General	---	62 years
Members of State Public Service Commission	---	62 years
Chief Justice of High Court	---	62 years
Other Judges of High Court	---	62 years

## CHAIRMEN OF VARIOUS COMMITTEES IN THE CONSTITUENT ASSEMBLY

Committee on the Rules of Procedure	Rajendra Prasad
Steering Committee	Rajendra Prasad
Finance and Staff Committee	Rajendra Prasad
Credential Committee	Alladi

# INDIAN POLITY

	Krishnaswami Ayyar	Minorities Sub-Committee	H.C. Mookherjee
House Committee	B. Pattabhi Sitaramayya	Fundamental Rights Sub-Committee	J.B. Kripalani
Order of Business Committee	K.M. Munsii	North-East Frontier Tribal Areas and Assam Excluded & Partially Excluded Areas Sub-Committee	Gopinath Bardoloi
Ad hoc Committee on the National Flag	Rajendra Prasad	Excluded and Partially Excluded Areas (Other than those in Assam) Sub-Committee	A.V. Thakkar
Committee on the Functions of the Constituent Assembly	G.V. Mavalankar	Union Powers Committee	Jawaharlal Nehru
States Committee	Jawaharlal Nehru	Union Constitution Committee	Jawaharlal Nehru
Advisory Committee on Fundamental Rights, Minorities and Tribal and Excluded Areas	Vallabhbhai Patel	Drafting Committee	B.R. Ambedkar

## Constitutional Bodies

Bodies	Election Commission	UPSC	State PSC
<b>Part</b>	Part XV	Part XIV	Part XIV
<b>Articles</b>	324	315-323	315-323
<b>Appointed by</b>	President	President	Governor
<b>Consists of</b>	Chief Election Commissioner and other Election members	Chairman and other members	Chairman and other members
<b>Tenure</b>	6 years or until they attain the age of 65 years	6 years or until they attain the age of 62 years	6 years or until they attain the age of 62 years

## INDIAN POLITY

<b>How/for what he can be removed</b>	Same manners as judge of supreme court i.e., if a resolution is passed by both houses of parliament with special majority	If he is adjudged an insolvent, any paid employment outside office, unfit to the eyes of President	If he is adjudged an insolvent, any paid employment outside office, unfit to the eyes of President
<b>Functions</b>	It ensures free and fair elections	Central recruiting agency for all India services, Central services and public services of centrally administered	Conducts examinations for appointments to the services of the state

<b>Bodies</b>	<b>Finance Commission</b>	<b>National Commission for SC's</b>	<b>National Commission for ST's</b>
<b>Part</b>	Part XII	Part XVI	Part XVI
<b>Articles</b>	280	338	338-A(89 <sup>th</sup> Constitutional Amendment Act, 2003)
<b>Appointed by</b>	President	President	President
<b>Consists of</b>	Chairman and other members	Chairperson, a vice-chairperson and three other member	Chairperson, a vice-chairperson and three other member
<b>Tenure</b>	They hold office on President's order	They hold office on President's order	They hold office on President's order
<b>How/for what he can be removed</b>	They can be reappointed on their performance	-	-

# INDIAN POLITY

<b>Functions</b>	Distribution of the net proceeds of taxes to be shared between the Centre and the States, governs grants-in-aid to states etc	Investigate, monitor, inquire and advise on the matters relating to the progress of SC's	Investigate, monitor, inquire and advise on the matters relating to the progress of ST's
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<b>Bodies</b>	<b>Special officer for Linguistic minorities</b>	<b>Comptroller and Auditor General of India</b>	<b>Attorney General of India</b>	<b>Advocate General of India</b>
<b>Part</b>	Part XVII	Part V	Part V	Part VI
<b>Articles</b>	350-B(7 <sup>th</sup> Constitutional Amendment Act,1956)	148 -151	76	165
<b>Appointed by</b>	President	President	President	Governor
<b>Consists of</b>	Commissioner for Linguistic Minorities(Allahabad) assisted by Asst. Commissioner at three headquarters in Belgaum, Chennai and Kolkata	Independent office and head of the Indian Audit and Accounts	He is the highest law officer in India. In addition, Solicitor General and addtl. Solicitor General of India assist him.	Independent and highest law officer in State



## INDIAN POLITY

<b>Tenure</b>	They hold office on President's order and not the Parliament	6 years or until they attain the age of 65 years	No tenure or removal mentioned but he holds during the pleasure of President and so President alone can remove him	No tenure or removal mentioned but he holds during the pleasure of Governor and so Governor alone can remove him
<b>How/for what he can be removed</b>	-	Same manners as judge of supreme court i.e., if a resolution is passed by both houses of parliament with special majority	President can remove him at any time, when the government resigns or is replaced, as he is appointed on its advice	Governor can remove him at any time, when the government resigns or is replaced, as he is appointed on its advice
<b>Functions</b>	Takes up all matters pertaining to the grievances of the linguistic minority individuals or groups in states and UT's and brings remedial actions	He audits the expenditure from Consolidated and Contingency Fund of India, for each state and UT's	Advices the Government of India on matters referred by President, appear on behalf of Government of India in all cases	Gives advice to the government of the state upon all legal matters

# INDIAN POLITY

## IMPORTANT SCHEDULES IN THE CONSTITUTION

First schedule	contains the list of states and union territories and their territories
Second schedule	contains provisions as to the President, Governors of States, Speaker and the Deputy Speaker of the House of the People and the Chairman and the Deputy Chairman of the Council of States and the Speaker and the Deputy Speaker of the Legislative Assembly and the Chairman and the Deputy Chairman of the Legislative Council of a State, the Judges of the Supreme Court and of the High Courts and the Comptroller and Auditor - General of India the list of states and union territories and their Territories
Third Schedule	contains the Forms of Oaths or Affirmations.
Fourth Schedule	contains provisions as to the allocation of seats in the Council of States.
Fifth Schedule	contains provisions as to the Administration and Control of Scheduled Areas and Scheduled Tribes.
Sixth Schedule	contains provisions as to the Administration of Tribal Areas in the States of Assam, Meghalaya, Tripura and Mizoram.
Seventh Schedule	contains the Union list, State list and the concurrent list. Gives allocation of powers and functions between Union & States. It contains 3 lists 1. Union List (For central Govt.) 99 Subjects. 2. States List (Powers of State Govt.) 66 subjects 3. Concurrent List (Both Union & States) 46 subjects.
Eighth Schedule	contains the list of 22 constitutionally recognised languages • Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Manipuri, Malayalam, Konkani, Marathi, Nepali, Oriya, Punjab, Sanskrit, Sindhi, Tamil, Telegu, Urdu, Santhali, Bodo, Maithili, Dogri. • Sindhi was added in 1967 by 21 Amendment. • Konkani, Manipuri and Nepali were added in 1992 by 71 amendment

# INDIAN POLITY

	<ul style="list-style-type: none"> <li>Santhali, Maithili, Bodo and Dogri were added in 2003 by 92 amendment</li> </ul>
Ninth Schedule	contains provisions as to validation of certain Acts and Regulations
Tenth Schedule	contains provisions as to disqualification on ground of defection.
Eleventh Schedule (73rd amendment)	contains the powers, authority and responsibilities of Panchayats.
Twelfth Schedule (74th amendment)	contains the powers, authority and responsibilities of Municipalities.

## IMPORTANT POINTS

1	Who was the permanent President of the Constituent Assembly?	<b>Dr. Rajendra Prasad.</b>
2	Who was the Chairman of the Drafting Committee?	<b>Dr. B. R. Ambedkar.</b>
3	Who was the legal advisor of the Constituent Assembly?	<b>B. N. Rao.</b>
4	How long the Constituent Assembly took to prepare the Indian Constitution, the largest in the world?	<b>2 year 11 month and 18 days.</b>
5	Indian Constitution was adopted by the Government of India on?	<b>26 November 1949.</b>
6	Indian Constitution was enforced by the Government of India on?	<b>26 January 1950.</b>
7	Part III (article 12 - 35) of the Constitution deals with?	<b>Fundamental Right.</b>
8	Which article contains Right to freedom of speech?	<b>Article 19.</b>
9	After which amendment Right to Property became a legal right?	<b>44th Amendment.</b>
10	Which Article describes the election of President?	<b>Article 55.</b>
11	The term of the president is?	<b>5 years.</b>
12	Which Article lays down the procedure for impeachment of the President?	<b>Article 61.</b>

## INDIAN POLITY

13	Who is the ex-officio chairman of the Council of States (Rajya Sabha)?	<b>Vice-President.</b>
14	Who is the authority to decide any dispute in connection with the election of the President and the Vice-President?	<b>The Supreme Court of India.</b>
15	Who gave advice to the Government of India upon legal matters?	<b>Attorney General of India.</b>
16	Who is the authority to decide whether the introduced bill is a Money Bill or not?	<b>Speaker of the Lok Sabha.</b>
17	Money Bill can be introduced only in the Lok Sabha, True or False?	<b>True</b>
18	A bill which is related with revenue and expenditure of the Government is called?	<b>Finance Bill</b>
19	The term of members of Rajya Sabha is?	<b>6 years</b>
20	Who was the temporary President of Indian Constitution?	<b>Dr. Sachidananda Sinha</b>

### **NATIONAL SYMBOLS:**

#### **NATIONAL ANTHEM:**

(1) The National Emblem of India is an adaptation form the Sarnath Lion Capital of Ashoka.

(2) In the original there are four Lions standing back to back mounted on an abacus.

(3) The four animals at the bottom of the national emblem are a galloping horse and a bull (visible) and a lion and a elephant (not visible) separated by intervening wheels over a bell-shaped lotus.

(4) The Lion Capital was erected in the third century B.C. by Emperor Ashoka.

(5) The National Emblem was adopted by the Government of India on 26th January 1950.

(6) The words SATYAMEVA JAYATE taken from Mundaka Upanishad are inscribed below the abacus in the Devanagri script.

#### **NATIONAL CALENDER:**

1)The National Calendar based on the SAKA ERA with Chaitra as its first month and a normal year of 365 days was adopted on 22nd March 1957.

## INDIAN POLITY

(2) Chaitra is the first month of the year, falling on 22nd March normally and on 21st March in a leap year.

(3) The dates of the National Calendar have a permanent correspondence with the dates of the Gregorian Calendar.

### **NATIONAL FLAG:**

(1) The design of the National Flag was adopted by the Constituent Assembly of Sovereign India on 22nd July 1947.

(2) The National Flag is a horizontal tricolour of saffron at the top, white in the middle and green at the bottom.

(3) The ratio of the width of the National Flag to its length is 2:3.

(4) The design of the wheel (DHARMACHAKRA) is taken from the abacus of the Sarnath Lion Capital of Ashoka.

(5) The wheel (DHARMACHAKRA) or Ashoka Chakra at the centre has 24 spokes and is navy blue in colour.

(6) Flag code of India, 2002 (effected on 26 January 2002) governs the display of National Flag of India.

### **NATIONAL ANTHEM:**

(1) The national anthem JANA GANA MANA was composed by poet Rabindranath Tagore in Bengali.

(2) It was adopted by the Constituent Assembly of Sovereign India on 24 January 1950.

(3) It was rendered in English by Tagore himself.

(4) It was first sung on 27th December, 1911 at the Calcutta Session of the Indian National Congress.

(5) The complete song consists of five stanzas. The first stanza constitutes the full version of the National Anthem.

(6) The playing time of the National Anthem is 52 seconds.

### **NATIONAL SONG:**

(1) Bankim Chandra Chatterji's composed song "VANDE MATARAM" taken from ANAND MATH has been adopted as the National Song of India.

(2) It was also adopted by the Constituent Assembly of Sovereign India on 24 January 1950.

(3) It has an equal status with JANA GANA MANA.

(4) It was first sung in the 1896 session of the Indian National Congress.

**NATIONAL ANIMAL:** Tiger (*Panthera tigris*)

**NATIONAL BIRD:** Peacock (*Pavo cristatus*)

**NATIONAL FRUIT:** Mango (*Mangifera indica*)

## INDIAN POLITY

**NATIONAL FLOWER:** Lotus (Nelumbo nucifera)

**NATIONAL BIRD:** Banyan (Ficus benghalensis)

**NATIONAL RIVER:** The Ganges

**NATIONAL AQUATIC ANIMAL:** Gangetic dolphin

### Important Indian Committees

- Kamlesh Chandra Committee – to examine the wage structure, service conditions of the Gramin Dak Sevaks (GDS) in the Department of Posts (DoP).
- Adam Lewis Panel – to safeguard integrity in International tennis.
- Shyam Benegal Committee – to look into revamp the film certification nuances by Central Board of Film Censors (CBFC).
- RM Lodha Committee – on the IPL betting scandal.
- Dr T K Viswanathan Committee – on Bankruptcy Law Reforms
- A P Shah committee – to look into the dispute between Oil and Natural Gas Corporation Limited (ONGC) and Reliance Industries Limited (RIL) on Krishna Godavari (KG) gas fields.
- L Narasimha Reddy Committee – to look into the implementation of One Rank One Pension (OROP) scheme for the ex-servicemen.
- Arvind Subramanian Committee – on Possible Tax rates under Goods and Services Tax (GST)
- MB Shah Committee – on Black Money
- RV Easwar Committee – to simplify the provisions of the Income Tax Act, 1961.
- T Haque committee – NITI Aayog constituted T Haque Expert Group on Land Leasing
- R Gandhi committee – recommended conversion of Urban Cooperative Banks (UCBs) with business size of 20,000 crore rupees or more into regular banks.
- Deepak Mohanty committee – to frame action plan on financial inclusion.
- A P Shah committee – A high level committee on the controversial issue of payment of Minimum Alternate Tax (MAT) by foreign institutional investors.
- Vijay Kelkar committee: on Revisiting and Revitalizing the Public Private Partnership (PPP) Model of Infrastructure Development.
- AK Bhargava committee: to look into the issues of "Net neutrality".
- Ajay Shankar Committee: To review functioning of PPP Cell
- Prof. NR Madhava Menon Panel: Reported guidelines for regulating expenditure and content of advertisement in govt. ads

# INDIAN POLITY

- H Devaraj Committee: Reported most deemed university
- H R Khan Panel: To evaluate unclaimed PPF and Post Office Savings
- V V Daga Committee: To conduct forensic audit of NSEL
- Sivaramakrishnan committee: Submit Report to build the capital city for Andhra Pradesh
- Ramanujam committee: To avoid obsolete laws
- Bimal Jalan: To head the Expenditure Management Commission
- Hari Gautam Committee: To review the status of UGC
- Justice SB Sinha (One Member Commission): To Probe 2006 Meerut Fire Tragedy
- Suresh Prabhu Committee: To review gas pricing formula
- R S Sharma Expert Committee: To review the Company (Cost Records and Cost Audits) Rules 2014
- Justice MB Shah: On Black Money
- Deepak Mohanty Committee: Data and Information Management in the RBI
- Arvind Mayaram Committee: To clear definition to the FDI and FII
- Nachiket Mor Committee: To permit NBFC's to work as Business correspondence
- P J Nayak Committee: Governance of Boards of Bank in India
- Bibek Debroy: for Restructuring the railway
- Justice CS Dharmadhikari Committee: recommended complete ban on dance bars in hotels and restaurants.
- Pratyush Sinha: To assess compensation for coal blocks.
- Jairam Ramesh: On sustainable development
- K.V. Kamath panel: to examine the financial architecture for Micro, Small and Medium Enterprises (MSME) sector.
- Gopalakrishna Committee: on Capacity Building in Banks and non-Banks
- G N Bajpai Committee: Guidelines for national pension system (NPS) schemes in private sector.
- Scientist Raghunath Anant Mashelkar panel: To recommend best technologies for Prime Minister Narendra Modi's "Swachh Bharat" national sanitation campaign.
- T S R Subramanian Committee: To review five key green laws concerning protection and conservation of environment, forest, wildlife, water and air among others.
- Tandon Committee: Follow Up Of Bank Credit
- DR Gadgil Committee: Agricultural Finance

# INDIAN POLITY

- Godwala Committee: Rural Finance
- ML Dantwala Committee: Regional Rural Banks
- SS Nadkarni Committee: Trading In Public Sector Banks
- Venketaiya Committee: Review Of Rural Financing System
- Bhide Committee: Coordination Between Commercial Banks And SFC's
- AK Bhuchar Committee: Coordination Between Term Lending Institutions And Commercial Banks.
- R. Jilani: Inspection System in Banks
- Goiporia Committee: Customer Service In Banks
- LC Gupta Committee: Financial Derivatives
- James Raj Committee: Functioning Of Public Sector Banks
- Vipin Malik Committee: Consolidated Accounting By Banks
- A Ghosh Committee: Frauds & Malpractices In Banks
- BD Thakar Committee: Job Criteria In Bank Loans (Approach)
- A K Khandelwal: HR Issues of Public Sector Banks
- R.H. Khan: Harmonization of the Role of Financial Institution in Banks
- Rajamannar Committee: Changes In Banking Laws , Bouncing Of Cheques Etc.
- Usha Thorat Panel: Financial Inclusion
- Chatalier Committee: Finance To Small Scale Industry
- K Madhav Das Committee: Urban Cooperative Banks
- R S Saria Committee: Agricultural Finance And Cooperative Society
- SS Kohli Committee: Rationalization Of Staff Strength In Banks
- J.V. Shetty: Consortium Lending by Banks
- I.T. Vaz: Norms for Working Capital Finance by Banks
- Y.V. Reddy: Financial Aggregate System
- Rakesh Mohan: Small Savings: Tax and Interest Rates
- M Damodaran: Customer Service in Banks
- Pillai Committee: Pay Scales Of Bank Officers
- Rangrajan Committee: Computerization Of Banking Industry
- Cook Committee (On Behalf Of BIS – Under Basel Committee ): Capital Adequacy Of Banks
- Pendarkar Committee: Review The System Of Inspection Of Commercial, RRB And Urban Cooperative Banks
- Dave Committee: Mutual Funds (Functioning)



# INDIAN ECONOMY

## ECONOMY

### INTRODUCTION:

*'An economy is a system whereby goods are produced and exchanged. In other words, the state of a country or region in terms of the production and consumption of goods and services and the supply of money.*

**The Economy of India is the ninth largest in the world by nominal GDP and the third largest by purchasing power parity (PPP).**

The independence-era Indian economy before and a little after 1947 was inspired by the economy of the Soviet Union with socialist practices, large public sectors, high import duties and lesser private participation characterising it, leading to massive inefficiencies and widespread corruption.

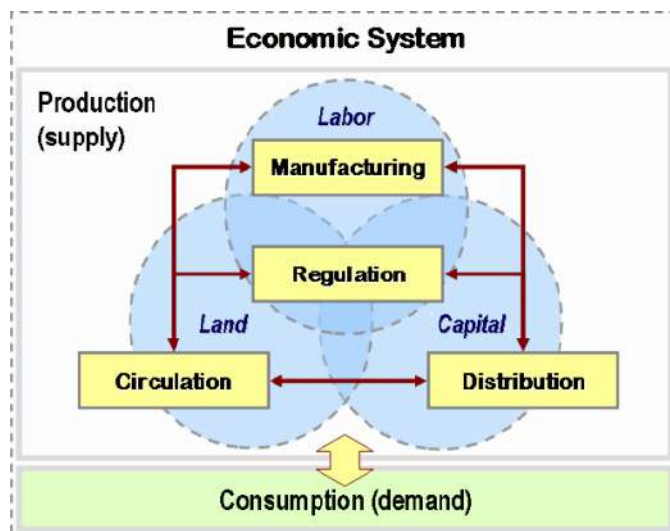
However, later on India adopted free market principles and liberalised its economy to international trade. Following these strong economic reforms, the country's economic growth progressed at a rapid pace with very high rates of growth and large increases in the incomes of people. India recorded the highest growth rates in the mid-2000s, and is one of the fastest-growing economies in the world.

The growth was led primarily due to a huge increase in the size of the middle class

consumer, a large labour force and considerable foreign investments.

**India is the fourteenth largest exporter and eleventh largest importer in the world.** Recently India has become one of the most attractive destinations for investment owing to favourable government policies and reforms.

The approval of Foreign Direct Investment(FDI) in several sectors have allowed investments to pour into the Economy.



### IMPORTANT TERMS:

#### DEMAND

- **Demand:-** Quantity of the commodity that a consumer is able and willing to purchase in a given period and at a given price.
- **Demand Schedule:-** It is a tabular representation which shows the relationship

# INDIAN ECONOMY

between price of the commodity and quantity purchased.

➤ **Demand Curve:-** It is a graphical representation of demand schedule.

➤ **Individual Demand:-** Demand by an individual consumer.

## **DEMAND TYPES:**

• **Cross demand:** Demand primarily dependent upon prices of related goods is called cross demand. The complementary goods and substitutes are called related goods.

• **Income demand:** Demand primarily dependent upon income is called income demand.

• **Direct demand:** Demand for goods and services made by final consumers to satisfy their wants or needs is called direct demand. For example guest of hotels make the demand for food.

• **Derived demand:** Demand for goods and services made according to direct demand is called derived demand.

• **Joint demand:** Demand made for two or more goods and services to satisfy single need or want is called joint demand.

• **Composite demand:** Demand for a single commodity made in order to use for

different purposes is called composite demand.

## **IMPORTANT POINTS TO REMEMBER:**

➤ First Industrial Resolution Policy in India – 1948

➤ New Industrial Policy – 1991

➤ Planning Commission was set up in - 1950

➤ First Five year plan started from - 1951

➤ Major aim of planning - To improve standards of living of people

➤ Removal of Poverty (**Garibi Hatao**) - 4th Five Year Plan (Indira Gandhi)

## **ECONOMY TYPES:**

Without a viable economy, a state will collapse. There are three main types of economies: free market, command, and mixed. The chart below compares free-market and command economies; mixed economies are a combination of the two.

### ➤ **FREE-MARKET ECONOMIES:**

In free-market economies, which are essentially capitalist economies, businesses and individuals have the freedom to pursue their own economic interests, buying and selling goods on a competitive market, which naturally determines a fair price for goods and services.

### ➤ **COMMAND ECONOMIES:**

A command economy is also known as a centrally planned economy because the

# INDIAN ECONOMY

central, or national, government plans the economy. In a communist society, the central government controls the entire economy, allocating resources and dictating prices for goods and services

## ➤ **MIXED ECONOMIES:**

A mixed economy combines elements of free-market and command economies. Even among free-market states, the government usually takes some action to direct the economy. These moves are made for a variety of reasons; for example, some are designed to protect certain industries or help consumers.

## **ECONOMY SECTORS:**

### • **PRIMARY SECTOR:**

Agriculture and agriculture related activities are the primary sectors of economy. The Indian agriculture sector accounts for 18 per cent of India's Gross Domestic Product (GDP) and employs just a little less than 50 per cent of the country's workforce.

### • **SECONDARY SECTOR:**

When the main activity involves manufacturing then it is the secondary sector. All industrial production where physical goods are produced come under the secondary sector.

### • **TERTIARY SECTOR:**

When the activity involves providing intangible goods like services then this is part of the tertiary sector. Financial services, management consultancy, telephony and IT are good examples of service sector.

**MICRO ECONOMICS:** It is a study of behaviour of individual units of an economy such as individual consumer, producer etc.,

### • **PRODUCTION POSSIBILITY CURVE**

**(PPC):** PP curve shows all the possible combination of two goods that can be produced with the help of available resources and technology.

• **MARGINAL OPPORTUNITY COST:** MOC of a particular good along PPC is the amount of other good which is sacrificed for production of additional unit of another good.

### • **Marginal rate of transformation:**

MRT is the ratio of units of one goodsacrificed to produce one more unit of other good.

## **NEW ECONOMIC POLICY:**

The new economic policy 1991 was introduced to revive the economy. It emphasised a bigger role for Private sector. It focused on FDI on supplement growth. It aimed at export led growth along with reducing the role of state and making planning liberal and market driven.

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The main characteristics of new Economic Policy 1991 are:

1. **Delicensing:** Only six industries were kept under Licencing scheme. The private sectors were allowed to set up industrial units without taking any licences. Industrial licensing was abolished for almost all but product categories.

2. **Entry to Private Sector:** The role of public sector was limited only to four industries; rest all the industries were opened for private sector also.

3. The threshold limit of assets in respect of MRTP companies and other major undertakings was abolished. They were free to undertake investments without any ceiling prescribed by MRTP.

4. **Disinvestment:** Disinvestment was carried out in many public sector enterprises.

5. The role of RBI reduced from regulator to facilitator of financial sector. This means that the financial sector may be allowed to take decisions on many matters without consulting the RBI. The reform policies led to the establishment of private sector banks, Indian as well as foreign. Foreign investment limit in banks was raised to around 50 per cent.

6. **Liberalisation of Foreign Policy:** The government granted approval for FDI up to 51per cent in high priority areas.

7. In 1991 the rupee was devalued against foreign currencies. This led to an increase in the inflow of foreign exchange.

8. Liberalisation in Technical Area: Automatic permission was given to Indian companies for signing technology agreements with foreign companies.

