SSC CGL 2017 - Geography Guidebook

PHYSICAL GEOGRAPHY

- The word 'geography' derives from the greek words 'geo' (meaning *'the earth')* and "graphia" (meaning 'to *write')*. Geography is the science that deals with the description of Earth's surface.

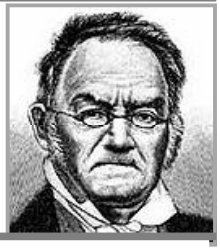
Physical geography

Physical geography focuses on geography as an **Earth science** (and is sometimes called Earth System Science).

World Day of Water	March 22
World Environment Day	June 5
Earth Day	April 22
World Meteorological Day	March 23
World Solar Energy Day	May 3
World Environment Day	June 5
World Food Day	October 16
World Forestry Day	March 21
World Habitat Day	Ist Monday in October
World Standard Day	October 14
World Animal Welfare Day	October 4

Alexander Von Humboldt, considered to be the founding father of physical geography

Carl Ritter - considered to be one of the founding fathers of modern geography



Gondwanaland

- For hundreds of millions of years, all the land of Earth was joined together in one large mass or super continent. Scientists call it **Pangaea** (meaning "all lands" in Greek)..
- Then about 200 million years ago the land began to drift apart. It broke into two pieces, and scientists have called the continent in the **North Laurasia** and the continent in the **South Gondwanaland.**
- The two large continents continued to break apart into the smaller continents that exist today. Scientists call this movement 'continental drift'.
- It included most of the landmasses in today's southern hemisphere, including Antarctica, South America, Africa, Madagascar, Australia-New Guinea, and New Zealand, as well as Arabia and the Indian subcontinent.
- Gondwanaland was named by Eduard Suess, an Austrian geologist.
- Gondwanaland was a hot and dry place with rainy seasons. The first tree ferns and coniferous trees appeared there. Dinosaurs lived there at one time too.

Physical Geography

Geomorphology studies the Earth's structure, the rocks that make up the earth, relief features like mountains and plains and their evolution.

Hydrology is the study of the movement, distribution and quality of water throughout the earth.

Oceanography is the study of ocean currents, waves and tides.

Climatology is the study of climatic features such as temperature, precipitation and humidity.

Biogeography is the science that deals with the distribution of flora and fauna in different parts of the world.

Pedology is the study of soils and soil formation.

Paleontology is the study of fossils.

Cartography: Deals with the production and study of maps and charts.

Chorology : Study of geographical areas, plants and animal distribution.

Demography : Described as *population geography*, it examines the structure of human populations and their dynamic aspects.

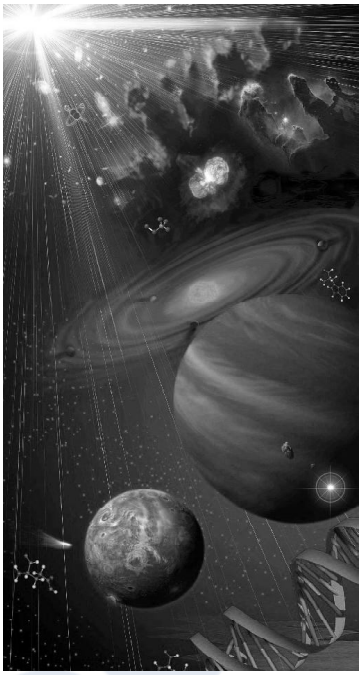
Lithology: Deals with the characteristics of rocks.

Geology: Study of the chemical composition of earth's crust.

Potamology: Study of rivers.

Orology: Study of mountains.

Petrology: Study of the origin, composition and structure of rocks.



The Origin of the Earth

Most of the theories concerned with the origin of the earth emphasise that the planet originated as a hot gaseous mass, which on cooling, turned first into a liquid and then into a solid mass.

Continental drift theory

Continental Drift Theory was put forward by the German scientist ***Alfred Wegner*** in 1915. According to the Continental Drift Theory, part of the crust are capable of horizontal movement round the globe causing the continents to slowly change their positions in relation to one another.

- The fact that South America is a mirror image of Africa is presented as a proof of the continental drift theory.

Plate Tectonics Theory

Plate tectonics theory was put forward by A.Holmes. According to this theory the lithosphere of earth is considered to be divided into lithospheric plates. Each plate is capable of moving over the asthenosphere carrying oceanic or continental crust alike. At plate boundaries major landforms are created.

- Most theories about the origin of the earth assumes that it began in a gaseous state.
- Life appeared on earth only when the earth cooled from its gaseous state to solid one.
- **Carbon dating** is the most important method for estimating the age of fossils found in the rocks of the earth's crust.
- The age of the earth is estimated to be about 4.6 billion years.

Alfred Lothar Wegener
(1880 – 1930)

Wegener was a German interdisciplinary scientist and meteorologist, who became famous for his **theory of continental drift.**

- **Crust** is the outermost and thinnest layer of the earth's surface.
  - The crust comprises about 5% of the earth body.
  - Thickness of the crust is more under the continents and lesser under oceans.
  - The outermost layer of the crust is composed of lighter silicates termed as **sial** (Silica + Aluminium).
  - Moho or Mohorovicic discontinuity separates crust from mantle.
  - The average density of this layer is 2.7
- **The Mantle** a layer between crust and the core.
  - Mantle contains 83% of the total volume and 68% of the total mass of the earth. Average density of this layer is 5.68.
  - Mantle is separated from the core by Gutenberg discontinuity.
  - It is largely composed of silicon and magnesium called sima.
  - The rocks in this layer may be in the glassy state.
- **Core** is the central region of the earth.
  - It is 3475 km in radius.
  - By volume, it is 16% of the earth body .
  - By mass, it constitutes 32% of the mass of the earth.
  - The temperature of the inner core is 6000^0C - 7000^0C
  - The inner core is composed of NiFe (Ni for Nickel Fe for Iron.).
  - Density of this part is 17.2.
  - Average density of earth is 5.53.

Place of the Earth in the Universe

Two theories have been given to locate the earth's position in the universe. These are Geocentric theory and Helio centric theory.

Geocentric Theory

This theory prevailed in ancient and middle ages. According to this theory, the earth is located in the centre of the universe and all the planets revolves around it.

Heliocentric theory

This theory states that the sun is the centre and all the planets including the earth revolves around it.

Structure of Earth

1. **Crust :**This is the outer layer of the Earth varying between 5 to 50 km in depth under the surface of the earth.
2. **Mantle**: This portion is made up of iron and magnesium silicates, with temperature ranging up to 1600^0 C and extends downwords to a depth of about 1000 km. The thickness of the lower mantle is about 1900 km.
3. **Core**: The outer core, approximately 2100 km thick, consists of molten iron and nickel with temperatures ranging between 2000^0 C and 5000^0C. Below this is the solid inner core which has diameter of 2,740 km.

The Earth

Age	: 4.6 billion years
Mass	: 5.976×10^{24} kg.
Volume	: 1.083×10^{24} litres
Mean Density	: 5.518 kg/litres
Shape	: An oblate spheroid or a geoid.
Size	: Polar diameter 12,713.54 km; Equatorial diameter 12,756,32 km; Polar circumference 40,008.00 km and Equatorial circumference 40,075.16 km.
Area	: Total surface area 509,7000,000 sq. km; Land area about 148,400,000 km (about 29 per cent of the total area); Water area about 361,300,000 sq. km. (about 71 per cent of the total surface area).
Motions	: (i) Rotation (spinning motion on polar axis), once every 23 hours 56 minutes and 4.09 seconds (ii) Revolution (around the sun), once every 365 days, 6 hours, 9 minutes and 9.54 seconds.
Surface Features	: Highest point on land - Mt Everest 8,848 m above the sea level. Lowest area on land-shore of Dead Sea (399 m below sea level). Mean height of land 756 m.
Ocean Depths	: Deepest area - Mariana Trench in Pacific Ocean south-west of Guam (11,033 m below the sea surface). Average depth of oceans 3,730 m.
Chemical make up of the Earth's Crust	: (percent by weight): oxygen 46.6, silicon 27.7, aluminium 8.1, iron 5.0, calcium 3.6, sodium 2.8, potassium 2.6, magnesium 2.0 and other elements 1.6.
Mean Surface Temperature	: 14°C, Highest temperature 58°C at Al Aziziyah, Libya and the lowest temperature -89.6°C at Vostok Station in Antarctica.
Inclination of the Polar Axis to the Orbital Plane	: 23 deg. 26 min. 59 second.
Orbital Speed About the Sun	: 29.8 km/s
Mean Distance From the Sun	: 149,598,500 km (one astronomical unit). The maximum distance at the time of aphelion between July 2 and 5 is about 152 million km and the minimum distance at perihelion between January 2 and 5 is about 147 million km.

- **The rotation of the earth causes day and night and the revolution of the earth results in the change of the seasons. Since the path of the earth about the sun is elliptical, the distance between the two keeps changing.**

Geographic Information Systems (GIS)

- GIS uses computers for storing and processing information about the Earth's surface and land use.
- Geographic Information Systems or GIS is a technology that attaches a database to an electronic map.
- GIS technology can be used for scientific investigations, resource management and development planning.
- GIS is used to calculate the emergency response in the event of a natural disaster.
- GIS can help to pinpoint wetlands that need protection from pollution.
- The map gives detailed data, i.e., every asset in a municipality, town or even a park, primary school, hospital, housing can be shown on the map.

Lithosphere, Asthenosphere & Centrosphere

- The earth is divided into lithosphere, asthenosphere and centrosphere.
- **Lithosphere** is the outer portion of the earth, including the crust and the upper mantle.
- **Asthenosphere** is the upper part of the mantle which is about 250 km thick. The rocks contained in the asthenosphere are partially molten.
- **Centrosphere** is the central part of the earth which inspite of having a very high temperature behaves like solid due to immense pressure of the overlying rocks.

The National Geographic Society

- The National Geographic Society (NGS) is one of the largest nonprofit scientific and educational institutions in the world.
- Its interests include geography, archaeology and natural science, the promotion of environmental and historical conservation, and the study of world culture and history.
- It is located in Washington D.C.
- *The National Geographic* magazine is currently published in 32 language editions in many countries around the world.
- National Geographic Channel, is a television channel that airs nonfiction television programs produced by the NGS.

Composition of the Earth's Crust

- Most abundant element in atmosphere is Nitrogen (78%) then Oxygen (21%). But the most abundant element in the universe is hydrogen.
- The crust is made up of rocks. The rocks are made up of minerals in a consolidated form.
- The process of rock formation, consolidation of mineral particles is called lithification.
- A rock can be defined as an aggregate of minerals.
- The ratio between the total amount of light reflected from an object in space and the total amount of light falling on an object is called **albedo.**
- A perfect reflector has an albedo of 1 and earth has an albedo of 0.34 (34%).

Position, Shape and Size of Earth

- Earth moves around the sun in an elliptical orbit. The spinning (rotation) of the earth at a high speed has caused its mass to bulge at the equator and sink in at the poles.
- The bulging of central part (equatorial region) is due to centrifugal force.
- The plane passing through the Earth's orbit is called orbital plane. The Earth's axis is inclined and makes an angle $66\frac{1}{2}^0$ with the orbital plane.
- The difference between the equatorial diameter (12,755 km) and the polar diameter (12, 712 km) of earth is 43 km.
- 71% of the total surface area of earth is water and 29% is land.
- Earth has 40,005 km polar cir-

Earth is lying between the Venus and Mars. It is the third planet of the solar system. It ranks fifth in size with a mean radius of 6371 kilometers. The shape of the earth is **oblate spheroid**, ie, almost spherical, but flattened a little at the poles with a slight bulge at the centre (equator).

The movement of earth can be mainly divided into two as, **rotation** and **revolution.** Rotation is the spinning of earth on its own axis. Earth takes 365 days, 5 hours, 48 minutes and 45.51 seconds for one revolution around the sun. It is called one solar year. Earth has to cover 938 million kilometers along its elliptical orbit to complete one revolution.

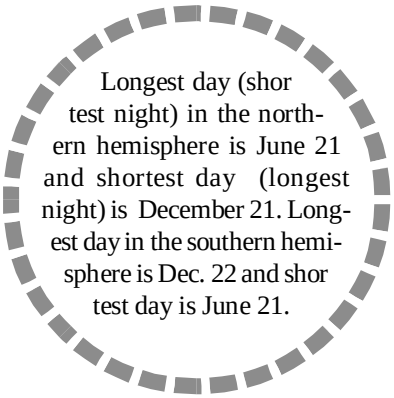
cumference and 40,077 km equatorial circumference.

Motions of the Earth and their Consequences

- The movement of earth can be mainly divided into two as, **rotation** and **revolution.**
- Rotation is the spinning of earth on its own axis.
- Earth spins on its axis at an angle of 66½^0 to the plane of earth from west to east.
- Earth's rotation takes 23 hours, 56 minutes and 4.091 seconds to complete one rotation.
- Rotation results in the formation of day and night, changes in the direction of wind and ocean currents. The daily occurrence of tides twice is also resulted by the rotation of earth.
- Day and night are not of equal duration throughout the year because of the tilt of earth's axis.
- Earth rotates 1^0 in 4 minutes. Therefore earth rotates 15^0 in one hour. It takes 24 hours (one day) to complete one rotation (360^0).
- Day and night are equal at the equator throughout the year, because the circle of illumination always divides the equator into two equal parts.
- The duration of day and night at the poles is six months each.
- Rotation also causes coriolis forces (named after the French mathematician Gaspard de Coriolis who first explained them mathematically) which are related to the decreasing rotational velocity with increasing latitude and tend to deflect anything which is moving over the earth's surface.
- Coriolis force is zero at the equator and increases progressively towards either poles.
- **Revolution** is the movement of earth in its orbit around the sun, along an almost circular path (elliptical) called its orbit. The earth revolves approximately one degree in one day. The speed of revolution of earth is 29 km/second.
- The earth's revolution causes a change in seasons. Seasons are classified into four called the **Spring, Summer, Autumn** and **Winter.** The earth's axis is inclined at an angle of 66 ½^0 to the plane of its orbit.
- **Equinoxes** are dates when the night and days are equal. During these days the sun shines vertically on the equator. This occurs twice a year. **March 21** is called the *vernal equinox* or *Spring equinox* and **September 23** is called *autumnal equinox*.
- **Solstice** is the time of the year when the difference between

Earth's Plates

- The Earth's rocky outer crust solidified billions of years ago, soon after the Earth formed.
- The top layer of the Earth's surface is called the crust (it lies on top of the plates). Oceanic crust (the thin crust under the oceans) is thinner and denser than continental crust. Crust is constantly being created and destroyed; oceanic crust is more active than continental crust.
- The plates are made of rock and drift all over the globe; they move both horizontally (sideways) and vertically (up and down). Over long periods of time, the plates also change in size as their margins are added to, crushed together, or pushed back into the Earth's mantle. These plates are from 50 to 250 miles (80 to 400 km) thick.
- The current continental and oceanic plates include: the Eurasian plate, Australian-Indian plate, Philippine plate, Pacific plate, Juan de Fuca plate, Nazca plate, Cocos plate, North American plate, Caribbean plate, South American plate, African plate, Arabian plate, the Antarctic plate, and the Scotia plate. These plates consist of smaller sub-plates.
- Type of Plate Movement: Divergence, Convergence, and Lateral Slipping.
- When two continental plates collide, mountain ranges are created as the colliding crust is compressed and pushed upwards.



the length of days and the length of nights is the largest. During these days, the sun shines vertically over the tropic.

- On or around **June 21,** the North pole tilts towards the sun and the sun shines directly over the tropic of cancer. This is called *Summer Solstice*. On or around **December 22**, the earth is at the end of its orbit. The South pole tilts towards the sun and the North pole away from it, which is called as *Winter Solstice*.
- **Tropics** are the regions circling the earth between the Tropic of Cancer (23^0 27'N) and the Tropic of Capricorn (23^0 27'S). These imaginary lines of latitude, mark the farthest points reached by the sun's vertical rays. The $23\frac{1}{2}^0$ North parallel is termed as Tropic of Cancer and the $23\frac{1}{2}^0$ South parallel is termed as Tropic of Capricorn.
- Sun rays fall vertically at the Tropic of Cancer on June 21 and they fall vertically at the Tropic of Capricorn on December 22.
- **Aphelion** is the point in the earth's or other planets orbit which is farthest from the sun. Earth is at its aphelion on **July 4** every year at a distance of 152 million kilometers.
- **Perihelion** is a point in the orbit of a planet or any other celestial body at which it passes closest to the sun. Earth will be at its peri helion on January 3 every year at a distance of 147 million kilometres.
- **Perigee** is the point in the orbit of the moon at which it is closest to the earth. **Apogee** is the point in the orbit of the moon at which it is farthest from the earth.

Location of Place and Time on the Earth's Surface

- Equator is an imaginary line passing round the earth midway between the north and south poles, dividing the earth into two equal halves.
- **Latitude** is the angular distance in degrees on the earth's surface measured north and south of the equator. The latitude of any point on the earth is most precisely expressed in degrees, minutes and seconds.
- There are about 180 parallel latitudes. The distance between any two parallel latitudes is always equal. One degree of latitude is approximately equal to 111 km.
- A meridian is an imaginary line extending from the north pole to the south pole at right angles to the equator.
- Prime Meridian is the 0^0 meridian which passes through Greenwich,a place near London. It is also known as the Greenwich meridian.
- **Longitudes** are equi-distant lines drawn east and west of the Greenwich meridian. They denote the angular distances of a place due east or west of the Greenwich meridian. There are 360 meridians of longitudes.
- One hour is equal to 15^0 of longitude.
- Longitude is an important factor in determining the time in all parts of the world. *Local time* of a place is calculated with respect to the mid day position of the sun at that place.
- **Local time** varies from Greenwich time (London) at the rate of four minutes / degree of longitude.
- **Standard time** is the uniform time fixed by each country.
- Standard time in India is the local time of a place near Allahabad at $82\frac{1}{2}^0$E longitude.
- Greenwich Mean Time is the standard time of U.K. It is based on the local time of the meridian passing through Greenwich near London.
- If a person going east of Greenwich for 180^0, he would put his clock forward by 12 hours. At the same time if another person is going to west of Greenwich for 180^0, he would put his clock backward by 12 hours. When they meet on the International Date Line, there would be one day's difference between them.
- Earth is divided into 23 full time zones and two half time zones

each having longitudinal width of 15^0 and $7\frac{1}{2}^0$ respectively.

- The **International Date Line** is situated at 180^0 meridian from Greenwich. It runs down the mid Pacific Ocean, veering to keep all of the islands in a group.
- When one crosses the International Date Line from east to west the date is to be advanced by one day (loses one day). Similarly when one crosses the Date Line from west to east, the date is to be set back by one day (gains one day).
- A ship while crossing the Date Line eastwards gains a day, while it loses a day crossing westwards.
- The local time of Arunachal Pradesh is two hours ahead of that of Gujarat because Arunachal Pradesh is 30^0 east of Gujarat.
- Russia, the largest country in the world, extends 165^0 from East to West. Therefore it is divided into eleven time zones, each differing in one hour.
- The distance between any two meridians is not equal. They get closer from the equator to poles.
- Since earth rotates 15^0 in one hour, there is a difference of one hour in local time to every 15^0.
- **Sidereal day** is the time between two observed passages of a star over the same meridian of longitude.
- Sidereal day = 23 hrs. 56 min. 4.09 seconds.
- **Solar day** is the time between two successive transits of the sun over the same meridian.
- Mean solar day = 24 hrs.

The difference between the Greenwich Mean Time and Indian Standard Time is 5 ½ hours. Greenwich Mean Time is the standard time of United Kingdom. Indian Standard time is the local time of a place near Allahabad at 82 ½°E longitude.

Volcanoes

- A volcano is formed when the molten magma in the earth's interior escapes through the crust by vents and fissures accompanied by steam gases (hydrogen sulphide, sulphur dioxide, hydrogen chloride, carbon dioxide etc) and pyroclastic materials.
- The molten rock material is the most common form of volcanic matter ejected during volcanic activity. This material is called Magma. Upon reaching the surface of the earth, it is called Lava.
- Volcanic activity is an important process of construction on the earth's surface.
- *Crater* is a funnel shaped depression having a circular plan and a neck at the centre. Craters are formed by explosion or subsidence.

Pinatubo ash plume reaching a height of 19 km, 3 days before the climactic eruption of 15 June 1991.

- Some times, the volcanic material may not be able to reach the surface and it may get deposited in the layers of the crustal rocks. This type of activity is called intrusive volcanic activity.
- Lava that is rich in silica and poor in metallic minerals is called acid lava.
- Lava that is rich in metallic minerals has a low melting point and remains liquid for a longer time even with some loss of heat. Therefore such lava is more likely to reach the surface, is called basic lava.
- Circular deposit of lava may remain higher than the areas surrounding it. Such a feature is called a volcanic plug.
- Concave Saucer shaped deposits of lava in the crustal rocks are called lopoliths.
- There are three types of volcanoes - active, dormant and extinct.
- An **active** volcano erupts occasionally
  eg: Mount Stromboli in Italy, Barren Islands in India (The only active volcano in India). Mt. Etna in Sicily and Cotopaxi in Ecuador.
- Mt. Stromboli whose frequent eruptions that resulted in more like a summit glow, have earned it a crown title 'Light house of the Mediterranean.'
- **A dormant** volcano has not been seen to erupt, but it shows evidence of recent activity.

- Mt. Vesuvius and Mt. Krakatau are examples of dormant volcano.
- **An extinct** volcano shows no sign of life.
  Eg: Mt. Kilimanjaro
- Fumaroles are fissures in the ground of volcanic areas through which gases including nitrogen, ammonia, carbon monoxide and methane are given off.
- **The Pacific** belt is known as the ***Ring of fire*** because of the largest number of active volcanoes along the coasts of America and Asia on the ocean.
- **Batholiths** are a large mass of magma which often forms the root of a mountain and is made up of granite.
- Famous volcanoes of the world: Cotopaxi (Ecuador), Mt. Kilimanjaro (Tanzania), Mt. Etna (Italy), Mt. Vesuvius (Italy), Mt. Popa (Myanmar), Mauna Lao, Mt. Kenya, Mt. Stromboli (Italy).
- The volcanic islands of Hawai in the mid pacific, the famous hot water geycers of the Yellow Stone region of North America are examples of inplate volcanoes.
- Surtsey, is an island born from a series of volcanic explosions from deep within the earth's core culminated in the creation of a barren crest of rock that jutted from the Atlantic Ocean.

Earthquakes

- An earthquake (also known as a quake, tremor or temblor) is the result of a sudden release of energy in the Earth's crust that creates seismic waves.
- Earthquakes which originates naturally below the surface sending out a series of shock waves.
- Earthquakes are frequently associated with faults. The place of origin of an earthquake inside the earth is called its focus.
- Epicentre is the point on the earth's surface vertically above the focus. On the earth's surface the maximum damage is caused at the epicentre.
- Most of the earthquakes originate at a depth of about 60 km below the surface of the earth. The point of origin of an earthquake in the interior of the earth is called the seismic focus.
- **Seismology** is the study of earthquakes and their impact. There are two corresponding measures of the severity of an earthquake : intensity and magnitude.
- Intensity is the measure of the local effect which varies according to both the distance from the source of the earthquake and the intrinsic strength of the earthquake. The intensity is expressed in **Points.**
- About 68% of all earthquakes are observed in the vast region of the Pacific ocean as a **'Ring of fire'.**
- Some earthquakes are caused by the movement of lava beneath the surface of earth during volcanic activity.
- The Kutch earthquake (1819), the Assam earthquake (1897), the Kangra earthquake (1905), the Bihar earthquake (1934), the Lathur, Maharashtra earthquake (1993) and the Gujarat (Kutch) earthquake (2001) are the well known examples of earthquakes in India.

Earthquakes are measured with a seismo meter; a device which also records is known as a seismograph.

The Aravallis is the oldest mountain range in India. The Himalayas are the youngest fold mountains in India. The Himalayas, the Alps, the Andes, the Rockies etc. are examples of fold mountains or young mountains. The Pyrenees (Europe), Appalachians (America) and the Aravallis (India) are examples of old mountains. They were formed in the pre-drift area.

Tsunami

- Tsunamis (tidal waves) are long-wave length, long-period sea waves produced by the sudden or abrupt movement of large volumes of water.
- The Japanese word for a great sea wave, 'tsunami', has came into general use to identify a seismically generated sea wave.
- Earthquakes, volcanic erup-

Ritcher Scale & Seismograph

- An earthquake is measured by its Magnitude and Intensity.
- Magnitude is a measure of the strength of the earthquake at its source (focus). It is assessed in **Richter scale.**
- **Seismometers** are instruments that measure motions of the ground, including those of seismic waves generated by earthquakes, nuclear explosions, and other seismic sources. It is also used to measure the strength (intensity) and location of earthquakes.
- Richter Magnitude Scale was developed in 1935 by Charles F Richter of the California Institute of Technology as a mathematical device to compare the size of earthquakes. The magnitude of an earthquake is determined from the logarithm of the the amplitude of waves recorded by seismographs.
- On the Richter Scale, magnitude is expressed in whole numbers and decimal fractions. The Richter magnitudes are based on a logarithmic scale (base 10). What this means is that for each whole number you go up on the Richter scale, the amplitude of the ground motion recorded by a seismograph goes up ten times.
- The Richter Scale has no upper limit. Recently, another scale called the **Moment Magnitude Scale** has been devised for more precise study of great earthquakes.
- Earthquakes with magnitude of about 2.0 or less are usually called microearthquakes; they are not commonly felt by people. A magnitude 5.3 might be computed for a moderate earthquake, and a strong earthquake might be rated as magnitude 6.3. The magnitude ranging '7' is severe and magnitude ranging '8' is devastating.

tions and other underwater explosions (including detonations of underwater nuclear devices), landslides and other mass movements, meteorite ocean impacts or similar impact events, and other disturbances above or below water all have the potential to generate a tsunami.

- Tsunamis can also travel thousands of kilometers across open ocean and wreak destruction on far shores hours after the earthquake that generated them. Most destructive tsunamis are caused by earthquakes of magnitude 7.5 or more.

Rocks and Minerals

- Rocks and minerals mainly constitute the upper part of the earth's crust. Minerals are natural substances having characteristic properties and more or less specific chemical compositions.
- Rocks are solid materials that makes up the earth's crust. On the basis of texture, structure and composition, rocks may be classified into **igneous, sedimentary** and **metamorphic.**
- **Igneous rocks** are formed by the solidification of molten magma from the interior of the earth. About 95% of the earth's crust is made up of this type of rocks generally do not occur in layers. Most of them are crystalline.
  eg: Granite, Volcanic rocks and Basalt.
  - Also called primary rocks; they are generally hard, massive, crystalline and contain no fossils.
  - Intrusive igneous rocks formed due to solidification of lava under the surface of the earth. They have content of silica and poor in metallic minerals. Also called acid lava rocks.
  - If the lava has very high melting point it may get solidified at great depths. Rocks thus formed are called plutonic rocks. Granite is a common plutonic rock.
  - Extrusive igneous rocks are formed when the lava reach the surface of the earth and then solidify. It is also called basic lava rocks. e.g., Rhyolite, basalt etc.
- **Sedimentary rocks** are formed from the sediments deposited on the ocean beds. They com-

Petrology is the study of the origin, composition and structure of rocks, while **Lithology** is the study of the characteristics of rocks.

prise only about 5% of the earth's crust, but covers about 75% of the total land surface.

Sedimentary rocks are generally softer, fossils are commonly found in these rocks. These rocks are also called stratified rocks.

eg: Sandstone, Limestone etc.

- Shale is the most abundant of all sedimentary rocks which is composed of silt and clay.
- Sandstone is a common sedimentary rock which is formed mainly of quartz particles cemented together by silica, lime or iron oxide.

❑ **Metamorphic rocks** are formed when pre-existing sedimentary or igneous rock is altered as a result of changes in physical or chemical conditions.

eg : Quartzite and Marble

- The process which produces metamorphic rocks is called **metamorphism.**
- Quartzite is the metamorphic form of the sedimentary rock, sandstone.
- **Slate** is formed by the compression of sedimentary rocks like shale and mudstone. **Gneiss** is formed by the metamorphosis of igneous rocks like granite.
- Chalk is a calcareous rock made up of microscopic skeletal elements from a variety of lime secreting organisms.

❑ Coal and Peat represents the accumulation of vegetation which originated in swamps. Peat is the first stage in the transformation of vegetable matter into coal.

❑ 'Black Twins' is the name given to iron and coal. 'Black lead' is **graphite. Anthracite** is the most superior type of coal.

Classification of Landforms

There are three major landforms - mountains, plateaus and plains.

Mountains:

- An uplifted portion of the earth's surface is called a hill or a mountain.
- In our country, a mountain is differentiated from a hill, when its summit or top rises to more than 900 metres above the base.
- Those with less than this elevation are called hills.
- On the basis of their origin or mode of formation, the mountains are classified as structural or tectonic, residual or dissected and volcanic.

Structural mountains:

- All great mountain systems of the earth are of this type.
- Such systems are hundreds of kilometres wide and thousands of kilometres long.
- Many of them lie near or parallel to continental coastlines.
- Both the fold and the block mountains are included in this type.

(1) Fold mountains:

- The major mountains of the present day including the Alps in Europe, the Rockies of North America, the Andes of South America and the Himalayas of Asia are structural fold mountains.
- The granitic core of such mountains is surrounded by metamorphic rocks, merging with sedimentary layers along the margins.
- These young fold mountains are still rising under the influence of the earth's tectonic force.
- The Aravallis are considered to be one of the oldest mountains on the earth.

(2) Block mountains:

- These mountains are formed when great blocks of the earth's crust may be raised or lowered during the late stages of mountain building.
- The land between the two parallel faults, either rises forming block mountains or horsts, or subsides into a depression termed as a rift valley or graben.
- An old fold mountain may also be left as block mountains due to continuous denudation.
- The Vosges in France, Black forest mountains in Germany and Salt Range in Pakistan are cited as typical examples of block mountains.
- River Rhine in Europe flows through a rift valley.

(3) Volcanic mountains:

- As these are formed by the accumulation of volcanic material, they are also known as mountains of accumulation.
- The matter is thrown out and deposited around the crater to form a mountain.

  If the lava is thin and basic in its composition, it spreads a long distance forming a flatter cone of gentler slope and of lowe elevtation
- If it is thick and of acid

composition a small volcanic cone sharply pointing out is the result.

- Sometimes lava is thrown out along with ash and cinders. Such a volcanic cone is termed as ash and cinder cone.

(4) Residual or Dissected Mountains:

- They owe their present form due to erosion by different agencies.
- That is why they are also known as relict mountains or mountains of circumdenudation.
- Hills like the Nilgiris, they Parsanath, the Girnar and Rajmahal in India are examples of this type.

Plateaus

- A plateau is an elevated area generally in contrast to the nearby areas.
- It has a large area on its top unlike a mountain and has an extensively even or undulating surface.
- The rocks of the plateau are layered with sandstones, shales and limestones.
- But an inclined or a tilted strata many also become flat through continuous wearing down.

The great Deccan Plateau with its slope towards east is a tilted plateau in our country.

- Very often, rivers and streams cut out deep valleys and canyons in a plateau regions.

The plateaus are of four types on the basis of their situation.

(1) intermontane plateaus
(2) continental plateaus
(3) piedmont plateaus
(4) lava plateaus

(1) Intermontane plateaus:

- The plateaus which are partly or fully enclosed by mountains are known as intermontane. Plateaus.
- The highest and extensive plateaus of the world such asTibet, Bolivia and Mexico are of this category.
- These are the results of the mountain-building process which was accompanied by a vertical uplift of the adjoining enclosed lands.

(2) Piedmont Plateaus:

- Situated at the foot of a mountain, they are bounded on the opposite side by a plain or an ocean.
- The plateau of Malwa in India, Those of Patagonia in Argentina and the Appalachian in US are some of the examples

(3) Continental plateaus:

- They rise abruptly from the lowlands or from the sea.
- They are the result of a continental uplift producing large tablelands like the plateaus of Brazil, South Africa, West Australia, Chotanagpur and Shillong. Their heights vary from 600-1500 metres.
- Sometimes a plain or a low-lying area is vertically uplifted and gives rise to a plateau.
- In India plateaus of Kaimur, Rohtas, Ranchi and Karnataka are of this type.

(4) Lava plateaus:

- When lava spreads out to cover the pre-existing land surface, a lava plateau is formed which is also called a plateau of accumulation.
- The horizontal sheets of lava flow have trapped the original topography varying in depth from 1200-1500 metres over large parts of Maharashtra and the adjoining areas in Deccan.

Plains

- A relatively flat and a low-lying land surface with least difference between its highest and lowest points is called a plain.
- The plains are usually lowlands.
- Plains can be placed according to their position and surface relief but are better classified on the basis of their mode of formation.

They are sub-divided into structural, erosional and depositional plains.

Structrural plains:

- These plains are fomed by the uplift of a part of the sea floor usually bordering a continent, that is the continental shelf.
- On the other hand, there are structurally depressed areas which make up very extensive lowlands on the earth.

Erosional plains:

- These are formed when an elevated tract of land, for instance, a mountain, a hill or a plateau is worn down to a plain by the process of erosion.
- Over long ages, the higher land is levelled down into a sort of plain.
- The surface is hardly smooth and forms almost a plain termed as a peneplain.
- These are found in river, ice and wind eroded regions.

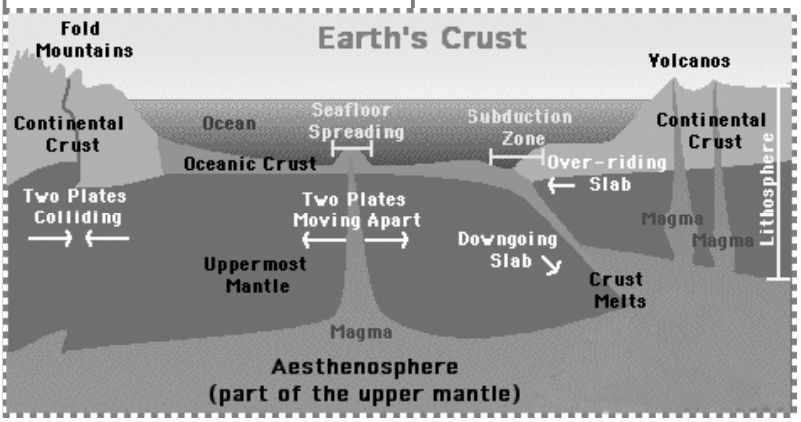
Depositional plains:

- These plains are formed by the filling up of sediments into depressions along the foot hills, lakes and seas.

- The deposition at sediments, eroded and brought down by large rivers, forms riverine alluvial plains.
- The Indo-Ganga plains in the Indian subcontinent is an example of alluvial plain.
- **Peneplains** are formed by the wearing down of land due to weathering and erosion.
- **Coastal plains** are those parts of the continental shelf which have been uplifted.
- **Glacial plains** are formed through glacial erosion and deposition.
- **Lacustrine plains** are old lake beds and are made up of sediments deposited by rivers etc.
- **Karst plains** are formed in limestone areas mainly by the agency of underground water.
- **Flood plains, delta plains** and **alluvial plains** are all formed through the deposition of eroded material by rivers.

Movements of the Earth's Crust

- Warping and **Isostasy** constitute vertical movements, while folding, faulting and continental drift constitutes horizontal movement.
- **Folding** is the process whereby the rock strata are bent into a series of arches (anticlines) and troughs (synclines) as a result of the horizontal earth movements which cause compression within the crust.
  - Fold mountains are formed by the crumbling or folding of rocks.
  - The Himalayas, the Alps, the Andes, the Rockies etc. are examples of fold mountains.
  - **Faulting** is the process by which the tensional earth movements under the effect of considerable pressure creates a fracture in the earth's crust.
  - Faulting gives rise to relief features such as block mountains and rift valleys.
- Block mountains are formed by the lifting up of land between faults or by the sinking of land outside the faults. They are usually steep sided
  eg: The Vosges.
- A **Rift valley** is a long, relatively narrow depression formed by the sinking of a block of land between two or more or less parallel faults.
  eg: East African Rift Valley.
- **Warping** is the deformation of earth's crust which affects very large areas on the earth's surface. It results in the formation of domes, shields and depressions.
- **Isostasy** is a condition of gravitational balance between the crustal segments of different thickness.
- Continental drift refers to the horizontal movements of the continents on a vast scale.
  - The Himalayas, The Andes, The Rockies and The Alps are examples of **young mountains.** They came into being after the continental drift.
- The Pyrenees (Europe), Appalachians (America) and the Aravallis (India) are examples of **old mountains.** They were formed in the pre-drift area.
- The Rockies are North American mountain ranges while the Alps are European, the Andes belongs to South American range. Mt. Blanc is the highest peak in the Alps.
- The Vindhyas separates Southern India from Northern India.
- Satpuras lies in between Narmada and Tapti and Narmada lies in between Vindhya and Satpura.
- The southernmost tip of Western Ghats is called Cardamom Hills. Sahyadri and Nilgiri are parts of the Western Ghats. Western Ghats and Eastern Ghats meet at Nilgiri Hills.



Earth's Rotation

- Earth's rotation is the rotation of the solid Earth around its own axis. The Earth rotates towards the east. As viewed from the North Star Polaris, the Earth turns counter-clockwise.
- Earth's rotation period relative to the Sun (true noon to true noon) is its true solar day or apparent solar day.
- The velocity of the rotation of Earth has had various effects over time, including the Earth's shape (an oblate spheroid), climate, ocean depth and currents, and tectonic forces.
- Earth's rotation results in the deflection of all moving objects on the earth's surface.
- The primary effect of Earth's rotation is the phenomenon of day and night.
- Due to the rotation of the earth, the stars, the planets, the moon and the sun appear to move in the opposite direction viz., from east to west (e.g. the sun rises in the east in the morning, moves overhead at noon and sets in the west in the evening.)
- If there is no rotation, one side of the earth will always be facing the sun and be excessively hot. The other side will have darkness always and be excessively cold.
- Another effect of spin or rotation placed on weather systems by what is called Coriolis effect.
- The rotation of the Earth also contributes to the shift of the shape of our home planet. Earth's shape has actually been modified by its rotation, and we describe its shape as that of an oblate spheroid.
- The most celebrated test of Earth's rotation is the **Foucault pendulum** first built by physicist Léon Foucault in 1851.

Moment Magnitude Scale (MMS)

MMS was developed in the 1970s to succeed Richter Scale. The magnitude is based on the moment of the earthquake. The MMS is used to estimate magnitudes for all modern large earthquakes by the United States Geological Survey.

Mercalli Scale

The intensity of earthquake is measured using Mercalli Scale. The Mercalli scale quantifies the effects of an earthquake on the Earth's surface, humans, objects of nature, and man-made structures on a scale of 1 through 12. This was developed by Italian volcanologist Giuseppi Mercalli in 1902.

The Atmosphere

- Atmosphere is defined as an envelope of gaseous mixtures covering the earth held to it by gravitational forces. Atmosphere is essential for the life on earth.
- The principal constituents of the lower atmosphere are

  Nitrogen (78.08% by volume)

  Oxygen (20.94%)

  Argon (0.93%)

  Carbondioxide (0.033%)

  Besides, there are minute proportions of other gases.
- **Oxygen** is the most important component among atmospheric gases.
- **Nitrogen** which is an important constituent of all organic compounds is relatively inert.
- The main function of nitrogen is to control combustion by diluting oxygen, thus it acts as a dilutant.

- The amount of carbondioxide varies from place to place, being greatest around the cities and smallest in the country side. Green plants during photosynthesis absorb carbondioxide from the atmosphere and use it to manufacture food and keep other bio-physical processes going.
- Ozone (O_3) consisting of three oxygen atoms chemically linked is another variable constituent of the atmosphere. In the lowest layers, the proportion of ozone is very low (less than 0.00005 by volume of atmosphere).
- **Between 20km and 40 km** altitude greater concentrations of ozone are found. At levels above 32 km, it increases forming what is known as the **ozone belt.** It plays a crucial role in blocking the harmful ultraviolet radiation from the sun.
- **Water vapour** is one of the most variable gaseous substances present in the atmosphere, constituting between 0.02% and 4% of the total volume in cold dry and humid tropical climates respectively. 90% of moisture content in the atmosphere exists within 6km on the surface of earth.
- Atmosphere also contains huge numbers of solid and liquid particles called **aerosols.** In addition, negligible quantities of other gases such as argon, neon, helium, hydrogen, xenon, krypton, methane etc are present in the atmosphere.

Structure of Atmosphere

- The earth's atmosphere is made up of a series of layers on the basis of the vertical distribution of temperatures.
- **Troposphere** is the lowest layer of the atmosphere and extends roughly to a height of 7 to 8 km near the poles to some 16km over the equator. The thickness is greater at the equator, because the heated air rises to greater heights.
- **Stratosphere** is a region of uniform temperature extending from an altitude of about 11km above the earth to a height of nearly 50km. It is free from water vapour, clouds and dust.
  - The upper part of the stratosphere has plenty of ozone which affords protection to human beings on the earth against the fatal effects of ultraviolet radiations.
  - The Stratosphere also provides ideal conditions for flying aeroplanes. The upper limit of this layer is called *stratopause*.
- **Mesosphere** is a very cold region above the stratosphere which extends from 50 or 80km above the earth's surface.
  - Within the mesosphere the temperature decreases with altitude from about 0°C at stratopause to about –100°C at mesopause. *Mesopause* is the boundary line between ionosphere and mesophere.
- **Thermosphere** is the uppermost layer of the atmosphere

Magnetosphere

Magnetosphere is the area around the earth that extends beyond the atmosphere. The earth's magnetic field operates here. It begins at about 1000 km. It is made up of positively charged protons and negatively charged electrons. This traps the particles that are given off by the sun. They are concentrated into belts or layers called the Van Allen radiation belts. The Van Allen belts trap deadly radiation. When large amounts are given off during a solar flare, the particles collide with each other causing the aurora borealis or the northern lights.

The Atmosphere is divided into layers according to major changes in temperature. 99% of the total mass of the atmosphere is below 32 kilometers. Atmosphere can be classified into five main layers. **troposphere, stratosphere, mesosphere, thermosphere (Ionosphere)** and the **Magnetosphere.** Troposphere - 0 to 12 km, Stratosphere - 12 to 50 km, Mesophere - 50 to 80 km, Thermosphere - 80 km and up. Thermosphere contains Ionosphere and Exosphere.

extending from the mesopause at an altitude of about 85 kms to the outer limits of atmosphere.

- **Ionosphere** is that part of the thermosphere which extends above the mesosphere from 65 km to nearly 400 km above the earth's surface. It is an electrically charged layer characterised by the ionisation of atoms.
- Due to the presence of electric charge in the Ionosphere, radio waves transmitted from the earth are reflected back to the earth by this layer.
- **Exosphere** is the uppermost region of the atmosphere. It extends beyond the ionosphere above a height of about 400km. The air is extremely rarefied and the temperature gradually increases through the layer. Here the gravity of earth is exceedingly weak.
- The lowest temperature of air is recorded just before sunrise, because of the predominance of land over water in the north, the northern hemisphere is warmer.
- The pressure exerted by atmosphere as a result of its weight above a unit area of the earth's surface is called the **atmospheric pressure.**
- Atmospheric pressure is expressed in millibars (mb) and is measured with a mercury barometer.
- Two principal types of barometer used are mercury barometer and aneroid barometer.
- One millibar of atmospheric pressure is equal to the force of one gram on a square centimetre.
- The normal pressure at sea level is taken to be about 76 centimetres (1013.25 millibars).
- Aurora are produced by charged particles from the sun captured by earth's magnetic field at a height of about 100km.
- **Aurora Borealis** is a luminous phenomenon in the northern hemisphere and **Aurora Australias** is a luminous phenomenon in the southern hemisphere.
- **Insolation** is the radiant energy that reaches the surface of the earth from the sun. Insolation is the most important single source of atmospheric heat.

Winds

- A wind can be defined as a stream of air in a fairly well-defined direction. Winds are generated due to differences in pressure from one place to the other.

The effect of rotation of earth on the direction of winds is called the ***Coriollis effect.*** This effect causes deflection in the direction of winds.

- Wind is 'air in motion' and plays an important role in climatic variations on the earth.
- Air always moves from a region of **high pressure to a region of low pressure.** The chief cause of winds is the difference in pressures.
- Winds can be classified into
  - **Regular winds** (Primary) *eg: tradewinds and westerlies.*
  - **Periodical winds** (Secondary) *eg: monsoon winds.*
  - **Variable winds** (Tertiary) *eg: cyclones and other local winds*
- **Trade winds** refers to the winds that blows from the sub-tropical belts of high pressure towards the equatorial region of low pressure.

International Date Line

This line is a zig-zag line and roughly coincides with the 180th meridian.

- When the date line is crossed from the east to the west, the date must be advanced by one day, when the line is crossed from the west to the east, the date must be set back by one day.
- The International Date Line (the meridian 180°) was chosen because it passes through the mid-Pacific, where there are no land masses.
- It goes zig-zag in some places to avoid land and leaves some island groups wholly on the same side of the line.
- It deflects to the east of 180° the Bering Strait, between Siberia and Alaska.
- It deflects to the West of 180° to leave the Hawaiian group of islands on the East of the line.
- It deflects again to the East, South of the equator to avoid the Fiji and Tonga islands, on the same side as New Zealand. If the date line is drawn exactly North and South, it will cut inhabited islands making what is Tuesday to one man, a Wednesday his next door neighbour.
- The twenty-four hour time is increasingly used by railways, airlines etc. for dispensing with the suffix a.m. and p.m.
- The day begins at midnight, the zero hour and the following hours are numbered from 0 to 23 hours.

- **A *gale*** is a strong wind having the speed between 56 and 72 km per hour.
- **A *storm*** refers to a strong wind whose speed exceeds 72 to 121 km/hr.

- Trade winds blow towards the equator between 5^0 and 30^0 north and south latitude.
- The word 'trade' comes from the saxon word 'tredon' which means 'to tread and follow a regular path.'
- **Trade winds** are also called **tropical easterlies.**
- Trade winds are called so because prior to the steamage; sailing ships carrying goods of trade and cargo depended on these winds.
- **Westerlies** or Anti-Trade winds are regular winds which blows outside the tropics in the temperate zone. These winds blow from the sub-tropical high pressure areas to sub-polar low pressure areas and between 35^0 and 60^0 North and South latitudes.
- **Polar Easterlies** constitute the wind system characteristic of the arctic and polar zones. They extend from about 60^0 north and 60^0 south latitude to the poles.
- **Monsoon winds** are seasonal winds which blow briefly over India, Sri Lanka, China and north-west Australia.
- Monsoon climate is marked by summer rains and winter droughts.
- The word 'monsoon' derived its name from the Arabic word 'mausin' meaning seasonal winds. Traditionally monsoon has been considered as a result of the differential heating of land and sea.
- According to dynamic theory, monsoon are a result of the shift of the Inter Tropical Convergence Zone (ITCZ) under the influence of the vertical sun.
- **Polar winds** are winds which blow from the high pressure area around the poles towards the temperate regions.
- **Planetary winds** are permanent winds which blow throughout the year from one latitude to the other in response to the latitudinal differences in air pressure. They blow over the vast areas of continents and oceans.
- **Horse Latitudes** are sub-tropical belts of variable winds and columns that lie between the latitudes of 25^0 and 35^0 North and South. They coincide with the sub-tropical high pressure belts.
- Horse Latitude winds are weak and shifting. In early days, the sailing vessels with a cargo of horses found it difficult to sail under such calm conditions. They used to throw horses into the sea to save valuable drinking water and this part therefore came to be called as Horse Latitudes.
- **Doldrums** are equatorial belts of low pressure where the north-east and south-east trade winds converge on and meet each other approximately between 5^0 south and 5^0 north latitude. The belt is characterised by extremely low pressure with calm conditions.
- **Roaring Forties** are powerful westerly winds that blow throughout the year over the oceans of the southern hemisphere between 40^0 and 60^0 south latitudes. They are called Best brave winds and bring storms and heavy rainfall.
- The winds which developed between 45^0 and 55^0 are called **Furious Fifties** and that developed between 55^0 and 65^0 are called ***Shrieking sixties.*** These are the dreaded terms used by sailors.
- **Local winds** develop as a result of the local differences in temperature and pressure. They affect the smaller areas and are restricted to the lowest levels of the troposphere.
- **Local winds** includes hot, cold, convectional and slope winds.
- The most famous local cold winds that blow from Alps over France towards the Mediterranean sea is the **mistral.**

The winds blowing in the Northern Hemisphere are deflected to their right and those blowing in the Southern hemisphere to their left under the Coriollis effect. This principle of deflection is called **Ferrel's Law.** Ferrel's law is a law postulated in 1856 by the American scientist

- ***Loos*** are very hot and dry local winds that blows from the west in the months of May and June, usually in afternoons in the plains of Northern India and Pakistan. Its temperature invariably varies between 45^0C and 50^0C. It may cause sunstroke to people.
- Local convectional winds are of two types - **Land breeze and sea breeze.**
- **Land breeze** is defined as the process by which cold winds blows from the land to sea during night. Land breeze is not as strong as the sea breeze.
- During the day time, the land get warmer than the sea producing low pressure over the land into which cooler air moves from over the sea. The local winds that blows from sea to land during the day time is called **Sea breeze.**
- Valley breeze and mountain breeze are the counterparts of land and sea breeze. During the day time the slopes of the mountain gets heated more than the valley floor. As such the air from the valley flows up the slope. This is called the **Valley breeze.** After sunset the process is reversed. Rapid loss of heat through terrestrial radiation along the mountain slopes results in the sliding of cold dense air from higher elevations to valleys. This is called the **mountain breeze.**
- **Jet streams** are narrow concentrated bands of meandering high velocity geotrophic streams bounded by low speed winds and is a part of upper level westerlies.

Instruments to Measure Wind

- **Wind Wane :** Instrument for knowing the direction of wind.
- **Anemometer :** Measures the velocity of the wind.
- **Beaufort wind scale** is an internationally accepted wind scale which consists of a series of number devised by Sir Francis Beaufort in 1805 to indicate different wind strengths.