9. Setting up of Foreign Investment Promotion Board (FIPB): This board was set up to promote and bring foreign investment in India.

10. Sick public sector units were recommended to Board for Industrial and Financial Reconstruction (BIFR) for revival.

11. Setting up of Small Scale Industries: Various benefits were offered to small scale industries.

12. PSU were given more autonomy There are three major components or elements of new economic policy—**Liberalisation, Privatisation, Globalisation.**

## **SALIENT FEATURES OF INDIAN ECONOMY:**

➤ The economy of India is the tenth-largest in the world by nominal GDP and the third-largest by purchasing power parity (PPP).

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- India was 6th largest exporter of services and 19th-largest exporter of merchandise in 2013.
- It is the 12th-largest merchandise and 7th largest services importer. Agriculture sector is the largest employer in India's economy but contributes a declining share of its GDP (13.7% in 2012-13).
- Its manufacturing industry has held a constant share of its economic contribution, while the fastest-growing part of the economy has been its services.

## **ECONOMIC PLANNING IN INDIA:**

### **General Objectives:**

- ❖ To improve national income and raise the standard of living in the country.
- ❖ To attain rapid industrialization with an emphasis on basic and heavy industries.
- ❖ To create and expand employment opportunities.
- ❖ To ensure distributional justice through reduction in inequalities in income and wealth.
- ❖ To increase employment opportunities.
- ❖ Economic planning is the method of allocating resources (physical and human) among different uses in order of preferences and the detailed scheme prepared for that is called as the economic plan.

❖ Bombay Plan, aimed at doubling the per capita income in the next 15 years, was prepared by eight noted businessmen of the country in 1943.

❖ **People's Plan was prepared by Shri M N Roy in April, 1945.**

❖ **Gandhian Plan was prepared by Shriman Narayan in 1944.**

❖ **Sarvodaya Plan was prepared by Shri Jaiprakash Narayan in January, 1950.**

### **NATIONAL INCOME IN INDIA:**

The first attempt to estimate the National income of India was made 1868 by **Dadabhai Naoroji** in his book 'Poverty and Un-British Rule in India.

The first scientific estimate of National Income of India was made by **Dr. V K R V Rao.**

### **NATIONAL INCOME:**

#### **Definition:**

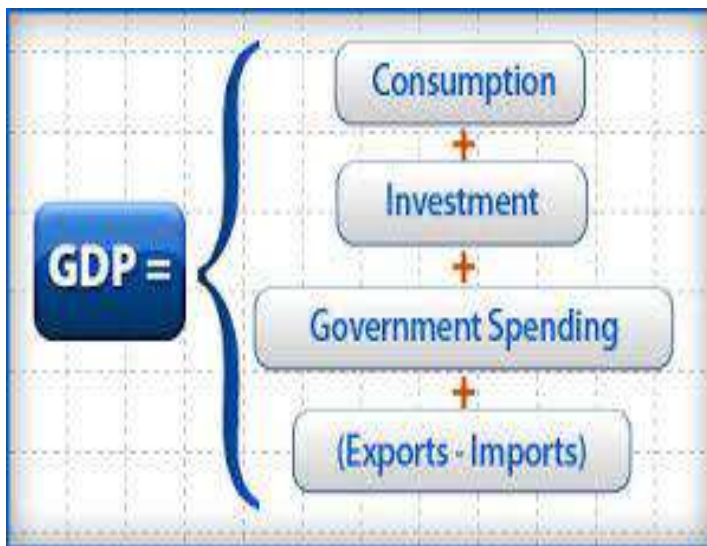
- ❖ The total amount of money earned within a country.
- ❖ In other words, the total amount of income accruing to a country from economic activities in a year's time is known as national income. It includes payments made to all resources in the form of wages, interest, rent and profits.

#### **CONCEPTS:**

**(A) Gross Domestic Product (GDP):**

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- ❖ GDP is a broad measurement of a nation's overall economic activity.
- ❖ GDP includes all private and public consumption, government outlays, investments and exports minus imports that occur within a defined territory.
- ❖ Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period.



## Three different ways to measure GDP:

1. Product Method
2. Income Method
3. Expenditure Method

These three methods of calculating GDP yield the same result because National Product = National Income = National Expenditure.

**1. The Product Method:** In this method, the value of all goods and services produced in different industries during the year is

added up. This is also known as the value added method to GDP or GDP at factor cost by industry of origin. In other words, it is the sum of gross value added.

## 2. The Income Method:

The people of a country who produce GDP during a year receive incomes from their work. Thus GDP by income method is the sum of all factor incomes: Wages and Salaries (compensation of employees) + Rent + Interest + Profit.

## 3. Expenditure Method:

Gross domestic product can be calculated using the following formula:

$$\mathbf{GDP = C + G + I + NX}$$

Where

C all private consumption, or consumer spending, in a nation's economy

G the sum of government spending

I the sum of all the country's investment, including businesses capital expenditures

NX the nation's total net exports, calculated as total exports minus total imports (NX =

Exports - Imports) which can be positive or negative

## (B) GDP at Factor Cost:

GDP at Factor Cost = Net value added + Depreciation.

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## **GDP at factor cost includes:**

(i) Compensation of employees i.e., wages, salaries, etc.

(ii) Operating surplus which is the business profit of both incorporated and unincorporated firms. [Operating Surplus

= Gross Value Added at Factor Cost—Compensation of Employees—Depreciation]

(iii) Mixed Income of Self-employed.

## **(C) Net Domestic Product (NDP):**

NDP is the value of net output of the economy during the year. Some of the country's capital equipment wears out or becomes obsolete each year during the production process. The value of this capital consumption is some percentage of gross investment which is deducted from GDP.

**GDP at Factor Cost = GDP at Market Price – Indirect Taxes + Subsidies.**

**Net Domestic Product = GDP at Factor Cost – Depreciation**

## **(D) Nominal and Real GDP:**

When GDP is measured on the basis of current price, it is called GDP at current prices or nominal GDP. On the other hand, when GDP is calculated on the basis of fixed prices in some year, it is called GDP at constant prices or real GDP.

## **(E) GDP Deflator:**

The GDP deflator is a tool used to measure the level of price changes over time so that current prices can be accurately compared to historical prices. In other words, it eliminates the effects of price changes over time.

## **(F) Gross National Product (GNP):**

GNP (Gross National Income) is the market value of all final goods and services produced within the country in a year plus net factor income abroad is called gross national product.

## **GNP includes four types of final goods and services:**

(1) Consumers' goods and services to satisfy the immediate wants of the people;

(2) Gross private domestic investment in capital goods consisting of fixed capital formation, residential construction and inventories of finished and unfinished goods;

(3) Goods and services produced by the government; and

(4) Net exports of goods and services, i.e., the difference between value of exports and imports of goods and services, known as net income from abroad.

## **(G) GNP at Market Prices:**

GNP at Market Prices = GDP at Market Prices + Net Income from Abroad.

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## **(H) GNP at Factor Cost:**

GNP at Factor Cost = GNP at Market Prices – Indirect Taxes + Subsidies.

## **(I) Net National Income:**

NNP is the amount which comes after the minus of depreciation in the gross national product (GNP). This is known as depreciation.

In order to arrive at NNP, we deduct depreciation from GNP. The word 'net' refers to the exclusion of that part of total output which represents depreciation.

## **NNP = GNP – Depreciation**

## **(K) NNP at Factor Cost:**

Net National Product at factor cost is the net output evaluated at factor prices. It includes income earned by factors of production through participation in the production process such as wages and salaries, rents, profits, etc. It is also called **National Income**.

**NNP at Factor Cost = NNP at Market Prices – Indirect taxes + Subsidies**

**= GNP at Market Prices – Depreciation – Indirect taxes + Subsidies.**

**= National Income.**

Normally, NNP at market prices is higher than NNP at factor cost because indirect taxes exceed government subsidies. However, NNP at market prices can be less

than NNP at factor cost when government subsidies exceed indirect taxes.

## **(L) Domestic Income:**

Income generated (or earned) by factors of production within the country from its own resources is called domestic income or domestic product.

## **Domestic income includes:**

(i) Wages and salaries, (ii) rents, including imputed house rents, (iii) interest, (iv) dividends, (v) undistributed corporate profits, including surpluses of public undertakings, (vi) mixed incomes consisting of profits of unincorporated firms, self-employed persons, partnerships, etc., and (vii) direct taxes.

Since domestic income does not include income earned from abroad, it can also be shown as:

**Domestic Income = National Income – Net income earned from abroad.**

## **(M) Private Income:**

Private income is income obtained by private individuals from any source, productive or otherwise, and the retained income of corporations.

Private Income = National Income (or NNP at Factor Cost) + Transfer Payments +



# INDIAN ECONOMY

Interest on Public Debt — Social Security — Profits and Surpluses of Public Undertakings

## **(N) Personal Income:**

PI is the total income received by all individuals and household of a country from all possible sources before payment of direct taxes. It is the actual income received by a individual and household during a year.

Personal Income = Private Income – Undistributed Corporate Profits – Profit Taxes.

## **(O) Disposable Income:**

DI is the total income by all individuals and household of a country from all possible sources after a payment of direct taxes.

## **(P) Real Income:**

Real income is national income expressed in terms of a general level of prices of a particular year taken as base.

Real NNP =  $\text{NNP for the Current Year} \times \frac{\text{Base Year Index (=100)}}{\text{Current Year Index}}$

## **(Q) Per Capita Income:**

The average income of the people of a country in a particular year is called Per Capita Income for that year.

## **FIVE YEAR PLAN**

When India became an independent country, many questions had arisen in front of the country's leaders at that time. The British had left the Indian

economy handicapped; leaders had the challenges to make country's economy strong. A formal model of planning was adopted. The Planning commission was established on 15th March 1950, with Former Prime Minister Jawaharlal Nehru as the Chairman. The Planning Commission is directly reporting to the Prime Minister of India. Now, it is known as NITI Aayog (National Institute for Transforming India Aayog) and established by Prime Minister Narendra Modi on 1st January 2015.

Planning Commission was assigned the task of formulating plans for the most effective and balanced utilisation of resources and determining priorities. Since then the Planning Commission frames the centralized and integrated national economic programs at the interval of every five years, thereby known as the Five-Year Plans.

The First Five-Year Plan of India was presented by Pandit Jawaharlal Nehru in 1951.

## **First Plan (1951-56):**

- It was based on Harrod-Domar Model.
- Focus on Agriculture, Price Stability, Power and Transport
- It was a successful plan primarily because of good harvests in the last two years of the plan.

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## **Second Plan (1956-61):**

- It also called Mahalanobis plan named after the well known economist.
- Focus on rapid industrialization.
- Advocated huge imports through foreign loans.
- Shifted basic emphasis from agriculture to industry.
- During this plan prices increased by 30%, against a decline of 13% during the First plan

## **Third Plan (1961-66):**

- It stressed agriculture and improvement in the production of wheat, but the brief Sino-Indian war of 1962 exposed weaknesses in the economy and shifted the focus towards the defence industry and the Indian Army.
- Complete failure in reaching the targets due to unforeseen events-Chinese aggression (1962), Indo-Pak war (1964), severe drought 1965-66.

## **Three Annual Plans (1966-69):**

- Prevailing crisis in agriculture and serious food shortage necessitated the emphasis on agriculture during the Annual Plans.
- During these plans a whole new agricultural strategy was implemented. It involving wide-spread distribution of high-yielding varieties of seeds, extensive use of

fertilizers, exploitation of irrigation potential and soil conservation.

- During the Annual Plans, the economy absorbed the shocks generated during the Third Plan.

## **Fourth Plan (1969-74):**

- Main emphasis was on growth rate of agriculture to enable other sectors to move forward

First two years of the plan saw record production. The last three years did not measure up due to poor monsoon.

- Influx of Bangladeshi refugees before and after 1971 Indo-Pak war was an important issue.

## **Fifth Plan (1974-79)**

- It proposed to achieve two main objectives: 'removal of poverty' (Garibi Hatao) and 'attainment of self reliance'.
- Promotion of high rate of growth, better distribution of income and significant growth in the domestic rate of savings were seen as key instruments.
- The plan was terminated in 1978 (instead of 1979) when Janta Party government rose to power.

**Rolling Plan (1978-80):**Janta government put forward a plan for 1978- 1983. However, the government lasted for only 2 years.

# INDIAN ECONOMY

Congress government returned to power in 1980 and launched a different plan.

## **Sixth Plan (1980-85):**

- Focus - Increase in national income, modernization of technology, ensuring continuous decrease in poverty and unemployment, population control through family planning etc

## **Seventh Plan (1985-90):**

- Focus - rapid growth in food-grains production, increased employment opportunities and productivity within the framework of basic tenants of planning.
- The plan was very successful, the economy recorded 6% growth rate against the targeted 5%

## **Eight Plan (1992-97):**

- The eighth plan was postponed by two years because of political uncertainty at the centre

Worsening Balance of Payment position and inflation during 1990-91 were the key issues during the launch of the plan.

- The plan undertook drastic policy measures to combat the bad economic situation and to undertake an annual average growth of 5.6%

- Some of the main economic outcomes during eighth plan period were rapid economic growth, high growth of agriculture

and allied sector, and manufacturing sector, growth in exports and imports, improvement in trade and current account deficit.

## **Ninth Plan (1997-2002):**

- It was developed in the context of four important dimensions: Quality of life, generation of productive employment, regional balance and self-reliance.

## **Tenth Plan (2002-2007):**

- To achieve 8% GDP growth rate
- Reduction of poverty ratio by 5 percentage points by 2007
- Providing gainful high quality employment to the addition to the labour force over the tenth plan period
- Universal access to primary education by 2007
- Reduction in gender gaps in literacy and wage rates by atleast 50% by 2007
- Reduction in decadal rate of population growth between 2001 and 2011 to 16.2%
- Increase in literacy rate to 72% within the plan period and to 80% by 2012
- Increase in forest and tree cover to 25% by 2007 and 33% by 2012.
- Cleaning of all major polluted rivers by 2007 and other notified stretches by 2012.

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## **Eleventh Plan (2007-2012):**

- Accelerate GDP growth from 8% to 10%. Increase agricultural GDP growth rate to 4% per year.
- Create 70 million new work opportunities and reduce educated unemployment to below 5%
- Raise real wage rate of unskilled workers by 20 %
- Lower gender gap in literacy to 10 percentage point. Increase the percentage of each cohort going to higher education from the present 10% to 15 %
- Reduce Total Fertility Rate to 2.1
- Raise the sex ratio for age group 0-6 to 935 by 2011-12 and to 950 by 2016-2017
- Provide clean drinking water for all by 2009
- Attain WHO standards of air quality in all major cities by 2011-12
- Increase energy efficiency by 20 percentage points by 2016-17

## **Twelfth Plan: 2012-17**

- This plan's focus is on instilling "inclusive growth".
- The plan is concentrated to encourage the development of India's agriculture, education, health and social welfare through government spending.

- It is also expected to create employment through developing India's manufacturing sector and move the nation higher up the value chain.

## **TAX STRUCTURE IN INDIA:**

Taxes are the amount of money government imposes on an individual or corporates directly or indirectly so as to generate revenue or to keep in check any black money activities in India.

The tax on incomes, customs duties, central excise and service tax are levied by the Central Government. The state Government levies agricultural income tax (income from plantations only), Value Added Tax (VAT)/ Sales Tax, Stamp Duty, State Excise, Land Revenue, Luxury Tax and Tax On Professions. The local bodies have the authority to levy tax on properties, octroi/entry tax and tax for utilities like water supply, drainage etc.

## **DIRECT TAXES:**

Taxes can be either direct or indirect. **"A direct tax is one that the taxpayer pays directly to the government"**. These taxes cannot be shifted to others. A homeowner pays personal property taxes directly to the government. A family pays its own federal income taxes. These contribute

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major chunk of the total taxes collected in India.

## **INCOME TAX:**

The Indian Income Tax Department is governed by CBDT and is part of the Department of Revenue under the Ministry of Finance, Govt. of India.

**Corporate Income Tax** – This is the tax levied on the profits a corporate house earned in a year. In India, the Corporate Income tax rate is a tax collected from companies.

**Securities Transaction Tax** Introduced in 2004, STT is levied on the sale and purchase of equities (ie Shares, Debentures or any other security). more clearly, The income a individual generate through the securities market be it through reselling of shares or through debentures is taxed by the government of India and the same tax is called as Securities Transaction Tax.

**Banking Cash Transaction Tax** - A bank transaction tax is a tax levied on debit (and/or credit) entries on bank accounts. It can be automatically collected by a central counterparty in the clearing or settlement process.

**Capital Gains Tax:-** Capital Gain tax as name suggests it is tax on gain in capital. If you sale property, shares, bonds & precious

material etc. and earn profit on it then you are supposed to pay capital gain tax.

## PROPERTY TAX

- ❖ GIFT TAX
- ❖ HOUSE TAX
- ❖ PROFESSIONAL TAX
- ❖ DTC

## **INDIRECT TAXES:**

An indirect tax can be passed on to another person or group. A business may recover the cost of the taxes it pays by charging higher prices to customers. A tax shift occurs when the business shifts its taxes to others. This is a type of tax levied on the individuals whose income falls under the taxable category (2.5 lakhs per annum).

Indirect Taxes:-

- ❖ SALES TAX
- ❖ VAT(VALUE ADDED TAX)
- ❖ CUSTOM DUTY
- ❖ OCTROI
- ❖ EXCISE DUTY
- ❖ ANTI DUMPING DUTY
- ❖ ENTERTAINMENT TAX
- ❖ TOLL TAX
- ❖ SERVICE TAX
- ❖ GST-GOODS & SERVICE TAX
- ❖ Value Added Tax

When we pay an extra amount of price for the goods and services we consume or buy,

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that extra amount of money is called as VAT. This tax is about to be replaced by Goods and Services Tax. Customs Duty – Customs Duty is a type of indirect tax levied on goods imported into India as well as on goods exported from India. In India, the basic law for levy and collection of customs duty is Customs Act, 1962. It provides for levy and collection of duty on imports and exports. Service Tax Service Tax is a tax imposed by Government of India on services provided in India. The service provider collects the tax and pays the same to the government. It is charged on all services except the services in the negative list of services.

**Sales Tax:-** Sales tax charged on the sales of movable goods.

**Custom duty & Octroi (On Goods):-** Custom Duty is a type of indirect tax charged on goods imported into India. One has to pay this duty, on goods that are imported from a foreign country into India. Octroi is tax applicable on goods entering from one state to another for consumption or sale. In simple terms one can call it as Entry Tax.

**Excise Duty:-** An excise duty is a type of tax charged on goods produced within the country. Another name of this tax is CENVAT (Central Value Added Tax).

## **INFLATION:**

- a sustained increase in the aggregate or general price level in an economy. Inflation means there is an increase in the cost of living.

*"Inflation means that your money won't buy as much today as you could yesterday"*

**Formula for calculating Inflation =**  
**(WPI in month of current year - WPI in same month of previous year) × 100**  
**WPI in same month of previous year**

## **INFLATION TYPES:**

**Comprehensive Inflation:** When the prices of all commodities rise throughout the economy.

**Sporadic Inflation:** When prices of only few commodities in few regions (areas) rise.

**Open Inflation:** When government does not attempt to restrict inflation, it is known as Open Inflation. In a free market economy, where prices are allowed to take its own course, open inflation occurs.

**Suppressed Inflation:** When government prevents price rise through price controls, rationing, etc., it is known as Suppressed Inflation or Repressed Inflation.

**Hyperinflation:** It refers to a situation where the prices rise at an alarming high rate. The prices rise so fast that it becomes

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very difficult to measure its magnitude. However, in quantitative terms, when prices rise above 1000% per annum (quadruple or four digit inflation rate), it is termed as Hyperinflation.

**Deficit Inflation:** Deficit inflation takes place due to deficit financing.

**Credit Inflation:** Credit inflation takes place due to excessive bank credit or money supply in the economy.

**Scarcity Inflation:** Scarcity inflation occurs due to hoarding. Hoarding is an excess accumulation of basic commodities by unscrupulous traders and black marketers.

**Creeping Inflation-** Price Rise by 2%- not controlled in time- prove disastrous- economic and political stability of the economy

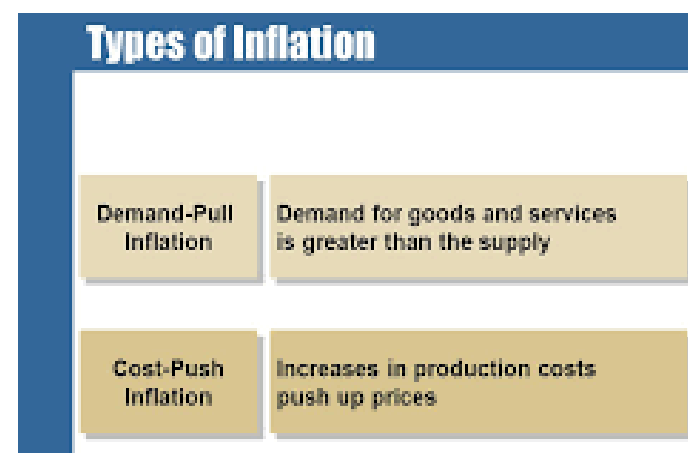
**Walking Inflation** - mild and tolerable >10% PA- moderate- stable inflation- people expectations remain more or less stable.

**Running Inflation-** rises rapidly <10% ranges 10-20%- exceeds "Galloping inflation. Causes economic distortions and disturbances in the economy.

**Hyper Inflation** - 1000% PA. Low purchasing power, real wages fall and inequalities increases- serious distortions- overall economic condition.

**Profit Inflation:** When entrepreneurs are interested in boosting their profit margins, prices rise.

**Demand-Pull Inflation:** Inflation which arises due to various factors like rising income, exploding population, etc., leads to aggregate demand and exceeds aggregate supply, and tends to raise prices of goods and services. This is known as Demand-Pull or Excess Demand Inflation.



**Cost-Push Inflation:** When prices rise due to growing cost of production of goods and services, it is known as Cost-Push (Supply-side) Inflation.

## **MONEY SUPPLY:**

The four main monetary aggregates of measures of money supply which reflect the state of the monetary sector are:-

(i) M1 (Narrow money) = Currency with the public + demand deposits of the public;

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(ii)  $M2 = M1 + \text{Post Office Savings deposits}$ ;

(iii)  $M3$  (Broad money) =  $M1 + \text{time deposits of the public with banks}$ ;

and (iv)  $M4 = M3 + \text{Total post office deposits}$ .

Price movement in the country is reflected by the Wholesale Price Index (WPI) and the Consumer Price Index (CPI). WPI is used to measure the change in the average price level of goods traded in the wholesale market, while the Consumer Price Index (CPI) captures the retail price movement for different sections of consumers.

## **COST**

**Cost of production:** Expenditure incurred on various inputs to produce goods and services.

**Cost function:** Functional relationship between cost and output.

$C = f(q)$  Where  $f = \text{functional relationship}$

Where  $c = \text{cost of production}$

$q = \text{quantity of product}$

**Money cost:** Money expenses incurred by a firm for producing a commodity or service.

**Explicit cost:** Actual payment made on hired factors of production.

For example wages paid to the hired labourers, rent paid for hired accommodation, cost of raw material etc

**Implicit cost:** Cost incurred on the self-owned factors of production.

For example, interest on owners capital, rent of own building, salary for the services of entrepreneur etc.

**Opportunity cost:** is the cost of next best alternative foregone / sacrificed.

**Fixed cost:** are the cost which are incurred on the fixed factors of production.

These costs remain fixed whatever may be the scale of output. These costs are present even when the output is zero. These costs are present in short run but disappear in the long run.

**Total Variable Cost:** TVC or variable cost – are those costs which vary directly with the variation in the output. These costs are incurred on the variable factors of production. These costs are also called “prime costs”, “Direct cost” or “avoidable cost”. These costs are zero when output is zero.

**Total cost:** is the total expenditure incurred on the factors and non-factor inputs in the production of goods and services. It is obtained by summing TFC and TVC at various levels of output.

## **REVENUE**

**Revenue:-** Money received by a firm from the sale of a given output in the market.



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**Total Revenue:** Total sale receipts or receipts from the sale of given output.

$TR = \text{Quantity sold} \times \text{Price (or) output sold} \times \text{price}$

**Average Revenue:** Revenue or Receipt received per unit of output sold.

- $AR = TR / \text{Output sold}$
- AR and price are the same.
- $TR = \text{Quantity sold} \times \text{price or output sold} \times \text{price}$
- $AR = (\text{output} / \text{quantity} \times \text{price}) / \text{Output} / \text{quantity}$
- $AR = \text{price}$
- AR and demand curve are the same.

Shows the various quantities demanded at various prices.