- The Jet streams have an average velocity of 120 km per hour in winter and 50km per hour in summer.
- A hurricane is a strong wind whose speed exceeds 121 km/hr.
- ***Cyclones*** are irregular wind movements involving closed air circulation around a low pressure centre. Cyclones are associated with destructive and violent disturbances such as heavy squalls and torrential rainfall.
- Cyclones are called ***hurricanes*** in the South-east Carribean region.
- In the Philippines islands, eastern China and Japan, cyclones are called **Typhoons**.
- Around South-east African coast, Madagascar, Mauritius islands and North-west Australia they are called **Willie Willies**.
- If the speed of cyclone is greater than 250 km/hr, it is known as **Super Cyclone.**
- **Tornadoes** are violently rotating storms, characterised by a funnel shaped cloud in which winds whirl around a small area of extremely low pressure. They are generally accompanied by torrential rains.
- *Water Spout* is a tornado occurring in the sea usually in tropical and sub-tropical regions which connects a whirling cone of dense cloud with a cone of spray raised from sea and thus raises a huge column of water.
- Anti–cyclone is a high pressure wind blowing outwards from the centre, clockwise in the Northern Hemisphere and anti-clockwise in the Southern Hemisphere.
- Coriolis force is a 'fictious' force needed to relate the movement of air masses over the earth's surface to its rotating co-ordinate system (the grid). It was named after the French mathematician Gaspard de Coriolis, who first described it in 1835.
- **Coriolis force** is absent at the equator and increases towards the poles. The force **is responsible for the formation and direction of movement of anti-cyclones and whirlpools.**

Clouds

- **Clouds** are a visible mass of small water drops or ice crystals formed by the condensation of water vapour in the atmosphere, usually at a considerable height above the earth's surface.
- Clouds are caused mainly by the adiabatic cooling of air below, its dew point.
- On the basis of appearance, the clouds can be identified as

(i) **Cirrus clouds** are high, white & thin. They are composed of ice crystals. They

The Equator is an imaginary line on the Earth's surface equidistant from the North Pole and South Pole that divides the Earth into a Northern Hemisphere and a Southern Hemisphere.

form delicate patches and give a fibrous and feathery appearance.

(ii) **Cumulous clouds :** have a flat base and have the appearance of rising domes. These clouds are often described as having cauliflower structure.

(iii) **Stratus clouds :** as sheets of layer that covers much or all of the sky.

- **Stratiform clouds** - These clouds are fairly thin and blanket like. Subdivided into high clouds, medium clouds and low clouds.
- **Alto and Nimbo** are the two prefixes which refer to middle level clouds and low clouds of considerable thickness with dark grey appearance respectively.

  For eg:- (1) Low clouds include stratocumulus, stratus, nimbostratus, cumulus and cumulo nimbus. (2) Medium clouds include alto cumulus and alto stratus. (3) High clouds include cirrus, cirro stratus and cirro cumulus.
- **Precipitation** is the formation of water particles or ice within the cloud that falls towards the earth's surface. It occurs when condensation takes place rapidly within the cloud.
- Precipitation in the form of ice-pellets (hail stones) that develops in and fall from cumulo nimbus clouds, either at a cold front or where intense heating of the surface causes rapidly ascending convection currents called *Hails*.

Climatic zones of the Earth

- Equator is the biggest circle drawn on the globe.
- The regions between 5° north and 5° south of the equator is called the Equatorial region. Here the temperature is very high and rainfall is very heavy.
- **Torrid zone** which is the hottest zone lies between 23½° North and 23½° South. ie., between the Tropic of Cancer and Tropic of Capricorn.
- **Temperate zone:** Lies between 23½° north and 66 ½° north North Temperate zone and South Temperate zone lies between 23½° south and 66½° south. This zone has a marked annual range of temperature.
- **Frigid zone** lies between 66½° north and 90°N in the case of north frigid zone and 66½° south and 90° south in the case of south frigid zone. They are extremely cold regions.

Climatic Conditions of Earth

The world climate can be classified into Tropical Climate, Dry Climate, Humid Mesothermal Climate, Humid Microthermal Climate, Polar Climate and Highlands Climate.

Tropical Climate

- Major subtypes of tropical climate are the tropical rainforest, tropical monsoon and tropical savanna climates.
- Occurs in the tropical zone where the mean monthly temperature remains generally above 22°C.

Dry Climate

- This climate is characterised by a general water deficit.
- It can be classified into-tropical and substropical desert, and tropical and subtropical steppes.

Humid Mesothermal Climate

- It is subdivided into - Mediterranean type, China type and West European type.

Humid Microthermal Climate

- Based on the type of forests growing in the region, this climate is also known as '*taiga*'. The summer temperature is higher than 10°C, but the temperatures in the winter season go below the freezing point and remain so for eight months.
- This type of climate is experienced in North America and Eurasia.

Polar Climate

- This climate is also known as the *tundra* and is experienced in the polar regions.

- It is experienced in Arctic margins of North America and Eurasia and the Antarctic continent.

Highland Climate

- It is significantly modified by the altitude and the aspect of the slope and these regions have a variable climate.
- This climate is experienced in the mountainous regions of Himalaya, Tibetan Plateau, Rockies, Andes and Alps.
- **Weather** is a condition of the atmosphere at a certain place and time, with reference to temperature and the presence of rain, sunshine, wind etc.
- **Climate** is the regular pattern of weather conditions of a particular region.
- **Humidity** is the degree of water vapour present in the air. For any specified temperature, there is a definite limit to the maximum quantity of moisture that can be held by the air. This limit is known as the *saturation point.*
  - *Humidity can be measured by means of a* ***hygrometer.***
- **Relative humidity** is the ratio between the amount of water vapour actually present in an air mass and the maximum amount that the air mass can hold at that temperature. It is expressed in terms of percentage.
- **Vapour Pressure -** The amount of pressure exerted by a given column of air differs according to the varying amounts of water vapour present in it. That part of barometric pressure due to water vapour alone is known as vapour pressure.
- Vapour pressure is maximum at the equator (about 30 mb) and decreases towards the poles (less than 10 mb).
- **Dew** is the moisture deposited in the form of water droplets on the earth's surface or on objects near the earth's surface.
  - **Dew point** is the temperature at which air is fully saturated and below which condensation normally occurs.
- **Condensation** is the physical process of transformation from the vapour to liquid state. Condensation occurs when temperature reaches the dew point.
- **Frost** is a weather condition that occurs when the air temperature is at or below 0^{o}C. The moisture on the ground surface and objects, freezes to form an icy deposit.

Fog-Smog-Mist

- **Fog** is made up of droplets of water suspended in the lower layers of atmosphere resulting from the condensation of water vapour around nuclei of floating dust or smoke particles.
- **Smog** also called smoke fog, is a form of fog that occurs in areas where the air contains a large amount of smoke.
- **Mist** is the term given for a reduction of visibility between 1 - 2km caused by the condensation, producing water droplets within the lower layers of atmosphere. It is the intermediate between fog and haze.
- Mist and fog are identical and are formed in the same way. The only difference is that in a fog, the particles of water are smaller and visibility is poorer than in a mist.
- **Haze** is formed by water particles that have condensed around the nuclei in the atmosphere but may also be a result of particles of smoke, dust or salt in the air.

Global warming and climate

- Global warming refers to an average increase in the Earth's temperature, which in turn, causes changes in climate. A warmer earth may lead to changes in rainfall patterns, a rise in sea level and a wide range of impacts on plants, wildlife and humans.
- Average global temperatures have risen (0.6 ± 0.2°C) since the late 19^{th} century. The scientific consensus is that a significant proportion of this past rise, particularly in the last 25-50 years, is due to humanity's emission of green house gases such as carbon dioxide. (CO_2)
- The impact of climate change. Carbon dioxide emitted mainly by the burning of fossil fuels and the emission of methane, nitrous oxide, CFC's and other green house gases thickens the blanket of greenhouse gases over the earth's atmosphere upsetting the natural flow of energy from the sun.
- Deforestation accelerates global warming by reducing the absorption of carbon dioxide in the atmosphere.

- Based on current emission levels, it is estimated that the global trremperature will rise by between 1°C and 3.5°C by the year 2100.
- The mean sea level may rise upto 100 cm by the year 2100, causing flooding and submergence of many islands and coastal cities.

Ozone depletion

- The Ozone layer is found in the atmosphere between 20-50 km from the Earth's surface.
- The Ozone layer is region of concentration of the allotrope of an oxygen molecule known as Ozone (O_3) which is produced by the action of Solar radiation on ordinary Oxygen atoms.
- It filters sunlight and prevents the harmful ultraviolet radiation from reaching the Earth's surface by absorbing most of the ultra violet radiation.
- If these ultraviolet rays were to reach the Earth's surface in full intensity all exposed bacteria would be destroyed and animal tissues damaged severely.
  In this protective role, the presence of the Ozone layer is an essential factor in the life environment.
- There are certain household and industrial chemicals, having widespread application in refrigeration, air conditioning, fire extinguishing and dry cleaning, that are known to deplete this life-saving layer. These chemical are called Ozone-Depleting substances and include primarily the Chlorofluoro Carbons (CFCs), Carbon Tetrachloride (CCl_4) and Hydro Chloro fluoro carbons (HCFCs)
- Molecules of these substances drift upward through the troposphere and eventually reach the stratosphere.
- As these compounds absorb ultra violet radiation they are decomposed and chlorine is released.
- The Chlorine in turn attacks molecules of Ozone, converting them in large numbers into ordinary oxygen molecules.
- In this way, the Ozone concentration within the stratospheric ozone layer can be reduced.
  With less ozone in the atmosphere, more ultraviolet radiation reaches the earth, leading to a higher incidence of skin cancer (or melanomia) catarats, destru-ction of certain forms of aquatic life, reduction in crop yields and damage to the immune system.

Oceanography

- It deals with the study of oceans and is concerned with elucidation of the physical and biological characteristics of the oceans.

Pacific Ocean

- This is the largest ocean in the world.
- One-third of the earth is covered by this ocean. It covers an area of 166 million sq.km. and has a volume of 696 million cubic km.
- The outer boundary of the

There are five major oceans each encompassing within it a large number of seas, bays and gulfs. They are **the Pacific**, **the Atlantic**, **the Indian**, **the Arctic** and **the Antarctic** or **the Southern Ocean**.

deep ocean-type structure is called the *andesite line*, so named after the andesite rock that is found only in the ocean bottoms and not on the continents.

- The name 'Pacific' was given by Magellan who was the fist European to cross it in 1521 to reach Philippines.
- The Mariana Trench in the Challenger Deep of the Pacific Ocean is the deepest point on the earth.
- In shape, it resembles a broad triangle with its apex in the north at the Bering Strait and the base to the south.

Atlantic Ocean

- This is the second largest ocean in the world.
- It is the busiest ocean route in the world.
- The Atlantic Ocean separates American continents from Europe and Africa.
- The greatest depth in the Atlantic is Milwaukee depth in the Puerto Rico Trench.
- Bermuda Triangle is located in the Atlantic Ocean.

Indian Ocean

- Indian Ocean is the third largest ocean in the world and the only ocean named after a country, India.

Years, Months & Calendars

- The days and years are based on solar (sun) time.
- One day equals to the length of time it takes for the earth to make one complete revolution in its own axis.
- **One year** is the approximate time taken by the earth to make one complete revolution around the sun.
- The Sumerians, Babylonians and ancient Egyptians had calendars based on the **lunar month.** The original Roman calendar apparently covers only agricultural months.
- A calendar instituted in 1582 by Pope Gregory XIII has now been used in most of the world. Its distinguishing feature is that, in it a century year is a leap year.
  - **Leap year** is an year which is exactly divisible by four. But the last year of a century will be a leap year only if it is exactly divisible by 400. Thus 1700, 1800, 1900 are not leap years but 1600, 2000, 2400 etc are leap years. This correction was made by Pope Gregory XIII in AD 1582.
- A year with **366 days** is called a **leap year.** In a leap year, February will have 29 days.
- The concept of leap year was introduced in the Roman calendar by Julius Ceasar in 46 BC, on the advice of his astronomer Sosigenes.
- Britain introduced the Gregorian calendar in 1752.

- The greatest depth in the Indian Ocean is the Java Trench (7,725 m).
- Madagascar is the largest island in the Indian Ocean.
- Indian Ocean is mostly confined to the Southern Hemisphere while in the Northern Hemisphere, it extends only to a few degrees of latitude. Due to this fact, the Indian Ocean is often called *half an ocean.*

Arctic Ocean

- The Arctic Ocean is connected to the Pacific Ocean through the narrow Bering Strait and to the Atlantic Ocean through large openings of the Barents Sea, Greenland Sea and numerous straits in the Canadian archipelago.
- This ocean is roughly circular in shape and it surrounds the North Pole.

Antartic Ocean (Southern Ocean)

- The Antarctic Ocean flows in the eastern direction.
- The Antarctica Ocean is the fourth largest among the five main oceans .
- The current, popularly known as West Wind Drift moves the ocean from west to east all around Antarctica. This current mixes the ends of the Pacific, the Southern ends of the Atlantic, and the Indian Ocean.

Ocean Movements

There are three types of motions in the oceans viz., the tides, the waves and the currents.

- Tides imply a rhythmic rise and fall in the level of water in the oceans and seas. They are caused by the gravitational pull of the moon and the sun on the surface of the earth.
- An earthquake originating on the sea bottom may give rise to very high magnitude waves called *tsunamis.*
- Both the tides and the waves do not involve large scale movement of water from one region to the other.

Submarine Topography

Ocean Currents

- General movement of a mass of surface water in a fairly defined direction is known as an *ocean current.*
- Ocean currents are of two kinds:
  (i) Warm Currents
  (ii) Cold Currents
  - **Warm currents** which flows from a warmer region to a colder region (equatorial to the polar regions).
  - **Cold currents** which flow from a colder to a warmer region (polar region to the equatorial region).
  - Ocean currents are caused by

several interacting forces. One of the prime causes, particularly of surface currents is **wind.**

- Florida current and Brazil current are warm currents of the Atlantic ocean.
- Kuroshio current is in the Pacific Ocean.
- **Agulhas current** is a major warm current of Indian Ocean.
- Ocean currents change their direction annually in the Indian Ocean.
- Labrador, Canaries, Beneguela and Falkland are cold currents of Atlantic Ocean.
- Alaska, Peruvian or Humboldt and California are cold currents of the Pacific Ocean.
- Ocean currents influence the climate of the regions they pass through.

Tides

- Tide is the periodic rise and fall of sea water. The tides are caused by gravitational pull of the moon and sun on earth's sea water.
- The time period between a high tide and a low tide is approximately six hours. Each of them happens twice a day.
- Highest tidal amplitude and range was found in Bay of Fundy.
- Highest tides recorded in India is at Okha, Gujarat.
- Generally, tides occur twice a day. But in **Southampton**, along the southern coast of England, experiences tides **4 times a day.**
- A rise in the water level is called high tide and a fall is called low or ebb tide. Tides are of two types, Spring Tides and Neap Tides.
- **Spring Tides** are caused as a result of the moon and sun pulling the earth gravitationally in the same direction. They occur twice a month around the full moon and new moon. It is the tide of maximum rise.
- **Neap Tides** are caused when the moon and the sun pull the earth gravitationally in opposite directions. These tides are produced when the moon and the sun are at right angles to the earth. It is the tide of minimum rise, occuring twice a month. They occur on half moon days.

Waves

- A wave is an undulation that moves across the surface of the sea caused by the transfer of energy from the wind to the sea.
- Standing waves or stationary waves are caused by storm or sudden disturbances in water or atmosphere.
- Tidal waves or seismic waves or **tsunamis** are waves which are formed by underwater earthquakes in volcanic eruptions at the sea bottom. They have a long tidal period and a very high speed.
- **A *canyon*** is a deep narrow valley with almost upright sides formed by the denudation of soft rocks by rivers and rain water.
  eg : Grand canyon on the Colorado River in U.S.A
- **Coral reef** is a ridge of rock in the sea that is composed chiefly of the skeletons of small animals called reef - building coral polyps.
- The most extensive of all the barrier reefs is the Great Barrier Reef of Australia.
- **Atoll** is a circular or horse–shoe shaped coral reef surrounding a lagoon either having an island or submerged plateau in it. They are found chiefly in the Pacific Ocean.
- ***Lagoon*** is a shallow stretch of water separated completely or partly from the sea by a narrow strip of land.
- ***Isthmus*** is a narrow strip of land joining two larger areas of land that would otherwise be separated by water. The isthmus of Panama joins North and South America.
- ***Strait*** is a narrow passage of water connecting two seas or two large areas of water.
- A bay is a part of the sea or of a large lake enclosed by a wide curve of the shore.
- ***Gulf*** is a part of the sea almost surrounded by land. Gulf streams are warm currents flowing across the Atlantic Ocean from the gulf of Mexico towards Europe.
- High seas are the open seas or oceans outside any territorial waters of countries. They are also known as International waters.
- The laws binding the territorial right over the sea has been fixed by the UN and have been accepted since 1974. Within the Exclusive Economic Zone (EEZ) the coastal state has the right to exploit all economic resources - fish, minerals, oil and gas and energy production.

- **An estuary** is the single v-shaped mouth of a river when it merges into the sea. It is widest near the sea.
- **A delta** is a triangular tract of alluvium, usually fan shaped at the mouth of a river where it deposits more material than can be carried away. The river gets divided into two or more channels (distributaries), which may further divide and rejoin to form a network of channels.

  The world's largest delta Sunderbans, is formed by the Ganges and the Brahmaputra in India and Bangladesh. Its area is nearly 75,000 sq.km.
- **Beach** is the shore of a sea, consisting of a strip of pebbles, sand or mud lying between low and high water marks.
- **Shoal** is a shallow region in a sea, river or lake.

Waterbodies

- Hydrosphere - The mass of water that covers about 71% of the earth's surface. Oceans are the largest single constituent unit of the hydrosphere.
- Average depth of the ocean is about 4 km.
- Oceans contains more than 97% of the total water on the earth.
- The study of various aspects of oceans is called oceanography.
- Oceans predominate over land areas in southern hemisphere.
- The greatest depth in Indian ocean is the **Diamentina** Trench.
- **Arctic ocean** is the smallest ocean in the world.
- The two most abundant elements in sea water are chlorine and sodium.
- **Peninsula** is a piece of land almost surrounded by water. Southern India is a peninsula.
- The sea with the highest degree of salinity is the Dead Sea. No fish live in this sea, hence it is called Dead Sea.

  The Panama Canal links the Pacific Ocean with the Atlantic Ocean. The length of Panama Canal is 82 km (50 miles). It was built by the USA during 1904-14. Now the control of the canal is with Panama.
- **Kiel canal,** an international canal linking the North Sea with the Baltic sea was built by the Germans in the years before first world war. It is 96 km long. It was declared an international waterway by the Treaty of Versailles in 1919.
- **Berring Strait** connects the Pacific Ocean and the Arctic Ocean in the north, which separates Asia and North America. The International Date Line passes through the Berring Strait.
- Baffin Bay lies in between Greenland and Canada.
- The **Grand Banks** are the famous fishing grounds in the North-West Atlantic.
- Abyssal Plain - The deepest and most extensive part of the ocean floor and it accounts for the largest proportion of the total area of the oceans.
- **A waterfall** is simply the fall of an enormous volume of water from a great height. Jog or Gersoppa Falls on Sharavati (a tributary of Cauvery) in Karnataka is the highest waterfall in India.
- **A glacier** is a moving mass of ice at a speed averaging between 30 to 40 cm and 15 to 18 metres per day. It originates at high altitudes due to low temperatures and high orographic precipitation.

The Suez Canal

- The Suez Canal is an artificial sea-level waterway in Egypt, connecting the Mediterranean Sea and the Red Sea.
- Opened in November 1869, it allows water transportation between Europe and Asia without navigating around Africa.
- The canal was nationalised by Col. Nasser on July 26, 1956.
- Suez Canal is an artificial water way from Port Said to Suez. It is 169 km long (105 mile). It separates Asia from Africa. It was opened in 1869 and nationalised in 1956. Suez Canal has shortened the distance between Southampton and Mumbai by about 6500 km.
- Ferdinand de Lesseps, the French architect designed it.

Rivers

- The **Nile** (6670 km) which is the longest river in the world drains into the Mediterranean Sea.
- **The Amazon**, flowing into the South Atlantic, is the largest river in terms of size and volume of water discharged. It is

6437 km long. It makes the largest river basin in the world covering an area of 7,045,000 sq.km.

- The longest river in Europe is the **Volga,** 3690km.
- The longest river of Oceania is the **Murray** in Australia (3220km).
- **The Indus** (2900km) is the longest river of the Indian subcontinent. The longest river of India is the Ganges (2640km).
- Indus river system is the most extensive river system in the Indian subcontinent. It includes - Indus, Ravi, Beas, Sutlej, Jhelum, Chenab.
- **The Brahmaputra** (2688km) is bigger than the Ganges; but only a small part of it flows through India. It originates from Manasarovar Lake in Tibet. In Tibet, its name is Tsangpo.
- The only river that crosses the equator twice is river **Congo.**
- Victoria falls are in river **Zambezi.**
- The only river to cross the Tropic of Capricon twice is river *Limpopo* in South Africa.
- City at the confluence of Blue and White Nile is Khartoum, capital of Sudan.

Desert

Antartic Deserts, Arctic, Sahara (Africa), Arabian Desert (Middle East), Gobi Desert (Asia), Kalahari Desert (Africa), Pantago nian Desert (South America), Great Victoria Desert (Australia), Syrian Desert (Middle East), Great Basin Desert (North America) are the ten largest deserts in the world .

- Longest river of Asia ..... Yangtze (Chang Jiang)
- Longest river of Europe ..... Volga
- Longest river of North America ..... Missisipi-Missouri
- Longest river of South America ..... Amazon
- Longest river of Australia ..... Murray
- Longest river of Africa ..... Nile
- Longest river of South East Asia ..... Mekong
- Longest river of South West Asia ..... Euphrates
- Longest river of Russia ..... Ob
- Longest river of Sri Lanka ..... Mahaweli Ganga
- World's longest rivers in descending order of length are Nile, Amazon, Chang Jiang and Missisipi-Missouri.

- Hot deserts have sparse vegetation often found in clumps over small patches of land.
- Cacti are the most typical plant. In some places, dwarf trees like Accacia, Date palms etc are also found.
- **June 17 :** World day to combat desertification
- **The Takla Makan** (32,000 sq.km) is the largest desert in China; Gobi (Mongolia) is the coldest desert in the world. Largest Desert in India is **Thar Desert.**
- Camel is known as the ship of the desert.
- **Atacama Desert** in Northern Chile is the driest place on Earth. It is virtually sterile because it is blocked from moisture on both sides by the Andes mountains and by the Chilean Coast Range.
- Kalahari Desert lies in Southern Africa. The Bushmen are the aborigines of Kalahari.
- **Hottest Place -** Denakit Depression, Ethiopia, 34.4°C
- **Hottest inhabited place** - Dji Buti.

Islands

- **Greenland** (Kalaait Nunait), which is the largest island in the world, is in North Atlantic (2, 176,000 sq.km). It is a territory of Denmark.
- Archipelago is a group of is-

Lakes

- Lake Superior (North America) is the largest freshwater lake in the world.
- The Caspian Sea is the largest salt water lake. It borders with Russia, Kazakhistan, Azerbaijan, Iran and Turkmenistan.
- Lake Baikal (Russia) is the deepest freshwater lake (depth 1620 m).
- The highest navigable lake in the world: Lake Titicaca in Peru and Bolivia.
- The saltiest lake in the world : Lake Van (Turkey)
- Great lakes arranged from west to east are Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario.
- Great lake lying entirely in USA is Lake Michigan.

The Sahara (8,400,000 sq.km) is the largest desert in the world. It spreads over nearly 6% of world's total land area and 28% of the land area of Africa.

lands. **Indonesia** is the largest archipelago in the world.

- Ireland is known as the Emerald Island. Baharain is known as the Pearl Island.
- The second largest island is New Guinea.
- Malagasy (Madagascar) is the largest island in the Indian Ocean (588,000 sq.km).
- Andaman and Nicobar Islands is the biggest union territory in India. It lies in the Bay of Bengal. Its capital is at Port Blair. There are 223 islands in the group.
- Lakshadweep is in the Arabian Sea. There are 27 coral islands in the group.
- Japanese archipelago of over 4000 islands.
- Japan comprises 4 islands - Honshu, Hokkaido, Kyshu, Shikoko. Among this Honshu is the biggest island.
- **Types of Island**
  1. Continental Islands
  2. Oceanic Islands
  3. Tropical Islands
  4. Desert Islands
- Greenland is the example of Continental Island.

Natural Vegetation

- Natural vegetation refers to a plant community that has been left undisturbed over long time.
- Flora denotes the plants of a particular country or region.
- Fauna denotes the animal kingdom found in a particular geographical region.
- The world climate types have been classified on the world's climatic / temperate zones.
- The major climatic types of the world have been classified as
  (i) Equatorial
  (ii) Tropical Monsoon
  (iii) Tropical Desert
  (iv) Mediterranean type
  (v) Cool Temperate (Continental or Ocean)
- Teak is the most valuable timber, which is used for furniture making and is found in tropical monsoon climate.
- **Savannah** is a region which lies on both sides of the equator roughly between 5 degrees and the tropics. Here summers are hot and moist and winters are warm and dry.
- Deciduous forests are forests with trees which shed their leaves seasonally.
- Tundras is the belt of treeless, cold desert which remains under heavy snow during most of the year. Eskimos live there. Igloos are dome shaped huts of Eskimos which are dug half underground and covered with blocks of ice. Eskimos are also called Inuits.
- Natural resources are classified into biotic and abiotic resources.
  - **Biotic resources** are renewable resources consisting of living things such as forests and their products, agricultural crops, fodders, wild and domestic animals etc.
  - **Abiotic resources** consists of non-living things like minerals and fuels which are mostly non-renewable.
- Reserved forests are forests reserved for commercial exploitation.
- **Wettest place - Mawsynram India - 1187 cm.**
- Valley of moon is the Atacama desert.
- Tropical monsoon forest is the typical vegetation of monsoon land, like that of India.