**Marginal Revenue:** Additional revenue earned by the seller by selling an additional unit of output.

## BUDGET

### Two types of Revenue Receipts.

- i) Tax Revenue ii) Non-tax Revenue

**Capital Receipts:** It includes

- Market Loans (loans raised by the government from the public)
- Borrowings by the Government
- Loans received from foreign governments and International financial Institutions.

**Two examples of Developmental Expenditure:**

- Plan expenditure of Railways and
- Posts

**Two examples of Non-Developmental expenditures:**

- Expenditure on defence
- Interest payments

### Surplus Budget

A Surplus Budget is one where the estimated revenues are greater than the estimated expenditures.

### Four different concepts of Budget Deficits:

- Budget Deficit:** It is the difference between the total expenditure, current revenue and net internal and external capital receipts of the government.
- Revenue Deficit -** It is the excess of governments revenue expenditures over revenue receipts.
- Primary Deficit -** It is the fiscal deficit MINUS Interest payments
- Fiscal Deficit -** It is the difference between the total expenditure of the government, the revenue receipts PLUS those capital receipts which finally accrue to the government.

### Revenue Expenditure

It is the expenditure incurred for the normal running of government departments and

# INDIAN ECONOMY

provision of various services like interest charges on debt, subsidies etc.

## **Capital Expenditure**

It consists mainly of expenditure on acquisition of assets like land, building, machinery, equipment etc., and loans and advances granted by the Central Government to States & Union Territories.

**BALANCE OF TRADE:** Balance of trade is the difference between the money value of exports and imports of material goods (visible item)

## **BALANCE OF PAYMENTS:**

The balance of payments of a country is a systematic record of all economic transactions between residents of a country and residents of foreign countries during a given period of time. It includes both visible and invisible items. Hence the balance of payments represents a better picture of a country's economic transactions with the rest of the world than the balance of trade.

A balance of payments statement is a summary of a Nation's total economic transaction undertaken on international account. There are two types of account.

- **Current Account:** It records the following 3 items

a) Visible items of trade: The balance of exports and imports of goods is called the balance of visible trade.

b) Invisible trade: The balance of exports and imports of services is called the balance of invisible trade e.g. Shipping insurance etc.

c) Unilateral transfers: Unilateral transfers are receipts which resident of a country receive (or) payments that the residents of a country make without getting anything in return e.g. gifts.

The net value of balances of visible trade and of invisible trade and of unilateral transfers is the balance on current account.

- **Capital Account:** It records all international transactions that involve a resident of the domestic country changing his assets with a foreign resident or his liabilities to a foreign resident.

## **PUBLIC SECTOR UNDERTAKING (PSUs)/ PSEs:**

A state-owned enterprise in India is called a **public sector undertaking** (PSU) or a **public sector** enterprise. These companies are owned by the union government of India, or one of the many state or territorial governments, or both. The company stock needs to be majority-owned by the government to be a PSU.

# INDIAN ECONOMY

## **MAHARATNA/NAVRATNA/MINIRATNA STATUS FOR PUBLIC SECTOR UNDERTAKINGS**

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. As on 30 September 2015 there are **7 Maharatnas, 17 Navratnas and 73 Miniratnas**. There are nearly 300 CPSEs in total.

### **Maharatna:**

- ❖ A company qualifying for the Maharatna should have an average annual turnover of Rs 20,000 crore during the last three years against Rs 25,000 crore prescribed earlier.
- ❖ The average annual net worth of the company should be Rs 10,000 crore.
- ❖ The Maharatna status empowers mega CPSEs to expand their operations and emerge as global giants.
- ❖ The coveted status empowers the boards of firms to take investment decisions up to Rs 5,000 crore as against the present Rs 1,000 crore limit without seeking government approval.
- ❖ The Maharatna firms would now be free to decide on investments up to 15% of their

net worth in a project, limited to an absolute ceiling of Rs 5,000 crore.

### **List of Maharatnas:**

Bharat Heavy Electricals

- Coal India Ltd.
- GAIL (India) Ltd.
- Indian Oil Corporation
- NTPC Ltd.
- Oil and Natural Gas Corporation
- Steel Authority of India Ltd.

### ➤ **Navratna:**

- ❖ The Central Public Sector Enterprises (CPSEs) fulfilling the following criteria are eligible to be considered for grant of Having Schedule 'A' and Miniratna Category-1 status.
- ❖ Having at least three 'Excellent' or 'Very Good' Memorandum of Understanding (MoU) ratings during the last five years.
- ❖ The Navratna status empowers PSEs to invest up to Rs. 1000 crore or 15% of their net worth on a single project without seeking government approval.
- ❖ In a year, these companies can spend up to 30% of their net worth not exceeding Rs. 1000 cr. They also enjoy the freedom to enter joint ventures, form alliances and float subsidiaries abroad.

### **List of Navratna:**

Bharat Electronics Ltd.

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- Bharat Petroleum Corporation
- Container Corporation of India
- Engineers India Ltd.
- Hindustan Aeronautics
- Hindustan Petroleum Corporation
- Mahanagar Telephone Nigam Ltd.
- National Aluminium Company Ltd.
- National Buildings Construction Corporation
- National Mineral Development Corporation
- Neyveli Lignite Corporation
- Oil India
- Power Finance Corporation
- Power Grid Corporation of India
- Rashtriya Ispat Nigam Ltd.
- Rural Electrification Corporation
- Shipping Corporation of India
- **Miniratna Category:** For Miniratna category I status, the CPSE should have made profit in the last three years continuously, the pre-tax profit should have been Rs. 30 crores or more in at least one of the three years and should have a positive net worth.
- ❖ For category II, the CPSE should have made profit for the last three years continuously and should have a positive net worth.
- ❖ Miniratnas can enter into joint ventures, set subsidiary companies and overseas

offices but with certain conditions. This designation applies to PSEs that have made profits continuously for the last three years or earned a net profit of Rs. 30 crore or more in one of the three years.

❖ Miniratna Category-II CPSEs  
Category II miniratnas have autonomy to incurring the capital expenditure without government approval up to Rs. 300 crore or up to 50% of their net worth whichever is lower.

### **30 Important facts about RBI:**

- ❖ Name of Central Bank of India: Reserve Bank of India (RBI)
- ❖ No of Central Bank in India: One (1)
- ❖ Reserve Bank of India Act passed in 1934.
- ❖ Reserve Bank of India (RBI) established on 1 April 1935. RBI was nationalize in the year of **1st January, 1949.**
- ❖ The bank was set up based on the recommendations of the 1926 Royal Commission on Indian Currency and Finance, also known as **the Hilton-Young Commission.**
- ❖ Initially RBI was constructed as a Private Share holders' bank with fully paid up capital of Rs **5 Crores.**
- ❖ RBI is a statutory body. RBI is not a Commercial Bank.

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❖ RBI is the **sole authority** in India to issue Bank notes in India. Minting of coins and printing 1 RS notes are done by the Government of India.

❖ RBI has the authority to issue bank notes of denominational values of Rs. 2, 5, 10, 20, 50, 100, 500, 1,000, 5,000 and 10,000. RBI demonetized notes in the denominations of five thousand rupees (Rs. 5,000) and ten thousand rupees (Rs. 10,000) in 1938. They were reintroduced in 1954 and again demonetized in 1978. RBI can print these notes according to **the RBI act of 1934**.

❖ RBI prints currency in **15 Languages**.

❖ RBI can issue currency notes as much as the country requires, provided it has to make a security deposit of Rs. 200 crores, out of which Rs. 115 crores must be in gold and Rs. 85 crores must be FOREX Reserves.

❖ Emblem of RBI: **Panther and Palm Tree**. The RBI logo was inspired from the East India Company Double Mohur.

❖ Initially the headquarter of RBI was in **Calcutta** (Now Kolkata) but in **1937** it was permanently moved to **Mumbai**, Maharashtra.

❖ The Reserve Bank of India has 19 regional offices, most of them in state capitals and 9 Suboffices.

❖ RBI does not have second class employees. It has 17000 Class I, Class III & Class IV employees.

❖ The Executive head of RBI is known as Governor. Present Governor of Reserve Bank of India (RBI) is **Raghuram Rajan** who replaced Duvvuri Subbarao on September 4, 2013. He is the 23<sup>rd</sup> RBI Governor of India

❖ The governor is associated by **Four** Deputy Governors.

List of Deputy Governor:

1. Name: **Shri H.R.Khan**

2. Name: **Urijit Patel** (New Appointment, Replaced Subir Gokarn.)

3. Name: **Shri R. Gandhi** (Appointed on April 3, 2014.)

4. Name: **Shri S.S. Mundra**.

❖ **Manmohan Singh** is the only Prime Minister to have also served as the Governor of RBI. He was the Governor of RBI from 1982-1985. He was the 15<sup>th</sup> RBI Governor of India

❖ The bank has also two training colleges for its officers, viz. Reserve Bank Staff College at Chennai and College of Agricultural Banking at Pune.

❖ RBI is a member bank of the **Asian Clearing Union**.

❖ The first RBI Governor was **Osborne Smith**

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❖ The Indian to hold the position of the Governor of RBI was **Mr. Chintaman Dwarkanath Deshmukh** (C.D. Deshmukh). He was the third governor of RBI.

❖ C D Deshmukh, then Governor of RBI, represented India at the **Bretton Woods negotiations in 1944.**

❖ 1st women Deputy Governor of RBI **K.J.Udeshi**. She was appointed in 2003.

❖ RBI is a member of IMF (International Monetary Fund). At present there are total **90 bank** in the second schedule of Reserve Bank of India Act, 1934. [Latest inclusion – **Bhartiya Mahila Bank**]

❖ RBI was also the central bank for two other countries. It played the role of Central Bank of **Pakistan** till June 1948 and the Central Bank of **Burma** ( Myanmar) till April 1947

❖ **RBI's Nagpur** branch holds the biggest chunk of India's gold deposits

❖ The institution is country's major holder of Gold Deposits.

❖ RBI has launched a website to raise awareness among masses about fake notes in the market. The website is **[www.paisaboltahai.rbi.org.in](http://www.paisaboltahai.rbi.org.in)**. Here, you will find detailed information on how to spot fake currency.

❖ In 2013-14, RBI transferred Rs 52679 crores of its profits to Government of India

❖ RBI runs a **Monetary Museum** in the premises of the **Mumbai** head

## **20 Facts about State Bank of India:**

❖ State Bank of India is the largest Indian banking and financial services company by yearly turnover and total assets.

❖ The headquarters of SBI is in **Mumbai**, India.

❖ SBI is a State owned Bank.

❖ Bank of **Bengal** was established in 1806 in Kolkata. It was the first presidency bank of India.

❖ Two other presidency bank was established, **Bank of Bombay** in 1840 and **Bank of Madras** in 1843. These three banks were private shareholders' bank.

❖ **East India Company** also contributed to the share capital of each of them. These banks were given monopoly of Govt. After 1823, These three banks received the exclusive right to issue paper currency in 1861 with the **Paper Currency Act**

❖ Presidency Banks were amalgamated into the **Imperial Bank of India** (IBI) which was established in 27 January 1921

❖ According to the parliamentary Act, State Bank of India Act (1955), Imperial Bank of

# INDIAN ECONOMY

India (IBI) was acquired by the **Reserve Bank of India**.

❖ **On 30 April 1955** RBI renamed Imperial Bank of India (IBI) as State Bank of India.

❖ **State Bank of India (Subsidiary Banks) Act passed in 1959**. In 1959, eight banks were converted as associate banks of SBI

**1. State Bank of Bikaner**

**2. State Bank of Jaipur**

**3. State Bank of Hyderabad**

**4. State Bank of Indore**

**5. State Bank of Mysore**

**6. State Bank of Saurashtra**

**7. State Bank of Patiala**

**8. State Bank of Travancore**

In 1963, State Bank of Bikaner and State Bank of Jaipur were merged to form State Bank of Bikaner and Jaipur (SBBJ).

❖ In 2008, State Bank of Saurashtra was merged with the Parent Bank, SBI

❖ In 2010, State Bank of Indore was merged with – SBI

❖ The total number of Associate Banks of SBI currently working in India **Five(5)**

❖ State Bank of India has 137 foreign offices in 32 countries across the globe.

❖ As of 31st March, 2014: SBI has 43,515 ATMs.

❖ As of 31st March, 2014: SBI group (including associate banks) has 51,491 ATMs.

❖ As of 31st March, 2014: SBI has 15,869 branches.

❖ On October 7, 2013, **Arundhati Bhattacharya** became the first woman to be appointed **Chairperson** of the bank.

❖ Slogans of SBI:

❖ 1. With you all the way

2. Pure banking nothing else

3. The Banker to every Indian

4. The Nation banks on us

## FINANCE COMMISSION

It is a body set up under **Article 280** of the Constitution.

### Functions:

❖ Its primary job is to recommend measures and methods on how revenues need to be distributed between the Centre and states.

❖ The Commission also lays down the principles for giving out grant-in-aid to states and other local bodies.

❖ The commission has to take on itself the job of addressing the imbalances that often arise between the taxation powers and expenditure responsibilities of the centre and the states, respectively.

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❖ Primarily, it has to ensure a sense of equality in public services across the states.

## **Members of the Commission:**

**Chairman: Mr. Y.V. Reddy** (Former Governor of the Reserve Bank of India)

## **Other members:**

1. Abhijit Sen, Member, Planning Commission
2. Sushama Nath, Former Union Finance Secretary
3. M Govinda Rao, former Director of National Institute of Public Finance and Policy
4. Sudipto Mundle, former Acting Chairman, National Statistical Commission
5. AN Jha, Secretary to the Commission.

Head quarters: **New Delhi**

Tenure for the commission: **5 years**

Formed on: **22 November 1951**

## **Key recommendation:**

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.

## **List of Chairmans of Finance Commission:**

First FC	KC Neogy (1952-1957)
Second FC	K Santhanam (1957-1962)
Third FC	AK Chandra (1962-1966)
Fourth FC	PV Rajamannar (1966- 69)
Fifth FC	Mahaveer Thyagi (1969-74)
Sixth FC	K Brahmananda Reddy (1974-1979)
Seventh FC	J M Shelat (1979 -1984)
Eighth FC	Y B Chavan (1984 -1989)
Ninth FC	N K P Slave (1989 - 1995)
Tenth FC	K C Pant (1995-2000)
Eleventh FC	A M Khusro (2000 - 2005)
Twelfth FC	C Rangarajan (2005-2010)
Thirteenth FC	Dr Vijay L Kelkar (2010-15)
Fourteenth FC	Dr.Y VReddy. (2015 - 2020)



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Some Important Committees	
Naarimhan Committee I-II	Banking Sector Reforms
S.P. Gupta Committee	Unemployment
Onkar Goswami Committee	Industrial Sickness
Abid Hussian Committee	Small Scale Industries
Shankar Lal Guru Committee	Agricultural Marketing
Malhotra Committee	Insurance
Rakesh Mohan Committee	Infrastructure
Khan Committee	Universal Banking
Bhandari Committee	Restructuring of Rural Banks
Chalayaia Committee	Tax Reforms
N.K. Singh Committee	Foreign Direct Investment
Janki Ram Committee	Share Scam
Rangrajan Committee	Balance of Payments
Y V Reddy Committee	Administered Interest Rate
MS Ahluwalia (Task Force)	Employment Opportunities
Meera Seth Committee	Handloom (Textile)
Abhijeet Sen Committee	Grain Policy

## UNEMPLOYMENT

Unemployment is a major developmental issue in Indian economy is unemployment. When the labour possesses necessary ability and health to perform a job, but does not get job opportunities that state is called as unemployment. Number of unemployed is equal to labour force minus workforce. The labour force refers to the number of persons who are employed plus the number who are willing to be employed. The work force includes those who are actually employed in economic activity. If we deduct work force

from labour force we get the number of unemployment. The unemployment rate means the number of persons unemployed per 1000 persons in the labour force.

## TYPES OF UNEMPLOYMENT

Following are the important types of unemployment.

1. **Voluntary unemployment:** Voluntary unemployment happens when people are not ready to work at the prevailing wage rate even if work is available. It is a type of unemployment by choice.

2. **Involuntary Unemployment:** It is a situation when people are ready to work at the prevailing wage rate but could not find job.

3. **Natural Unemployment:** This is postulated by the Post Keynesians. According to them in every economy there exists a particular percentage of unemployment.

4. **Structural unemployment:** This type of unemployment is not a temporary phenomenon. This type of unemployment occurs due structural changes in the economy. It results due the result of backwardness and low rate of economic development.

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5. **Disguised Unemployment:** When more people are engaged in a job than actually required, then it is called disguised unemployment.

6. **Under Employment:** This exists when people are not fully employment ie; when people are partially employed.

7. **Open Unemployment:** Open unemployment is a situation where a large labour force does not get work opportunities that may yield regular income to them. It is just opposite to disguised unemployment. It exists when people are ready to work but are not working due to non availability of work.

8. **Seasonal unemployment:** Generally this type of unemployment is associated with agriculture. This type of unemployment occurs when the workers are engaged in a season products.

9. **Cyclical Unemployment:** It is generally witnessed in developed nations. This type of unemployment is due to business fluctuation and is known as cyclical unemployment.

10. **Technological Unemployment:** This type of unemployment occur when there is introduction of a new technology which causes displacement of workers.

11. **Frictional Unemployment:** It is a temporary unemployment which exists when

people moved from one occupation to another.

## **Important schemes in INDIA**

1952: Community Development Programme (CDP) overall development of rural areas and people's participation.

1960-61: Intensive Agriculture Development program (IADP) To provide loan for seeds and fertilizers to farmers

1964-65: Intensive Agriculture Area programme (IAAP) To develop special harvest in agriculture area.

1965: Credit Authorization Scheme (CAS) Involved qualitative credit control of reserve bank of India

1966-67: High yielding variety programme (HYVP) To increase the productivity of food grains by adopting latest varieties of inputs of crops.

1966-67: Green Revolution: To Increase productivity. Confined to wheat production.

1969: Rural Electrification Corporation To provide electricity in rural areas

1972: Scheme of Discriminatory Interest Rate To provide loan to the weaker sections of society at a concessional interest rate of 4%

1972-73: Accelerated Rural water Supply Programme (ARWSP) Providing drinking water in villages

# INDIAN ECONOMY

1973: Drought Prone Area Programme: Protection from drought by achieving environment balance and by developing ground water

1973: Crash Scheme for Rural Employment CSRE For rural employment

1973-74: Marginal Farmer and Agriculture Labor Agency (MFALA) Technical & financial assistance to marginal farmers

1974-75: Small Farmer Development Scheme SFDS Technical & financial assistance to small farmers

1975: Command Area Development Programme: (CADP) Better utilization of irrigational capacities

1975: Twenty Point Programme (TPP) Poverty eradication and an overall objective of raising the level living

1977: National Institution of Rural Development Training, investigation and advisory for rural development

1977-78: Desert Development Programme: (DDP) To control the desert expansion by maintaining environment balance

1977-78: Food For Work Programme: providing food grains to labor

1977-78: Antyodaya Yojna: Scheme of Rajasthan, providing economic assistance to poorest families

1979: Training Rural Youth for Self Employment TRYSEM (launched on 15th August) educational and vocational training

1980: Integrated Rural Development Programme: IRDP (launched on October 2, 1980) overall development of rural poor

1980: National Rural Development programme NREP employment for rural manforce

1982: Development of Women & Children in Rural Areas (DWCRA) sustainable opportunities of self employment to the women belonging to the rural families who are living below the poverty line.

1983: Rural Landless Employment Guarantee Programme (RLEGP) (Launched on August 15) employment to landless farmers and laborers

1983-84: Farmers Agriculture Service Centers FASCs Tell the people use of improved instruments of agriculture

1984: National Fund for Rural Development: To grant 100% tax rebate to donors and also to provide financial assistance for rural development projects

1985: Comprehensive Crop Insurance Scheme: Crop Insurance

1986: Council of Advancement of People's Action & Rural Technology (CAPART) Assistance to rural people

# INDIAN ECONOMY

1986: Self Employment Programme for the Poor SEPUP Self employment through credit and subsidy

1986: National Drinking Water Mission: For rural drinking water renamed and upgraded to Rajiv Gandhi National Drinking Water Mission in 1991.

1988: Service Area Account Rural Credit

1989: Jawahar Rozgar Yojna: JRY Employment to rural unemployed

1989: Nehru Rozgar Yojna NRY Employment to Urban unemployed

1990: Agriculture & Rural Debt Relief Scheme: ARDRS Exempt Bank loans up to Rs. 10000 for rural artisans and weavers

1990: Scheme for Urban Micro Enterprises SUME Assist urban small entrepreneurs

1990: Scheme of Urban wage Employment SUWE Scheme for urban poor's

1990: Scheme of Housing and Shelter Upgradation (SHASU) Providing employment by shelter Upgradation

1991: National Housing Bank Voluntary Deposit Scheme Using black money by constructing low cost housing for the poor.

1992: National Renewal Fund This scheme was for the employees of the public sector

1993: Employment Assurance Scheme (EAS) (Launched on October, 2) Employment of at least 100 days in a year in villages

1993: Members of parliament Local Area Development Scheme MPLADS (December 23, 1993) Sanctioned 1 crore per year for development works

1994: Scheme for Infrastructural Development in Mega Cities: SIDMC Water supply, sewage, drainage, urban transportation, land development and improvement slums projects in metro cities

1993: District Rural Development Agency DRDA Financial assistance to rural people by district level authority

1993: Mahila Samridhi Yojna (October 2, 1993) Encourage rural women to deposit in Post office schemes

1994: Child labor Eradication Scheme Shift child labour from hazardous industries to schools 1995: prime Minister Integrated Urban Poverty Eradication programme PMIUPEP To eradicate urban poverty

1995: Mid day Meal Scheme: Nutrition to students in primary schools to improve enrolment, retention and attendance

1996: Group Life Insurance Scheme for Rural Areas Insurance in rural area for low premium 1995: national Social Assistance programme: Assist BPL people.

1997-98; Ganga Kalyan Yojna Provide financial assistance to farmers for exploring ground water resources 1997 Kastoorba

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Gandhi Education Scheme: (15 August 1997)  
Establish girls schools in low female literacy areas (district level)

1997: Swaran Jayanto Shahari Rojgar Yojna:  
Urban employment

1998: Bhagya Shree Bal Kalyan Policy  
Upliftment of female child's March

1999: Annapurna Yojna 10 kgs food grains  
to elderly people April

1999: Swaran Jayanto Gram Swarojgar  
Yojna Self employment in rural areas

April 1999: Jawahar Gram Samridhi Yojna  
Village infrastructure

August 2000: Jan Shree Bima Yojna  
Insurance for BPL people

2000: Pradhan Mantri Gramodaya Yojna  
Basic needs of rural people December 25,

2000: Antyodaya Anna Yojna To provide  
food security to poor December 25,

2000: Pradhan Mantri Gram Sadak Yojna:  
Connect all villages with nearest pukka road.

September 2001: Sampurna Grameen  
Rozgar Yojna Employment and food security  
to rural people

December 2001: Valmiki Ambedkar Awas  
Yojna VAMBAY Slum houses in urban areas

2003: Universal health Insurance Scheme:  
Health insurance for Rural people

2004: Vande mataram Scheme VMS  
Initiative of public Private partnership during  
pregnancy check up.

2004: National Food for Work programme  
Supplementary wage as foodgrains for work

2004: Kastoorba Gandhi Balika Vidyalaya  
Setting up residential schools at upper  
primary levels for girls belonging to  
predominantly OBC, SC & ST

2005: Janani Suraksha Yojna Providing care  
to pregnant women 2005, Dec. 16: Bharat  
Nirman Development of India through  
irrigation, Water supply, Housing, Road,  
Telephone and electricity

2005: National Rural Health Mission:  
Accessible, affordable, accountable, quality  
health services to the poorest of the poor on  
remotest areas of the country.

2005: Rajeev Gandhi Grameen Vidyuti Karan  
Yojna: Extending electrification of all villages  
and habitations and ensuring electricity to  
every household.

2005: Jawahar Lal Nehru national Urban  
Renewal Mission: (JNNURM)

2006: February 2: National Rural  
Employment Guarantee Scheme NREGS 100  
days wage employment for development  
works in rural areas.

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2007: Rastriya Swasthya Bima Yojna: Health insurance to all workers in unorganized area below poverty line.

2007: Aam Aadmi Bima Yojna Insurance cover to the head of the family of rural landless households in the country.