Important Straits

Ten Degree Channel	Little Andaman and Nicobar
Duncan passage	South Andaman and Little Andaman
Cape of Good Hope	Located at the southern tip of African continent.
Cape of Horn	Located at the southern tip of South America.
Strait of Malaca	Between Malaysia and Sumatra
Barents Strait	Between Scandinavian countries and Arctic Ocean.
Palk Strait	Between India and Sri Lanka
English Channel	Between England and France
Berring Strait	Russia and the USA
Florida Strait	Cuba and USA
Strait of Gibralter	Spain and Morocco
Strait of Magellan	Tip of South America
Bass strait	Separates Australia from Tasmania

INDIAN GEOGRAPHY

PHYSIOGRAPHY

- India is the largest country in the Indian subcontinent lying entirely in the Northern Hemisphere.
- The mainland extends from latitude 8°4' north to 37°6' north and from longitude 68° 7' east to 97°25' east.
- The southernmost point in Indian territory, the Indira Point is situated at 6°30' north in the Nicobar Islands.
- India stretches 3,214 km from north to south and 2,933 km from east to west.
- The total length of the mainland coastline is nearly 6,100 km and that of the land frontier is about 15,200km. The total length of the coastline including that of the islands, is about 7,500 km.
- With an area of about 32,87,263 sq.km., India is the seventh largest country in the world, accounting for about 2.4% of total world area.
- The northern most point of the country lies in the state of Jammu and Kashmir and it is known as *Indira Col*.

Administrative Divisions

- At the time of Indian independence, the country was divided into hundreds of small states and principalities.
- The princely states were reorganized on the linguistic basis in 1956 to form 14 states and 6 union territories.
- Now, the Indian Union consists of 28 states, 6 union territories and one national capital territory (Delhi).
- In 23 states, the legislature is unicameral. Bihar, Jammu and Kashmir, Karnataka, Maha rashtra and Uttar Pradesh have bicameral legislatures. Legislative power is distributed between Parliament and state legislatures.

"Fastest Continent"

India is entirely contained on the Indian Plate, a major tectonic plate that was formed when it split off from the ancient continent Gondwanaland. About 50 to 55 million years ago, in the Eocene epoch of the Cenozoic Era, the plate collided with Asia after covering a distance of 2,000 to 3,000 km (1,243 to 1,864 miles), having moved faster than any other known plate. India is thus referred to as the **"fastest continent."** This is causing the Eurasian Plate to deform, and the India Plate to compress at a rate of 4 mm/yr (0.15 in/yr).

The Indian mainland can be divided into five physiographic units namely

i. **The Great Mountains of the North**
ii. **The North Indian Plains**
iii. **The Peninsular Plateau**
iv. **The Coastal Plains**
v. **The Islands**

Northern Mountains

- The mountains of the north are young fold mountains.
- The Himalayas are the most prominent among these mountain ranges. Besides this, the trans-Himalayan ranges and the hill ranges of Purvachal are the important units.

The Himalayas

- It is one of the youngest mountain systems in the world and comprise mainly sedimentary rocks.
- The Indus valley in Kashmir and the Brahmaputra valley in Arunachal Pradesh are accepted as the western and the eastern limits of the Himalayas in India.
- The Himalayan region is considered the largest snow field in the world outside the polar ice caps.
- The Himalayan chain measures about 2,500 km from west to east and width of this fold system varies between 150 and 400km.
- According to the plate tectonics theory, the Indian plate moved northwards and its forward edge penetrated below the southern edge of the Tibetan plate. This resulted in the folding and uplift of the Himalayas.
- The Himalayas consist of three parallel ranges.
  (i) The southernmost range, called **the Siwalik** is the lowest.
  (ii) The ranges lying north of the Siwalik are known as the middle Himalayas or **the Himachal.**
  (iii) The northernmost ranges of the Himalayas, known as **the Himadri,** are the highest with an average height of more than 6,000 metres above the sea level.
- The Himadri contain some of the world's highest peaks.
- Mt. Everest (8848 m) in Nepal is the world's highest peak.

Neighbours of India

- India shares her borders with China (Chinese Tibetan Autonomous Region), Nepal and Bhutan in north, Pakistan and Afghanistan in north-west and Myanmar in east.
- Bangladesh forms almost an enclave within India on the eastern side.
- In the south, on the eastern side, the *Gulf of Mannar* and the *Palk Strait* separate India from Sri Lanka.
- The boundary between India (Arunachal Pradesh) and China is known as *McMohan Line*.
- The boundary line between the imperial India and Afghanistan is known as *Durand Line*.
- The boundary between India and Pakistan is known as *Radcliff Line*.
- India is surrounded by the Indian ocean on its three sides, thus it is a subcontinent. The Bay of Bengal and the Arabian Sea are its two northward extensions. India and its neighbours Pakistan, Nepal and Bhutan are known as the Indian sub-continent.
- The northern most tip, where the boundaries of China, India, Pakistan, Tajikistan and Afghanistan meet is known as *'Wakh Corridor'*.

- **Kanchenjunga** in Sikkim is the highest peak of the Himalayas in India. (8598 m).
- Highest Mountain Peak in India is K2 (8611 m).
- It is in Pak occupied Kashmir.
- The northernmost Himalayan ranges are called the *Great or Inner or Central Himalayas (Himadri)*. Beyond this range lies another range called the Tethys or the Tibetan Himalayas beyond which lies the structural zone called the Indo-Tsangpo Suture zone.

Mount Everest or *Sagarmatha*, the highest mountain peak (8,850 m) in the world belongs to **Himadri.** Other important peaks of this range are Kanchenjunga (8,598m), Makalu (8,481m) and Dhaulagiri (8,172m).

The Himalayas is the highest mountain range in the world and also the youngest mountain range.

- **Longest Mountain Range is Andes in South America.**

- To the south of the Central Himalayas lies the second major range, the Lesser or Lower or Middle Himalayas or Himachal. It is separated from the Great Himalayas by the structural zone called the Main Central Thrust Zone.
- The Himalayan rivers have cut deep gorges in the Himachal.
- In the Lesser Himalayas, slate, limestones and quartzites are the dominant rocks.
- The southernmost range of the Himalayan system is called *outer or sub-Himalayas or Siwaliks*. In between the outer Himalayas and the lower Hima-

layas lies the main boundary thrust. This valley zone is known by the name of *doons* and *duars*.

The abode of snow

- Mountains between the Indus and the Brahmaputra are called 'the Himalayas' meaning *'the abode of snow.'*
- *Ladakh Range* lies to the south of the Karakoram Range between the Indus and its tributary the Shyok River and extends upto Mustang in Tibet, over a distance of about 1,000km. The Trans-Himalayan Kailas Range is an offshoot of this range and Mount Kailas (6,500m) is the highest peak in it.
- *Zaskar Range* lies south of the Ladakh Range and the Greater Himalayas lie to its south. It is often considered the western part of the Greater Himalayan Range. The *Nanga Parbat* (8,126m) marks it culmination in the north-west. Kamet (7,756m) is the highest peak.
- The Himalayas are known for some of the beautiful valleys of the world. The Kashmir valley is a classical example. It is rightly described as 'paradise on the earth'.
- The other important valleys are Kulu and Kangra in Himachal Pradesh.
- The doons in the Kumayun Himalaya of Uttar Pradesh are also well known.
- The Brahmaputra marks the eastern-most geographical limit of the Himalaya.
- Mountains along the eastern boundary of India are called Purvanchal.
- Nanga Parbat in Kashmir and Nandadevi in U.P. are the other two important peaks of the Himalaya.

KARAKORAM RANGES

- The mountains extending between the Pamir plateau and the Indus river in Kashmir are known as the **Karakoram.**
- The Karakoram mountains contain the Siachen, which is the world's largest mountain glacier.
- Extend from the Pamir, east of the Gilgit River, 600 km long and the average width - 120-140 km.
- Ancient name was **Krishnagiri.**
- Trans Himalaya, originally a part of Eurasian plate.
- Abode of largest glaciers in India.
- Siachin, Baltoro, Biafo, and Hisper glaciers.
- World's second highest peak (in India): K2 or Godwin Austen (8611m).
- Other Important Peaks:Gasherbrum I or Hidden Peak, Broad Peak and Gasherbrum II.
- The *Siachin Galcier* occupying the Nubra valley is about 75 km long and it is considered the largest glacier outside the polar areas.

The Himalayas are regionally divided into Punjab Himalayas, Kumaon Himalayas, Nepal Himalayas, Assam Himalayas.

NAME	LOCATION	DISTANCE
Punjab Himalaya	Between Indus and Satluj	560 km
Kumaon Himalaya	Between Satluj and Kali	320 km
Nepal Himalaya	Between Kali and Tista	800 km
Assam Himalaya	Between Tista and Dihang	720 km

Important passes of Himalayas

- Kashmir : Burzil and Zoji-la
- Himachal Pradesh : Bara Lacha-la, Shipki-la.
- Uttaranchal : Thanga-la, Niti-la, Lipu-Lekhla
- Sikkim - Nathula, Jelepla
- Khybar pass is the most famous pass which leads from Peshwar to Kabul.
- South of Khybar pass is the Gomal Pass (it is in Pakistan).
- The Bolan Pass leads from Kandahar to Quetta.
- The Purvachal Hills in the north-east consist of the Patkai-Bum, the Garo-Khasi-Jaintia and Lushai Hills.
- Vindhya mountains cut off the northern plain from the south.
- The **Peninsular mountains** include The Western Ghats (The Sahyadris), The Eastern Ghats, The Satpura Range and The Aravallis.
- The **Western Ghats** runs along the west coast from the south of Tapti river valley to Kanyakumari.
- The **Eastern Ghats** are irregular hill ranges that stretch from northern Orissa to the Nilgiris in Tamil Nadu across the coastal Andhra.
- The **Satpura range** extends from the Narmada valley in the north to the Tapti valley in the south.
- The 800 km range Aravallis stretching from the north-east to the south - west of India separates the semi-desert regions of Rajasthan from the fertile Udaipur and Jaipur regions.
- **Aravallis** is the **oldest mountain range in India.**
- **Sahyadri hills** is a part of the Western Ghats. Nilgiris is also a part of Western Ghats. Nilgiri is known as the **Blue Mountains.**
- The southern most tip of Eastern Ghats is called Cardamom Hills.
- **The Western Ghats and Eastern Ghats meet at Nilgiri Hills.**

Peninsular Plateau (The Deccan Plateau)

The Peninsular Plateau (also called the The Deccan Plateau) is a large plateau in India. Deccan Plateau is divided into three major units – the Western Ghats, the Eastern Ghats and the Deccan Trap. The Deccan Plateau lies south of the Indo-Gangetic plain.

- It extends over eight Indian states and encompasses a wide range of habitats, covering most of central and southern India.
- It is separated from the Gangetic plain to the north by the Satpura and Vindhya Ranges, which form its northern boundary.
- The Eastern Ghats and the Western Ghats constitute its eastern and western boundaries, respectively.
- The river Narmada, which flows through a rift valley, divides the region into two parts: the Malwa Plateau in the north and the Deccan Plateau in the South.
- The northern part of the plateau is occupied by the Aravalli Ranges in the west, Malwa region in the centre and the Chotta Nagpur Plateau in the east.
- The Deccan Trap represents the core of the plateau region and it is in this part that the oldest rock systems of India are found. This region is made up of crystalline rocks.
- The plateau region includes a number of other minor mountains besides the Aravalli and the Eastern and Western Ghats. They include the Vindhyas and Satpuras in Central India.
- The Satpuras, which lie between the rivers Narmada and Tapi, have several hills including the Rajpipla Hills in Maharashtra, and the Maikal Range and Pachmarhi Hills in Madhya Pradesh.
- The Western Ghats separate the Deccan Trap region from the Western Coastal Plain while the Eastern Ghats lie between the Eastern Coastal Plain and the Deccan Trap.
- The Western Ghats form a continuous range from south to north and the highest range of this region is often called the *Sahyadri*.

- The Western Ghats are connected to the Eastern Ghats by the Nilgiri Hills (Blue Mountains). South of these are the Annamalai Hills (Annaimudi is the highest peak in the peninsular region) which are separated from the former by the Palghat Pass.
- Two branches of the Annamalai Hills are known as the Palani Hills and the Yelagiri (Cardamom) Hills.
- The Sivasamudram Fall, the Gokak Fall and the Mahatma Gandhi Fall are important waterfalls in this area.
- The most important waterfall formed by the Narmada is the Dhuandhar Falls near Jabalpur. The river flows through marble rocks in this region and hence the Dhuandhar Fall is also called the *Marble Falls*.
- The Aravallis due to erosion over a long period of time their height has been reduced and they can be considered *relict mountains*.
- River Chambal is the most important river originating from the eastern slopes of the Aravallis.
- The Luni and the Sabarmati are the most important rivers rising from the Aravallis and flowing in a westerly direction.
- The dry north-western part of Rajasthan is part of the extensive Thar Desert that extends into Pakistan.
- East of Aravalli range, the area is less dry and there are lower hills like Bundi Hills. Chambal and its tributaries flow through this part draining southeastern part of Rajasthan.
- The Thar Desert merges into the Rann of Kutch. Much of the Rann is a sandy area and parts of it are marshy.
- The rocks of the Deccan Trap are rich in deposits of a variety of minerals. Granite, basalt, gneiss and quartzite are the major rocks besides some limestone and sandstone.
- Some of the richest deposits of manganese are found in Madhya Pradesh. Iron and gold are seen in Jharkhand and Karnataka respectively.
- The Western Ghats mark the western boundary of the Deccan Plateau and they separate the plateau from the coastal plain. The famous Palghat, Borghat and Thalghat are important gaps that facilitate passage over this barrier.

The Aravallis are one of the oldest fold mountains in the world. The highest peak of Aravalli range is Guru Shikhar near Mt. Abu (1,158m) in Rajasthan.

The Western Ghats are known by different local names. In Maharshtra and Karnataka they are called Sahyadri. Further south, they are called the Nilgiris in Tamil Nadu. Still further south, along the Kerala and Tamil Nadu border, they are known as Anaimala and Cardamom Hills.

- The Anai Mudi, the highest peak, is 2,695 metres above the sea level. Udagamandalam is a well known hill station of the south located in Tamil Nadu.

Plains of India

- The vast plains of north India are alluvial in nature and the western most portion is occupied by the Thar Desert.
- The plains of south India i.e., coastal plains are also alluvial to a large extent.
- The northern plain is known as the Ganga-Brahmaputra plain and is divided into smaller units like the western plain, eastern plain, Bihar plain, Bengal plain and Brahmaputra plain.

Northern Plain

- This plain lies to the south of the northern mountain wall and stretches in the shape of an arc from the western most part of the country to the Brahmaputra valley in the east.
- Indo-Gangetic plain is one of the most extensive stretches of the alluvium in the world.
- The **Indo-Gangetic Plains** also known as the **Northern Plains** and **The North Indian River Plain** encompassing most of northern and eastern India, the most populous parts of Pakistan, parts of southern Nepal and virtually all of Bangladesh.
- The areas that are parts of the plains are as follows- Bangladesh, Assam, Bihar, Gujarat, Haryana, Punjab, Rajasthan, Tripura, Uttar

Pradesh, West Bengal, Nepal, Madhesh, Punjab, Sindh, Madhya Pradesh, Meghalaya, Jharkhand, Orissa, Balo chistan, North-West Frontier Province, Kashmir region.

- The total length of the northern plain is about 2,400km and the width varies from 145 to 480 km.

Western Plain

- The western part of the northern plain is also called the Indus plain or Punjab plain.
- It slopes gently towards west and extends into Pakistan through Punjab.
- The plain is drained by the Indus and its tributaries. That part of the plain that extends in India is drained into the Arabian Sea by the rivers - Sutlej, Beas and Ravi, tributaries of the Indus that join the main stream after entering Pakistan. The Indian part of the plain is also called the *Punjab and Haryana Plain.*
- Streams carrying water only during the rainy season and with their beds choked with boulders are called *chos* in Punjab.
- The water becoming sub-surface in this zone emerges on the surface in lower areas down stream and produces marshy conditions. Such marsh areas in Punjab are called *mand.*
- The only river that remains perennial in its upper course in Haryana is Ghaggar. This stream is lost in the dry area in Rajasthan.

Eastern plain

- It comprises the flood plain and the delta plains of the Ganga and the Brahmaputra.
- It is customary to divide this part into the Ganga plain and the Brahmaputra plain.
- An important division of the plain is made in terms of the *khadar* and the *bangar* zones. The term *khadar* refers to the new alluvium and the bangar to the old alluvium.
- The lower part of the plain adjacent to the rivers that is prone to frequent floods is called *khadar.*
- Bangar soils frequently have beds of *kanker* or hard *pans.*
- The western part of the plain, from Haridwar to Aligarh is called *Upper Doab* and from Aligarh to Allahabad is called the *Middle Doab.*
- The northern part of Ganga-Yamuna Doab and Uttar Pradesh is covered by *Ruhelkhand Plain.* This part is drained by Ghaghra, Rapti and Gomti rivers.
- The plain is characterized by streams that flow as sub-surface channels in dry season. This area is called the bhabhar or the *'bhabar zone'.*
- The marshy region at the foot of the Himalayas is called the *terai zone.* Much of this zone has been drained out and reclaimed for agriculture.
- The foot hill zones of the eastern plain in the northern parts of West Bengal and still eastward are occupied by the *Bengal Duars* and *Assam Duars.*

Among the largest cities of the Indo-Gangetic plain are Ahmedabad, Ludhiana, Amritsar, Chandigarh, Delhi, Jaipur, Jaisalmer, Kanpur, Lucknow, Allahabad, Varanasi, Patna, Kolkata, Dhaka, Lahore, Faisalabad, Rawalpindi, Islamabad, Multan, Hyderabad and Karachi.

Coastal Plains

- The coastal plains separate the peninsular plateau from the sea.
- The inner margins of the plains are marked by the Eastern and the Western Ghats that separate the Deccan plateau region from the coastal low lands.
- The Eastern and the Western Ghats that separate the Deccan plateau region from the coastal lowlands.
- The plain along the Bay of Bengal coast is called the *Eastern Coastal Plain* and the one extending along the Arabian Sea coast of India is called the *Western Coastal plain.*
- The Eastern coastal plain of India stretches along the Bay of Bengal from river Subernarekha to Kanya Kumari.
- The northern part of this plain is often called the *Utkal plain,* the middle one is the *Andhra Coastal Plain* and the southern most part is called the *Tamil Nadu Coastal Plain* (also called the *Coromandel coastal plain).*
- The rivers flowing into the Bay of Bengal from the plateau region have contributed to the formation of this coastal plain.
- Part of the plain that lies in the upper course of the rivers is called the *upper plain* and the part in which lie the deltas of the rivers, is called the lower plain.

- The major rivers flowing through the Eastern Coastal Plain are the Mahanadi, the Godavari, the Krishna and the Kaveri. The delta regions of these rivers are very fertile and support high densities of agricultural population.
- The western coastal plain forms a narrow strip of land along the western coast of India. It stretches from Gujarat to Kerala.
  - The Western Ghats forming the inner margin of this plain are a much higher mountain range than the Eastern Ghats that are more of a series of discontinuous hills.
  - The rivers flowing down the escarpment like slope of the Western Ghats are rapid streams and they do not form any deltas.
  - The northernmost part of this plain is called the *Gujarat coastal plain* and the southernmost, the **Kerala coastal plain**. In between these two sections lie *Konkan Coastal Plain* in the north and the *Malabar Coastal Plain* to the South.

The Islands

- Besides the mainland, India has two groups of Islands namely the Andaman and Nicobar Islands in the Bay of Bengal and the Lakshadweep Islands in the Arabian Sea.
- Andamans consists of a northern cluster of 204 small islands and Nicobar islands consists of a southern cluster of 19 Islands.
  - Ten degree channel separates Andaman from Nicobar.
  - Port Blair is the capital of Andaman & Nicobar Islands.
- The southernmost tip of India, **Indira point** is in Great Nicobar islands which is the biggest island in Nicobar group.
- The Lakshadweep in the Arabian sea comprises of a group of 36 islands, about 300km to the west of Kerala coast. Only 10 of the islands are inhabited.
  - Kavarathi is the capital of Lakshadweep.
- New Moore Island lies in Bay of Bengal near West Bengal also belongs to India.
- Coco Islands North of Andaman belong to Myanmar.
- The Andaman and Nicobar Islands are close to the Indo-Australian Plate Boundary.
- Barren Island became active in 1991 after being (inactive) for over two centuries.
- Minicoy islands is separated from Maldives by 8^{o} channel.

RIVER SYSTEM OF INDIA

The river system of the country can be classified on the basis of their origin in to two categories:
i. The Himalayan Rivers and ii. The Peninsular rivers

The Himalayan rivers

The Himalayan rivers has three principal systems
1. the Indus system
2. the Ganga system and
3. the Brahmaputra system

1. Indus system

It is one of the largest river systems in the world. River Indus rises from Kailas Range in the Tibetan Plateau region and is joined by a number of tributaries in Jammu and Kashmir.

- The most important tributaries of Indus include the Sutlej, the Chenab, the Ravi and the Beas that join it after entering into Pakistan.
- Sutlej is the largest amongst the tributaries of Indus.
- After flowing through Pakistan, Indus falls into Arabian Sea.
- River Indus is an antecedent river as it is considered as older than the Himalayas.
- River Sutlej rises beyond the Himalayas and has cut a gorge through the Central Himalayan Range.
- The Ravi is the smallest river of Punjab and is well-known as the 'River of Lahore.' It rises near the Rohtang pass in the Kulu hills of Himachal Pradesh.
- The Chenab is the largest of Indus tributaries. It has a total length of 1,800 km in India.
- The Jhelum, an important tributary of the Indus flowing through the state of Jammu and Kashmir (Srinagar Valley is the valley of the Jhelum) rises in a spring at Verinag.
- The Beas rises at *Beas Kund* near the Rohtang Pass in Himachal Pradesh.

Sutlej, Beas, Ravi, Chenab and Jhelum are the five tributaries of Indus. Mount Kailash in Tibet is the source of Indus river. It falls into the Arabian sea.

2. Ganga System

It is the largest drainage system of India carrying the run off of about 25 percent of the total land area of the country.

- The **River Ganga** is the longest river (2640 km) in India. Its source is at Gangotri glacier in the Himalayas.
- Ganga, the main stream, is constituted by two major head streams, the *Alakananda* and *Bhagirathi*. These two headstreams of the Ganga join at *Devprayag*.
- The source of the Alakananda is near the Tibetan border and that of the Bhagirathi near Gangotri.
- The Ganga is joined by the Yamuna near Allahabad.
- Yamuna, Gomti, Ghagra, Gandak, Ramganga, Son, Chambal, Betwa and Ken are the main tributaries of Ganga.
- Ganga flows through Uttar Pradesh, Bihar, West Bengal and Bangladesh and finally enters into the Bay of Bengal.
- Ganga is known by the name 'Padma' in Bangladesh.
- The river has been declared as **India's National River.**
- It has been considered the holiest of all rivers by Hindus.
- Some of the most important Hindu festivals and religious congregation (worship) such as the **Kumbh Mela** every twelve years at Media:Allahabad and the Chhath Puja.
- The Ganges Basin drains 1,000,000-square-kilometre (390,000 sq mi) and supports one of the world's highest density of humans.
- Only two rivers, the Amazon and the Congo, have greater discharge than the combined flow of the Ganges, the Brahmaputra and the Surma-Meghna river system.

In Hindu tradition Triveni Sangam is the "confluence" of three rivers, two physical rivers Ganga, Yamuna, and the invisible or mythic Saraswati River. The site is near Allahabad, India. A place of religious importance and the site for historic Kumbh Mela held every 12 years.

3. Brahmaputra system

Brahmaputra is the third major antecedent river of India flowing from the Himalayan region towards the northern plains.

- The 2,688 km Brahmaputra is longer than the Ganges, but only one third of the river passes through India.
- Brahmaputra originates from the Manasarovar lake in Western Tibet. It flows for a long distance parallel to the Himalayan ranges in an easterly direction. Here, it is known as the *Tsangpo*.
- It takes a southward turn and enters India in eastern Arunachal Pradesh under the name *Dihang*.
- When it enters Bangladesh, it is named as 'Meghna.'
- The Ganga and the Brahmaputra join in Bangladesh and form the extensive delta of *Sunderbans*. It derives the name from the *Sundri tree* that grows widely in this region.

Mahanadi system

It drains a large part of Orissa.

- The Mahanadi is one of the major rivers of peninsular plateau region flowing into Bay of Bengal.
- The Seonath, the Hasdeo and the Mand join it from the north and the Jonk joins from south.
- The river forms its delta in the Cuttack district of Orissa before flowing into the Bay of Bengal.

Godavari System

- Godavari is the largest among the rivers of the Peninsular India. The source of the river lies in the Nasik district of Maharashtra and it traverses over a course of more than 1,400km. It is commonly known as *'Vriddha Ganga'*.

Krishna System

- It is the second largest east flowing system of the peninsular region.
- The river rises in Western Ghats near Mahabaleshwar and flows in a north-easterly direction to Divi in Andhra Pradesh. It is commonly known as *'Dakshina Ganga'*.

Kaveri system

- The river Kaveri is the most southerly among the major rivers of the peninsular region flowing into the Bay of Bengal.
- It rises in the Brahmagiri Hills in Coorg district and flows towards the coast.
- It descends from South Karnataka Plateau to the Tamil Nadu Plains through the famous Sivasamudram waterfalls.

Peninsular rivers

It is a river that flows through the peninsular part of a country.(a peninsula is a patch of land covered by water on three sides and connected to a land on the fourth side)

- Peninsular rivers (The Deccan rivers) are generally rainfed and comprises the rivers of peninsular India. They are shorter and seasonal in nature.
- River **Godavari** is the largest river system (1465 km long) of peninsular India. It rises from Trambak in Nasik district in the Western Ghats.
- **Rajahmundry**, is the largest city on the banks of Godavari.
- The Peninsular rivers are generally rain-fed and, therefore, fluctuate greatly in volume. A very large number of them are non-perennial.
- Peninsular rivers contribute 30 percent of the total outflow in India.
- The major Deccan rivers are the Godavari, Krishna, Cauvery, Pennar, Mahanadi, Damodar, Sharavati, Netravati, Bharathapuzha, Periyar, Pamba, Narmada and Tapti.
- There are three major rivers – Narmada, Tapti and Sabarmati flowing into the Arabain sea from the Peninsular region. **Narmada and Tapti are the major west flowing rivers of India.** They drain into the Gulf of Cambay in the Arabian Sea.
- The river Narmada rises in the Amarkantak plateau, flows through a rift valley and makes a number of waterfalls. The *Marble Falls* near Jabalpur is a famous fall on this river.
- The Tapti (Tapi) rises near Betul district. The Parna, flowing from the Gawilgarh Hills, is the most important tributary joining the Tapti near Bhusawal.
- Satpura Mountain range lies between Narmada and Tapti.
- The Sabarmati rises in the Aravallis in Rajasthan and flows into the Gulf of Cambay in Gujarat.
- River **Krishna** rises from the north of Mahabaleswar in the

The Main Rivers in India

Name	Length (km)	Originates from	Ends in	Passes through
Ganga (Bhagirati)	2,507	Gaumukh	Bay of Bengal	Uttar Pradesh, Bihar and W.Bengal
Yamuna (Jamuna)	1370	Garhwal in Yamunotri	Bay of Bengal	Delhi, Haryana and Uttar Pradesh
Brahmaputra	2,850	Chemayung-Dung glacier, between lake Manasarovar and Mount Kailash	Bay of Bengal	North Eastern states of India
Kaveri (Dakshina Ganga" or Ganges of the south)	765	Hills of Coorg, Karnataka	Bay of Bengal	Karnataka and Tamil Nadu
Godavari	1,465	Trimbakeshwar near Nasik Hills in Maharashtra	Bay of Bengal	South-easterly direction, through Maharastra and Andhra Pradesh
Krishna	900	Near Mahabaleshwar in Maharashtra	Bay of Bengal	Maharastra, Karnataka and Andhra
Narmada	1,300	Amarkantak hill in Madhya Pradesh	Arabian Sea	Maharastra, Madhya Pradesh and Gujarat
Tapti	724	Pachmari, Madhya Pradesh	Arabian Sea	Madhya Pradesh and Gujarat
Gomti	805	Himalaya Range of Nepal	Bay of Bengal	Uttar Pradesh
Ghaghara		Shivalik mountain range of Himachal Pradesh	Disappears into the Thar Desert	Haryana, Punjab and Rajasthan
Mahanadi	860	Satpura Range	Bay of Bengal	Chattisgarh, Jharkhand, Orissa and Maharashtra

Western Ghats. It enters into the Bay of Bengal. Krishna basin forms the third largest river basin in India.

- River **Cauvery** rises from the Brahmagiri hills in the Coorg district of Tamilnadu. It is known as **Dakshina Ganga.** About 55 percent of the Cauvery basin lies in Tamilnadu, 41 percent in Karnataka and three percent in Kerala.
- The Cauvery water Dispute Tribunal gave its final verdict in 2006. It ordered Karnataka to release 192 TMCFT water to Tamil Nadu every year.
- River **Pennar** rises in the Kolar district of Karnataka.
- River Damodar is called as "Sorrow of Bengal and Jharkhand", because of frequent flood.
- Sabarmati rises from the Jai Samand lake of Udaipur, Rajasthan.
- The Luni originates from Annasagar in the Aravallis and ends on the Sahni marshes, North of Rann of Kutch.
- The Third river system is also called the 'Rivers of Inland Drainage Basins' which consists of small rivers in the sandy areas of Rajasthan.
- Some of Peninsular rivers such as Narmada and Tapti form estuaries. Other rivers such as Mahanadi, Godavari, Krishna, Cauvery form deltas.

Drainage of the Thar Desert Region

- The greater part of Rajasthan and Gujarat is dry land, which forms a part of the Thar desert.

Sunderban

The world's largest delta, Sunderbans is formed by the Ganges and Brahmaputra in West Bengal and Bangladesh, in the Bay of Bengal. The Sundarbans is the largest single block of tidal halophytic mangrove forest in the world. The forest lies in the vast delta on the Bay of Bengal formed by the confluence of the Ganges, Brahmaputra and Meghna rivers across southern Bangladesh and West Bengal. It became inscribed as a UNESCO world heritage site in 1997.

Difference between the Himalayan and the Peninsular Rivers

- Rivers such as Indus, Sutlej, Brahmaputra etc., are antecedent rivers i.e., they are older than the landforms over which the Himalayan rivers flow.
- Due to their sources in the snowfields, the Himalayan rivers are perennial and carry large amounts of water. Their erosional capacity is immense and they carry large amounts of silt.
- Most of the rivers of the peninsular plateau are consequent streams and they follow the general slope of the plateau region. Their valleys are well developed and they do not change their course frequently.
- Further, the peninsular rivers are seasonal in character as they are rainfed.
- Due to a lesser amount of flow, the hydroelectricity generation potential of the peninsular rivers is much lower than the Himalayan rivers.

- The Thar Desert (also known as the Great Indian Desert), is a large, arid region in the northwestern part of the Indian subcontinent.
- The Cholistan Desert adjoins the Thar desert spreading into Pakistani Punjab province.
- It is an area of internal drainage and the only river rising or flowing through this territory is the river *Luni*.
- The river Luni rises in the Aravalli Ranges and enters the Arabian Sea through the Rann of Kutch.
- For most of the year, Luni is dry.

Lakes

- The largest fresh water lake in India: Lake Kolleru (Andhra Pradesh). Wular is the second largest fresh water lake.
- The largest saltwater lake : Lake Chilka (Orissa)
- The second largest salt water lake is Sambhar in Rajasthan. It is the largest inland salt lake in India.
- Dal Lake is famous for house boats.
- The lakes of India generally classified as fresh water and brakish lakes.

Important lakes in India
Chilka (Orissa)
Sambar (Rajasthan)
Pulicat (Andhra Pradesh)
Vembanad (Kerala)
Wular (J & K)
Dal (J & K)
Uday Sagar (Rajasthan)
Pushkar (Rajasthan)
Loktak (Manipur Hills)
Bhimtal Lake (Nainital)
Roopkund Lake (Uttaranchal)
Osman sagar lake (Andhra)

MULTI-PURPOSE RIVER VALLEY PROJECTS

- India stands fifth in the world after Congo, Russia, Canada and the United States in potential of water power resources.
- **Damodar River Valley project** was the first multi-purpose river valley project in Free India.
- The project-irrigates half a million hectares of land in West Bengal and parts of south-east Bihar.
- **The Bhakra Nangal Project** is an example of water management on scientific lines on the largest scale.
- The project serves the states of Himachal Pradesh, Punjab, Haryana, Rajasthan and the National Capital Territory of Delhi.
- **Indira Gandhi or Rajasthan Canal** is the longest irrigation canal in the world
- Indira Gandhi Canal Project in Rajasthan utilized water of Satluj, Beas and Ravi to irrigate north-western parts of the country
- **The Kosi project** in Bihar has been taken up in cooperation with Nepal.
- Its main aim has been to control floods brought by the river Kosi, known as the 'River of Sorrow' for north Bihar.
- The main canal is taken off from Hanumannagar barrage on the Kosi.
- Another important joint venture of India and Nepal is the **Gandak Project.**
- The Hirakud dam in Orissa is the longest dam in the world.
- **The Tungabhadra Project** serves Karnataka and Andhra Pradesh.
- **The Nagarjunasagar project** is built on the river Krishna in Andhra Pradesh irrigates 8,67,000 hectares of land.
- The dam has been named after the Buddhist scholar Nagarjuna.
- **The Chambal project** helps irrigate parts of Madhya Pradesh and Rajasthan.
- The project consists of Gandhi Sagar Dam in Madhya Pradesh, and Kota Barrage and Jawahar Sagar Dam in Rajasthan.

Hydel power projects

- In the year 1902 the first water power house was set up on the river Kaveri at Sivasamudram in Karnataka.
- Tata Hydro electric scheme was introduced in the western ghats of Maharashtra to furnish power to the city of Mumbai.
- In Tamil Nadu, Pykara was the first water power station.
- In the north, Mandi power house was the first to be developed in the Himalayan region. The next one to be taken up was the Upper Ganga Canal Hydroelectric Grid System.
- **The Rihand project** is the largest manmade lake in India on the borders of Madhya Pradesh and Uttar Pradesh.
- **The Koyna project** in Maharashtra is on the east flowing tributary of the Krishna. Its capacity is 880 MW. It feeds power to Mumbai-Pune industrial region.
- **The Sharavathy project** in Karnataka is located at the Jog Falls, the highest in India.
- Its total capacity is 891 MW. It feeds Bangalore industrial region and is also taken to the states of Goa and Tamil Nadu.
- The Sabarigiri project in Kerala has an installed capacity of 300 MW while the Idukki project has a capacity of 390 MW.
- The Balimela project in Orissa has an installed capacity of 360 MW and in Gujarat Ukai Project has a capacity of 300 MW.
- In Jammu and Kashmir Salal Hydel Power project provide over a thousand MW of power.
- Tehri Hydel Power project is a joint project of the Govt of India and Uttaranchal. Tehri Hydro Development Corporation was set up in 1988.
- Narmada Valley Development Authority (NVDA), is an organization of Govt. of M.P. constituted for planning water resources development in Narmada basin
- Narmada is the fifth largest river in India and largest west flowing river of Indian peninsula originating from Maikala ranges at Amarkantak in Madhya Pradesh

DAM and RIVER

Bhakranangal Dam ..... Sutlej
Hirakud ..... Mahanadi
Tehri Dam ..... Bhageerathi
Uri Power Project ..... Jhelum
Nagarjunasagar Dam ..... Krishna
Kosi Project ..... Kosi
Koyna Project ..... Krishna

- Garland Canal Project linked Peninsular rivers of South India and Himalayan rivers through Canals.
- The Farakka Barrage Project is designed to serve the need of preservation and maintenance of the Kolkata Port by improving the regime and navigability of the Bhagirathi-Hoogly river system.
- **The Grand Anicut** also known as the Kallanai, was built by the Chola king **Karikala Cholan** in AD 26. It is considered as one of the oldest water-diversion or water-regulator structures in the world, which is still in use.
- Uttar Pradesh occupies the First place with the total length of rivers and canals as 31.2 thousand km, which is about 17 percent of the total length of rivers and canals in the country. Other states following Uttar Pradesh are Jammu & Kashmir and Madhya Pradesh.

MULTI-PURPOSE PROJECTS

PROJECT	RIVER	STATE	PURPOSE
Bhakra Nangal Multipurpose Project Bhakra dam: One of the highest gravity dam in the world. Govind Sagar Lake (H.P.) is a reservoir.	Sutlej (A tributary of Indus)	Joint venture of Punjab, Haryana and Rajasthan.	Irrigation, hydro electricity
Thein Dam project	Ravi (A tributary of Indus).	Punjab	Irrigation, hydroelectricity.
Dulhasti project	Chenab (A tributary of Indus)	Jammu and Kashmir	Part of the programme of cascade development for irrigation..
Salal project	Chenab (A tributary of Indus).	Jammu and Kashmir	Irrigation
Beas project	Beas (A tributary of Indus).	Joint venture of Punab, Haryana and Rajasthan.	Hydro electricity
Sharda Sahayak Project	Ghagra (left bank tributary of Ganga).	Uttar Pradesh	Irrigation
Ramganga multipurpose project	Chuisot stream near Kalabagh	Uttar Pradesh	Irrigation, hydroelectricity.
Banasagar project	Son	M.P., Bihar and U.P.	Irrigation
Rihand Scheme Reservoir: Govind Ballabh Sagar (U.P.).	Rihand	Uttar Pradesh	Hydroelectricity for the development of south eastern industrial region of U.P.

Upper Krishna Project	Krishna	Karnataka	Irrigation (Almatti dam is being constructed).
Tungabhadra multipurpose project.	Tungbhadra (A tributary of Krishna)	Joint venture of Andhra Pradesh and Karnataka.	Irrigation, hydroelectricity.
Ghatprabha project	Ghatprabha (A tributary of Krishna).	Andhra Pradesh and Karnataka	Irrigation, hydroelectricity.
Malprabha project	Malprabha (A tributary of Krishna).	Karnataka	Irrigation
Bhima project	Bhima	Maharashtra	Irrigation
Mettur project	Cauvery	Tamil Nadu	Hydroelectricity
Shivasamudram scheme	Cauvery	Karnataka	Hydroelectricity
Kundah project	Kundah	Tamil Nadu	Hydroelectricity
Sharavati Project	Sharavati (near Jog falls)	Karnataka	Hydroelectricity
Chambal project (Gandhi Sagar Dam (M.P., Rana Pratap Sagar and Jawahar Sagar Dam or Kota Dam.	Chambal (a tributary of Yamuna).	Rajasthan, Madhya Pradesh.	Irrigation, hydroelectricity.
Kakrapara Project	Tapi	Gujarat	Irrigation
Ukai project	Tapi	Gujarat	Irrigation
Sardar Sarovar Project	Narmada	Gujarat, M.P., Rajasthan Maharashtra.	Irrigation, hydroelectricity
Tawa project	Tawa (A tributary of Narmada).	Madhya Pradesh	Irrigation
Mahi project (Jamnalal Bajaj Sagar)	Mahi	Gujarat	Irrigation
Matatila project	Betwa	Uttal Pradesh, Madhya Pradesh.	Irrigation, hydroelectricity.

INDIAN CLIMATE

- The nation has four seasons: winter (January and February), summer (March to May), a monsoon (rainy) season (June to September), and a post-monsoon period (October to December).
- The climatic conditions in India are affected the most by the tropical monsoon. Due to the overwhelming influence of the tropical monsoon on Indian climate, India is called a tropical country.
- Indian climate is greatly influenced by the presence of Himalayas in the north and the Indian Ocean in the south.
- The climate of India is monsoonal type, fed up by two rain bearing winds.
- Latitude and the monsoon winds are the major factors affecting the Indian climate.
- The Tropic of Cancer divides India into two almost equal climatic zones namely the northern zone and the southern zone.
- Thunder storms cause upto 25 cm of rainfall along the Kerala and Karnataka coasts and about 10 cm. in the interior of South India. Such rains are called **'Cherry Blossoms' in Karnataka** where they prove immensely beneficial to coffee plantation. They are called as **'Mango Showers'** in South India, due to their salutary effect on mango crop.
- The normal date of the onset of the rains is 20th May in

Andaman & Nicobar Islands and by the end of June, it is usually established over most of the country.

- Normal duration of the monsoon varies from 2 to 4 months.
- The Trans-Himalayan and Greater-Himalayan regions, Drass and Kargil of Ladakh region are the coldest regions in the country.
- **Mawsynram** in Meghalaya (1141 cm) is the rainiest place in the world.
- **Jaisalmer** in western Rajasthan is the driest place in India which receives the lowest rainfall.
- El-Nino is a complex weather system that appears once in every 3 to 7 years bringing drought, floods and other weather extremes to different parts of the world. El-Nino is used in India for forecasting long range monsoon rainfall.

Monsoon

- India receives 90% of the total rainfall from monsoons. **Monsoons** are the seasonal winds which blow during six months of summer from ocean to land and for the six months of winter from land to sea.
- On the basis of monsoonal variations there are four seasons in India namely the cold (winter) season (December to February), the hot (summer) season (March to May), the south west monsoon (the rainy season) (June to September) and the season of retreating monsoon (October to November).
- **The South West Monsoon forms the main monsoon season in India (June to August).**
- **The North East Monsoon (October - November) brings rain mainly to Tamil Nadu.**
- The North - East Monsoons are comparitively minor monsoons confined to a smaller area of the country. They are the winds blowing out from the landmass of north-western India towards the Indian Ocean.
- Monsoon is a wind system of the tropical regions under which the direction of the winds is reversed seasonably and it results in summer rainfall and dry winters.
- During the summer season, the winds blow from sea to the continents so that the moist winds cause rainfall in this season.
- During winter, the direction of the winds is reversed so that they blow from continents towards the sea.
- The onset of monsoon in India implies the onset of the southeast monsoon (winds blowing from the Indian Ocean to the Indian subcontinent) in the beginning of the summer season so that the months from June to mid-September are rainy.
- The south-west monsoon winds are replaced from October onwards by the north-east monsoon blowing from the continental area towards the sea to the south. Hence the winter season remains by and large dry.

Seasons

- The climatic year of India can be divided into four seasons: the hot dry season, the hot wet season, the cool dry season and the cool wet season.
- *Hot Dry Season* : It is marked by the rising temperature during the latter half of the month of March. The highest temperatures in the south are experienced in April and in the northern plains in May and June.
- This part of the year is marked by a dry spell and the north-western parts of the country experience hot, dry winds called *loo*.
- *Hot Wet Season* : The trough of low pressure over the Indo-Gangetic plain causes the equatorial winds of oceanic origin to move over to India.
- This is the onset of southwest monsoon and also the beginning of the hot wet season.
- The peninsular landmass of India divides the southwest monsoon winds into two branches, one each blowing from the Arabian Sea and the Bay of Bengal.
- The Arabian Sea branch first strikes the Western Ghats and causes heavy rainfall in the Western Coastal Plains.
- On the eastern side of the Ghats, the rainfall is much lower due to the *rain-shadow effects* of the Ghats and interior Tamil Nadu remains dry during this season.
- The direction of the winds during this season over the Bay of Bengal is modified by the presence of the low pressure over the Ganga Valley and the physical barrier of the Arakan mountains. Hence their direction over this region becomes south-easterly.

- *Cool Dry Season* : This season lasts from mid-September to mid-December. It is the period of retreating south-west monsoon in India.
- The period is characterized by low temperature, low northerly winds, clear skies and low humidity.
- Although the season is dominated by subsistent easterly or northeasterly winds over the peninsula, winds generally blow from a westerly direction in the northern part of the country.
- *Cool Wet Season* : By October, the southwest monsoon withdraws from most parts of India and the northeast monsoon establishes itself over the entire area from which the southwest monsoon has withdrawn.
- The western remains dry up to the end of November in most parts.
- The western disturbances are cyclonic systems that develop in the belt of the westerly winds and they bring unsettled weather in their wake. These disturbances cause rain or snowfall in Jammu and Kashmir and north Indian Plains and break the dry spell. This period of the year is called the cold-wet season.
- The winds blowing towards Tamil Nadu from the northeast pick up some moisture as they blow over the Bay of Bengal and they cause rainfall in Tamil Nadu and parts of Andhra Pradesh due to the obstruction posed by the Eastern Ghats and the eastern face of the Western Ghats.
- Rajasthan and Gujarat regions remain dry during this season also.

Climatic Regions

- The wettest areas in the western coastal plain and parts of Assam fall under the category of *tropical rainforest climate*. This region receives more than 400 cm of rainfall and Mawsynram near Chirapunji, which receives the highest average annual rainfall in the world, lies here.
- The *tropical savanna climate* covers most of the peninsular region except for the semi- arid zone east of the Sahyadris. In this region, the temperature remains above 18.2^{0}C and the range of temperature is also high. It is seasonal in character.
- *Tropical and sub-tropical steppe climate* extends over large areas in Punjab, Haryana, Kutch, parts of the Gangetic plains and some parts of the Peninsular region. Temperature in this region falls below 18^{0}C in the winter season but may rise above 30^{0}C in summer.
- *Tropical semi-arid steppe climate* covers the rain-shadow area of the Sahyadris and parts of Maharashtra. Temperature remains between 20^{0}C and 23.8^{0}C.
- Parts of Kutch and the western parts of Rajasthan are included in the category of *tropical deserts*. It receives a rainfall of less than 25cm and the temperature may rise up to 50^{0}C.
- *A humid subtropical climate with dry winters* covers most of the northern plains from Punjab to Assam along the Himalayas.
- The Himalayas and the Karakoram Range are included in areas identified as having a *mountain climate*. Here, the temperature and rainfall vary according to altitude and the aspect of the slopes.

SOILS IN INDIA

Alluvial Soil

- Alluvial soil contributing the largest share, is formed by the deposition of sediments by rivers in the interior parts of India and by the sea waves in the coastal areas of the country.
- **Alluvial soil is the best agricultural soil** because

The Indian Council of Agricultural Research has divided the Indian soils into 8 categories. Alluvial soil, Black soil, Red soil, Laterite soil, Forest soil, Arid and Desert soil, Saline and Alkaline soils, Peaty and organic soils. Black soils (29.69%), Alluvial soils (22.16%), Red and yellow soils (28%).

(i) They contain a variety of salts derived from Himalayan rocks.
(ii) They are light and porous, therefore easily tillable.
(iii) They are good for canal irrigation because of high water table and an easily penetrable stratum.

- Alluvial soils are suitable for cultivation of almost all kinds of cereals, pulses, oil seeds, cotton, sugarcane and vegetables.
- Alluvial soils are rich in potash and poor in nitrogen and organic matter.
- Immature soils with weak profiles – Azonal
- Alluvial soils are devoted to the cultivation of wheat rice, pulses, sugarcane, jute, oilseeds, fodder etc.

Black Soil

- Black soil is found largely in the Deccan plateau.
- Black soil is suitable for the cultivation of cotton and therefore it is called **black cotton soil.**
- Also known as regur soils.
- Regur soils varies in colour from black to chestnut brown.
- Black soils are rich in iron, lime and aluminium content.
- Black soils have high moisture retention capacity.

Red Soil

- Red soil is formed by the weathering of ancient metamorphic and crystalline rocks.
- They are airy and need irrigation support for cultivation. Red soil is suitable for the cultivation of pulses and coarse grains.
- Red soils are poor in nitrogen, phosphorus, potassium and organic matter.
- They are more suitable for the cultivation of rice, ragi, tobacco and vegetable.
- The colour is red because of the presence of iron oxides.
- Mainly found in the Peninsular India and hilly states of North East India.

Laterite Soil

- Laterite soils are formed by the weathering of laterite rocks. Laterite soils are deficient in nitrogen. They are chiefly found in Karnataka, Kerala, Madhya Pradesh, Orissa and Malabar areas.
- These soils are agriculturally unimportant because of intensive leaching, low base exchange capacity and their acidic nature.
- These are the typical soil of the tropical regions with heavy seasonal rainfall and alternative dry season.
- These soils provide valuable building materials.

Forest Soil

- Forest soils are formed by the deposition of organic matter derived from forests. They are rich in organic matter and humus. They are found mainly in Punjab, Karnataka, Manipur and Jammu & Kashmir.
- These soils are used for plantations of tea, coffee, spices and fruits.

Arid and Desert Soils

- Arid and Desert soils are formed under arid and semi arid conditions in the north -western parts of the country. They are rich in phosphate though poor in nitrogen.
- These soils often have a high soluble salt content and very low humus content.
- These soils are made fertile by adding gypsum.

Saline and Alkaline Soils

- Saline and Alkaline soils are salt impregnated and infertile. These soils are found especially in the dry tracts of the north.

Peaty soils

- Peaty soils are developed under humid conditions as a result of the accumulation of large amounts of organic matter. These soils are highly saline and rich in organic matter.
- This soil is found in Kottayam and Alappuzha districts of Kerala, where they are called kari.
- When the rain cease they are put under paddy cultivation.
- It also occurs in the northern Bihar, Southern Uttaranchal (Almora district) and coastal areas of West Bengal, Orissa and Tamil Nadu.

Soil erosion and Conservation

- Soil erosion by water, wind and tillage affects both agriculture and the natural environment.
- Soil erosion is just one form of soil degradation. Other kinds of soil degradation include salinisation, nutrient loss, and compaction.

- Soil erosion means removal of the top layers of the soil at a rate higher than the rate of accrual of new fertile top part of the soil is removed.
- Soil conservation is a set of management strategies for prevention of soil being eroded from the earth's surface.
- The most common methods of soil conservation include afforestation, contour cultivation, keeping land covered by crops and other plants, mulching, construction of embankments and flood channels and scientific methods of cultivation keeping in view landform characteristics.
- Cultivation on the steep slopes and excessive grazing should also be avoided.

NATURAL VEGETATION (Forests)

- Natural vegetation in India varies from region to region due to variations in climatic conditions, soil types and relief features.

Some major types of vegetation found in India are Evergreen forests, Deciduous forests, Dry forests, Hill forests and Tidal forests.

- **Nearly 19.39% of the total land area in India is under forest.** The National Forest policy has laid down a target of raising the area under forest to nearly 33.3%.
- Tropical Evergreen forests are dense forests of luxuriant growth found in areas where rainfall ranges between 200 to 300 cm. eg; Western Ghats and sub-Himalayan regions.
- Dry Tropical forests are mostly prevalent in regions with an annual rainfall of 90 to 130 cm.
- Swamps or Littoral forests are also called tidal forests which occur in and around the tidal creeks and along the deltas of river Ganges, Mahanadi, Krishna and Godavari.
- Alpine forests cover the alpine areas in the Himalayas, at a height of 2880 m to 3700m.
- Siwaliks are covered with tropical moist deciduous flora such as sal and bamboo.
- Planting of trees is known as afforestation.
- Deforestation is the destruction of trees.
- Forests also help to prevent soil erosion and land slides. It maintains the ecological balance and provides forest products such as timber and industrial raw materials. Forests helps to protect wild life and rare species of trees and plants.
- **Madhya Pradesh has the largest area under forest among the Indian states.**
- **Haryana has the least area under forest.**
- Arunachal Pradesh has the largest percentage of area under forest.
- India provides about 8% of the world's hardwood and ranks third after Brazil and Indonesia.
- Mangrove forests are found in the coastal plains.
- The forests on the Ganges delta in Bengal are called Sunderbans after the sundari trees in these forests.
- **Evergreen forests** (Tropical) are found in the Western ghats and Sub-Himalayan region. They provide hardwood like teak, rosewood, ebony etc.
- **Social forestry** aims at not only providing fuelwood, fodder and other forest products, but also to meet the requirement of ecological balance through large scale afforestation on community lands and waste lands.
- **Energy plantations are plantations of softwood and grass to meet the energy needs of households.**
- World Environment Day : June 5.
- Government of India adopted a forest policy in 1952 and further modified it in 1988. According to new forest policy, the Government will emphasise sustainable forest management.
- Forest policy aimed at 1. bringing 33% of geographical areas under forest cover, 2. maintaining environmental stability, 3. conserving natural heritage of the country, 4. checks soil erosion, 5 increasing forest cover etc.
- Out of a total of 593 districts, 187 have been identified as tribal districts. The tribal districts account for about 59.8% of total forest cover of the country.
- The National Commission on Agriculture (1976) classified social forestry into 3 categories - Urban forestry, Rural forestry, Farm forestry.