2009: Rajiv Awas Yojna To make India slum free in 5 years

## **Which scheme merged with which?**

- National Food for Work program was merged with NREGA.
- Sampoorna Grameen Rozgar Yojna merged with NREGA.
- Intesified Jawhar Rozgar Yojna 1993 was merged with Employment Assurance Scheme 1996 which was later merged with Sampoorna grameen Rozgar Yojna 2001.
- IRDP , TRYSEM, DWCRA, Million Wells Scheme, SITRA & Ganga kalian Yojna merged with Swaran jayanti Gram Swarogjar Yojna.
- Rural Landless Employment Guarantee programme merged with Jawahar Rozgar Yojna which was replaced by Jawahar Gram Samridhi Yojna (1999) and Jawahar Gram Samridhi Yojna was merged with Sampoorna grameen Rozgar Yojna (2001)

## **IMPORTANT POINTS ON ECONOMICS:**

1. Which sector of Indian Economy has

shown remarkable expansion during the last decade? – Tertiary Sector

2. Hindu Rate of growth refers to the rate of growth of which sector? – GDP

3. In India, Hindu Rate of Growth is associated with which income? – National Income

4. What is the base year for computation of National Income in India? – 1993-94

5. As the economy develops, what happens in the share of the tertiary sector in the GDP? – Increases

6. Who coined the term 'Hindu rate of growth' for Indian Economy? – Raj Krishna

7. Who wrote a book describing the theory of economic drain of India during British rule? – Dadabhai Naoroji

8. Which is definitely a major indication of the State of the economy of a country? – Rate of GDP growth

9. Where is the Indian Sugarcane Research Institute situated? – Lucknow

10. The impact of Green Revolution was felt most in the production of which crop? – Wheat

14. Where first Agriculture University of India was established? – Pantnagar

15. In which year was the Food Corporation of India (FCI) set up? – 1965

# INDIAN ECONOMY

16. Which bank provides the largest credit to agriculture and allied sectors? – Commercial Banks
17. Which is the apex institution in the sphere of Agriculture credit? – NABARD
18. The Bonded Labour System (Abolition) Act was legislated in which year? – 1976
19. The Green Revolution in India was the outcome of the efforts of which person?  
– M. S. Swaminathan
20. Who is known as Father of White Revolution in India? – V. Kurien
21. Where is the Central Rice Research Institute located? – Cuttack
22. Dr. M. S. Swaminathan has distinguished himself in which fields? – Agriculture
23. Agriculture sector directly employs what percentages of labour force in India? – 65 %
24. Which method of soil conservation is most effective in arid areas? – Shelter belt
25. Which state is the most industrially advanced State in India? – Maharashtra
26. Industrial licensing was finally abolished (with a few exception) in which policy? – Industrial Policy, 1991
27. First Industrial Policy of free India was announced in which year? – 1948
28. Who was the Chairman of the National Commission for Enterprises in the Unorganised Sector? – Arjun Sengupta
29. Commercial paper is a source of credit for which industry? – Corporate Industry
30. Which car companies has launched a small cheaper car 'Nano'? – Tata Motors Ltd.
31. What is the classification of industries on the basis of raw-materials? – Primary and Secondary
32. Which is the biggest enterprise of the Government of India? – Railway
33. Raurkela Steel Plant was set up with the assistance from which country? – West Germany
34. In India, liberal Industrial Policy was adopted in which year? – 1991
35. Bhilai Steel Plant is the collaborative project of Indian Government and which other country? – Soviet Union
36. Since when disinvestment started in public enterprises? – 1991-92
37. Which entity holds the Number 1 position among Indian international trading company? –MMTC
38. Which one of the following Indian States does not keep its own High Court? – Manipur
39. Which one of the following is not the main jurisdiction of the High Court of a State? – Advisory Jurisdiction
40. Omkar Goswami Committee was set up by the Government for examining the issue of which matter? – Industrial sickness

## INDIAN ECONOMY

41. The licensing policy for the industries drew strength from which act? – Industrial Act, 1951
42. Where is the Forest Reserve Institute of India located? – Dehradun
43. Which State in India is estimated to have the largest coal reserves in India? – Jharkhand
44. Which is a 'Hot Spot' for biological diversity in India? – Sundarban
45. Major coalfields of India are located in the river valley of – Damodar
46. Which one of the following is the highest gravity dam which river? – Bhakra Dam
47. What is the minimum forest cover to maintain ecological balance in the plains? – 33%
48. Which is the longest irrigation canal in India called? – Indira Gandhi Canal
49. When was the first National Forest Policy issued by the Government of India? – 1952
50. The national forest policy aims at maintaining how much of the total geographical area under forests? – One-fifth
51. The Government of India has decided to declare which river a 'National River'? – Ganga
52. Which 'geographical indicators' has not been recognised for patent protection? – Darjeeling Basmati
53. National Horticulture Mission was launched in which Five Year Plans? – Tenth Five Year Plan
54. 'Twenty Point Programme' (Beessutri Karyakrama) was first launched in which Year? – 1975
55. Who presides over the National Development Council of India? – Prime Minister of India
56. Which is an extra- constitutional and non- statutory body? – Planning Commission
57. Which experienced the fastest expansion during the plan in India? – Services
58. Primary emphasis during Second Plan was laid on the development of which industry? – Basic and Key industries
59. Who was the First Chairman of Planning commission of India? – Pt. Jawahar Lal Nehru
60. Whose name is associated with formulation of Planning Strategy in Second Five Year Plan? – Prasanta Chandra (P.C.) Mahalanobis



# INDIAN ECONOMY

61. Which is the highest body that approves Five Years Plans in the country? – National Development Council
62. By whom was the Rolling Plan for backward country suggested? – Gunnar Myrdal
63. In which Five Year Plan, the main objective was the eradication of poverty? – Fifth Five Year Plan
64. Durgapur, Bhubaneswar and Rourkela iron steel-plants were setup during which plan? – First
65. The iron and Steel plants of Rourkela and Durgapur were conceived under which plan? – Second Five Year Plan
66. The real introduction of Decentralized Planning in India was made for the first time during the which plan? – 9th Plan
67. Planning Commission was established in 1950 through which order? – An executive order
68. The slogan 'Garibi Hatao' (Poverty abolition) was given in which Five Year Plan? – Fifth plan
69. In which one of year 'Rolling Plan' was on operation in India? – 1978-79
70. The major emphasis in the First Five Year Plan was on which field? – Agriculture
71. In which Five Year Plan, Economic Development Rate was maximum? – Tenth Five Year Plan
72. Only one can be the ex-officio Chairman of the Planning Commission. Who is that? – Prime Minister
73. Mahalanobis Model has been associated with which Five Year Plan? – Second Five Year Plan
74. The Planning Commission of India was constituted in which year? – 1950
75. Which Plan gave emphasis on removal of poverty for the first time? – Fifth
76. Which is not an objective of India's economic planning? – Population Growth

## INDIAN ECONOMY

77. The rolling plan concept in national planning was introduced by which government? – Janta Government

76. The Government has renamed NREGA scheme and the name associated with which person? – Mahatma Gandhi

77. District Primary Education Programme was initiated in which year? – 1994

78. To whose help STEP is the abbreviated name of the welfare programme? – Woman

79. On which basis has the planning, commission defined 'Poverty line' in rural areas in India? – 2400 k cal

80. The National Rural Employment Scheme was launched throughout the country from which date? – 1-4-2008

81. Which is the developed the concept of Human Development Index? – Mehboob-ul-Haq

82. National Rural Health Mission (NRHM) was launched in which year? – 2005

83. Swamjayanti Gram Swarajgar Yojana came into being in which year? – April, 1999

84. In terms of Human Development Index which is the most developed State of India? – Kerala

85. Which programme announced by the Prime Minister for the minorities in India? – 15 Point Programme

86. 'Food for Work Programme' was introduced during which Five Year Plans? Fifth Five year plan  
87. In which Five Year Plan, the main objective was the eradication of poverty? – Fifth Five Year Plan

88. While calculating HDI, what are the maximum value for Life Expectancy at birth (years) taken? – 85 and 25

89. In terms of Human Development Index, India falls under which category? – Very Low

90. Which is the standard of living in a country represented? – Per Capita Income

91. Which is a project to develop watersheds in India? – NWDPPRA

92. Which plan gave emphasis on removal of poverty of the first time? – Fifth

# INDIAN ECONOMY

93. In India, the Community Development

Programme was started on which date? –

October 2, 1952

94. Which represents 'I' in the abbreviation

IRDP? – Integrated

95. National Rural Employment Guarantee

Act (NREGA) does not promote? – Promote

inclusive growth

96. Poverty level in India is established on

the basis of which expenditure? – House-

hold consumer expenditure

97. Mid-Day Meal is a scheme to provide

nutritious food to which children? – school

going children

98. What is NOT the source of revenue of

Central Government? – Agriculture Income

Tax

99. Which is the largest single source of the

Government's earning from tax revenue? –

Central excise

100. Which taxes/duties is NOT under the

jurisdiction of the Central Government?–

Land Revenue.

## MISCELLANEOUS FACTS

According to Marshall "Economics is the science of wealth"

- Father of Economics is Adam Smith.
- Scarcity definition of Economics is due to Robbins.
- Deductive method is also known as Abstract method or Analytical method or Hypothetical method.
- Deductive method goes from general to particular.
- Inductive method goes from particular to general.
- For a linear demand curve point elasticity is defined as the ratio between the lower segment of demand curve to the upper segment of the demand curve.
- At upper terminal point of demand curve the  $e=0$  and at lower terminal point  $e$  is infinity ie not defined.

# INDIAN ECONOMY

- Consumer surplus is infinite when demand curve is inelastic and zero in case of perfectly elastic.
- According to Ricardo Rent is related to only land.
- According to Ricardo Rent is measured from marginal land or no rent land.
- According to Modern theory of rent, Rent can arise due to any factor of production.
- According to Modern theory of rent, Rent is measured from transfer earnings.
- According to Ricardo marginal land is the land which gives no rent.
- According to Ricardo the operation of Law of decreasing Returns gives rise to rent.
- According to modern theory of rent, rent arises when the supply of a factor is perfectly inelastic.
- According to Ricardo, rent does not determine price.
- The concept of Quasi rent is developed by Marshall.
- The rent arises due to any other factor other than land is called Quasi rent.
- The most appropriate measure of country's economic growth is Per Capita Real Income.
- Sudden decrease in death rate would cause increase in per capita.
- Garibi Hatao and Growth & Justice were the main objectives of Fifth Five Year Plan.
- Economic survey is published by the Ministry of Finance.
- National Income committee was formed in 1949.
- The Chairman of National Income Commission was VKRV Rao.
- National Income was first calculated by Dadabhai Naoroji.
- India's National Income is collected by Central Statistical Organisation CSO.
- Per capita income = National Income/Population.

# INDIAN ECONOMY

- The true index of economic growth is an increase in the per capita income at constant prices.
- An increase in the National Income at constant prices is called Real increase in National Income.
- In India we have national income statistics at constant prices only.
- Value added method is used for estimating National Income excluding intermediate goods.
- Personal disposable income is the difference between Personal income and personal direct tax.
- Net national product at factor cost is the same thing as National Income.
- Fiscal policy of India is formulated by the Ministry of Finance.
- Economic growth is usually coupled with Inflation.
- Stagflation is inflation with depression.
- Poverty gap is difference between poverty line and actual income levels of all those living below that line.
- Absolute poverty is poverty in terms of the basic minimum calorie requirement.
- Mixed economy is that economy wherein public and private sectors co-exist.
- The nature of Indian economy is mixed economy.
- Law of demand means Fall in demand due to rise in price.
- Slope of demand curve is Negative.
- Elasticity of demand is a Quantities statement.
- Elasticity of demand means Ratio of change between Price and Demand.
- Demand for match box is perfectly inelastic.
- Demand for necessities inelastic..
- Demand for luxuries is Elastic.
- When production is under Law of Diminishing Returns, then AC and MC curves are rising upwards.

# INDIAN ECONOMY

- When marginal revenue is zero, The total revenue will be maximum.
- When total revenue is maximum The marginal revenue is zero.
- When MR is negative, the AR is positive.
- Marginal revenue can be positive, negative and zero.
- AR can be positive.
- Under perfect competition MR & AR are equal.
- Under monopoly, the MR & AR curves are sloping downward.
- The number of laws of returns is three.
- Law of returns to scale under long period.
- On the basis of competition the market is classified into three parts.
- Selling cooking gas in India is Duopoly kind of market.
- If there are few sellers of a commodity, the market situation is called oligopoly.
- The product differentiation is found in perfectly competition market.
- Price discrimination is a feature of perfectly competition market.
- Marshall said "Equilibrium price is determined by both demand and supply.
- Under perfect competition, price of a factor is determined by Industry.
- Demand curve is vertical when demand has less than unity elasticity.
- Demand curve is horizontal when demand has infinite elasticity.
- Consumer's surplus is large when demand is inelastic.
- According to Malthus, Population increases Geometrically and food supply in Arithmetically.
- In estimating National Income, Dada Bhai Naorji attempted to show Poverty of Indians.
- New series gives the National Income estimates with revised base of 1964-65.
- The law of demand does not apply to the following cases.
  1. Future prices.
  2. Status goods.

# INDIAN ECONOMY

3. Giffen goods.

- Consumer surplus = Total utility -  $P \cdot Q$ .
- Properties of Indifference curves.
  1. Slopes downwards from left top to right bottom.
  2. Convex to the origin.
  3. ICs never intersect.
  4. ICs need not be parallel.
  5. ICs are asymptote to both X-axis and Y-axis.

- Under monopoly the MR curve lies below the AR curve.

- Fiscal policy of India is formulated by Finance ministry.

- "Apna Khet, Apna Kam" a new scheme under MGNREGA has been initiated in Rajasthan.

- Balance of Payments BoP says record of all its economic transaction with the rest of the world.

- The central bank of the country is the Reserve Bank of India RBI.

- RBI was established in 1935 by the GoI Act, 1935.

- RBI was nationalised in the year 1949.

- First Governor of RBI was Osborne Smith.

- First Indian Governor of RBI was C.D. Deshmukh.

- Present Governor of RBI is Dr. Raguram Rajan.

- Security Exchange Board of India -SEBI is a statutory body ; was established in 1988.

- ☆ SEBI was made statutory body in 1992.

- ☆ SEBI has its headquarters in Mumbai.

- ☆ Chairman of SEBI is O. Kumar Sinha\*.

- SIDBI was established in 1990 by the act of parliament.

- ☆ The Headquarters of SIDBI is in Lucknow.

- NABARD was established on 12- July, 1982.

- ☆ NABARD was established on the recommendations of Sivaraman Committee.

- ☆ NABARD was established in Sixth Five Year Plan.

# INDIAN ECONOMY

- Central Statistical Organisation CSO has shifted the base year for estimating National Income from 1993-94 to 1999-2000.
- The number of approved share markets in India is 23.
- India's unemployment rate is 4.9%.
- Gujarat has the lowest unemployment rate in the country.
- J&K has the highest unemployment rate in north India.
- Highest unemployment rate is in Sikkim followed by Arunachal Pradesh..
- The largest source of National Income in India is the Service sector.
- For controlling inflation, the central bank should take the step to sale of government securities in open market.
- Stagflation refers to a situation which is characterized. by Sustained Price-rise and rising unemployment.
- New poverty line in India is Rs.32 per day in rural areas and Rs. 47 in urban areas
- The year of great divide is 1921.

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# GEOGRAPHY

## Solar System Some Facts

Biggest Planet	Jupiter
Smallest Planet	Mercury
Nearest Planet to Sun	Mercury
Farthest Planet from Sun	Neptune
Nearest Planet to Earth	Venus
Brightest Planet	Venus
Brightest star after Sun	Sirius
Planet with maximum satellites	Jupiter
Coldest Planet	Neptune
Hottest Planet	Venus
Heaviest Planet	Jupiter
Red Planet	Mars
Biggest Satellite	Ganymede
Smallest Satellite	Deimos
Blue Planet	Earth
Morning/Evening Star	Venus
Earth's Twin	Venus
Green Planet	Neptune
Planet with a big red spot	Jupiter
Lord of the Heavens	Jupiter
Greatest Diurnal Temperature	Mercury
God of Heaven	Earth
God of wars	Mars
God of Underworld	Pluto

### Natural Satellites that have atmosphere in our Solar System:

1. Europa – Jupiter      2. Ganymede - Jupiter
3. Callisto – Jupiter    4. Io - Jupiter
5. Enceladus – Saturn   6. Triton - Neptune
7. Titan – Saturn

A trans-Neptunian object is any minor planet in the Solar System that orbits the Sun at a greater distance on average than Neptune. This region is also known as Kuiper Belt.

### Earth Latitude and Longitude

There are total 181 latitudes including the equator. Each parallel of latitude is a circle, but they are not equal.

1 degree latitude = 111km

Each meridian of longitude is a semi-circle. 180° meridian (International Date Line) lies exactly opposite to 0° meridian. Such points are called Antipodal Points.

The earth is divided into 24 longitudinal zones, each being 15° or 1 hour apart in time (4 minutes/degree).

### Origin of the Earth

#### The Earth- Shape and Size

##### Shape of the earth

Pythagoras (572-500 B.C), a Greek philosopher and mathematician, was among the first to suggest that the Earth was shaped like a globe. Copernicus gave the Heliocentric theory.

##### The Earth is not flat

If the Earth were a flat disc, then the rising Sun would have been seen at all places at the same time. But this does not happen. Places in the east see the rising Sun earlier.

When a ship approaches land, its funnel or mast is seen first and then the hull. If the earth had been flat, whole ship would have been seen at the same time.

##### The Earth is a sphere

- ❖ The Earth is rarely oriented in the same position during successive eclipses but it always casts a circular shadow, thus proving that the Earth is a sphere. A sphere is the only solid body that will always cast a circular shadow.
- ❖ At the North Pole, the Pole star can always be observed at 90 degrees in the sky, since the star lies in the line with the axis of the Earth.
- ❖ As one travels southwards, the angle of Pole star decreases.
- ❖ At the Equator the angle becomes zero degree.

##### The Earth as an Oblate Spheroid

Refined measurements of the Earth have proved that the true form of the Earth resembles a sphere that has been compressed at the poles and made to bulge at the Equator. This form is known as an oblate spheroid.

**The various factors which make the earth suitable for life to revolve and survive are**

# GEOGRAPHY

✓ The Earth has all the essential elements like carbon (in the form of CO<sub>2</sub>), hydrogen (H<sub>2</sub>), nitrogen (N<sub>2</sub>) and oxygen (O<sub>2</sub>) which act as building blocks for the origin of life.

✓ The earth is neither too hot nor too cold. It has the right temperature range for carrying out the life sustaining chemical reactions.

✓ The earth has enough oxygen gas in its atmosphere for the survival of living beings through breathing.

✓ The earth has a protective blanket of ozone layer high up in its atmosphere to save life from harmful ultraviolet radiations coming from the Sun.

## Interior of the Earth

❖ Earth Circumference:  
40,232 KM

❖ The earth's radius is 6,370 km.

❖ Earth Area: 510 million  
SquareKilometers

❖ Average distance from sun: 149  
million Kilometers.

## Earth Rotation

• Spins on its imaginary axis from west to east in 23hrs, 56min and 40.91sec.

• Rotational velocity at equator is 1667 Kilometers/h and it decreases towards the poles, where it is zero.

It takes 27.322 days to rotate earth and light from moon to Earth takes 1.3 seconds

## Earth's rotation results in

i. Causation of days and nights;

ii. A difference of one hour between meridians which are 15° apart;

iii. Change in the direction of wind and ocean currents; Rise and fall of tides every day.

iv. The longest day in North Hemisphere is June 21, while shortest day 22 Dec (Vice-versa in S.Hemisphere).

• Days and nights are almost equal at the equator.

## Earth Revolution

• It is earth's motion in elliptical orbit around the sun.

• Earth's average orbital velocity is 29.79 Kilometers/s.

• Takes 365 days, 5 hrs, 48 min and 45.51 sec. It results in one extra day every fourth year.

## Direct Sources

✓ Easily available solid earth material is surface rock or the rocks we get from mining areas.

✓ During volcanic eruption, **Magma** is the molten material thrown onto the surface of the earth and it is difficult to analysis the depth of the source of such magma.

✓ Besides mining, scientists have taken up a number of projects to penetrate deeper depths to explore the conditions in the crustal portions.

✓ Scientists world over are working on two major projects - "**Deep Ocean Drilling Project**" and "**Integrated Ocean Drilling Project**".

✓ Gold mines in South Africa are as deep as 3 - 4 km.

✓ The deepest drill is done at Kola, in Arctic Ocean has so far reached a depth of 12 Km.

## Indirect sources

✓ In mining activity, the temperature, pressure, density of the material increase with the increasing distance towards the interior of the earth. Knowing the total thickness of the earth, scientists have estimated the rate of change of these characteristics at different depths.

✓ The material and the structure observed in **Meteors** (from outer space) are similar to the solid bodies available in our planet.

✓ The other indirect sources are **Gravitation**, **Magnetic field** and **Seismic activity**.

✓ The Gravitation force (g) is greater near the poles and less at the equator. It differs according to the latitudes and also with the mass of the material. Gravity anomalies give us information about the distribution of mass of the material in the crust of the earth.

# GEOGRAPHY

- ✓ Magnetic surveys also provide information about the distribution of magnetic materials in the crustal portion.
- ✓ Seismic activity is one of the most important sources of information about the interior of the earth. Example: earthquake.

## EARTHQUAKE

- ✓ Earthquake (also known as a **quake**, **tremor** or **temblor**) refers to the vibration of the earth's surface caused by endogenetic forces of Earth.
- ✓ The **seismicity**, **seismism** or **seismic activity** of an area refers to the frequency, type and size of earthquakes experienced over a period of time.
- ✓ The magnitude or intensity of energy released by an earthquake is measured by the **Richter Scale**, whereas the damage caused is measured by modified **Mercalli Intensity Scale**. The magnitude is expressed in numbers from 0 – 10. The range of intensity scale is from 1 – 12.

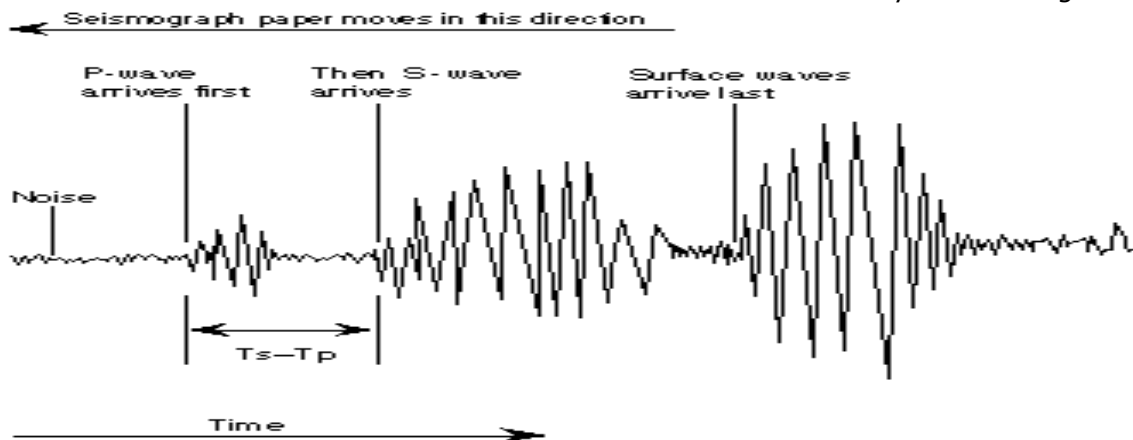
## Causes

- ✓ Most of the earthquakes are caused by the movements of plates.
- ✓ It is the result of a sudden release of energy in the Earth's crust that creates seismic waves which travel in all directions.

- ✓ The point where the energy is released is called the **focus** of an earthquake and the point on the surface nearest to the focus is called **epicentre**.

## Types of Waves

- ✓ Seismograph records the waves reaching the surface.
- ✓ Earthquake waves are of two types – **Body waves** and **Surface waves**.
- ✓ **Body waves** are generated due to the release of energy at the focus and move in all directions travelling through the body of the earth.
- ✓ There are two types of body waves – **P waves** and **S waves**.
- ✓ Primary wave (P waves) is the waves of short wavelength and high frequency. They are longitudinal waves and can travel through solid, liquid and gases.
- ✓ Secondary wave (S waves) are the waves of short wave length and high frequency. They are traverse waves, which travel through all solid particles.
- ✓ **Surface waves or long waves** are generated when the body waves interact with the surface rocks and generate a new set of waves and they move along the surface.



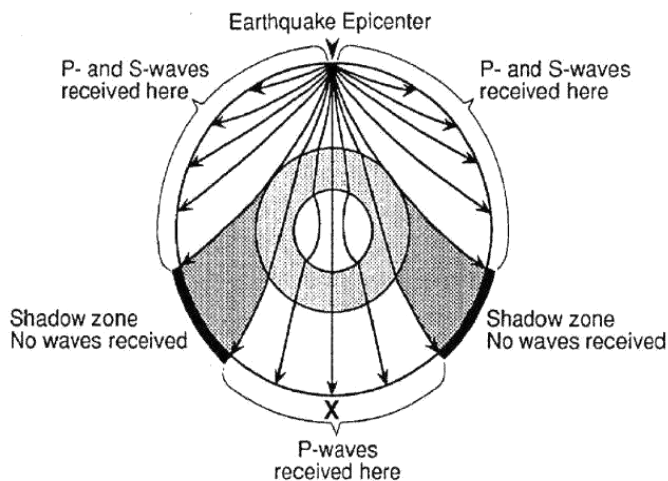
- ✓ Out of these waves, surface waves are considered to be the most damaging waves.