INDIA'S WILD LIFE

- India,a country of diverse wild-life & it is the second largest country on the planet to have such diverse life forms.
- India is home to several well known large mammals including the Asian Elephant, Bengal Tiger, Asiatic Lion, Leopard, Sloth Bear and Indian Rhinoceros.
- Other well known large Indian mammals include ungulates such as the rare Wild Asian Water buffalo, common Domestic Asian Water buffalo, Nilgai, Gaur.
- India displays significant biodiversity. One of eighteen megadiverse countries, it is home to 7.6% of all mammalian, 12.6% of all avian, 6.2% of all reptilian, 4.4% of all amphibian, 11.7% of all fish, and 6.0% of all flowering plant species.
- The wild life reserves of India are of two types - the **Wild life sanctuaries** and **National parks.**
- Presently, the country has 490 Wildlife Sanctuaries, 96 National Parks and 27 Tiger Reserves.
- Wild life protection in India was given statutory status with the adoption of the Wild-life (Protection) Act, 1972 by all the Indian states except Jammu and Kashmir.
- **Keibul Lamjo** is the only floating National Park in the country, is located in Manipur in Loktak Lake.
- Trade in endangered species is subject to strict rules under the Convention on International Trade in Endangered Species (CITES) of wild flora and fauna, to which India is a signatory.
- Some of the endangered species are Asiatic Lion, One Horned Rhinocerous, Hangul, Royal Bengal Tiger, Wild Ass etc.
- **The Animal Welfare Board of India** was established in 1962. Research programmes in wild-life are carried out by the **Wild life Institute of India, Dehradun** and the **Salim Ali Centre for Ornithology and Natural History, Coimbatore.**
- Project Tiger is the centrally sponsored scheme launched on April 1, 1973 to save the ti-

World's rarest monkey, the golden langur typifies the precarious survival of much of India's megafauna.

National Parks

India's first national park (an IUCN category II protected area) was established in 1935 as *Hailey National Park*, now known as **Jim Corbett National Park**. By 1970, India only had five national parks. In 1972, India enacted the Wildlife Protection Act and Project Tiger to safeguard the habitats of conservation reliant species. Further federal legislation strengthening protections for wildlife was introduced in the 1980s. There are 96 national parks. All national park lands encompass a combined 38,029.18 km², 1.16% of India's total surface area.

Biosphere Reserves

Biosphere reserves are multi purpose protected area to preserve the genetic diversity in representative eco system. So far fourteen biosphere reserves have been set up. They are:

Nilgiri, Nanda Devi, Nokrek, Great Nicobar, Gulf of Mannar, Manas, Sunderbans, Similipal, Dibru Saikhowa, Dehong Debang, Panchmarhi, Kanchenjunga and Agasthyamala and Achanakmar Amarkantak.

National animal

Royal Bengal Tiger

National aquatic animal

Dolphin

National bird

Indian Peacock

National tree

Banyan tree

Wildlife Institute of India (WII) is established in 1982. It is an internationally acclaimed Institution, which offers training program, academic courses and advisory in wildlife research and management.

There are about 2546 species of fishes (about 11% of the world species) found in Indian waters. About 197 species of amphibians (4.4% of the world total) and more than 408 reptile species (6% of the world total) are found in India. There are about 1250 species of birds from India (12% of the world species). There are about 410 species of mammals known from India which is about 8.86% of the world species.

gers from extinction on India. It has become the most successful conservation ventures in modern history.

- At present **Madhya Pradesh** with 912 tigers tops the state with greater number of Tigers. Madhya Pradesh is known as **the tiger state of India.** M.P was followed by Uttar Pradesh in 1992.
- Today, there are 39 Project Tiger wildlife reserves in India.
- **Project Elephant was launched to protect the wild life and elephant population.**
- Most of India's rhinos today survive in the Kaziranga National Park.
- A wild life week is observed in the first week of October every year.

Flora of India

- The Flora of India is one of the richest of the world due to a wide range of climate, topography and environments in the country. There are over 15000 species of flowers in India.

Lotus, National Flower of India

AGRICULTURE IN INDIA

- Crops in India can be classified into subsistence crops, commercial crops, plantation crops and horticulture crops.
- India's total geographical area is 328.7 million hectares of which 140.8 million hectares is the net sown area, while 192.80 million hectares is the gross cropped area.
- Agriculture contributes about 17.8% to national Gross Domestic Product (GDP) and nearly 16% to export earnings.

Types of Cultivation

1. Sedentary Cultivation
2. Crop rotation
3. Shifting cultivation
4. Mixed cropping
5. Relay cropping
6. Terrace cultivation
7. Mixed farming

- Operation flood I was launched in 1970, which aimed at capturing a commanding share of the liquid milk market.
- A centrally sponsored Com-

ICAR

Indian Council of Agricultural Research (ICAR) is an autonomous body under the Ministry of Agriculture. Headquarters: New Delhi. The council is the apex body for coordinating, guiding and managing research and education in agriculture including horticulture.

- India is the world's largest producer of milk, cashew nuts, coconuts, tea, ginger, turmeric and black pepper.
- It also has the world's largest cattle population (281 million).
- It is the second largest producer of wheat, rice, sugar, groundnut and inland fish
- It is the third largest producer of tobacco.
- India accounts for 10% of the world fruit production with first rank in the production of banana and sapota.

Crop season in India can be classified into three such as Kharif, Rabi and Zaid.

- **Kharif (rainy) crops** are sown in June/July and harvested in September / October. Rice, Jowar, Bajra, Ragi, Maize, Cotton and Jute are the important Kharif crops.
- **Rabi (winter) crops** are sown in October/ December and harvested in April/ May. Wheat , Barley , Peas, Rape-seed, Mustard and Grams are the important Rabi crops.
- **Zaid (Summer) crops :** Zaid crops are grown in the short periods after the harvest of the Kharif and Rabi crops. Sown in April, May and June. Products are mostly fruits and vegetables.

Areas of Cultivation

Temperate Himalayan Region
Eastern Himalayan Region & Western Himalayan Region.
The Eastern Himalayan Region
Assam, Sikkim and Mishmi Hills
The Western Himalayan Region
Kulu, Kangra and Kashmir Valleys, Garhwal, Kumaon and Simla Hills
Northern Dry Region
Punjab, Haryana, Delhi, Gujarat, Rajasthan, Uttar Pradesh and Western Madhya Pradesh
Eastern West Region
West Bengal, Orissa, Bihar, Jharkhand, Andhra Pradesh, Tamil Nadu, Chattisgarh, Assam, Meghalaya, Manipur, Tripura and Mizoram.
Western Wet Region
Kerala, Karnataka
Southern Region
Parts of Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Maharashtra, Gujarat, Karnataka and Uttar Pradesh

Green Revolution

- To increase yield per hectare government of India introduced a programme called Green Revolution.
- The Green Revolution (first) was launched in 1967-68.
- The second Green Revolution was launched in 1983-84.
- Father of Green Revolution - Dr. Norman Borlaug
- Father of Green Revolution in India - Dr. M.S. Swaminathan
- Green Revolution focused the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure, and distribution of hybridized seeds, synthetic fertilizers, and pesticides to farmers.
- Punjab pioneered green revolution among the other states transforming India into a food-surplus country.

Crop	*Areas of Production*
Barley	Uttar Pradesh, Bihar, Madhya Pradesh
Cotton	Gujarat, Andhra Pradesh, Madhya Pradesh, Maharashtra, Punjab, Haryana, Tamil Nadu, Karnataka.
Jute	West Bengal, Bihar, Assam, Orissa, Tripura
Groundnut	Gujarat, Tamil Nadu, Andhra Pradesh
Mustard & rape seed	Rajasthan
Sunflower	Maharashtra, Andhra Pradesh, Karnataka
Pulses	Madhya Pradesh, Uttar Pradesh, Rajasthan, Punjab, Haryana, Karnataka, Andhra Pradesh.
Coffee	Karnataka, Kerala, Tamil Nadu, Andhra Pradesh.
Rubber	Kerala, Tamil Nadu, Karnataka
Silk	Karnataka, Jammu and Kashmir, Andhra Pradesh, Assam, Bihar (tassar)
Tobacco	Gujarat, Andhra Pradesh, Karnataka, Tamil Nadu, Orissa, Bihar.
Cardamom	Karnataka, Sikkim, Kerala, Tamil Nadu
Cashewnut	Kerala, Andhra Pradesh
Castor seed	Gujarat, Andhra Pradesh
Chillies	Maharashtra, Andhra Pradesh, Orissa
Cloves	Kerala, Tamil Nadu, Karnataka
Cocoa	Kerala, Karnataka, Tamil Nadu
Ginger	Kerala, Meghalaya
Pepper	Kerala, Karnataka, Tamil Nadu
Poppy	Uttar Pradesh, Himachal Pradesh, Punjab
Ragi	Karnataka, Tamil Nadu
Saffron	Jammu and Kashmir
Banana	Gujarat, Maharashtra, Tamil Nadu, Kerala
Pineapples	Assam, Meghalaya, West Bengal, Tripura
Mango	Uttar Pradesh, Bihar, Andhra Pradesh, Maharashtra, Tamil Nadu.
Apple	Himachal Pradesh, Jammu and Kashmir, Uttaranchal
Arecanut	Kerala, Karnataka, Assam, Meghalaya, Maharashtra and Tamil Nadu.
Coconut	Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Goa.
Grapes	Maharashtra, Andhra Pradesh, Karnataka, Punjab, Uttar Pradesh, Himachal Pradesh
Orange	Maharashtra, Karnataka, Tamil Nadu, Meghalaya, Sikkim.
Turmeric	Andhra Pradesh, Tamil Nadu, Bihar, Orissa, Maharashtra.

States first in production

Saffron ..... Jammu Kashmir
Tea ..... Andhra Pradesh
Spices Garden ..... Kerala
Coffee ..... Karnataka
Sandalwood ..... Karnataka
Cotton ..... Gujarath
Tobacco ..... Andhra Pradesh
Plantain ..... Maharashtra
Wheat ..... Uttar Pradesh
Sugar cane ..... Uttar Pradesh
Paddy Crop (Rice) ..... West Bengal & Andhra
Coriander ..... Rajasthan

White Revolution

- The White Revolution in the country has been achieved by means of Operation Flood. It was carried out in three phases.
  Operation Flood I .... 1970 - 1981
  Operation Flood II ... 1981 - 1985
  Operation Flood III ... 1985 - 1996.
- White revolution launched to increase the quality and quanity of milk and dairy products.
- The Father of the White Revolution in India is Dr. Varghese Kurien. He is also known as **Milkman of India.**

mand Area Development Programme was launched in 1974-75 with the main objective of improving utilization of irrigation potential and optimizing agricultural productivity.

- **Irrigation** in India can be classified into Wells, Tanks and Canals.
  - Wells account for about 48% of the total irrigated area in the country.
  - Tanks account for about 10% of the total irrigated area, are used in Central and Southern India.

NABARD

NABARD (National Bank for Agriculture and Rural Development) is set up as an apex Development Bank with a mandate for facilitating credit flow for promotion and development of agriculture, small-scale industries, cottage and village industries, handicrafts and other rural crafts. It is an apex development bank based in Mumbai, Maharashtra. It was established on 1982.

National Food Security Mission

'National Food Security Mission', has been launched from 2007-08 to increase the production of rice by 10 million tons, wheat by 8 million tons and pulses by 2 million tons by the end of the Eleventh Plan (2011-12). The National Food Security Mission will have 3 components (i) Rice (ii) Wheat & (iii) Pulses. The Mission is functioning under the control of Ministry of Agriculture.

Punjab is known as the **Granary of India** or **India's bread-basket**.

Punjab (Land of the five rivers) is one of the most fertile regions on earth. The region is ideal for wheat-growing. Rice, sugar cane, fruits and vegetables are also grown.It produces 14% of India's cotton, 20% of India's wheat, and 9% of India's rice. The Firozpur District is the largest producer of wheat and rice in the state.

Green Revolution	High Yielding Variety of Seeds
White Revolution	Milk & Dairy products
Silver Revolution	Egg and Poultry
Silver Fibre Revolution	Cotton
Yellow Revolution	Edible Oil
Blue Revolution	Fisheries
Pink Revolution	Prawns
Golden Revolution	Honey
Golden Fibre Revolution	Jute
Brown Revolution	Cocoa

Animal Resources

- India has the largest number of livestock in the world.
- The rearing of various animals and obtaining different products from them is called **animal husbandry.**
- The Central Semen Production and Training Institute at Hessarghatta is one of the premier organisation in the country engaged in multiplying high pedigree animals.

Sericulture

- Natural silk is produced from the cocoons of the silk worms. Rearing of silkworms and production of silk from them is called **sericulture.**
- Sericulture is the biggest village industry in India after handloom and khadi.
- India is the second largest silk producer in the world.
- Karnataka is the leading producer of silk in India.
- Bihar and Jharkhand are the leading producers of tasar silk.
- India has the unique distinction of being the only country producing all the five kinds of silk – Mulberry, Eri, Muga, Tropical Tasar and Temperate Tasar.
- Mulberry silk is the most popular variety in India, contributing more than 87% of the Country's silk production.
- Cultivation of mulberry plants is referred to as Moriculture.

MINERAL RESOURCES

- India's major mineral resources include Coal (third-largest reserves in the world), Iron ore, Manganese, Mica, Bauxite, Titanium ore, Chromite, Natural gas, Diamonds, Petroleum, Limestone and Thorium (world's largest along Kerala's shores).
- India's minerals range from both metallic and non-metallic types. The metallic minerals comprise ferrous and non-ferrous minerals while the non metallic minerals comprise mineral fuels, precious stones, among others.
- India produces 89 minerals out of which 4 are fuel minerals, 11 metallic, 52 non-metallic and 22 minor minerals.
- India also exports iron ore, titanium, manganese, bauxite, granite, and imports cobalt, mercury, graphite etc.
- India ranks 3rd in production of coal & lignite, 2nd in barites, 4th in iron ore, 5th in bauxite and crude steel, 7th in manganese ore and 8th in aluminium.
- Iron Ore is the backbone of modern civilisation. Varieties of iron ore:

  Magnetite - the best quality of iron ore and contains 72% pure iron.

  Haematite - contains 60 to 70% pure iron.

  Limonite - contains 40 to 60% pure iron.
- Jharkhand has the largest reserves accounting for about 25% of the total reserves of iron ore in India.
- India's richest haematite deposits are located in Barabilkoira valley in Orissa.
- The Bailadila mine is the largest mechanised mine in Asia from where iron ore is exported to Japan through Vishakha patnam.
- Japan is the biggest buyer of Indian iron ore.
- India has the second largest manganese ore reserves in the world after Zimbabwe.
- India is the fifth largest producer in the world after

- **India has the world's largest reserves of Iron.**
- **India is the largest producer of mica in the world.**
- **India possesses the largest reserves of monazite known in the world.**
- **India ranks fifth in the world in the production of manganese.**

ONGC

Oil and Natural Gas Corporation Limited (ONGC) (incorporated on 23 June 1993) is a state-owned oil and gas company in India. It was set up as a commission on 14 August 1956. It contributes 77% of India's crude oil production and 81% of India's natural gas production. Indian government holds 74.14% equity stake in this company.

Minerals	*Areas of Production*
Antimony	Punjab, Karnataka, Rajasthan, Bihar
Asbestos	Karnataka, Rajasthan
Beryllium	Rajasthan, Jharkhand, Tamil Nadu, Andhra Pradesh
Barytes	Andhra Pradesh, Maharashtra
Diamonds	Madhya Pradesh (Panna mines)
Graphite	Orissa, Rajasthan, Andhra Pradesh
Granite	Tamil Nadu, Karnataka, Andhra Pradesh
Magnesite	Tamil Nadu, Uttaranchal
Marble	Rajasthan (Makrana)
Nickel	Orissa, Jharkhand, Tamil Nadu
Rock Salt	Gujarat, Himachal Pradesh
Sea Salt	Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh
Sulphur	Tamil Nadu
Tin	Bihar, Jharkhand, Rajasthan
Coal	Jharkhand, West Bengal, Madhya Pradesh, Andhra Pradesh, Maharashtra, Orissa
Lignite	Neyveli
Gold	Andhra Pradesh (Ramagiri), Karnataka (Kolar, Hutti)
Gypsum	Rajasthan, Tamil Nadu, Jammu and Kashmir, Uttar Pradesh, Himachal Pradesh, Gujarat
Silver	Karnataka (Kolar), Rajasthan, Jharkhand, Tamil Nadu
Chromite	Andhra Pradesh, Jharkhand, Karnataka, Maharashtra, Manipur, Orissa, Tamil Nadu
Dolomite	Madhya Pradesh, Chattisgarh, Orissa, Gujarat, Karnataka, West Bengal, Uttar Pradesh, Uttaranchal, Maharashtra
Thorium	Kerala, Tamil Nadu, Andhra Pradesh
Uranium	Jharkhand, Madhya Pradesh, Meghalaya, Himachal Pradesh, Uttar Pradesh.
Ilmenite	Tamil Nadu, Kerala
Rock phosphate	Madhya Pradesh, Rajasthan, Uttar Pradesh, Jharkhand, Andhra Pradesh.

Brazil,Gabon, South Africa and Australia.

- The main reserves are found in Karnataka, followed by Orissa, Madhya Pradesh, Maharashtra and Goa.
- Orissa is the leading producer of manganese in the state.
- Raniganj (West Bengal), Jharia (Bihar), Singrauli (Madhya Pradesh) and Korba (Chhattisgarh) are the major coal fields in India.
- **Marble is found largely in Rajasthan.**
- Leading salt producer in India is Gujarat. It produces 60% of salt of the country.
- State with the largest mineral deposit is Jharkhand.
- Jharkhand is the state with highest mineral output in India.
- **Chottanagpur plateau is the richest mineral belt of India.**
- India's contribution to gold production across the world is less than one percent (0.75%).
- **Karnataka** is the largest producer of gold followed by Andhra Pradesh.

Geological Survey of India

GSI, established in 1851 is a government organization in India for conducting geological surveys and studies. It is one of the oldest of such organizations in the world. There are two geological parks maintained by GSI. **Saketi Fossil Park**, Saketi, Himachal Pradesh and **Nehru Park**, Hyderabad, Andhra Pradesh. The park displays life size figures of dinosaurs like T-Rex.

- There are mainly three gold fields in India:
  Kolar gold field in Karnataka
  Hutti gold field in Karnataka
  Ramgiri gold field in Ananta pur district of Andhra Pradesh
- Silver is mainly produced from Zawar mines of Udaipur district in Rajasthan.
- **Orissa** has the largest deposits of Nickel.
- Lignite also known as brown coal. It is a lower grade coal and contains about 40 to 55% carbon.
- It is found in Rajasthan, Neyveli of Tamil Nadu, Assam and Jammu and Kashmir.
- Jharia in Jharkhand has been recognised as the store house of the best metallurgical coal in the country.
- Coal India Ltd produces the largest quantity of coal in India followed by Singareni Collieries Comp Ltd.
- Assam is the oldest oil producing state in India.
- **Digboi in Assam is the oldest oil well of India.**
- Natural gas fields are Ankleshwar and Cambay in Gujarat, Bombay high and Assam.
- The first successful oil well was sunk at Digboi in 1889.
- Bombay High is the offshore oil field located in the coast of Maharashtra.
- Oil Refineries with the largest refining capacity-
  Reliance Petroleum Ltd, Jamnagar
  Indian Oil Corp Ltd, Koyali
- Bauxite is exported to countries such as China, Korea, Ukraine, Saudi Arabia.

Major Cement companies
Ambuja cement, Aditya Cement, JK Cement and L & T Cement.

Steel Companies
Steel Authority of India (SAIL), Bbilai Steel Plant, Durgapur Steel Plant, Rourkela Steel Plant, Bokaro Steel Plant.

- India has the world's largest deposits of coal. Bituminous coal is found in Jharkhand and Bihar and Ranigunj in West Bengal. Lignite coals are found in Neyveli in Tamilnadu.
- Coal has been described as the bridge into the future.
- India ranks third in the world after China and USA in coal production.
- The Panna diamond belt is the only diamond producing area in the country, which covers the districts of Panna, Chatarpur and Satna in Madya Pradesh, as well as some parts of Banda in Uttar Pradesh.
- Bauxite deposits are found in western Bihar, southwest Kashmir, Central Tamilnadu, and parts of Kerala, U.P, Maharastra and Karnataka.
- With the recent spurt in world demand for chromite, India has stepped up its production to reach the third rank among the chromite producers of the world.
- Recent discoveries of Krishna-Godawari off-shore basin and Rava field will have big constribution in the field of gas production in India.

Non - Metallic Minerals

- **Jharkhand is the leading producer of mica.** Bihar, Rajasthan and Andhra Pradesh also produce mica.
- Japan (19%) and USA (17%) are the major buyers of our mica.
- Limestone with more than 10% magnesium is called dolomite, when the percentage rises to 45, it becomes true dolomite.
- Iron and Steel industry is the chief consumer of dolomite.
- About 90% dolomite reserves are concentrated in Madhya Pradesh, Chattisgarh, Orissa, Gujarat, Karnataka, West Bengal, Uttar Pradesh and Maharashtra.
- Rajasthan is the largest producer of Asbestos followed by Andhra Pradesh and Karnataka.
- Gypsum is mainly used in making ammonia sulphate fertilizer and in cement industry. Rajasthan is the main producer followed by Jammu and Kashmir.
- Major deposite of magnesite are found in Uttranchal, Tamil Nadu and Rajasthan.
- Jharkhand is the largest producer of **Kyanite** in India followed by Maharashtra and Karnataka.
- In **Sillimanite** production, Orissa contributes 55.87% of the total production, followed by Kerala and Maharashtra.
- Diamond is found at **Panna** in Madhya Pradesh.
- In salt production, rock salt is taken out in Mandi district of Himachal Pradesh. Sambhar lake in Rajasthan produces about 10% of annual production. And Gujarat coast produces nearly half of our salt.

- Bureau of Indian Standards (BIS) is a quasi governmental institution for drawing up standards for the products of Indian industry. It was established in 1947.
- National Productivity Council (NPC) is an autonomous body formed to inculcate productivity in industries, established in 1958.

- Uranium deposits occur in Jadugoda of Singhbhum and Hazaribagh districts of Jharkhand.
- Thorium, a likely future substitute for Uranium as a fission material in atomic reactors, occurs in considerable quantities as ThO_2, in the beach sands of Kerala coast.
- Monazite deposits of commercial value are found in about 160 kms between Cape Comorin and Kollam in Kerala.
- Thorium is also derived from monazite. Zirconium is also found in Kerala coast.
- Uranium compounds occurs in Singhbhum - copper belt of Jharkhand, Aravalli's and central Himalaya.

MAJOR INDUSTRIES IN INDIA

- The first Industrial Policy was brought in 1948.
- Major industries include telecommunications, textiles, jute and sugar industries, chemicals, food processing, steel, transportation equipment, cement, mining, petroleum, machinery, information technology enabled services and pharmaceuticals.
- Some of the major items manufactured in India are computers, communication equipment, broadcasting and strategic electronics, television sets, microwave ovens, and washing machines.
- Industry accounts for 28% of the GDP and employ 14% of the total workforce.
- The Industrial policy adopted by the Government of India envisages a mixed economy, i.e., the co-existence of public and private sectors.
- Textile Industries includes cotton, jute, wool, silk and synthetic fibre textiles. It accounts for 24.6% in total exports.
- **Cotton textiles is the oldest industry in India. It has the largest number of workers employed in an industry.**
- Kanpur is famous for textiles and clothing, large modern tanneries, leather works and shoe manufacturing.
- Sholapur is famous for important textiles based on cotton grown in local regur soils.
- The first modern cotton textile mill was established in Bombay in 1851.
- Dharwar Belgaum are known for cotton textiles, railway and general engineering goods.
- The first modern cotton mill was established in 1818 at Ghoosury (West Bengal).
- The first jute mill was started in 1855 at Rishra near Kolkata.
- The modern woollen textile industry was started with the establishment of Lal Imli at Kanpur in 1876.
- Ludhiana produces 90% of woolens in India and is also Known as the **Manchester of India.**
- Tirupur has gained universal recognition as the leading source of hosiery, knitted garments, casual wear and sportswear.
- India is the only country producing all the five known commercial varieties of silk, viz. Mulberry, Tasar (Tropical), Oak Tasar, Eri and Muga.
- **Karnataka is the largest producer of silk. Second position goes to West Bengal.**
- First modern silk factory - was set up at Howrah in 1832.
- India is fifteenth in services output. It provides employment to 23% of work force, and it is growing fast.
- In 2009, seven Indian IT firms were listed among the top 15 technology outsourcing companies in the world.
- In 1870, the first steel industry,'Bengal Iron Company' was set up at Kulti, West Bengal.
- Three integrated steel plants were set up at Bhilai, Durgapur and Rourkela. Later two more steel plants, at Bokaro and Vishakhapatnam, were set up. Private sector plants, of which the Tata Iron and Steel Company (TISCO), Jamshedpur is the biggest.
- Bhilai plant was set up in collaboration with Russia on the Kolkata - Nagpur Railway line in the Durg district (Chhatisgarh).
- Rourkela steel plant in Orissa was set up under the second five year plan in association with Germany.