## Shadow zone

- ✓ There are some areas where the waves are not get recorded in seismographs is called **shadow zone**.

# GEOGRAPHY

- ✓ The zone between  $105^{\circ}$  and  $145^{\circ}$  from epicenter was identified as shadow zone for both P and S waves.
- ✓ The zone within  $105^{\circ}$  both P and S waves are recorded and the zone beyond  $145^{\circ}$  record the arrival of P waves alone.



**Earthquake zones in India** - Arunachal Pradesh, Nagaland, Tripura, Manipur, Mizoram, Andaman and Nicobar Islands, Jammu and Kashmir etc.

## STRUCTURE OF THE EARTH

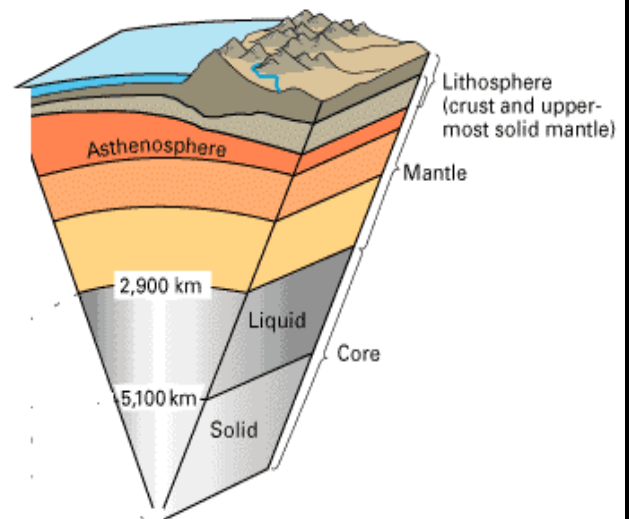
### The Crust

- ✓ It is the outermost solid part of the Earth. It is brittle in nature.
- ✓ The thickness of the crust varies under the oceanic and continental areas.
- ✓ The mean thickness of oceanic crust is 5 km whereas that of the continental is around 30 km but it is as much as 70 km thick in the Himalayan region.
- ✓ It is made up of heavier rocks having density of  $3 \text{ g/cm}^3$ .
- ✓ Basalt is the rock found in oceanic crust.
- ✓ The upper part of the crust is called 'sial' because it consists of silica and aluminium in greater proportions whereas the lower part of the crust is called 'sima' because it consists of silica and magnesium in higher proportions.

### The Mantle

The portion of the interior beyond the crust is called the Mantle.

- ✓ Mantle extends from Moho's discontinuity to a depth of 2,900 km.
- ✓ The upper portion of Mantle is called asthenosphere (word astheno means weak) and it is extending upto 400 km.
- ✓ It is the main source of magma. It has a density ranges from 3.0 to 4.7.
- ✓ The crust and the uppermost part of the mantle are called lithosphere. Its thickness ranges from 10- 200 km.



### The Core

- ✓ The core - mantle boundary is located at the depth of 2900 km.
- ✓ The outer core is in liquid state while the inner core is in solid state.
- ✓ The density of material at the mantle core boundary is around  $5 \text{ g/cm}^3$  and at the centre of the earth at 6300 km, the density value is around  $13 \text{ g/cm}^3$ .
- ✓ The core is made up of very heavy material mostly constituted by nickel and iron and it is sometimes referred to as the nife layer.

### Tectonic Activities:

Plate tectonics (tectonicus - "pertaining to building") is a scientific theory that describes the large-scale motion of Earth's lithosphere. Plate

# GEOGRAPHY

tectonics is the theory that Earth's outer shell is divided into several plates that glide over the mantle, the rocky inner layer above the core.

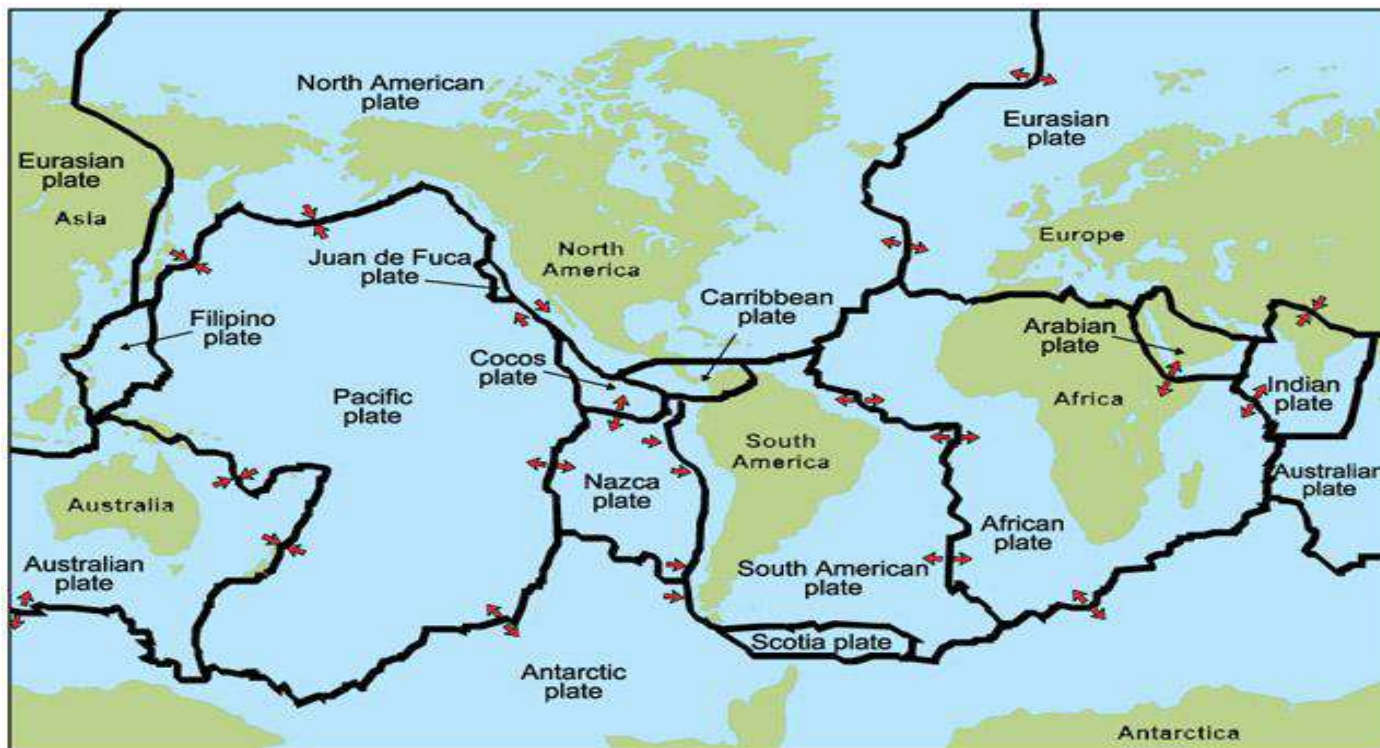
**Super continents:** As the continents jostle around the Earth, they occasionally come together to form giant supercontinents, a single landmass. A more recent supercontinent called Pangaea formed about 300 million years ago.

**Orogeny:** Orogeny refers to forces and events leading to a large structural deformation of the Earth's lithosphere (crust and uppermost mantle) due to the interaction between tectonic plates.

(Note: **Geological time scale:**- The geological time scale (GTS) is a system

of chronological measurement that relates stratigraphy to time, and is used by geologists, paleontologists, and other Earth scientists to describe the timing and relationships between events that have occurred throughout Earth's history. Stratigraphy is a branch of geology which studies rock layers (strata) and layering (stratification).

**Denudation:** In geology, denudation is the long-term sum of processes that cause the wearing away of the Earth's surface by moving water, ice, wind and waves, leading to a reduction in elevation and relief of landforms and landscapes.)



## Ring of Fire

An area around the Pacific Ocean where large numbers of earthquakes and volcanic eruptions occurs. It is home to over 75% of the world's active and dormant volcanoes.

**The movement of the plates creates three types of tectonic boundaries:** **convergent**, where plates move into one another; **divergent**,

where plates move apart; and **transform**, where plates move sideways in relation to each other. In some places, the plates are pulling apart. New crust is pushed up from below. These are called divergent boundaries and they create rifts or valleys. Large lakes sometimes form in rifts. The Red Sea formed where the African and Arabian plates pulled apart.

# GEOGRAPHY

In other places the plates are pushing against each other, creating mountains. These areas are known as convergent boundaries. Sometimes one crust is dragged beneath – or subducted – below another one. Ocean plates are heavier than continental plates so these plates are always dragged beneath.

A transform boundary happens when plates slide past each other but neither collides nor rips apart. The San Andreas Fault in California is a transform boundary.

## Effects of Tectonic Movement:

It causes earthquakes

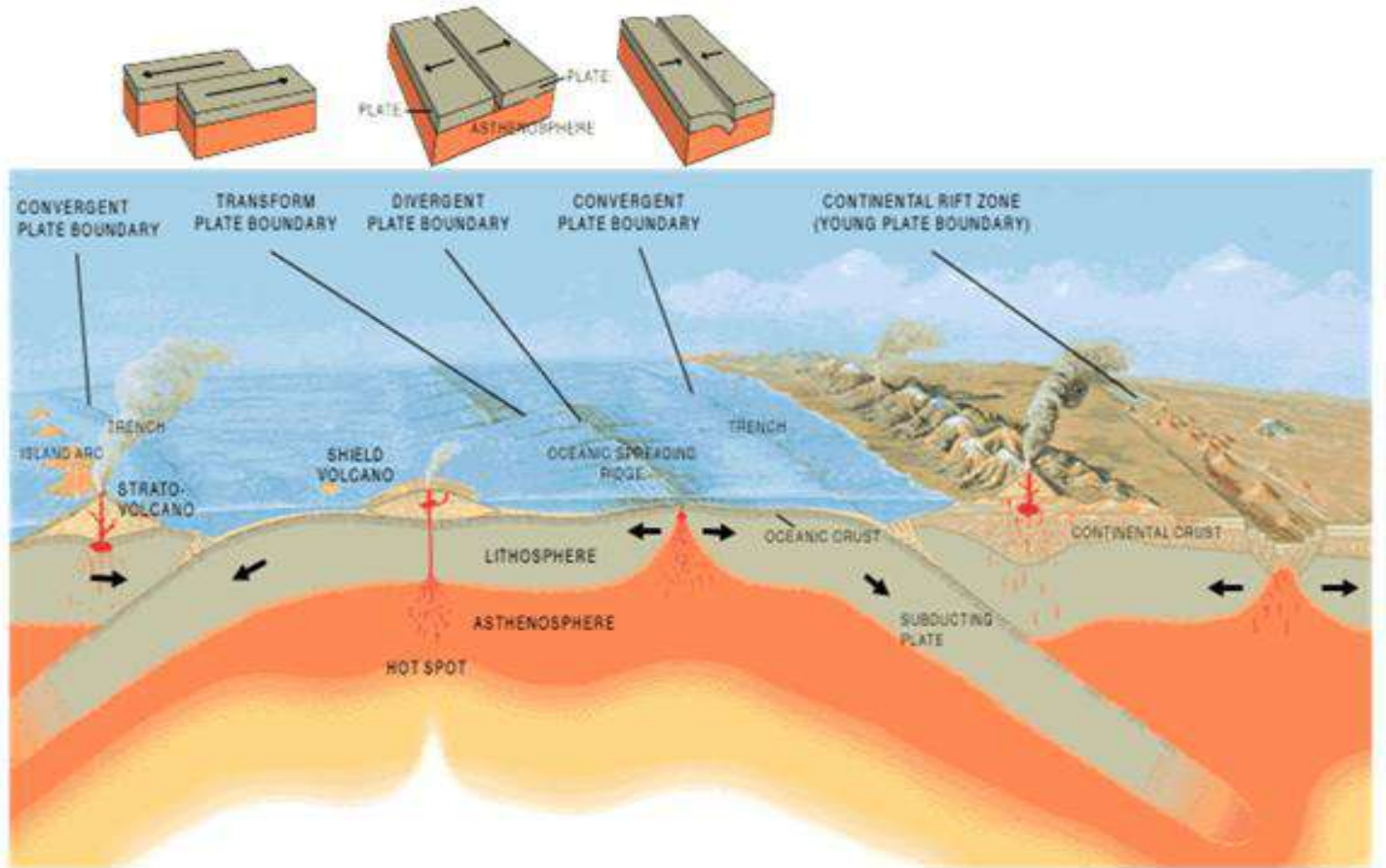
It causes volcanism

It induces recycling of elements within the biosphere and between the geosphere and biosphere

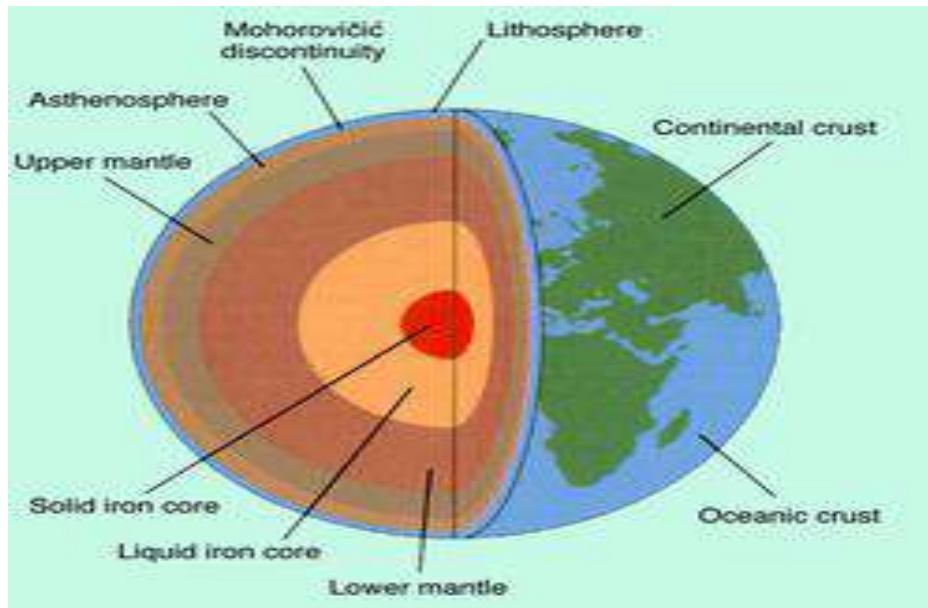
It causes mountain-building

**Earthquake:** During an earthquake, the lithosphere breaks suddenly along a fault. Slip of a few millimeters to tens of meters typically occurs along the fault during an earthquake.

**Volcano Formation:** When a tectonic plate sinks, it sinks down into the mantle and becomes very hot. So hot, in fact, that the rock melts. This molten rock will gradually make its way up to the surface of the earth through a series of cracks.



# GEOGRAPHY



## Types of Volcanoes

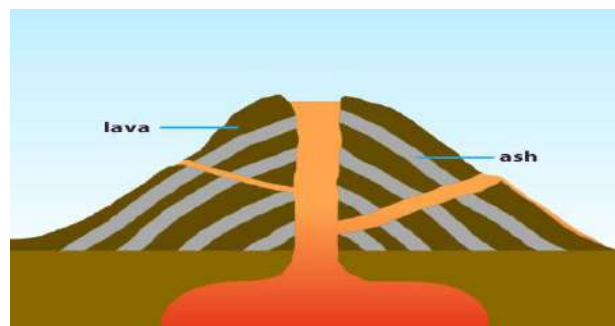
Volcanoes are classified on the basis of nature of eruption and the form developed at the surface

There are three main types of volcano - composite or strato, shield and dome.

## Composite Volcanoes

Composite volcanoes are steep sided cones formed from layers of ash and pyroclastic flows.

Composite volcanoes can rise over 8000 feet.



Eruptions are explosive due to the thick, highly viscous lava that is produced by composite cone volcanoes. The thick lava cannot travel far down the slope of the volcano before it cools.

Composite volcanoes are usually found at destructive plate margins. Examples of composite volcanoes include Mount Fuji (Japan), Mount St Helens (USA) and Mount Pinatubo (Philippines).

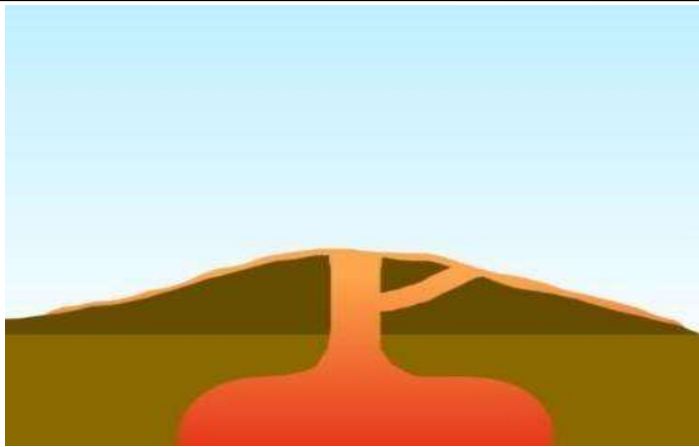
## Shield Volcanoes

Shield volcanoes are low with gently sloping sides and are formed from layers of lava.

Eruptions are typically non-explosive. Shield volcanoes produce fast flowing fluid that can flow for many miles.



# GEOGRAPHY



Shield volcanoes are usually found at constructive boundaries and sometimes at volcanic hotspots. Examples of shield volcanoes include Mount Kilauea and Maunaloa on Hawaii.

## **Dome (Acid Lava Cones)**

Acid is much thicker than which flows from shield volcanoes.

Dome volcanoes have much steeper sides than shield volcanoes. This is because the lava is thick and sticky. It cannot flow very far because it cools and hardens.

An example is Puy de Dome in the Auvergne region of France which last erupted over 1 million years ago.

## **Volcanic eruptions**

✓ The pouring out of the magma or molten rock through ground surface is called a volcanic eruption.

✓ At the time of eruption, the magma, steam, fragments of rock, dust and gaseous substances are ejected with great force from under the ground surface through a pipe like passage.

✓ The opening of this pipe on the earth's surface is known as the vent which forms a crater.

✓ The lava which is thrown into the sky during an eruption, falls to the ground in the form of solid fragments. Dark clouds gather in the sky and it begins to rain heavily.

✓ The volcanic ash and dust mixes with the rainwater giving rise to hot mud flows.

## **Types of volcanic eruptions**

✓ Volcanic eruptions are classified into two types depending on the manner of ejection of the magma:

(i) Central eruption

(ii) Fissure eruption

## **Central eruption**

✓ This type of eruption is sometimes very explosive, because lava, steam, gas, dust, smoke, stone fragments are ejected from a narrow pipe from under the ground with greater intensity. This type of eruption gives rise to conical or dome shaped hills.

# GEOGRAPHY

✓ Some examples of volcanic mountains formed due to central eruption are Mt. Kilimanjaro in Africa, the Fujiyama in Japan and the Vesuvius and Mt. Etna in Italy.

✓ It is basically poured acidic lava.

## **Fissure eruption**

✓ A very long fissure develops in the ground surface and so, the molten rock, rock fragments, steam and gases within, pour out slowly.

✓ These eruptions take place at a very slow speed. Since this lava is more fluid, it spreads over longer distances.

✓ The lava cools down on the ground over a period of time, increasing the thickness of the surface in that area. Basalt plateaus are formed due to these eruptions.

✓ Basalt plateaus are also found in Brazil in south America and Saudi Arabia in west Asia and Deccan Plateau in India.

✓ In Maharashtra, the fertile black regur soil has been formed from basalt rocks. It is also called **black cotton soil**.

## **Introduction - Rocks**

• The solid parts of the Earth's crust are called rocks.

• The rocks are made up of two or more minerals.

• These rocks contain silica from 40% to 80%. Feldspar and quartz are the most common minerals found in rocks.

• Rocks are classified in three main types depending on the process of their formation.

1. Igneous
2. Sedimentary
3. Metamorphic

## ***Igneous rocks***

✓ Lava pours out at the time of volcanic eruptions and cools down later on, forming rocks.

✓ The molten materials known as magma sometimes cool down beneath the earth's crust, again forming rocks.

✓ They are called as the primary rocks as all the other rocks are formed directly or indirectly from the igneous rocks.

✓ It is believed that the igneous rocks are formed during each period of geological history of earth.

✓ They are hard, granular and crystalline rocks, less affected by chemical weathering.

✓ Moreover, it does not have any fossil or does not form any strata or layers of lava.

## **Classification of Igneous rocks**

### **On the basis of Mode of Occurrence**

✓ **Intrusive rocks** They are formed due to the solidification of rising magma below the

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surface of the Earth. E.g., Granite, Lapolith, Batholiths, Sills etc.

✓ **Extrusive rocks** They are formed due to cooling and solidification of hot and molten magma at the Earth surface. Eg. Basalt Gabbro etc.

### On the basis of Silica Content

✓ **Acidic** It has more silica content. Eg. Granite

✓ **Basic** It has less amount of silica content. Eg. Gabbro.

### Sedimentary rocks

✓ It is formed due to the aggregation and compaction of sediments derived from the older rocks, plants, animals and contains fossils of plants.

✓ The sedimentary rocks can be classified on the basis of the nature of sediments – mechanically, chemically and organically formed rocks.

✓ Mechanically formed – sandstone, conglomerate, limestone, shale etc.

✓ Organically formed – geysers, chalk, limestone etc.

✓ Chemically formed – chert, limestone, potash etc.

### Metamorphic rocks

✓ These are the changed form of Igneous and Sedimentary rocks.

✓ These are the rocks, which change either in form or composition without disintegration.

✓ Already formed metamorphic rocks are metamorphosed and this process is called metamorphosis.

✓ The agents of metamorphism are Heat, Compression and Solution.

✓ Examples are Gneissoid, granite, syenite, slate, schist, marble, quartzite etc.

### Rock transformation

Sedimentary Rocks	Metamorphic Rocks
Limestone	Marble
Sandstone	Quartzite
Shale / Clay	Slate, Phyllite, Schist
Coal	Diamond

Original Rocks	Metamorphic Rocks
Sandstone	Quartzite
Limestone	Marbal
Shale and mudstone	Slate
Granite	Gneisse

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Coal	Graphite coal
Clay	Slate
Basalt	Homblend

## ATMOSPHERE

An atmosphere is a layer of gases surrounding a planet or other material body of sufficient mass that is held in place by the gravity of the body. The envelope of air that completely surrounds the earth is known as atmosphere. The atmosphere extends to about 1000 km from the surface of the earth. But 99% of the total mass of the atmosphere is found within 32 km. This is because the atmosphere is held by the gravitational pull of the earth.

### Composition of the Atmosphere

- (i) Nitrogen – 78%
  - (ii) Oxygen – 21%
  - (iii) Argon -0.93%
  - (iv) Carbon dioxide – 0.03%
  - (v) Neon – 0.0018%
  - (vi) Helium – 0.0005%
  - (vii) Ozone – 0.0006%
  - (viii) Hydrogen – 0.00005%
- Carbon dioxide is present in small quantity in the atmosphere. It is an important constituent of air because it has the ability to absorb heat and thus keep the atmosphere warm, thereby, balancing the heat of the earth. Dust

intercepts and reflect incoming insolation. The polluted particles present in the air not only absorb larger amount of insolation but also greatly absorb the terrestrial radiation. Dust in the atmosphere contributes to the red and orange colour of sunrise and sunset.

### Layers of the Atmosphere

There are five distinct layers of the atmosphere –

- (a) Troposphere
- (b) Stratosphere
- (c) Mesosphere
- (d) Thermosphere
- (e) Exosphere

#### (a) Troposphere

This is the first layer of the atmosphere. It extends to a height of 18 km at the equator and 8 km at the poles. In this layer temperature decreases with height. This is due to the fact that the density of air decreases with height and so the heat absorbed is less. It contains more than 90% of gases in the atmosphere. Since most of the water vapour forms clouds in this layer, all weather changes occur in the troposphere ("tropo" means "change"). The height at which the temperature stops decreasing is called tropopause. Here the temperature may be as low as -58 degree Celsius.

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## **(b) Stratosphere**

This is the second layer of the atmosphere. It extends from the tropopause to about 50 km. Temperature increases due to the absorption of the ultraviolet radiations of the Sun by Ozone present in this layer. The temperature slowly increases to 4 degree celsius. This layer is free from clouds and associated weather phenomena. Hence, it provides ideal flying conditions for large jet planes.

## **(c) Mesosphere**

Above the stratosphere lies the Mesosphere. The mesosphere extends to a height of 80 km. Here the temperature decreases again, falling as low as -90 degree celsius.

The end of this layer is known as the mesopause.

## **(d) Thermosphere**

This layer extends to a height of about 640 km. This increase in temperature is due to the fact that the gas molecules in this layer absorb the X-rays and Ultraviolet radiation of the Sun. The electrically charged gas molecules of the thermosphere reflect radio waves from the Earth back into the space. Thus, this layer also helps in long distance communication. The thermosphere also

protects us from meteors and obsolete satellite because its high Temperature burns up nearly all the debris coming towards the Earth.

## **(e) Exosphere**

The exosphere extends beyond the thermosphere upto 960km. It gradually merges with interplanetary space. The temperatures in this layer range from about 300 degree Celsius to 1650 degree Celsius. This layer contains only traces of gases like oxygen, nitrogen, argon and helium because the lack of gravity allows the gas molecules to escape easily into space.

## **World Climatology:**

### **Climate:**

Climate 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.

Climate differs from weather, in that weather only describes the short-term conditions of these variables in a given region. A region's

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climate is generated by the climate system, which has five components: **atmosphere, hydrosphere, cryosphere, lithosphere, and biosphere.** **Paleoclimatology** is the study of ancient climates.

The World Meteorological Organization (WMO) is an intergovernmental organization with a membership of 191 Member States and Territories. It originated from the International Meteorological Organization (IMO), which was founded in 1873. Established in 1950, WMO became the specialised agency of the United Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences. It has its headquarters in Geneva, Switzerland, and is a member of the United Nations Development Group. The current Secretary-General is Petteri Taalas. The current president is David Grimes. **World Meteorological Day** is held annually on 23 March.

(Note: Geophysics is a subject of natural science concerned with the physical processes and physical properties of the Earth and its surrounding space

environment, and the use of quantitative methods for their analysis.)

## Causes of Climatic change:

- 1) Change in heat output of the sun (note: It is estimated that of the total radiation coming to us, 35 percent is reflected back to space by dust, clouds and air molecules. 14% is absorbed by green house gases. Only 51% reaches the earth and warms the surface.)
- 2) Tilting of the earth. (It is tilted to 23.44 degrees and it is in decreasing phase)
- 3) Orbit of the earth around the sun (it has less contribution towards climate)
- 4) Quantity of green house gases in the atmosphere.
- 5) Plate Tectonic movement (e.g.: Britain was near to the equator 300 million years ago and therefore was hotter than it is today.)
- 6) Mountain ranges can affect the climate by influencing the circulation of air.
- 7) Volcanoes affect the climate through the gases and dust particles thrown into the atmosphere during eruption.
- 8) Slight change in ocean current cause large effect on coastal and global climate.
- 9) Vegetation coverage on the land.

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## World Climatic Types

<i>Climatic Zone</i>	<i>Latitude (Approximate)</i>	<i>Climatic Type</i>	<i>Rainfall Regime (with approx. total)</i>	<i>Natural Vegetation</i>
Equatorial Zone	0°-10°N and S	1. Hot, wet equatorial	Rainfall all year round : 80 inches	Equatorial rain forests
Hot Zone	10°-30°N and S	2. a) Tropical Monsoon	Heavy summer rain: 80 inches	Monsoon forests
		b) Tropical Marine	Much summer rain: 70 inches	
		3. Sudan Type	Rain mainly in summer: 30 inches	Savanna (tropical grassland) Desert vegetation and scrub
		4. Desert: a) Saharan type b) Mid-latitude type	rain: 5 inches	
Warm Temperate Zone	30°-40°N & S	Western Margin (Mediterranean type)	Winter rain: 35 inches	Mediterranean forests and shrub Steppe or temperate grassland Warm, wet forests and bamboo
		6. Central Continental (Steppe type)	Light summer rain: 20 inches	
		7. Eastern Margin: a) China type b) Gulf type c) Natal type	Heavier summer rain : 20 inches	
Cool Temperate Zone	45°-65°N & S	8. Western Margin (British type)	More rain in autumn & winter : 30 inches	Deciduous forests Evergreen coniferous forests Mixed forests (coniferous and deciduous)
		9. Central Continental (Siberian type)	Light summer rain: 25 inches	
		10. Eastern Margin (Laurentian type)	Moderate summer rain : 40 inches	
Cold Zone	65°-90° N & S	11. Arctic or Polar	Very light summer rain : 10 inches	Tundra, mosses, lichens
Alpine Zone		12. Mountain climate	Heavy rainfall (variable)	Alpine pastures, conifers, fern, snow

### Types of Rainfall:

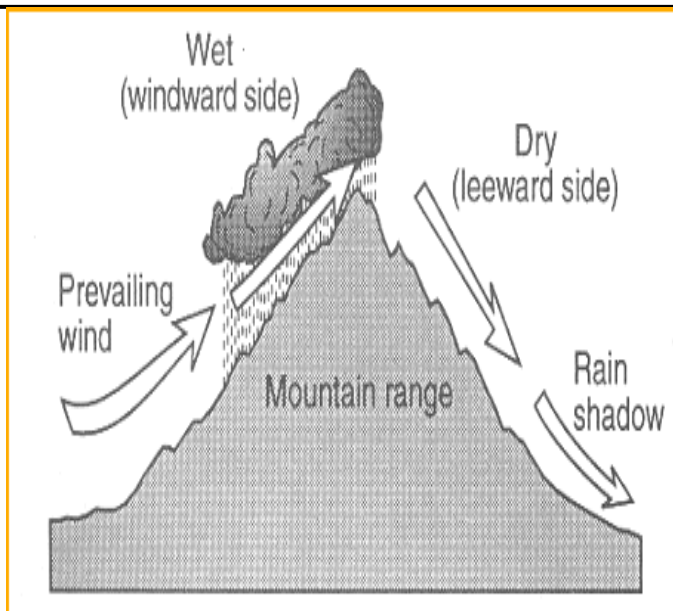
#### **1) Relief rainfall (Orographic rain):**

Relief rainfall occurs when air has been blown over the sea and is then forced up over an area of high land. This causes the air to cool and the moisture in the air condenses and rain falls. Here Windward side and Leeward side are important terms to understand.

#### **Precipitation:**

In meteorology, precipitation is any product of the condensation of atmospheric water vapour that falls under gravity. The main forms of precipitation include drizzle, rain, sleet, snow, graupel and hail.

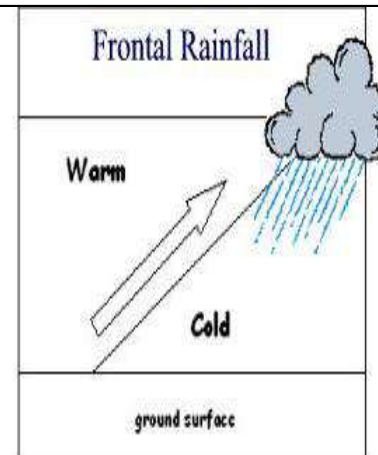
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**Föhn Wind or Chinook Wind:** A föhn is a type of dry, warm, down-slope wind that occurs in the lee (downwind side) of a mountain range.

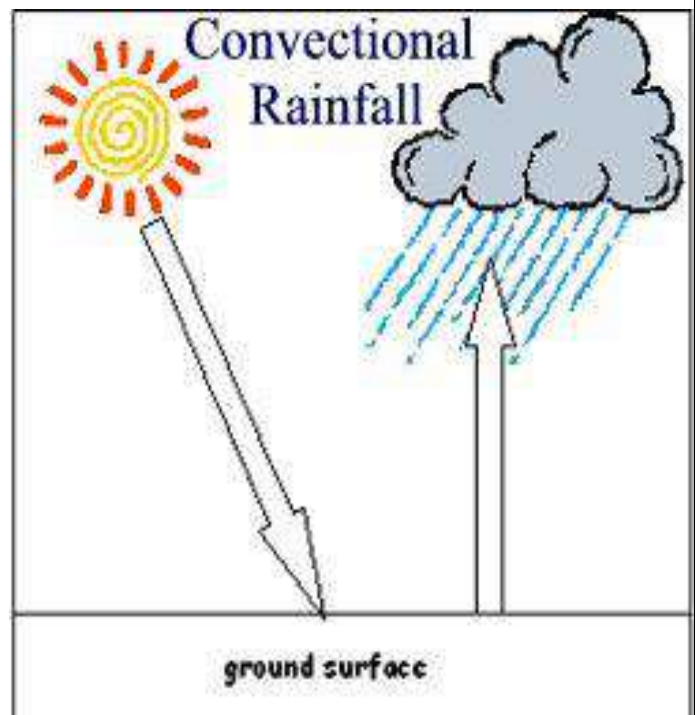
## 2) Frontal rainfall (Cyclonic Rain):

Frontal rainfall occurs when warm air is forced to rise over cold air. The moisture in the warm air condenses as it cools which causes clouds and rain.



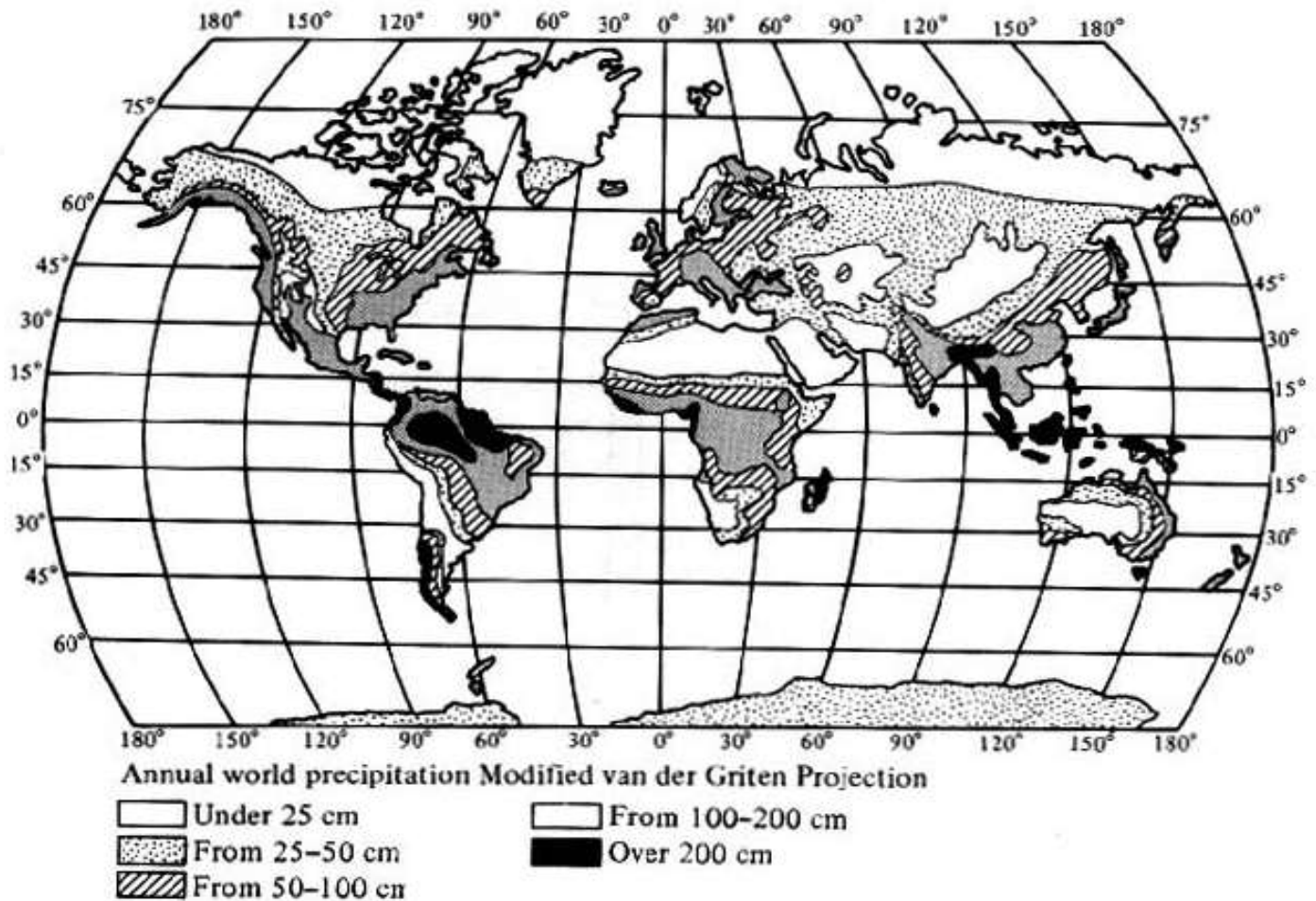
## 3) Convective rainfall:

Occurs mostly in tropics where it is hot. When air is hot it rises and cools and condenses forming rain. If the air is hot enough, it rises very quickly and can cause thunderstorms (Torrential downpours).





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## Types of Clouds:

### High level clouds at heights of 5-13 km:

**Cirrus:** Fibrous, threadlike, white feather clouds of ice crystals, whose form resembles hair curls.

**Cirrostratus:** Milky, translucent cloud veil of ice crystals, which sometimes causes halo appearances around moon and sun.

**Cirrocumulus:** Fleecy cloud; Cloud banks of small, white flakes.

### Medium level clouds at heights of 2-7 km:

**Alto cumulus:** Grey cloud bundles, sheds or rollers, compound like rough fleecy cloud, which are often arranged in banks.

**Altostratus:** Dense, gray layer cloud, often evenly and opaquely, which lets the sun shine through only a little.

### Low level clouds at heights of 0-2 km:

**Stratocumulus:** Cloud plaices, rollers or banks compound dark gray layer cloud.

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**Stratus:** Evenly grey, low layer cloud, which causes fog or fine precipitation and is sometimes frazzled.

**Clouds with large vertical extending at heights of 0-13 km:**

**Cumulus:** Heap cloud with flat basis in the middle or lower level, whose vertical development reminds of the form of towers, cauliflower or cotton.

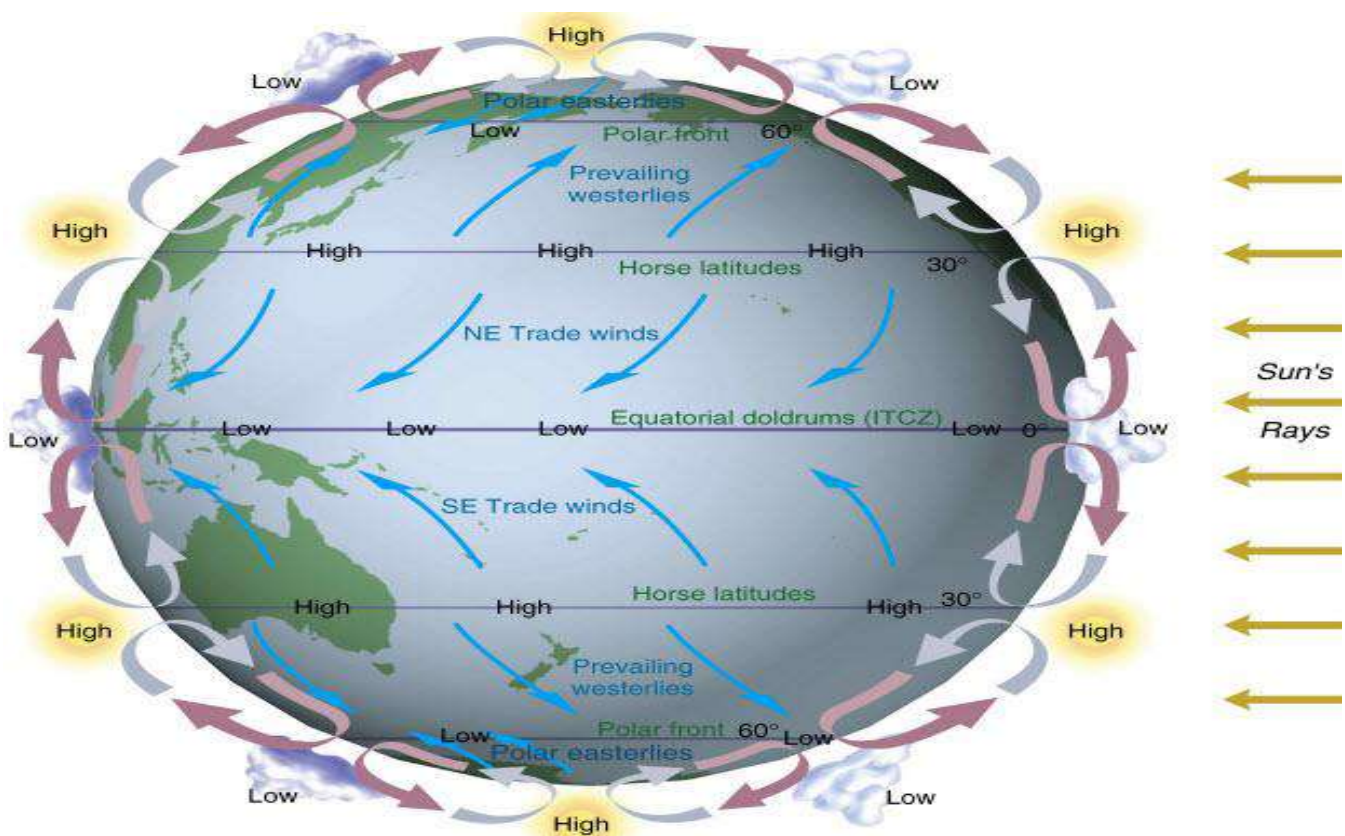
**Cumulonimbus:** In the middle or lower level developing thundercloud, which mostly up-rises into the upper level.

**Nimbostratus:** Rain cloud. Grey, dark layer cloud, indistinct outlines

## **Pressure and Planetary Winds:**

The variations in pressure are shown on maps by means of Isobars. These are lines joining the places having the same barometric pressure.

**Pressure Gradient:** The rate of change of atmospheric pressure between two points on the earth's surface is called pressure gradient.



## **Cyclones and Anti-cyclones:**

The Earth's spin causes the wind to curve. This is called the Coriolis Effect. The wind in

the northern hemisphere curves to the right and the wind in the southern hemisphere curves to the left.

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When the wind swirls counter-clockwise in the northern hemisphere or clockwise in the southern hemisphere, it is called cyclonic flow. When the wind swirls clockwise in the northern hemisphere or counter-clockwise in the southern hemisphere, it is called anticyclonic flow. An example of cyclonic flow is the flow around a low pressure area while an example of anticyclonic flow is the flow around a high pressure area.

## Different Names of Cyclone in Different Countries:

**Hurricanes:** West Indies and the Coast of Florida.

**Typhoons:** Philippine island, the coasts of China and Japan.

**Cyclones:** Bay of Bengal and Arabian Sea.

**Welly-Wellies:** Northeast and northwestern coasts of Australia.

**Tornadoes:** USA and Mexico.

## Glaciation:

Glaciation is the formation, movement and recession of glaciers. (A glacier is a persistent body of dense ice that is constantly moving under its own weight). Lambert Glacier is a major glacier in East Antarctica it is the Largest in the world.

## **Processes of Glacial Erosion:**

1. **Plucking:** This is a process of glacial erosion where the glacier freezes in the joints and beds of the underlying rocks, tears out individual blocks and drags them away.

2. **Abrasion:** In this process of glacial erosion, the glacier scratches, scrapes, polishes and scours the floor and sides of the valley with the debris embedded in it.

## Landforms of Highland Glaciation:

1. **Corrie, Cirque or Cwm:** This is a highland glaciation landform which is a semi-circular or an armchair-shaped hollow, usually found at the upper end or sides of a glacial valley.

2. **Arête and Pyramidal Peaks:** An arête is a jagged, steep-sided mountain ridge common in the European Alps.

Pyramidal peak is a jagged peak formed when the back walls of some corries on the sides of a mountain become steep.

3. **U-shaped Valley:** A U-shaped valley is a steep-sided, flat-bottomed, wide valley which contains features formed by both glacial erosion and deposition.

4. **Hanging Valley:** This is a tributary of a U-shaped valley which ends abruptly above the floor of the U-shaped valley and is separated from it by almost vertical slope.

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4. **Rock Basins and Rock Steps:** A rock basin is a depression on the floor of a U-shaped valley. It is usually formed when a glacier erodes and excavates the bedrock of its valley in an irregular manner.

6. **Moraines:** These are materials, such as stones, clay and rock debris that have been transported by a glacier and abandoned in specific formations.

## Landforms of Lowland Glaciation:

1. **Roche Moutonnee:** This is a resistant residual rock hummock. The surface is striated by ice movement. Its upstream side is smoothed by abrasion and its downstream side, which is steeper, is roughened by plucking.

2. **Crag and Tail:** The crag is a mass of hard rock with a precipitous slope on the upstream side, which protects the softer leeward slope from being completely worn down by the on-coming ice.

3. **Boulder Clay or Glacial Till:** It is a landform of glaciated highlands which involves the mixture of unstratified clay deposits that includes finely powdered rock, called rock-flour, sand, irregular stones and rocks left behind by a melting glacier or an ice sheet.

4. **Erratic:** These are boulders of varying sizes, transported by ice or glacier and

deposited where the ice melts, sometimes a great distance away from the source of the boulders. They are also referred to as perched blocks.

5. **Drumlins:** These are swarms of oval, elongated 'whale-back' hummocks composed wholly of boulder clay, elongation being in the direction of the ice flow that is on the downstream side.

6. **Eskers:** These are long, narrow, sinuous ridges composed of sand and gravel, believed to have been deposited by a former sub-glacial stream.

7. **Outwash Plains:** These are type of landforms of glaciated lowlands made up of fluvio-glacial deposits washed out from the terminal moraines by the streams and channels of the stagnant ice mass.

8. **Kames:** These are small, rounded masses of sand and gravel formed as deltas on the surface of a static glacier, or at its margin.

## Landforms Produced by River Erosion:

1. **Gorge or Ravines:** These are narrow, steep-sided valleys. They are usually found at the upper course of a river where vertical erosion is greater than lateral erosion.

A gorge is formed when the predominant process of the river is either vertical corrosion or down cutting, with little or no valley widening.

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2. **Canyons:** These are large, steep-sided, narrow bottomed gorges. A river usually runs in the bottom.

3. **Rapid:** Rapid is the part of a river where the current flows fast, because of a sudden increase in the slope which is not steep enough to produce a waterfall.

4. **Waterfall:** The falling water occurs when a river course is interrupted by an abrupt, steep drop.

5. **Potholes:** A pothole is a hollow in the rock bed of a stream abraded by boulders as they are swirled round by eddies.

6. **Interlocking Spurs:** An interlocking spur is part of a valley wall projecting from either side of a winding valley.

7. **River Capture:** This is the process by which a river acquires the headstreams of another river and thus enlarges its own drainage area at the expense of the other.

## Landforms of Wind Erosion in Deserts:

1. **Deflation Hollows:** As explained earlier in my last discussion, the process of deflation can continue until a deflation hollow such as that of the Faiyum Depression in Egypt is eventually formed.

2. **Rock Pedestal:** Rock pedestals are sound pillars with conical peaks which look like mushrooms. The hard rock is left standing on the narrow stem of the weak

rock. Rock pedestals are common in the Sahara where they are called gour.

3. **Zeugens:** Zeugens are flat-topped rock masses that have formed into a ridge and furrow landscape in the desert. Each ridge has a tabular mass of resistant rock underlain by a layer of soft rock.

4. **Yardangs:** Yardangs are series of sharp, irregular rock crests separated from one another deep grooves.

5. **Mesas and Buttes:** A mesa is a table-like land mass with a very resistant horizontal top layer and very steep sides.

6. **Inselbergs:** Inselbergs are rock islands located on plains. They are steep-sided and can be either round-topped. They vary in size and shape.

7. **Ventifacts:** These are stones or pebbles which have been scoured, smoothed and faceted by wind-blown sand.

## Plains Landforms-Types and Importance:

1. **Depositional Plains:** They are formed by the deposition of transported materials brought by various agents. They can be subdivided as follows:

**Alluvial Plains:** These are formed by the gradual accumulation of silt brought by rivers from the upper course to the lower course. Flood plains and deltaic plains are in this sub-group.

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**Glacial Plains:** They are formed mostly by deposition of sediment brought by ice sheets.

**Lacustrine Plains:** A lacustrine plain is the bed of a former lake, filled in by sediment deposited by inflowing rivers.

**Coastal Plains:** These are due to the deposition of marine and stream sediment on sea beaches.

**Lava Plains:** They are formed through the filling up of valleys by flowing lava.

**Sand Dune Plains:** Such plains are in deserts, semi-deserts or the Sahelian zone of West Africa where there is sparse vegetation and plenty of sand.

**Flood Plains:** These are areas of lowland adjacent to a river, built up by deposits of alluvium. Each time a river floods its banks, it spreads a layer of silt on the adjacent plains. The levels of the plains rise with each layer that is deposited.

## **2. Erosional Plains Pedi-Plains:**

These are formed by the prolonged action of agents of denudation.

**Pen-Plains:** These are almost level plains formed by the wearing down of mountains and plateau by agents of denudation.