Industry		Area of Production
Woollen textiles	:	Punjab, Maharashtra, Uttar Pradesh, Gujarat, Karnataka, Jammu and Kashmir
Copper smelting	:	(Khetri) Rajasthan, Madhya Pradesh, Maharashtra
Heavy machinery	:	Ranchi, Visakhapatanam, Durgapur
Machine tools	:	Bangalore, Pinjore, Kalamassery, Hyderabad, Srinagar
Heavy electricals	:	Bhopal, Hyderabad, Tiruchirapalli, Haridwar.
Railway equipment	:	Chittaranjan (electric engines), Varanasi (diesel engines), Jamshedpur and Bhopal (electric engines), Integral Coach Factory Perambur (Tamil Nadu), Rail Coach Factory, Kapurthala (Punjab)
Shipbuilding	:	Visakhapatnam, Mumbai
Cars	:	Mumbai (Fiat), Calcutta (Ambassador), Gurgaon (Maruthi)
Buses, trucks	:	Chennai, Mumbai
Jeeps, tempos, trucks	:	Mumbai, Pune, Gurgaon
Two-wheelers	:	Pune, Mumbai, Faridabad, Chennai, Mysore, Ludhiana, Tirupati
Cycles	:	Mumbai, Asansol, Sonipat, Delhi, Chennai, Jalandhar, Ludhiana
Tractors	:	Faridabad, Pinjore, Delhi, Mumbai, Chennai
Fertilisers	:	Tamil Nadu, Uttar Pradesh, Gujarat, Kerala, Andhra Pradesh
Pharmaceuticals	:	Hyderabad, Rishikesh, Gurgaon, Chennai, Muzaffarpur
Pesticides	:	Delhi, Alwaye
Cement	:	Tamil Nadu, Madhya Pradesh, Gujarat, Karnataka, Andhra Pradesh, Rajasthan, Chhattisgarh, Jharkhand.
Leather goods	:	Agra, Kanpur, Mumbai, Calcutta, Delhi.
Glass	:	Uttar Pradesh, Maharashtra, West Bengal
Paper	:	West Bengal, Andhra Pradesh, Orissa, Maharashtra, Karnataka, Madhya Pradesh, Bihar.

- Bokaro, the biggest plant in Asia was set up under the fourth five year plan in association with the Russian Government. It is located in Jharkhand.
- The public sector steel plants are managed by the Steel Authority of India (SAIL). SAIL was established in 1973.
- India is now the eighth largest producer of steel in the world.
- The first on-shore steel plant in India was setup at Vishakhapatnam.
- Indian Aluminium Coporation Ltd was formed in 1937.
- **BALCO** came into being in 1965, **NALCO** in 1981.
- Aluminium companies with the highest sales in descending order - **HINDALCO, NALCO, INDAL, MALCO.**
- Indian Copper Corporation was set up in 1924 which was taken over by Hindustan Copper Ltd (established in 1967), in 1972.
- Presently, there are four zinc smelters in the country - Alwaye (Kerala), Debari and Chanderi (Rajasthan) and Vishakha patnam (Andhra Pradesh).
- Among the Third-World countries, India is a major exporter of heavy and light engineering goods. The engineering industry has shown its capacity to manufacture large-size plants and equipment for various sectors like power, fertilizer, and cement.
- Heavy Engineering Corporation Ltd was set up at Ranchi (Jharkhand) in 1958.
- **Kirloskar Brother Ltd** is the pioneer company in the maufacturing of machine tools.
- Hindustan Machine Tools (HMT) is the largest manufacturer of machine tools in the country.
- **Locomotives:** Chittaranjan Locomotive Works, Diesel Locomotive Works (Varanasi), Tata Engineering and Locomotive Works (Jamshedpur).
- The Integral Coach Factory at Perampur near Chennai was set up in 1955 with Swiss collaboration.
- Top four automobile companies with the highest sales:
  Tata Motors
  Maruti Udyog Ltd.
  Mahindra & Mahindra Ltd.
  Ashok Leyland Ltd.

- In medium and heavy commercial vehicles, Tata Engineering and Locomotive Company **(TELCO)** is the leading producer.
- There are four main centres of ship building industry at **Vishakhapatnam, Kolkata, Kochi** and **Mumbai.**
- Hindustan Shipyard Ltd, Vishakha patnam set up in 1941, is the first ship building yard in the country to receive ISO-9001 certification.
- Cochin Shipyard Ltd, Kochi was incorporated in 1972. It also manufactures ships for Indian Navy.
- Mazgaon Dock at Mumbai builds cargo ships, passenger ships, dredgers etc. for Indian navy.
- The first aircraft industry was set up at Bangalore in 1940 under the name of Hindustan Aircraft Ltd. Later, Hindustan Aircraft Ltd was merged into Aeronautics India Ltd in 1964 to form Hindustran Aeronautics Ltd, Bangalore.
- Major companies in integrated refining and marketing are HPCL, BPCL and IOC.
- Godavari - Krishna delta is known for local tobacco, sugarcane, rice, oil, cement and small textiles.
- The industry associated with sports materials mainly located at Agra, Meerut (UP), Ludhiana, Jalandhar (Punjab) and Delhi.
- Pinjore in Haryana and Jalahalli in Bangalore are associated with watch industry.
- Moradabad is famous for brass utensils with engraving and polishing.
- Indian Explosives factory is located at Gomia in Hazaribagh (Jharkhand).
- First fertilizer plant was set up at Ranipet of Tamil Nadu in 1906.
- First public sector fertilizer plant is at **Sindri** (Jharkhand).
- The first super-phosphate factory was set up at Ranipet in Tamil Nadu in 1906.
- India is now the third largest producer of nitrogenous fertilizers in the world.
- Fertilizer companies with the highest sales are - National Fertilizer Ltd, Tata Chemicals Ltd, Rashtriya Chemicals & Fertilizers Ltd.
- The first successful attempt was made in 1912 - 13 when the Indian Cement Co Ltd set up a plant in porbander (Gujarat).
- The Indian Cement industry is the second largest in the world after that of China.
- Madhya Pradesh and Chhattisgarh, are the leading producer of total cement production in India.
- Leather industry is divided into two parts - tanning and leather goods.
- For tanning, Kanpur, (1st tannery centre), Chennai, and Kolkata are three largest Centres.
- The Central Leather Research Institute at Chennai is the largest of its kind in the world.
- **Uttar Pradesh** is the leading producer of glass in India followed by West Bengal and Maharashtra.
- **Firozabad** in Agra district is the largest producer of glass.
- The first synthetic rubber factory was started in **Bareilly** in 1955.
- The first successful effort was made in 1870 with the setting up of the Royal Bengal Paper Mills at Ballyganj near Kolkata.
- The important centres for paper products are Lucknow, Titagarh, Raniganj, Pune, Naihati etc.
- Maharashtra is the largest producer of paper followed by Andhra Pradesh, Gujarat.
- Uttar Pradesh has the largest number of paper mills.
- Paper companies with the highest sales are Ballarpur Industries Ltd, Orient Paper & Industries Ltd and Tamil Nadu Newsprint & Paper Ltd.
- **West Bengal** is the leading state in paper manufacturing.
- In India, **Jharkahand** is the largest producer of Lac (50%), followed by Madhya Pradesh and Chhattisgarh. India is the largest exporter in the world.
- Lac is obtained from an insect named Cerria lacca wihich lives on trees.
- Sugar Industry is the second largest agro-based industry in India after cotton textile industry.
- India is the largest sugar producing country with over 15% share of the global output.
- India is world's largest producer of sugarcane and sugar as well.
- Maharashtra is the largest sugar producer followed by Uttar Pradesh and Tamil Nadu.

WORLD GEOGRAPHY

ASIA

- Occupying about one-third of the land area of the world, it is the largest continent.
- Lake Baikal, the deepest lake of the world is located in Siberia.
- Pamir Plateau is a meeting place of several ranges which form the Pamir knot.
- Pamir plateau is also known as the "Roof of the World" because it is the highest plateau in the world.
- Mt. Everest (Highest peak of the world) and K2 (second highest peak of the world) belong to the Himalayas and the Karakoram ranges respectively.
- Mawsynram in Meghalaya (India) is the wettest place in the world.
- Verkhoyansk in north-east Siberia is the coldest place in the Northern Hemisphere recording a mean January temperature of -45°C.
- China is the most populous and third largest country of the world lies in the east of Asia.
- Shanghai, the premier port of China on the Yangtze Kiang river handles bulk of foreign trade.
- Taiwan formerly known as Formosa, includes the Island of Taiwan, two offshore Islands -Quemoy and Matsu.

Asia is the world's largest and most populous continent, located primarily in the eastern and northern hemispheres. It covers 8.6% of the Earth's total surface area (or 29.9% of its land area) and with approximately 4 billion people, it hosts 60% of the world's current human population. It is bounded on the east by the Pacific Ocean, on the south by the Indian Ocean and on the north by the Arctic Ocean. In terms of nominal GDP, Japan has the largest economy on the continent and the second largest in the world. In purchasing power parity terms, however, China has the largest economy in Asia and the second largest in the world.

- Hong Kong is a special administrative region of China.
- The four main islands of Japan are Hokkaido, Honshu, Shikoku, and Kyushu.
- Nagoya (Japan) is known as the **Detroit of Japan**.
- Indonesia is the most populous country of South East Asia and the biggest Islamic nation of the World.
- Indonesia is the largest archipelago in the world, comprising of the islands of Sumatra, Java, Borneo, Bali, the lesser Sunda Islands group, Sulawesi, Timor and the western half of the island of New Guinea is many smaller group of islands.
- Singapore is the smallest country of South East Asia.
- Philippines is the only Christian nation in the Asia.
- Laos is the only land locked country of South East Asia.
- Vientiane the capital of Laos is situated on the bank of Mekong river.
- Penang Island (Malaysia) is known as **Singapore of the future**
- Myanmar (Burma) is famous for its beautiful Buddhist temples called **Pagodas**.
- Myanmar is known as the **Land of Mountains and Rivers.**
- Thailand is the only South East Asian Country, which was never colonized.
- Thailand is known as the **rice bowl of south East Asia** and **Land of White Elephants.**

Asia - Capital

Afghanistan ..... Kabul	Malaysia ..... Kuala Lumpur
Bahrain ..... Manama	Maldives ..... Male
Bangladesh ..... Dhaka	Mongolia ..... Ulaanbaatar
Bhutan ..... Thimphu	Nepal ..... Kathmandu
China ..... Beijing	Oman ..... Muscat
Cyprus ..... Nicosia	Pakistan ..... Islamabad
Indonesia ..... Jakarta	Qatar ..... Doha
Iran ..... Tehran	Saudi Arabia ..... Riyadh
Iraq ..... Baghdad	Philippines ..... Manila
Israel ..... Jerusalem	Sri Lanka ..... Colombo
Japan ..... Tokyo	Syria ..... Damascus
Jordan ..... Amman	Taiwan ..... Taipei
Kazakhstan ..... Astana	Tajikistan ..... Dushanbe
North Korea ..... Pyongyang	Thailand ..... Bangkok
South Korea ..... Seoul	Turkey ..... Ankara
Laos ..... Vientiane	United Arab Emirates . Abu Dhabi
Lebanon ..... Beirut	Uzbekistan ..... Tashkent
	Vietnam ..... Hanoi

- Bangkok is situated on the bank of Chao Phraya river.
- Phuket Island, the tourist resort of Thailand, is also known for tin mines.
- Turkey is known as **The Sick man of the Europe**.
- Lebanon is known as **Switzerland of Middle East**.
- Beirut the capital of Lebanon is known as the **Paris of Lebanon**, lies at the cross roads of Asia, Europe and Africa.
- Israel is the centre for diamond cutting and polishing, next to Belgium in the world.
- Israel's collective farming is called Kibbutizm.
- Jerusalem known as the Holy City, is a place of Pilgrimage for Jews, Muslims and Christians.
- Jordan is known as the **Land of Seven Hills**.
- Jordan has the shortest coastline in the world, only 20kms.
- Tehran, the capital of Iran is the most populated city of West Asia.
- Largest country of West Asia : Saudi Arabia
- Tibet Plateau is the largest plateau in the world.
- Sri Lanka is separated from India by the Gulf of Mannar and the Palk Strait.
- Japan is called **Nippon** in Japanese, which means **land of the rising sun**.
- Gobi desert situated to the southeast of Mongolians plateau and extends into China.
- Bangladesh is known as **Land of Rivers and Distributaries.**
- Pakistan is known as **Country of Canals.**
- Mangla Dam, located on the Jhelum river is the largest in Pakistan.
- Bhutan is known as the **land of Thunder Dragon.**
- Sri Lanka is linked to India by Adam's Bridge.

Largest lake: Caspian Sea
Lowest Point :
Dead Sea, Israel/Jordan
Highest point: Mt. Everest, Nepal
Longest river: Yangtse Kiang

AFRICA

- **Africa** is the world's second-largest and second most-populous continent, after Asia.
- At about 30.2 million km² (11.7 million sq mi) including adjacent islands, it covers 6% of the Earth's total surface area and 20.4% of the total land area.
- With a billion people (as of 2009, see table) in 61 territories, it accounts for about 14.72% of the World's human population.
- The continent is surrounded by the Mediterranean Sea to the north, both the Suez Canal and the Red Sea along the Sinai Peninsula to the northeast, the Indian Ocean to the southeast, and the Atlantic Ocean to the west.
- The continent has 54 states, including Madagascar, various island groups, and the Sahrawi Arab Democratic Republic, a member state of the African Union whose statehood is disputed by Morocco.

- African continent is separated from Europe by the Mediterranean sea and from Asia by the Red Sea.
- Africa belongs to all the four hemispheres and bulk of the continent lies in tropics.
- The only continent which is crossed by Tropic of Cancer, Equator and Tropic of Capricon.
- Marrakesh, the religious capital of Morocco is known as the **red city** because of its red clay building.
- Khartoum, the capital of Sudan is situated at the Confluence of Blue Nile and White Nile.
- Khartoum, the administrative centre and the largest town known as **key of Sudan.**
- Rwanda is known as the **nation of a thousand hills** because of its mountainous nature.
- Tsawa National Park one of the largest Biosphere reserves located in Kisumi, Kenya.
- Island of Zanzibar is also known as **clove island.**
- Zambia is separated from Zimbabwe by the river Zambezi.
- Limpopo river cuts the tropic of Capricon twice.
- Nigeria, a country of low lands and plateau also known as **Land of Palm Oil.**
- Lesotho is an enclave within the Republic of South Africa.
- South Afica is the largest producer of gold and diamond in the world.
- Kimberly in South Africa is famous for best quality diamonds.
- The largest diamond mine in Kimberly is considered to be the biggest man - made hole in the earth.
- One of the special physical features of Africa is its Great Rift Valley. It is running from the South of lake Malawi northward to the Red sea and then through the Gulf of Suez and the Gulf of Aquaba to the Dead sea.
- Lake Victoria, the largest lake in Africa, is also the source of river Nile, which is the longest river in the world.
- River Zaire carries the greatest volume of water among all the rivers of Africa.
- Sahara, the largest desert in the world is located in northern part of Africa.
- The Kariba dam on the Zambezi is the largest producer of water power in Africa.
- South Africa leads the countries of the world in the production of Chromium, a metal which does not rust.
- Aswan Dam, Sennar Dam and Owen Dam are located on the Nile.
- Petroleum is found in many parts of Africa such as Nigeria, Libya and Angola.

Highest Point : Mt. Kilimanjaro, Tanzania
Lowest Point : L. Assal, Dijibouti
Highest recorded temperature : Al Aziziyah, Libya
Largest Lake : Victoria
Most Southerly point : Cape Agulhas, South Africa.

Africa - Capital

Algeria ..... Algiers
Angola ..... Luanda
Botswana ..... Gaborone
Burkino Faso ..... Quagadougou
Burundi ..... Bujumbura
Cameroon ..... Yaounde
Cape- Verde ..... Praia
Central African Republic .. Bangui
Chad ..... N'Djamena
Congo ..... Brazzaville
Dijibouti ..... Dijibouti
Egypt ..... Cairo
Equatorial Guinea ..... Malabo
Eritrea ..... Asmara
Gabon ..... Libreville
Gambia ..... Banjul
Ghana ..... Accra
Guinea ..... Conakry
Guinea Bissau ..... Bissau
Kenya ..... Nairobi
Lesotho ..... Maseru
Liberia ..... Monrovia
Libya ..... Tripoli
Madagascar ..... Antananarivo
Malawi ..... Lilongwe
Mali ..... Bamako
Mauritius ..... Port Louis
Morocco ..... Rabat
Mozambique ..... Maputo
Niger ..... Niamey
Nigeria ..... Abuja
Rwanda ..... Kigali
Senegal ..... Dakar
Seychelles ..... Victoria
Somalia ..... Mogadishu
South Africa ..... Pretoria
Sudan ..... Khartoum
Tanzania ..... Dodoma

South Africa..... Capital
Administrative Capital .. : Pretoria
Legislative Capital ... : Cape Town
Law Capital..... Johannasburg

- Ostrich, a large, fast running bird is found in the Kalahari desert.
- Swahili is a local language in Africa.
- Lake Volta, the largest man-made lake in the world, extends through large portions of eastern Ghana.
- Hot and dust - laden winds often blow from the north east during dry summer season known as the Harmattan.
- Nigeria is the only coal producing country of Western Africa.
- Hot, dry and sand laden winds blow from the South in Egypt during early summer in April and May, also known as Khamsin.
- Suez Canal links the Mediterranean sea with the Red Sea.
- The opening of Suez Canal in 1869 shortened the voyage from Mumbai to London by more than 7,000 kilometres.
- The Merino sheep of South Africa are famous for their fine wool.
- Johannasburg is the largest city of South Africa.
- The Southernmost tip of South Africa is Cape of Good Hope.
- The biggest port of South Africa is Capetown.

Important Rivers of Africa

Nile ..... Longest river in the world
Aswan Dam, Sennar Dam & Owen Dam located on this river

Zaire or Congo .. Confluence of Lualoba & Luapula river
It cuts equator twice
Stanley fall & Living stone fall are on the Zaire river
Inga dam is located.

Zambezi ..... Victoria falls & Kariba dam is located in it.
Coborra Bassa Dam in Mozambique is also located on this river.
Natural political boundary between Zambia & Zimbabwe

Orange ..... Natural boundary between South Africa & Namibia.
Aughrabies falls is located on this river.

Limpopo ..... It cuts the Tropic of Capricon twice
It seperates South Africa from Botswana & Zimbabwe

Niger ..... Port Harcourt of Nigeria is located on the Niger Delta

IMPORTANT STRAITS

	Separates	Connects
Strait of Gibralter	Europe & Africa	Mediterranean Sea with Atlantic Ocean
Strait of Bab-el-Mandeb	Dijibouti (Africa) & Yemen (Asia)	Red Sea with Gulf of Aden

African Deserts

Sahara desert - (Largest single stretch of desert), Libyan desert Arabian desert, Nubian desert - (Extension of Sahara which occupies a third of the Sudan's territory in the north), Namib desert,
Kalahari desert - Semi desert region of Botswana lies to the east of Namib desert

COAST OF AFRICA

Gold Coast - Ghana
Slave Coast - Togo, Benin & Nigeria
Grain Coast - Sierra Leone & Liberia
Ivory Coast - Cote - de - Ivore

EUROPE

- Europe ranks sixth. Its boundaries are the Arctic Ocean in the west and the Mediterranean Sea in the South. In the east, it is separated from Asia by the Ural Mountains, the Caucasus mountains and the Caspian Sea.
- Iceland, Norway, Sweden and Denmark are collectively known as Scandinavia.
- Estonia, Lithuania and Latvia are together known as the Baltic states.
- Belgium, the Netherlands and Luxemburg are called the Low countries.
- Serbia, Montenegro, Slovenia, Croatia, Bosnia - Herzegovina,

Europe - Capital

Iceland ..... Reykjavik
Denmark ..... Copenhagen
Norway ..... Oslo
Finland ..... Helsinki
Sweden ..... Stockholm
Spain ..... Madrid
Portugal ..... Lisbon
France ..... Paris
Italy ..... Rome
Germany ..... Berlin
Switzerland ..... Berne
Poland ..... Warsaw
Belgium ..... Brussels
Netherlands ..... Amsterdam
UK ..... London
Ukraine ..... Kiev
Albania ..... Tirana
Austria ..... Vienna
Belarus ..... Minsk
Bulgaria ..... Sofia
Croatia ..... Zagreb
Czech Republic ..... Prague
Estonia ..... Tallinn
Greece ..... Athens
Hungary ..... Budapest
Ireland ..... Dublin
Latvia ..... Riga
Lithuania ..... Vilnius
Malta ..... Valletta
Romania ..... Bucharest
Slovenia ..... Ljubljana
Yugoslavia ..... Belgrade
Slovekia ..... Bratislava
Kosovo ..... Pristina

Macedonia, Bulgaria, Greece, Romania and Albania are known as the Balkan states.

- British Isles include the two main islands of Ireland (comprising Northern Ireland and the Irish Republic) and Great Britain (Scotland, Wales and England) as well as a number of small Islands.
- In the South, there is a chain of high mountains the Alpine system
- The worlds most northerly capital : Reykjavik, Iceland
- Reykjavik is also known as **The Smoking Bay.**
- Denmark is the smallest country of Scandinavia.
- Greenland the world's largest island and the Faroe islands also belong to Denmark.
- Copenhagen the capital of Denmark is known as **the key to the Baltic.**
- Finland is known as the **Land of Forests and Lakes.**
- Finland is a low lying country covered with forests and lakes and its finnish name, Suomi means 'Lakeland'.
- The capital and the largest city of Finland, Helsinki is known as the **White city of the North.**
- Stockholm, the capital of Sweden is known as **Beauty on the Sea.**
- Milan (Italy) is known as the **Manchester of Italy.**
- Rome is known as **City of Seven Hills**
- Vatican city is the smallest Sovereign and an independent state of the world, which is completely surrounded by Italy.
- Switzerland is a land locked mountainous country of Central Europe, with 60% of land area covered by the Alps Mountain.
- Antwerp has ancient civilisation in diamond cutting and also the world's biggest diamond trading centre.
- The United Kingdom consists of the Island of Great Britain, Northern Ireland and many small islands.
- Russia touches fourteen other countries and crosses eight time zones.
- Moscow is a part of five seas the Baltic Sea, Lake Ladoga, the Arctic Ocean, the Black sea and the Caspian Sea.
- St. Petersburg is the strategic location at the entrance of Baltic Sea and is the European terminus of Trans - Siberian Railway.
- Vladivostok (City of East), Russia situated along the coast of sea of Japan is the last station of Trans- Siberian Railway Route.
- Wide continental shelves of North Sea, called as Dogger Bank , is one of the most pro-

Highest point - Mt. Elbrus, Russia
Most Southerly point - Gavdos, Greece
Largest Lake - L. Ladoga, Russia
Largest river - Volga

Commonwealth of Independent States (CIS)

Countries	Capitals
Russia	Moscow
Belarus	Minsk
Ukraine	Kiev
Moldova	Kishinev
Armenia	Yerevan
Azerbaijan	Baku
Turkmenistan	Ashkhabad
Uzbekistan	Tashkant
Kazakhstan	Alme - Ata
Tajikistan	Dushanbe
Kyrgystan	Frunze

(Georgia left CIS in 2006)

ductive regions for fishing in the world.
- North sea is connected to the Baltic Sea through Kiel Canal.
- Strait of Gibralter is known as the **Key to the Mediterranean.**
- Monte Carlo, one of the biggest gambling centres in the world is the capital of Monaco.
- Mt. Blanc is the highest peak of Alps (in France)
- Important mountain ranges of Europe include Alps, Pyrenees, the Carpathian and the Caucasus.
- The highest mountain peak of Europe, Mt. Elbrus is the Caucasus.
- In the South - East part of Europe, there is an extensive grassland called the Steppes.
- Rhine is the busiest inland waterway of Europe.
- British Isles is separated from the mainland of Europe by the English Channel.
- The Pyrenees mountains separate France from Spain.
- The Ruhr (Germany) is the biggest and the richest coal producing area of Europe.
- The Ural mountains, the Ural river and the Caspian Sea divide Russia into European and Asiatic parts.

IMPORTANT RIVERS

River	City Located
Po	Venice
Tiber	Rome
Seine	Paris
Rhone	Lyon
Tagus	Lisbon
Wista (Vistula)	Warsaw
Danube	Vienna, Budapest Belgrade, Brussel

- Moscow is the largest railway junction.
- Murmansk is the only ice-free port along the Arctic Ocean route to Vladivostok.
- Europe is the only inhabited continent situated entirely outside the tropics.
- The most northerly city in the world is Hammerfast (Norway).
- The famous Battle of Waterloo was fought on the soil of Belgium.
- The best known industry of Amsterdam is diamond cutting.
- Mt. Stromboli is known as the **light house of the Mediterranean.**

NORTH AMERICA

- Third largest continent in the world.
- Tropic of Cancer passes through Mexico, Bahamas islands.
- North America comprises Canada, USA, Mexico, Central America and West Indies.
- Central American countries are known as the **Banana Republic.**
- Hamilton is known as **the Pittsburgh of Canada.**
- Halifax, the capital of Nova Scotia is an important ice free port in Canada.
- Canada has the longest shoreline in the world.
- Winnipeg (Canada) is the biggest wheat centre of the world.
- Vancouver, the largest city of British Columbia, Canada situated near the mouth of Fraser river.
- 'Birmingham of Canada " - Hamilton.