## **3. Marine Plains**

Marine plains are formed from residual marine deposits which are produced after a fall in the level of the sea.

## **Flows:**

Flow movement occurs when there is a lot of water in the debris. The principal types of flows are:

**Earth flow:** This is the down slope movement of masses of water-impregnated clay or silt, under the influence of gravity.

**Mudflow:** Like an earth flow, a mudflow involves the flow of wet material. It also involves more thoroughly lubricated material and has a higher speed than an earth flow.

**Solifluction (i.e. soil flow):** This type of flow is associated with the subarctic region where the ground is permanently frozen (permafrost) a few centimeters below the surface. In summer, the top soil thaws and is saturated with water. The water-saturated soil then flows in a down slope over the smooth permafrost layer below.

**Debris Avalanche:** This type of flow movement is extremely rapid. It has the attributes of flow and slide as the regolith disintegrates during movement and starts to flow.

## **Creep:**

**Soil Creep:** This is the slow, down slope movement of soil and debris under the influence of gravity. It occurs on all soil-covered slopes, particularly those underlain by materials with high clay content. The causes of soil creep include shaking by

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earthquakes, growth of frost needles, heating and cooling of soil, trampling and burrowing by animals, alternate drying and wetting of the soil, root growth, chemical changes accompanying weathering (solution) and heavy rain falls.

**Talus Creep:** This is the down slope movement of angular rock fragments of different sizes.

**Rock Creep:** This is the movement of joined blocks, partly as a result of soil creep and partly as a result of sliding.

## **Types of Forests:**

### **Tropical rain forests:**

Hugely dense, lush forest with canopies preventing sunlight from getting to the floor of the forest. Throughout the year it receives high temperatures and abundant rainfall. It is located near the equator. It is a vital storehouse of biodiversity, sustaining

millions of different animals, birds, algae and fish species.

### **Sub-tropical forests:**

It is located at the south and north of the tropical forests. Trees here are adapted to resist the summer drought.

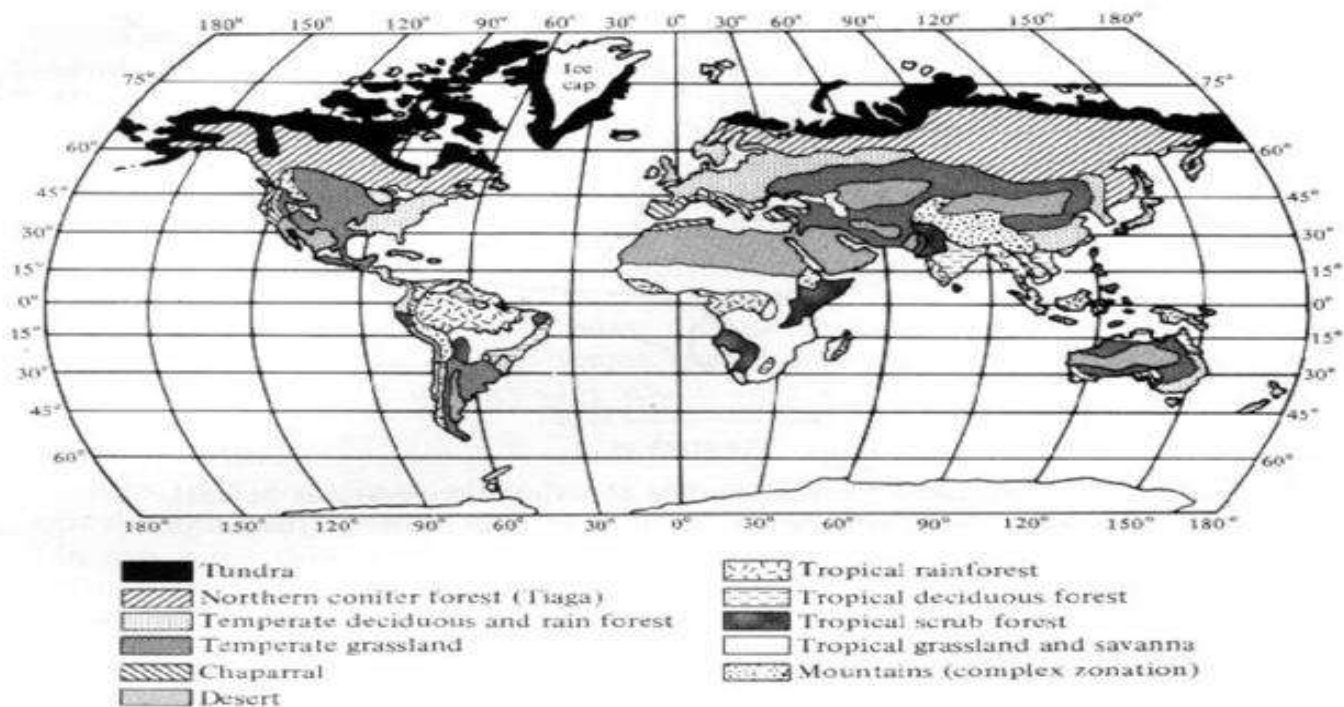
### **Mediterranean forests:**

Located at the south of the temperate regions around the coasts of the Mediterranean, California, Chile and Western Australia. The growing season is short and almost all trees are evergreen, but mixed with hardwood and softwood.

### **Temperate forests:**

It is located at Eastern North America, North eastern Asia, and western and eastern Europe. It is a mix of deciduous and coniferous evergreen trees. Usually, the broad-leaved hardwood trees shed leaves annually. There are well-defined seasons with a distinct winter and sufficient rainfall.

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## Coniferous forests:

It is located in the cold, windy regions around the poles. They have both hardwoods and conifers. The hardwoods are deciduous. The conifers are evergreen and structurally adapted to withstand the long drought-like conditions of the long winters.

## Montane forests:

It is known as cloud forests because they receive most of their precipitation from the mist or fog that comes up from the lowlands. It is usually found in high-elevation tropical, subtropical and temperate

zones. Plants and animals in these forests are adapted to withstanding the cold, wet conditions and intense sunlight. The trees present here are mainly conifers.

## Plantation forests:

It has around 7% of global forest cover (140 million hectares). It produces more sustainable timber and fibre than natural forests. Plantations produce around 40% of industrial wood. Plantation forests are on the increase rate.



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## **Largest Lakes in the World in decreasing order:**

<b>Name</b>	<b>Countries with shoreline</b>	<b>Notes</b>
Caspian Sea	Kazakhstan Russia Turkmenistan Azerbaijan Iran	The Caspian Sea is often regarded as the world's largest lake, but it contains an oceanic basin (contiguous with the world ocean until 11 million years ago) rather than being entirely over continental crust.
Superior	Canada United States	Largest of the Great Lakes by volume, having more water than the other four combined. Popularly considered the largest freshwater lake by surface area, though Lakes Michigan and Huron are treated hydrologically as a single entity due to their connection at the deep watered Straits of Mackinac; this single entity would be the largest freshwater lake by surface area if it were treated as a single lake.
Victoria	Uganda Kenya Tanzania	The largest lake by area in Africa.
Huron	Canada United States	Contains Manitoulin Island, the world's largest lake island.
Michigan	United States	Largest lake by area entirely within one country.
Tanganyika	Burundi Tanzania Zambia Democratic Republic of the Congo	Longest freshwater lake in the world and largest volume fresh water lake in Africa.
Baikal	Russia	Deepest lake in the world and largest volume fresh water lake in the world.
Great Bear	Canada	Largest lake entirely within Canada.

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Lake		
Malawi	Malawi Mozambique Tanzania	
Great Slave Lake	Canada	Deepest lake in North America.

## Longest Rivers of the world in decreasing order:

River	Source	Outflow
Nile	Tributaries of Lake Victoria, Africa	Mediterranean Sea
Amazon	Glacier-fed lakes, Peru	Atlantic Ocean
Mississippi-Missouri-Red Rock	Source of Red Rock, Montana	Gulf of Mexico
Chang Jiang (Yangtze)	Tibetan plateau, China	China Sea
Ob	Altai Mts., Russia	Gulf of Ob

Pati	Argentina
New Cornelia Tailings	United States
Tarbela	Pakistan

## List of Dams in the order of height

Name	Country	River
Jinping-I Dam	China	Yalong
Nurek Dam	Tajikistan	Vakhsh
Xiaowan Dam	China	Lancang
Xiluodu Dam	China	Jinsha Jiang
Grande Dixence Dam	Switzerland	Dixence

## List of Ocean and Sea in the order of area

Name	Place of greatest known depth
Pacific Ocean	Mariana Trench
Atlantic Ocean	Puerto Rico Trench
Indian Ocean	Sunda Trench
Southern Ocean	South Sandwich Trench
Arctic Ocean	77°45'N; 175°W

## World's Largest Dams in decreasing order

Dam	Location
Three Gorges	China
Syncrude Tailings	Canada
Chapetón	Argentina

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Mediterranean Sea	Off Cape Matapan, Greece
Caribbean Sea	Off Cayman Islands
South China Sea	West of Luzon
Bering Sea	Off Buldir Island
Gulf of Mexico	Sigsbee Deep
Okhotsk Sea	146°10'E; 46°50'N
East China Sea	25°16'N; 125°E
Hudson Bay	Near entrance
Japan Sea	Central Basin
Andaman Sea	Off Car Nicobar Island
North Sea	Skagerrak
Red Sea	Off Port Sudan
Baltic Sea	Off Gotland

Himalayas	Asia	Mount Everest
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## Union Territories

State	Range/Region	Height (m)
Andaman & Nicobar Islands	North Andaman	732
Chandigarh	Capital Area	383
Dadra and Nagar Haveli	Amboli	278
Daman and Diu	Diu	30
Delhi	Tughlaqabad	319
Lakshadweep	Agatti Island	15
Puducherry	Red Hills	30

## List of Mountain Ranges in the order of length

Range	Continent	Highest point
Andes	South America	Mount Aconcagua
Southern Great Escarpment	Africa	Ntlenyana
Rocky Mountains	North America	Mount Elbert
Trans Antarctic Mountains	Antarctica	Mount Kirkpatrick
Great Dividing Range	Australia	Mount Kosciuszko

## List of Desert in the order of Area

Name	Type	Location
Antarctica	Cold Winter	Antarctica
Sahara	Subtropical	North Africa
Arabian Desert	Subtropical	Western Asia
Gobi Desert	Cold Winter	Central Asia
Kalahari Desert	Subtropical	Southern Africa
Great Victoria Desert	Subtropical	Australia

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Patagonian Desert	Cold Winter	South America
Syrian Desert	Subtropical	Western Asia
Great Basin Desert	Cold Winter	United States
Chihuahuan Desert	Subtropical	North America
Great Sandy Desert	Subtropical	Australia
Karakum Desert	Cold Winter	Turkmenistan
Colorado Plateau	Cold Winter	United States
Sonoran Desert	Subtropical	North America
Kyzylkum Desert	Cold Winter	Central Asia
Taklamakan Desert	Cold Winter	China
Thar Desert	Subtropical	South Asia
Gibson Desert	Subtropical	Australia
Dasht-e Margo	Subtropical	Afghanistan
Registan Desert	Subtropical	Afghanistan

Simpson Desert	Subtropical	Australia
Atacama Desert	Cool Coastal	South America
Mojave Desert	Subtropical	United States
Namib Desert	Cool Coastal	Southern Africa
Dasht-e Kavir	Subtropical	Iran
Dasht-e Loot	Subtropical	Iran

### Highest Peaks in decreasing order:

Peak	Height	Parent Range
Mount Everest / Sagarmatha / Chomolungma	8,848	Mahalangur Himalaya
K2 / Qogir / Godwin Austen	8,611	Baltoro Karakoram
Kangchenjunga	8,586	Kangchenjunga Himalaya
Lhotse	8,516	Mahalangur Himalaya
Makalu	8,485	Mahalangur Himalaya
Cho Oyu	8,188	Mahalangur Himalaya
Dhaulagiri I	8,167	Dhaulagiri Himalaya

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Manaslu	8,163	Manaslu Himalaya
Nanga Parbat	8,126	Nanga Parbat Himalaya
Annapurna I	8,091	Annapurna Himalaya

Pradesh	(shared with Tibet)	Himalaya
Jammu and Kashmir (claimed)	K2	Karakoram
Jammu and Kashmir (administered)	Saltoro Kangri	Karakoram
Jharkhand	Parasnath	Parasnath Hills
Karnataka	Mullayanagiri	Western Ghats
Kerala	Anamudi	Western Ghats
Madhya Pradesh	Dhupgarh	Satpura
Maharashtra	Kalsubai	Western Ghats
Manipur	Mount Iso (also known as Tenipu)	Senapati District
Meghalaya	Shillong Peak	Khasi Hills
Mizoram	Phawngpui	Saiha District
Nagaland	Mount Saramati (Shared with Myanmar)	Naga Hills

## Highest Peaks in Indian States:

State	Peak	Range/Region
Andhra Pradesh	Arma Konda	Eastern Ghats
Arunachal Pradesh	Kangto (shared with Tibet)	Eastern Himalaya
Assam	Unnamed peak near Laike	Dima Hasao District
Bihar	Fort Someshwar	West Champaran District
Chhattisgarh	Gourlata	Bailadila Range
Goa	Sosogad	Western Ghats
Gujarat	Girnar	Junagadh District
Haryana	Karoh Peak	Morni Hills
Himachal	Reo Purguil	Western

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Odisha	Deomali	Eastern Ghats
Punjab	Unnamed peak on the Naina Devi range	Rupnagar District
Rajasthan	Guru Shikhar	Aravali
Sikkim	Kangchenjunga (shared with Nepal)	Eastern Himalaya
Tamil Nadu	Doddabetta	Nilgiri Hills
Telangana	Doli Gutta	Deccan Plateau
Tripura	Betalongchhip	Jampui Hills
Uttar Pradesh	Amsot Peak	Shivalik Hills
Uttarakhand	Nanda Devi	Garhwal Himalaya
West Bengal	Sandakphu (shared with Nepal)	Eastern Himalaya

The equator passes through 13 countries: Ecuador, Colombia, Brazil, Sao Tome & Principe, Gabon, Republic of the Congo, Democratic Republic of the Congo, Uganda, Kenya, Somalia, Maldives, Indonesia and Kiribati.

The Tropic of Cancer passes through the Bahamas, Mexico, Mauritania, Mali, Western Sahara, Algeria, Niger, Libya, Egypt, Saudi Arabia, India, China, Abu Dhabi, Oman, Bangladesh, Burma and Taiwan.

## **OCEAN CURRENTS**

Ocean currents are large masses of surface water that circulate in regular patterns around the oceans. Those that flow from equatorial regions polewards have a higher temperature and are warm currents. Those that flow from poles towards the equator have a lower temperature and are cold currents.

Important factors affecting ocean currents:

### **1. Planetary winds**

They are one of the dominant influences on the flow of ocean currents. The strongest evidence is seen in the north Indian ocean. Here the direction of the currents changes completely with the monsoon winds which comes from the north east in winter and south west in summer.

### **2. Temperatures.**

**Countries through which tropic of capricorn passes through are as follows in west to east direction:**

- |                 |               |
|-----------------|---------------|
| 1- Chile        | 2- Argentina  |
| 3- Paraguay     | 4- Brazil     |
| 5- Namibia      | 6- Botswana   |
| 7- South Africa | 8- Mozambique |
| 9- Madagascar   | 10- Australia |

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As warm water is lighter and rises, and cold water is denser and sinks, warm equatorial waters move slowly along the surface polewards, while the heavier cold waters of the polar region creep slowly along the bottom of the sea towards the equator.

### 3. Salinity

Waters of high salinity are denser than water of low salinity. Hence waters of low salinity flow on the surface of waters of high salinity while waters of high salinity flow at the bottom towards waters of low salinity.

### 4. The earth's rotation

The earth's rotation deflects freely moving objects, including ocean currents, to the right. In the northern hemisphere this is a clockwise direction. In the southern hemisphere it is in an anti-clockwise direction.

### 5. Land

A landmass always obstructs and diverts a current.

## IMPORTANT OCEAN CURRENTS OF NORTH ATLANTIC OCEAN

1. Cayenne current
2. North Equatorial current
3. Florida current
4. Gulf stream
5. Canaries current

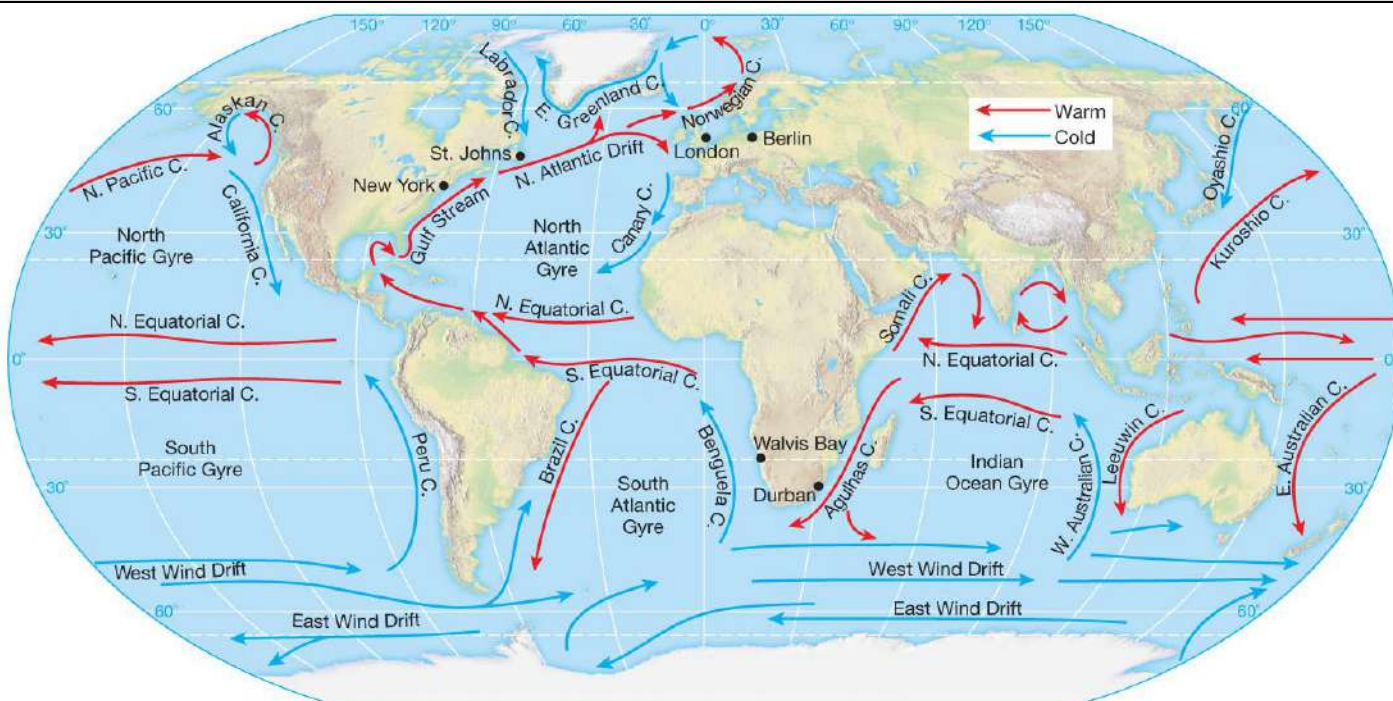
6. Labrador Current
7. South Atlantic ocean
8. Brazilian current
9. Benguela current

### Currents of the Atlantic Ocean:

#### North Equatorial Current (Warm)

North equatorial current is a significant Pacific and Atlantic Ocean current that flows east-to-west between about 10° north and 20° north. This current is generated because of upwelling of cold-water near the west coast of Africa. This warm current is also pushed westward by the cold Canary current. On an average, the north equatorial warm current flows from east to west but this saline current is deflected northward when it crosses the mid-Atlantic Ridge near 15°N latitude. It again turns southward after crossing over the ridge. This current after being obstructed by the land barrier of the east coast of Brazil, is bifurcated into two branches viz. Antilles current and Caribbean current. The Antilles current is diverted northward and flows to the east of West Indies islands, and helps in the formation of Sargasso Sea eddy while the second branch known as the Caribbean current enters the Gulf of Mexico and becomes- Gulf Stream.

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## South Equatorial Current (warm)

The South Equatorial Current is a significant Pacific, Atlantic, and Indian Ocean current that flows east-to-west between the equator and about 20 degrees south. In the Pacific and Atlantic Oceans, it extends across the equator to about 5 degrees north. South equatorial current flows, from the western coast of Africa to the eastern coast of South America between the equator and 20°S latitude. This current is more constant stronger and of greater extent than the north equatorial current. In fact this current is the continuation of the cold **Benguela current**. This warm current is bifurcated into two branches due to obstruction of land barrier in the form of the east coast of Brazil.

The northward branch after taking north-westerly course merges with the north equatorial current near Trinidad while the second branch turns southward and continues as Brazil warm current parallel to the east coast of South America. This current is basically originated under the stress of trade winds.

## Equatorial Counter Current

Equatorial Counter Current Equatorial Counter Current is a significant ocean current in the Pacific and Indian oceans that flows west-to-east at approximately five degrees north. The Counter Currents result from balancing the westward flow of water in each ocean by the North and South Equatorial currents.



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In El Nino years, Equatorial Counter current intensifies in the Pacific ocean. The Equatorial Counter current flows from west to east in between the westward flowing strong north and south equatorial current. This current is less developed in the west due to stress of trade winds. In fact the counter current mixes with the equatorial current in the west but it is more developed in the east where it is known as the **Guinea Stream**. The Equatorial Counter current carries relatively higher temperature and lower density than the two equatorial currents. According to some scientist this current is originated because of the influence of the westerlies which blow from west to east in the calm zone of the doldrums or in the convergence zone of the north east and south east trade Winds.

## **Gulf Stream**

➤ The Gulf Stream is a system of several currents moving in north-easterly direction. This current system originates in the Gulf of Mexico around 20°N latitude and moves in north easterly direction along the eastern coast of North America and reaches the western coasts of Europe near 70°N latitude. This system, named Gulf Stream because of its origin in the Mexican Gulf, consists of Florida current from the strait of Florida to

Cape Hatteras, Gulf Stream from Cape Hatteras to the Grand Bank, and North Atlantic Drift (current) from Grand Bank to the Western European coast.

## **Canary Current (Cold)**

The Canary current, a cold current, flows along the western coast of north Africa between Maderia and Cape Verde. In fact this current is the continuation of North Atlantic Drift which turns southward near the Spanish coast and flows to the south along the coast of Canaries Island. The average velocity of this current is 8 to 30 nautical miles per day. This current brings cold water of the high latitudes to the warm water of the low latitudes and finally merges with the northequatorial current. The Canary cold current ameliorates the otherwise hot weather conditions western coasts of North Africa.

## **Labrador Current (Cold)**

The Labrador Current, an example of cold current, originates in the Baffin Bay and Davis Strait and after flowing through the coastal waters of Newfoundland and Grand Bank merges with the Gulf stream around 50°W longitude. The flow discharge rate of the current is 7.5 million ml of water per second. This current brings with it a large number of big icebergs as far south as

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Newfoundland and Bank. These icebergs present effective hindrances in the oceanic navigation. Dense fogs are also produced due to the convergence of the Labrador cold current and the Gulf Stream near Newfoundland.

## **Brazil Current (Warm)**

The Brazil current is characterized by high temperature and high salinity. This current is generated because of the bifurcation of the south equatorial current because of obstruction of the Brazilian coast near Sun Rock. The northern branch flows northward and merges with the north equatorial current while the southern branch known as the Brazil current flows southward along the coast of South America up to 40°S latitude. Thereafter it is deflected eastward due to the deflective force of the rotation of the earth and flows in easterly direction under the influence of west the Falkland cold current coming from south merges with Brazil current at 40° S.

## **Falkland Current (Cold)**

The cold waters of the Antarctic Sea flows in the form of Falkland cold current from south to north along the eastern coast of South America up to Argentina. This current becomes most extensive and developed near 30°S latitude. This current also brings

numerous icebergs from the Antarctic area to the South American coast.

## **South Atlantic Drift (Cold)**

The eastward continuation of the Brazil current is called South Atlantic Drift This current is originated because of the deflection of the Brazil warm current eastward at forty degree latitude due to the deflective force of the rotation of the earth. The South Atlantic Drift thus, flows eastward under the influence of the westerlies. This current is also known as the Westerlies Drift or the Antarctic Drift.

## **Benguela Current (Cold)**

The Benguela current a cold current, flows from south to north along the western coast of South Africa. In fact the South Atlantic Drift turns northward due to obstruction caused by the southern tip of Africa. Further northward, this current merges with the South Equatorial Current

## **Currents of the Pacific Ocean: North Equatorial Current (Warm)**

The north equatorial current originates off the western coast of Mexico and flows in westerly direction and reaches the Philippines coast after covering a distance of 7500 nautical miles. This current is originated because of the Californian current and northeast monsoon. The volume of water continuously increases westward

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because numerous minor branches join this current from the north. A few branches also come out of the main current and turn towards north and south. One branch emerges from the north equatorial current near Taiwan and flows northward to join Kuroshio Current while the southern branch turns eastward to form counter equatorial current. It is significant to note that north equatorial current flows as a continuous current in the North Pacific Ocean but there are seasonal variations in its northern and southern marginal areas. The velocity of the current ranges between 12 and 18 nautical miles per day. With the northward (northern summer) and southward (south northward and southward but it always remains to the north of equator.

## **South Equatorial Current (Warm)**

The south equatorial current is originated due to the influence of south-east trade winds and flows from east to west. This current is stronger than the north equatorial current. The average velocity is 20 nautical miles per day while the maximum velocity becomes 100 nautical miles a day. Numerous minor current join this current from the left and thus, the volume of water continuously increases west-ward. The current is bifurcated into northern and

southern branches near New Guinea. The northern branch turns eastward and flows as counter equatorial current, the southern branch moves towards the northern and north-eastern coast of Australia

## **Counter Equatorial Current (Warm)**

The current flowing west to east between the north and south equatorial current is termed as counter equatorial current. Because of this trade winds immense volume of water is piled up in the western marginal part of the ocean with the result there is general slope gradient of water surface from west to east. This higher water level in the west and descending slope gradient of water surface from west to east make the oceanic water flow in easterly direction in the name of counter equatorial current which is the most developed counter current in the Pacific Ocean. This counter equatorial current is extended up to the Panama Bay.

## **Kuroshio System (Warm)**

The Kuroshio System consists of several currents and drifts is similar to the Gulf Stream system of the Atlantic Ocean. This system runs from Taiwan to the Bering Strait and consists of the Kuroshio Current, the Kuroshio extension, the north Pacific drift, the Tsushima current and the counter Kuroshio current.

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## **Oyashio Current (Cold)**

The Oyashio cold current is also known as Kurile cold current. This cold current flows through the Bering Strait in southerly direction and thus transports cold water of the Arctic Sea into the Pacific Ocean. Near Forty degree N latitude this current is bifurcated into two branches. One branch turns east-ward and merges with the Aleutian and Kuroshio currents. The second branch moves upto the Japanese coasts. This current is comparable to the cold Labrador Current of the North Atlantic Ocean. The convergence of cold Oyashio and warm Kuroshio Current causes dense fogs which become potential hazards for navigation.

## **California Current (Cold)**

The California current an example of cold current is similar to the Canary cold current of the Atlantic Ocean in most of its characteristics. In fact this current is the eastward extended portion of the North Pacific drift. The cold California current is generated because of the movement of oceanic water along the Californian coast from north to south in order to compensate the loss of water which is caused due to large-scale transport of water off the coast of Mexico under the influence of trade winds in

the form of the north equatorial current. This current after reaching the Mexican coast turns west-ward and merges with the north equatorial current.

## **Peru Current (Cold)**

The cold current flowing along the western coast of South America from south to north is called Peru current or Humboldt current. This current is known as Peru coastal current near the coast while it is called Peru oceanic current off the coast. Mean annual temperature ranges between 14°C and 17°C and the average velocity of moving water is 15 nautical miles (271m) per day. The temperature of sea water increases from the coast towards the ocean.

## **East Australia Current (Warm)**

South equatorial current is bifurcated near the Australian coast into northern and southern branches. The southern branch flows as east Australia current from north to south along the eastern coasts of Australia. New Zealand is surrounded by this current. It is deflected eastward near 40'S latitude due to deflective force of the earth and flows in easterly direction under the influence of the westerlies. This is a warm and consistent current. It raises the temperature of east Australian coast for considerable distance southward.

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## ISLANDS AND CORAL REEFS

An island is a piece of land surrounded on all sides by water. It may occur individually or in a group. Largest island is Greenland.

### Types of Islands

#### 1. Continental Islands

They were once connected to a continent. They still sit on the continental shelf. Some formed as Earth's shifting continents broke apart.

#### (a). Individual Islands



These lie just outside the continent, very much associated with the features of the mainland of which they were once part. Example Madagascar separated from mainland by Mozambique Channel, Srilanka by Palk of Strait

#### (b). Archipelagos or island groups



These comprise of group of islands of varying sizes and shapes.

Example: British Isles

#### (c). Festoons or Island arcs



The islands form an archipelago in the shape of a loop around the edge or the mainland, marking the continuation of mountain ranges which can be traced to the continent.

Example East Indies, Aleutian Islands

#### 2. Oceanic Islands

Islands that are not part of continental shelf areas, they are not, and have never been, connected to a continental landmass. They are normally small and located in the midst of oceans. They have flora and fauna unrelated to those of the continents.

#### (a) Volcanic Islands

Volcanic islands are built by volcanoes, not geologically part of any continent. Most of them are extinct. Examples are Mauna Loa in Hawaii, Mauritius and Reunion

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## (b) Coral Islands

The coral islands are very much lower and emerge just above the water surface. These islands are built up by coral animals of various species. Examples are Marshall Islands and Laccadives

### **CORAL REEFS**

Coral reefs are diverse underwater ecosystems held together by calcium carbonate structures secreted by corals. Coral reefs are built by colonies of tiny animals found in marine waters that contain few nutrients. Most coral reefs are built from stony corals, which in turn consist of polyps that cluster in groups. Reef-building corals are only found in shallow tropical and subtropical waters. This is because the algae found in their tissues need light for photosynthesis and they prefer water temperatures between 20°C.

#### **1. Fringing reefs**



Fringing reefs are reefs that grow directly from a shore.

While there may be areas of shallow intertidal or sub-tidal sand bottom lying between the beach and the inshore edge of coral growth, there is no lagoon between the reef and shore.

The fringing reef is by far the most common of the three major types of coral reefs, with numerous examples in all major regions of coral reef development.

Without an intervening lagoon to effectively buffer freshwater runoff, pollution, and sedimentation, fringing reefs tend to be particularly sensitive to these forms of human impact.

It is no surprise then that increasing human populations in coastal areas - and the accompanying increases in coastal development and intensive agriculture - have resulted in the decimation of fringing reefs throughout the world in recent years.

#### **2. Barrier reefs**



Barrier reefs are extensive linear reef complexes that parallel a shore, and are separated from it by lagoon. Barrier reefs

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are far less common than fringing reefs or atolls, although examples can be found in the tropical Atlantic as well as the Pacific.

The 1200-mile long Great Barrier Reef off the NE coast of Australia is the world's largest example of this reef type. The GBR is not actually a single reef as the name implies, but rather a very large complex consisting of many reefs.

The second largest Indo-Pacific barrier reef lies off New Caledonia's NE coast - it is some 400 miles long with a lagoon 1-8 miles wide. Another large barrier reef extends for nearly 170 miles to the north of Fiji and Vanua Levu. This reef type is rare in the Caribbean region, where only 2 true barrier reefs are found. The largest of these runs off the coast of Belize, and the other off the north coast of the island of Providencia (east of Nicaragua).

### 3. Atolls



An 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. Examples of this reef type are common in French Polynesia, the Caroline and Marshall Islands, Micronesia, and the Cook Islands. The Indian Ocean also contains numerous atoll formations. Examples are found in the Maldives and Chagos island groups, the Seychelles, and in the Cocos Island group. IN contrast, atolls are relatively rare in the Caribbean. Published counts range from 10-27, depending upon who is doing the classification. The far greater number of atolls in the IndoPacific region of coral reef development - as opposed the Greater Caribbean region - can be mainly attributed to the far greater size of the former region along with its unique geomorphology, which is far more conducive to volcanic island formation and subsequent subsidence.

### LITHOSPHERE:

The word lithosphere is derived from the word sphere, combined with the Greek word lithos, meaning rock. The lithosphere is the solid outer section of Earth, which includes Earth's crust (the "skin" of rock on the outer layer of planet Earth), as well as the underlying cool, dense, and rigid upper part of the upper mantle. The lithosphere extends from the surface of Earth to a depth of about

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(70–100 km). This relatively cool and rigid section of Earth is believed to "float" on top of the warmer, non-rigid, and partially melted material directly below.

Earth is made up of several layers. The outermost layer is called Earth's crust. The thickness of the crust varies. Under the oceans, the crust is only about (5–10 km) thick. Under the continents, however, the crust thickens to about 22 mi (35 km) and reaches depths of up to (60 km) under some mountain ranges. Beneath the crust is a layer of rock material that is also solid, rigid, and relatively cool, but is assumed to be made up of denser material. This layer is called the upper part of the upper mantle, and varies in depth from about (50–100 km) below Earth's surface. The combination of the crust and this upper part of the upper mantle, which are both comprised of relatively cool and rigid rock material, is called the lithosphere.

Below the lithosphere, the temperature is believed to reach (1,000°C), which is warm enough to allow rock material to flow if pressurized. Seismic evidence suggests that there is also some molten material at this depth (perhaps about 10%). This zone which lies directly below the lithosphere is called the asthenosphere, from the Greek word *asthenes*, meaning weak. The lithosphere,

including both the solid portion of the upper mantle and Earth's crust, is carried "piggyback" on top of the weaker, less rigid asthenosphere, which seems to be in continual motion. This motion creates stress in the rigid rock layers above it, forcing the slabs or plates of the lithosphere to jostle against each other, much like ice cubes floating in a bowl of swirling water. This motion of the lithospheric plates is known as plate tectonics, and is responsible for many of the movements seen on Earth's surface today including earthquakes, certain types of volcanic activity, and continental drift.

## **HYDROSPHERE**

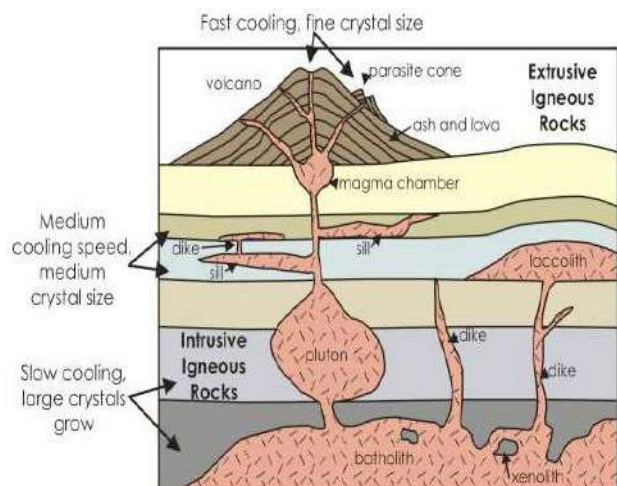
A hydrosphere is the total amount of water on a planet. The hydrosphere includes water that is on the surface of the planet, underground, and in the air. A planet's hydrosphere can be liquid, vapor, or ice. On Earth, liquid water exists on the surface in the form of oceans, lakes and rivers. It also exists below ground—as groundwater, in wells and aquifers. Water vapor is most visible as clouds and fog. The frozen part of Earth's hydrosphere is made of ice: glaciers, ice caps and icebergs. The frozen part of the hydrosphere has its own name, the cryosphere. Water moves through the hydrosphere in a cycle. Water collects in clouds, then falls to Earth in the form of rain



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or snow. This water collects in rivers, lakes and oceans. Then it evaporates into the atmosphere to start the cycle all over again. This is called the water cycle.

## VOLCANO



A volcano is a hole in Earth's surface through which magma (called lava when it reaches Earth's surface), hot gases, ash, and rock fragments escape from deep inside the planet. The word volcano also is used to describe the cone of erupted material (lava and ash) that builds up around the opening. Volcanic activity is the main process by which material from Earth's interior reaches its surface. Volcanoes played a large part in the formation of Earth's atmosphere, oceans, and continents. When Earth was new, the superheated gases within it (including carbon dioxide) streamed out through countless volcanoes to form the

original atmosphere and oceans. Volcanoes are found both on land and under the oceans (where they are called seamounts). Geologists label volcanoes by their periods of activity. If a volcano is erupting, it is called active. If a volcano is not presently erupting but might at some future date, it is called dormant. If a volcano has stopped erupting forever, it is called extinct. Generally, volcanoes are labeled extinct when no eruption has been noted in recorded history.

**Caldera:** Large circular depression formed when an empty magma chamber causes the collapse of the volcano above it.

**Hot spot:** An upwelling of heat from beneath Earth's crust.

**Lava:** Magma at Earth's surface.

**Magma:** Molten rock deep within Earth that consists of liquids, gases, and particles of rocks and crystals.

**Pyroclastic flow:** A dense wave of superheated air and rock that moves as a fluid from an erupting volcano, sometimes crossing thousands of square miles of landscape.

**Seafloor spreading:** Spreading of the seafloor outward at ridges where two oceanic plates are diverging.

**Seamount:** Large, submarine volcano.

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According to the geologic theory called plate tectonics, Earth's crust is broken into various rigid plates that "float" on the surface of the planet. The plates move in response to intense pressure created underneath by the movement of currents carrying heat energy from the center of the planet to the surface. This pressure causes plates to move toward or away from each other (and also past each other in a horizontal motion).

Volcanoes form on land near coastal areas when a continental (land) plate and an oceanic plate converge or move toward each other. Since the oceanic plate is denser, it subducts or sinks beneath the continental plate. As the rock of this subducted oceanic plate is pushed farther and farther beneath the continent's surface, extremely high temperatures and pressure melt the rock. This creates hot, buoyant magma that then rises toward the surface. When the magma reaches the crust, it collects in a magma reservoir or chamber. When pressure inside the reservoir exceeds that of the overlying rock, magma is forced upward through cracks in Earth's crust.

Hydrothermal vents are cracks in the ocean floor or chimney-like structures extending from the ocean floor up to 150 feet (45 meters) high. Due to nearby volcanic activity, these vents release hot mineral-

laden water into the surrounding ocean. Temperature of this fluid is typically around 660°F (350°C).

Often, the fluid released is black due to the presence of very fine sulfide mineral particles (iron, copper, zinc, and other metals). As a result, these deep-ocean hot springs are called black smokers. Hydrothermal vents usually occur at midocean ridges where new seafloor is created.

Hydrothermal vents are surrounded by unusual forms of sea life, including giant clams, tube worms, and unique types of fish. These organisms live off bacteria that thrive on the energy-rich chemical compounds transported by hydrothermal fluids. This is the only environment on Earth supported by a food chain that does not depend on the energy of the Sun or photosynthesis. The energy source is chemical, not solar, and is called chemosynthesis.

Seamounts (underwater volcanoes) form when oceanic plates both converge (move toward each other) and diverge (move away from each other). When oceanic plates converge, one sinks beneath the other, creating a deep-sea trench. Rising magma from the subducted plate then rises to form volcanoes along the trench. When oceanic plates diverge, magma seeps upward at the

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ridge between the plates to create new seafloor (a process called seafloor spreading). Volcanoes form on either side of the ridge.

Hot spots are special areas where volcanoes form apart from plates converging or diverging. Hot spots are a common term for thermal plumes of magma welling up through the crust far from the edges of plates. As a plate drifts over a hot spot, magma from Earth's interior rises and volcanic activity takes place. Some famous hot spots are Hawaii, Yellowstone National Park (United States), Iceland, Samoa, and Bermuda.

## **Volcanic eruptions**

Volcanoes erupt different material, and they each have their own style of erupting. These varied eruptions result from the differences in magma that each volcano contains. Magma that is low in gas and silica (silicon dioxide, a compound found widely in rocks and minerals) yields a gentle flow of thin, quickly spreading lava. In contrast, magma that is rich in gas and silica gives rise to violent explosions: the thick, tarlike magma may plug up the volcanic vent, blocking the upward movement of the magma until built-up pressure blows away the overlying rock. Geologists classify volcanic eruptions

according to four chief forms or phases: Hawaiian, Strombolian, Vulcanian, and Peleean.

In a Hawaiian phase, runny lava gushes out in a fountain without any explosive eruptions. In a Strombolian phase (named after the Stomboli volcano on an island north of Sicily), thick lava is emitted in continuous but mild explosions. Lava arcs and steam-driven clouds of ash shower the dome with molten drizzle. A Vulcanian phase occurs when a magma plug has blocked the volcanic vent. The resulting explosive eruption hurls tons of almost solid magma into the sky, and a vapor cloud forms over the crater. The most violent eruption is the Peleean, named after Mount Pelee on the Caribbean island of Martinique. Fine ash, thick lava, and glowing, gas-charged clouds are emitted, traveling downhill at a tremendous speed.

Fierce rains often accompany eruptions because of the release of steam from the volcano, which then condenses in the atmosphere to form clouds. Volatile gases in the magma also fly into the atmosphere upon eruption. These include hydrogen sulfide, fluorine, carbon dioxide, and radon. A dense wave of ash, superheated gases, and rock that moves as a fluid from an erupting volcano is known as a pyroclastic

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flow. Flows travel downhill at speeds more than 60 miles (100 kilometers) per hour, filling existing valleys with the fluid mixture. This material deflates as it cools. The rock formation that results is called an ignimbrite (pronounced IG-nim-bright), and the fused rock is called tuff. Ignimbrites can cover hundreds of square miles of landscape, such as the Mitchell Mesa Tuff of West Texas.

When a volcano erupts such a large volume of material, often emptying its magma chamber, the central part of the cone is left unsupported. As a result, the crater and walls of the vent collapse into the hollow chamber, creating a large circular depression known as a caldera across the summit. The famous Crater Lake in southern Oregon formed in this way.

## **Volcanic benefits**

The eruption of volcanoes through geologic time built the continents. The soil of some of the world's richest farmland draws its fertility from minerals provided by nearby volcanoes. The heat of magma boils water into steam that spins the turbines of geothermal power stations. Geothermal stations now light electric power grids in Iceland, Italy, New Zealand, and a other places. Enough heat flows from the world's volcanic regions and midoceanic ridges to power industrial civilization for several hundred million years.

This power source awaits only the development of feasible geothermal technology.

## **Earthquake**

An earthquake is a geological event inside the earth that generates strong vibrations. When the vibrations reach the surface, the earth shakes, often causing damage to natural and manmade objects, and sometimes killing and injuring people and destroying their property. Earthquakes can occur for a variety of reasons; however, the most common source of earthquakes is movement along a fault.

Some earthquakes occur when tectonic plates, large sections of Earth's crust and upper mantle, move past each other. Earthquakes along the San Andreas and Hayward faults in California occur because of this. Earthquakes also occur if one plate overruns another, as on the western coast of South America , the northwest coast of North America , and in Japan. If plates collide but neither is overrun, as they do crossing Europe and Asia from Spain to Vietnam, earthquakes result as the rocks at the abutting plates compress into high mountain ranges. In all three of these settings, earthquakes result from movement along faults.

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A fault block may also move due to gravity, sinking between other fault blocks that surround and support it. Sinking fault blocks and the mountains that surround them form a distinctive topography of basins and mountain ranges. This type of fault block configuration is typified by the North American Basin and Range topographic province. In such places, elevation losses by the valleys as they sink between the mountains are accompanied by tremors or earthquakes. Another kind of mountain range rises because of an active thrust fault. Tectonic compression (tectonic, meaning having to do with the forces that deform the rocks of planets) shoves the range up the active thrust fault, which acts like a natural ramp.

Molten rock called magma moves beneath but relatively close to the earth's surface in volcanically active regions. Earthquakes sometimes accompany volcanic eruptions as huge masses of magma move underground.

Nuclear bombs exploding underground cause small local earthquakes, which can be felt by people standing within a few miles of the test site. The earthquakes caused by nuclear bombs are tiny compared to natural earthquakes; but they have a distinctive "sound," and their location can be

pinpointed. This is how nuclear weapons testing in one country can be monitored by other countries around the world.

Earth is covered by a crust of solid rock, which is broken into numerous plates that move around on the surface, bumping, overrunning, and pulling away from each other. One kind of boundary between rocks within a plate, as well as at the edges of the plates, is a fault. Faults are large-scale breaks in Earth's crust, in which the rock on one side of the fault has been moved relative to the rock on the other side of the fault by tectonic forces. Fault blocks are giant pieces of crust that are separated from the rocks around them by faults.

When the forces pushing on fault blocks cannot move one block past the other, potential energy is stored up in the fault zone. This is the same potential energy that resides in a giant boulder when it is poised, motionless, at the top of a steep slope. If something happens to overcome the friction holding the boulder in place, its potential energy will convert into kinetic energy as it thunders down the slope. In the fault zone, the potential energy builds up until the friction that sticks the fault blocks together is overcome. Then, in seconds, all the potential energy built up over the years turns to

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kinetic energy as the rocks surge past each other.

The vibrations of a fault block on the move can be detected by delicate instruments (seismometers and seismographs) in rocks on the other side of the world. Although this happens on a grand scale, it is remarkably like pushing on a stuck window or sliding door. Friction holds the window or door tight in its tracks. After enough force is applied to over-come the friction, the window or door jerks open.

Some fault blocks are stable and no longer experience the forces that moved them in the first place. The fault blocks that face each other across an active fault, however, are still influenced by tectonic forces in the ever-moving crust. They grind past each other along the fault as they move in different directions.

Fault blocks can move in a variety of ways, and these movements define the different types of faults. In a vertical fault, one block moves upward relative to the other. At the surface of the earth, a vertical fault forms a cliff, known as a fault scarp. The sheer eastern face of the Sierra Nevada mountain range is a fault scarp. In most vertical faults, the fault scarp is not truly vertical, and one of the fault blocks "hangs" over the other.

This upper block is called the hanging wall and the lower block, the foot wall.

In horizontal faults, the blocks slide past one another without either block being lifted. In this case, the objects on the two sides of the fault simply slide past one another; for example, a road that straddles the fault might be offset by a number of feet. Complex faults display movements with both vertical and horizontal displacements.

Different kinds of earthquake-generated waves, moving at their own speeds, arrive at the surface in a particular order. The successive waves that arrive at a single site are called a wave train. Seismologists compare information about wave trains that are recorded as they pass through a number of data-collecting sites after an earthquake. By comparing data from three recording stations, they can pinpoint the map location (epicenter) and depth within the earth's surface (focus or hypocenter) of the earthquake.

These are the most important types of seismic waves:

**P-waves**—The fastest waves, these compress or stretch the rock in their path through Earth, moving at about 4 mi (6.4 km) per second.

**S-waves**—As they move through Earth, these waves shift the rock in their path up

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and down and side to side, moving at about 2 mi (3.2 km) per second.

**Rayleigh waves and Love waves**—These two types of "surface waves" are named after seismologists. Moving at less than 2 mi (3.2 km) per second, they lag behind P-waves and S-waves but cause the most damage. Rayleigh waves cause the ground surface in their path to ripple with little waves. Love waves move in a zigzag along the ground and can wrench buildings from side to side. The relative size of earthquakes is measured by the Richter scale, which measures the energy an earthquake releases. Each whole number increase in value on the Richter scale indicates a 10-fold increase in the energy released and a thirty-fold increase in ground motion. An earthquake measuring 8 on the Richter scale is ten times more powerful, therefore, than an earthquake with a Richter Magnitude of 7, which is ten times more powerful than an earthquake with a magnitude of 6. Another scale—the Modified Mercalli Scale uses observations of damage (like fallen chimneys) or people's assessments of effects (like mild or severe ground shaking) to describe the intensity of a quake.

Violent shaking changes water bearing sand into a liquid-like mass that will not support

heavy loads, such as buildings. This phenomenon, called liquefaction, causes much of the destruction associated with an earthquake in liquefaction-prone areas.

### **TSUNAMI**

A tsunami is a series of ocean waves that sends surges of water, sometimes reaching heights of over 100 feet (30.5 meters), onto land. These walls of water can cause widespread destruction when they crash ashore. These awe-inspiring waves are typically caused by large, undersea earthquakes at tectonic plate boundaries. When the ocean floor at a plate boundary rises or falls suddenly it displaces the water above it and launches the rolling waves that will become a tsunami. Most tsunamis, about 80 percent, happen within the Pacific Ocean's "Ring of Fire," a geologically active area where tectonic shifts make volcanoes and earthquakes common. Tsunamis may also be caused by underwater landslides or volcanic eruptions. They may even be launched, as they frequently were in Earth's ancient past, by the impact of a large meteorite plunging into an ocean. Tsunamis race across the sea at up to 500 miles (805 kilometers) an hour—about as fast as a jet airplane. At that pace they can cross the entire expanse of the Pacific Ocean in less

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than a day. And their long wavelengths mean they lose very little energy along the way. In deep ocean, tsunami waves may appear only a foot or so high. But as they approach shoreline and enter shallower water they slow down and begin to grow in energy and height. The tops of the waves move faster than their bottoms do, which causes them to rise precipitously.

A tsunami is usually composed of a series of waves, called a wave train, so its destructive force may be compounded as successive waves reach shore. The Pacific Tsunami Warning System, a coalition of 26 nations headquartered in Hawaii, maintains a web of seismic equipment and water level gauges to identify tsunamis at sea.

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