North America - Capital

Country	Capital
Antigua & Barbuda	St. John's
Bahamas	Nassau
Barbados	Bridgetown
Belize	Belmopan
Canada	Ottawa
Cuba	Havana
Dominica	Roseau
Dominican Rep.	Santo Domingo
Guatemala	Guatemala City
Haiti	Port-au-Prince
Honduras	Tegucigalpa
Jamaica	Kingston
Grenada	St. George's
Mexico	Mexico City
Nicaragua	Managua
Panama	Panama City
Trinidad &Tobago	Port-of Spain
USA	Washington D.C

- Worlds largest oil refinery located on Sarnia, Canada
- Smallest state of USA : Rhode Island
- Largest state of USA : Alaska
- Largest port in Pacific, also known as **City of Golden Gate** : San Francisco, USA
- Los Angeles, USA is best known for its film industry (Hollywood).
- World's largest aircraft assembly centre - Seattle, USA.
- Yellow Stone National Park in USA is famous for the world's best known Geyser, Old faithful.
- **Iron and steel capital** of the world - Pittsburgh, USA.
- The headquarters of the United Nations is located in New York.

Highest point - North America
Mt. Mc Kinley, Alaska, USA
Lowest Point
Death valley, California
Largest lake
L. Superior, Canada/ USA

- Largest port in USA, situated on the bank of Hudson river - New York City.
- Most populated city of USA also known as **city of sky scrapers**- New York City.
- **Pittsburgh of the South**- Birmingham, USA
- Mauna Kea, the highest peak in Hawai is active as a volcano.
- Capital of Hawai, Honolulu is known as **the cross roads of Pacific.**
- Niagra falls is located between Lake Erie and Lake Ontario.
- St. Lawrence is the busiest inland waterway in North America.
- The Grand Canyon of Colorado river is the largest of its kind in the world.
- The Grasslands found in the interior plains of North America are known as the **Prairies**.
- **Lake Superior :** World's second largest lake after Caspian Sea.
- **Lake Michigan :** Only Great lake that is entirely within the United States.

Rivers in USA

Mississippi - Missouri,
St. Lawrence, Colorado
Columbia (longest in USA)
Rio Grande (forms the Natural boundary between USA & Mexico)

Canada

Mackenzie (longest in Canada)
Yukon, Nelson, Peace

- Gold is found mainly in Ontario, which has the largest goldmine in the world.
- Chicago is the world's largest railway junction.
- Nova Scotia (Canada) is noted for its large orchards of apples.
- Canada is the largest producer of newsprint in the world.

SOUTH AMERICA

- Largest country (Both area & population) : Brazil
- Latin America comprises all the countries of South America along with Mexico, Central America and Caribean countries.
- **Countries** (Area wise) : Brazil, Argentina, Peru, Columbia, Bolivia, Venezuela, Chile.
- Land locked countries : Bolivia, Paraguay
- Equator passes through Ecuador, Columbia and Brazil.
- Tropic of Capricon passes through - Chile, Argentina, Paraguay and Brazil.
- World's highest capital : La Paz, Bolivia

South America Capital

Country ..... Capital

Argentina ..... Buenos Aires
Boliva ..... La Paz, Sucre
Brazil ..... Brasilia
Chile ..... Santiago
Colombia ..... Bogota
Ecuador ..... Quito
Guyana ..... Georgetown
Paraguay ..... Asuncion
Suriname ..... Paramaribo
Uruguay ..... Montevideo
Venezuela ..... Caracas

Important Rivers of South America

Amazon
- World's second longest river
- Largest river of the World (Volume)
- Largest tributary of Amazon:Madiera
- Dense equatorial forest in the river basin : Selvas

Orinoco
- Savanna like vegetation in the river basin:Llanos
- Angel falls located in this river.

Parana
- World's Largest waterfall (Volume) Iguazo located.
- Largest dam of South America, Itaipu located.
- An estuary into which Parana & Uruguay river falls - La plata.

- Fifth largest country in the world in terms of Area and population : Brazil
- World's leading coffee producer : Brazil
- Largest city of South America : Sao Paulo, Brazil
- Driest place in the world : Arica, Chile
- World's largest copper town : Chiquicamata, Chile
- **Pearl of the Pacific**: Guayaquil, Ecuador
- Important region known for phosphate (from bird droppings of Guano) : Peru
- Well developed slaughter houses in Argentina : Frigorificos
- World's highest water fall : Angel falls, Venezuela
- Strait between South America and Antarctica : Drake Passage

- **Important Gulfs :** Guayaquil, Penas, San Jorge, San Matias.
- Largest lake of South America : Lake Maracaibo, Venezuela.
- Highest navigable lake in the world : Lake Titicaca
- Region known for unique species of reptiles (turtles) birds and fishes : Galapagos Islands, Ecuador.
- Highest active volcano in the world : Mt. Ojas del Salado, Argentina
- Second highest mountain systems in the world next to the Himalayas : Andes
- Amazon basin is the home of the rubber tree.
- Largest bird of prey in the world : Candor
- Rhea is a flightless bird.
- Brazil has one of the largest iron - ore deposits of the world.

AUSTRALIA

- Australia is the smallest continent.
- It lies entirely in the Southern Hemisphere.
- Australia is the only country in the world that covers the entire continent.
- It is also known as **the Island Continent.**
- Tropic of Capricon passes almost through the middle of the continent.
- Australia was discovered by captain James Cook, an English Seaman, in 1770. He landed near the site of the present Sydney Harbour.
- It is surrounded by Timor Sea in the northwest, Arafura sea and Gulf of Carpentaria in the north, Great Barrier Reef in the north east and Great Australian Bight in the South.
- Kalgoorlie and Coolgardie, the two cities in western Australia is one of the important centre of gold mining in the world.
- The Murray and the Darling are the major rivers of Australia.
- North east coast of Australia extends a very long ridge like feature known as the Great Barrier Reef in Queens land which is the longest reef in the world.
- Gulf of Carpentaria is the largest gulf of Australia.
- Indigenous people of Australia are known as Aborigines.
- The grasslands of Australia are of two types tropical and temperates.

Highest point
Mt. Kosciusko, Australia
Lowest point : Lake Eyre, Australia
Largest Lake : Lake Eyre

Australia had eight Federal Units

Western Australia, Northern Territory, South Australia, Queensland, New Southwales, Victoria, Australian Capital Territory, Tasmania.

- Tropical grasslands are called Savannas and the temperate grasslands found in the Murray Darling basin are called Downs.
- The Marsupials of Australia include Kangaroo, Wallby and Koala
- Australia is the largest producer of bauxite in the world.
- Sydney is the largest city and important sea port of Australia.
- Great dividing range is also known as the 'snowy mountains'.
- Tasman sea separates Australia from New Zealand.

New Zealand is divided into two islands: The Northern Island and the Southern Island. Cook strait seperates the two islands. Wellington the Capital lies in the Northern Island.

ANTARCTICA

- Antarctica is Earth's southernmost continent, underlying the South Pole.
- It is situated in the Antarctica region of the southern hemisphere, almost entirely south of the Antarctic Circle, and is surrounded by the Southern Ocean.
- It is the fifth-largest continent in area after Asia, Africa, North America, and South America.
- About 98% of Antarctica is covered by ice.
- Only cold-adapted plants and animals survive there, including penguins, seals, mosses, lichen, and many types of algae.

Highest point
Vinson Massif, 4,897 m
Lowest point
Bentley Subglacial Trench, -2,555 m
Longest river
Onyx River, 25 km

THE ANTARCTIC TREATY

- The Antarctic Treaty was signed in 1959 by twelve countries and officially entered into force on June 23, 1961.
- The twelve countries had significant interests in Antarctica at the time: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom and the United States.
- Forty-six countries have signed the treaty.
- The treaty prohibits military activities and mineral mining, supports scientific research, and protects the continent's eco zone.
- Ongoing experiments are conducted by more than 4,000 scientists of many nationalities and with different research interests..

OLDEST COUNTRIES

San Marino (301 AD)
France (486 AD)
Bulgaria (632 AD)
Denmark (950 AD)
Portugal (1143 AD)
Andorra (1278 AD)
Switzerland (1291 AD)

YOUNGEST COUNTRIES

Montenegro (July, 2006)
Serbia (July, 2006)
East Timor (2002)
Palau (1994)
Czech Republic (1993)
Eritrea (1993)
Slovakia (1993)
Bosnia/Hertzegovina (1992)

Largest total area ..... Russia, 17,098,242 km²
Largest land area ..... Russia, 17,075,200 km²
Largest water area ..... Canada, 891,163 km²
Longest coastline ..... Canada, 243,792 km
Highest coastline to area ratio ..... Micronesia, 8,706.553 m/km²
Most countries bordered: ..... Russia and China
Largest forest area ..... Russia, 8,087,900 km²

Hottest,Coldest,Driest,Wettest

Hottest Place Dalol, Denakil Depression, Ethiopia, annual average temperature (93.2°F, 34°C)

Coldest Place Plateau Station, Antarctica, annual average temperature (-56.7°C)

Wettest Place Mawsynram, Assam, India, annual average rainfall (11,873 mm, 467.4")

Driest Place Atacama Desert, Chile, imperceptible rainfall on a yearly basis

SEVEN WONDERS OF ANCIENT WORLD

- Great Pyramid of Giza
- Hanging Gardens of Babylon
- Temple of Artemis at Ephesus
- Statue of Zeus at Olympia
- Mausoleum of Halicarnassus
- Colossus of Rhodes
- Lighthouse of Alexandria

LATIN AMERICAN COUNTRIES

Argentina	Bolivia
Brazil	Chile
Colombia	Costa Rica
Cuba	Ecuador
Dominican Republic	
El Salvador	Guatemala
Honduras	Mexico
Nicaragua	Panama
Paraguay	Peru
Uruguay	Venezuela

- Alternatively, Puerto Rico, Trinidad and Tobago, Jamaica, Bahamas, Barbados, Guyana, Suriname, Netherlands Antilles, Belize, Saint Lucia, Antigua and Barbuda, Grenada, Dominica, Saint Kitts and Nevis, Saint Vincent and the Grenadines are considered to be part of Latin America, but it is not always the case.
- Mostly due to the fact that those are English-speaking countries (Belize, Jamaica) or are colonies, territories and dependencies and not fully-independent countries (Netherlands Antilles, Puerto Rico).
- Latin America is a region of the Americas where Spanish and Portuguese, and variably French - are primarily spoken.
- Latin America consist of 3.9% of the Earth's surface or 14.1% of its land surface area.
- Its population was estimated at more than 568 million.
- Latin America can be subdivided into several subregions based on geography, politics, demographics and culture. Some geographical subregions are **North America**, **Central America**, **the Caribbean**, and **South America.**

Seven New Wonders of World

Swiss Corporation New7 Wonders Foundation named the wonders

The Great Wall of China

The Great Wall of China, a memorable landmark, is the most popular tourist attraction in China. There were three main Chinese dynasties that contributed to the construction of the Great Wall: first, the Qin from 221-207 B.C., then the Han from 206 B.C – 220 A.D and the Ming from 1368-1644

A.D. Their common purpose was to stop the "barbaric" Huns in the North from invading the Chinese borders. The Great Wall length measures about 6,700 km long. Height wise, it is 4.5m to 9m. The existing Wall today was constructed by the Ming Dynasty over 600 years ago. During that time, the original wall was in ruins.

Petra

Petra is a site in the Arabian desert, Jordan that was discovered by a Swiss explorer called Johann Ludwig Burckhardt

in 1812 Petra represents the ancient world's heritage culture. It is now said to be one of the seventh wonder of the world and it belongs to the UNESCO world heritage site. Petra mainly is admired because of its picture perfect architecture, its complex structure, quality and the non mentionable mere size.

Taj Mahal in Agra

The Taj Mahal is a tomb situated in Agra, India. The Taj Mahal was built by the Mughal emperor, Shah Jahan in the memory of his beloved wife, Mumtaz Mahal. The Taj Mahal is one of The Seven Wonders of the World and is said to be one of the finest art of the Mughal architecture. The Taj became a part of the UNESCO, World heritage Site.

Chichen Itza in Yucatan

Peninsula

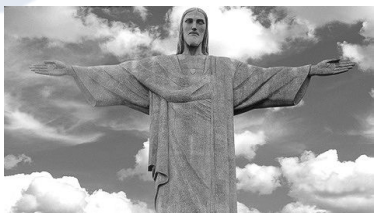
Chichen was founded by the Mayan civilization in 400 AD and it is located in the north central, north of Yucatan Peninsula now called Mexico.Chichen has a history that is 1500 years old.

Colosseum of Rome

Colosseum is one of the greatest architecture ever built in the history of Rome. The Colosseum was originally known as the Flavian Amphitheatre and is the largest amphitheatre to have ever been built in the Roman Empire. Its construction began sometime between 70 and 72 AD and was completed in 80 AD when Titus was the ruling emperor.

Christ The Redeemer Statue on Corcovado Mountain

Christ the Redeemer is a statue of Jesus Christ in Rio de Janeiro,



Brazil. The statue is 120 ft tall and has a weight of 635 tones. It is now a part of the new Seven Wonders of the World. It is located in the Corcovado Mountain which is at a peak of 700 meters i.e. 2,300 feet in the Tujuca forest National Park overlooking the city.

Machu Picchu in Peru

Machu Picchu is the pre Columbian, Inca empire site that is located almost 8,000 feet above the sea level. The site is located on a mountain ridge above the valley of Urubamba in Peru. The city is also called the "lost city of Incas". Machu Picchu was built in 146 AD.

Important Points

MOUNTAINS

Mountain day - December 21
Mountain Year - 2002
Land of the thousand mountains - Ruwanda
Land of the lakes and mountains - Mazedonia
City of the seven mountains - Rome
Mountain 'Kailasam' - China
Oldest Mountain - Aaravalli
Youngest Mountain - Himalayam

Important mountain ranges

Andes ..... South America
Rockies ..... North America
Atlas ..... Africa
Kilimancharo ..... Africa
Appalechian ..... America
Ural ..... Europe
Alps ..... Europe
Karpathyan ..... Europe
Mount Eribus ..... Antartica
Himalayam ..... Asia

VOLCANOES

Important volcanose

Vezuvias ..... Italy
Etna ..... Italy
Stromboli ..... Italy
Barren ..... India (Andaman Nicobar)
Kilimancharo ..... Tanzania
Krakathove ..... Indonesia
Pina thubo ..... Philippense

- Most of the volcanoes found near Pacific Ocean
- Ring of fire - Pacific
- Lighthouse of the Pacific - Ezalko
- Lighthouse of the Mediteranian - Stromboli

DESERTS

Fozil desert ..... Kalahari
Little Sahara ..... Australia
Death desert ..... Thakkala Makkan
Painted desert ..... North America
Coldest desert ..... Gobi
Warmest desert ..... Sahara
Driest desert ..... Attakkama
Great Indian desert ..... Thar

Important Deserts

Roob Asavali ..... Asia
Attakkama ..... South America
Sahara ..... Africa
Kalahari ..... Africa
Nameeb ..... Nameebia
Great Sandy ..... Australia
Great Victoria ..... Australia
Thakkala Makkan ..... China
Sahel ..... China
Thar ..... India

ISLANDS

Island of the volcanoes ..... Iceland
Island of the tortoise ..... Galappagose
Island of the Sailors ..... Samova
Island of the inspiration ..... Tazmania
Pearl of the Antilles ..... Cuba
Friendly island ..... Tonga
Spring island ..... Jamaica
Birthplace of Napolean ..... Kozhsikka Island
Biggest island ..... Greenland
Smallest island nation ..... Navru

- Folkland islands, Canari islands, Kozhzikka, St. Helena, Bahamas Burmuda islands situated in Atlantic Ocean.

LAKES

Important Lakes

Superior ..... North America
Ladol ..... Europe
Caspian ..... Asia
Victoria ..... Africa
Ayar ..... Australia
Marakkoiba ..... South America
Vozthok ..... Antartica
Azad ..... Syria
Nazar ..... Egypt

- Land of ten thousand lakes ..... Minazotta
- Land of thousand lakes ..... Finland
- Oldest lake, Deepest lake ..... Baikkal (Russia)
- Largest Island Lake ..... Manitollin
- Largest freshwater lake ..... Superior
- Largest salt water lake ..... Caspian sea
- Largest artificial lake ..... Volta (Ghana)

Racial Groups

1. **Negritos**
   Believed to be the oldest inhabitants and are now almost extinct. Found only in the Andaman and Nicobar Islands.
2. **Proto-Australoids**
   This group includes most of the tribal people of central and southern India.
3. **Mongoloids**
   They inhabit the mountainous zone in the north-eastern parts of the country.
4. **Mediterranean**
   The Palaeo-Mediterraneans inhabit the southern parts of India including Tamil Nadu, Kerala, Andhra Pradesh and Karnataka. The true Mediterranean inhabits the northern and western parts such as Punjab, Rajasthan and Uttar Pradesh. They are also known a **Dravidians.**
5. **Western Brachycephals**
   These people inhabit West Bengal, Orissa, Gujarat, Maharashtra, Tamil Nadu and Karnataka.
6. **Nordics or Indo-Aryans**
   They inhabit regions such as Jammu and Kashmir, Punjab, Haryana, Rajasthan and the Upper Gangetic Valley region.

Tribal Groups

1. **Abhors:** People of Mongoloid stock living in the north-eastern parts of India.
2. **Adivasis:** Tribals of Bastar district, Chhattisgarh.
3. **Angami:** Tribals of Nagaland.
4. **Apatanis:** Tribals of Arunachal Pradesh.
5. **Badagas:** Tribals of Nilgiri region in Tamil Nadu.
6. **Baiga:** Tribals of Madhya Pradesh.
7. **Bakkarwals:** People of Jammu and Kashmir who rear sheep and goats.
8. **Bhils:** People of Dravidian stock now living in central India (MP) and Rajasthan.
9. **Bhotias:** Tribals of Garhwal and Kumaon region in Uttaranchal, Sikkim and West Bengal.
10. **Birhors:** A tribal group of Madhya Pradesh, Chhattisgarh, Jharkhand and Orissa.
11. **Chenchus:** Tribals of Andhra Pradesh.
12. **Caddis:** Tribals of Himachal Pradesh who rear sheep.
13. **Garos:** Hill tribe of Meghalaya and Assam.
14. **Gonds:** Tribals inhabiting forests in Madhya Pradesh, Jharkhand, Andhra Pradesh and Orissa.
15. **Gujjars:** Animal rearers of Jammu and Kashmir and Himachal Pradesh.
16. **Jaintias:** Hill tribe of Meghalaya and Assam.
17. **Jarawas:** One of the oldest tribes of Andaman and Nicobar Islands inhabiting Little Andamans.
18. **Khasa:** Tribals of Jaunsar Bhabar region in Uttaranchal.
19. **Khasis:** Hill tribe of Meghalaya and Tripura.
20. **Khonds:** Tribals inhabiting parts of Orissa.
21. **Kol :** Tribals of Madhya Pradesh and Maharashtra.
22. **Kotas:** Tribals of Nilgiri Hills in Tamil Nadu.
23. **Kuki:** A tribe of Manipur, Assam, Nagaland and Tripura.
24. **Lahaulas:** Tribals inhabiting Lahaul region in Himachal Pradesh.
25. **Lepchas:** Original tribal inhabitants of Sikkim.
26. **Lushai:** Tribals of Mizoram and Tripura.
27. **Murias:** Tribals of Bastar district of Madhya Pradesh.
28. **Mikirs:** A tribal group of Assam.
29. **Moplahs:** Muslims of the Malabar district in Kerala.
30. **Munda:** A tribe of Jharkhand, West Bengal, Orissa, Tripura and Chhattisgarh.
31. **Nagas:** Tribals of Nagaland.
32. **Oraon:** Tribals inhabiting parts of Jharkhand, Chhattisgarh, Orissa and West Bengal.
33. **Onges:** One of the tribes of Andaman and Nicobar Islands.
34. **Santhals:** Tribals living in West Bengal, Jharkhand and Orissa.
35. **Scntinelcse:** One of the small statured tribes of Andaman and Nicobar Islands.
36. **Shompens:** Another tribal group of Andaman and Nicobar Islands.
37. **Todas:** Tribals of the Nilgiri Hills.
38. **Uralis:** Tribals inhabiting parts of Kerala.
39. **Varlis:** Tribals of Maharashtra, Gujarat and Dadra & Nagar Haveli.

Geographical Landmarks (World)

Highest Mountain Peaks

	Name	Height in metres	Range	Date of avoid ascent
1.	Mount Everest	8,848	Himalayas	May 29, 1953
2.	K-2 (Godwin Austen)	8,610	Karakoram	July 31, 1954
3.	Kanchenjunga	8,597	Himalayas	May 25, 1955
4.	Lhotse	8,511	Himalayas	May 18, 1956
5.	Makalu I	8,481	Himalayas	May 15, 1955

Highest Volcanoes

	Name	Height (in metres)	Range or location	Location
1.	Ojos del Salado	6,885	Andes	Argentine-Chile
2.	Gullatiri	6,060	Andes	Chile
3.	Cotopaxi	5,897	Andes	Ecuador
4.	Lascar	5,641	Andes	Chile
5.	Tupungatito	5,640	Andes	Chile

Largest Deserts

	Name	Approximate area in sq. km	Territories
1.	Sahara	8,400,000	Algeria, Chad, Libya, Mali, Mauritania, Niger, Sudan, Tunisia, Egypt, Morocco.
2.	Australian	1,550,000	Australia
3.	Arabian Desert	1,300,000	Southern Arabia, Saudi Arabia, Yemen
4.	Gobi	1,040,000	Mongolia and China (Inner Mongolia)
5.	Kalahari Desert	520,000	Botswana

Largest Islands

	Name	Location and status	Area in sq. km.
1.	Greenland (Kalaalit Nnuaat)	North Atlantic (Danish)	2,175,597
2.	New Guinea	Southwest Pacific (Irian Java, Indonesian, west part; Papua New Guinea, east part)	820,033
3.	Madagascar	Indian Ocean (Malagasy Republic)	587,042
4.	Baffin	North Atlantic (Canadian)	476,068
5.	Sumatra	North-east Indian Ocean (Indonesian)	473,605

Deepest Sea Trenches

	Name	Length in km	Deepest point	Depth in metres
1.	Mariana Trench (West Pacific)	2,250	Challenger Deep	11,776
2.	Tonga-Kermadec Trench (South Pacific)	2,575	Vityaz 11 (Tonga)	10,850
3.	Kuril-Kamchatka Trench (West Pacific)	2,250		10,542
4.	Philippine Trench (Wet Pacific)	1,325	Galathea Deep	10,539
5.	Idzu Bonin Trench(sometimes included in the Japan Trench)			9,810

Largest Rivers

	Name	Source	Outflow	Length in km
1.	Nile	Lake Victoria, Africa	Mediterranean Sea	6,690
2.	Amazon	Glacier-fed lakes, Peru	Atlantic Ocean	6,296
3.	Mississippi-Missouri	Red Rock, Montana (USA)	Gulf of Mexico	6,240
4.	Yangtze Kiang	Tibetan Plateau, China	China Sea	5,797
5.	Ob	Altai, Mts, Russia	Gulf of Ob	5,567

Largest Lakes (Natural)

	Name and Location	Area in sq km	Length in km	Maximum depth in metres
1.	Caspian Sea, CIS-Iran	394,299	1,199	946
2.	Superior, USA-Canada	82,414	616	406
3.	Victoria, Tanzania-Uganda	69,485	322	82
4.	Aral, CIS	66,457	428	68
5.	Huron, USA-Canada	59,596	397	229

Highest Waterfalls

	Waterfall	Location	River	Height in metres
1.	Angel	Venezuela	Tributary of Carnol	972
2.	Tugela	Natal, South Africa	Tugela	914
3.	Cuquenan	Venezuela	Cuquenan	610
4.	Sutherland	South Island, New Zealand	Arthur	580
5.	Takkakaw	British Columbia	Tributary of Yoho	503

Biggest Countries (In Area)

	Name	Area (sq km)	Location
1.	Russia (Yosemite)	17,075,000	Europe-Asia
2.	Canada	9,976,139	North America
3.	China	9,561,000	Asia
4.	USA	9,372,614	North America
5.	Brazil	8,511,965	South America

Smallest Countries (In Area)

	Name	Area (sq. Km)	Location
1.	Vatican City	0.44	Europe
2.	Monaco	1.95	Europe
3.	Nauru	21.10	South Pacific
4.	Tuvalu	26.00	South Pacific
5.	San Marino	61.00	Europe

Large Peninsulas

Name	Area in sq km	Name	Area in sq km
Arabia	3,250,000	Labrador	1,300,000
Southern India	2,072,000	Scandinavi	800,300
Alaska	1,500,000	Iberian Peninsula	584,000

Continents - Data

Name	Percentage of earth's area	Area in sq km	Population (million)
Asia	29.5	43,998,000	3513.2
Africa	20.0	29,800,000	748.1
North America	16.3	21,510,000	295.7
South America	11.8	17,598,000	325.1
Europe	6.5	9,699,550	727.7
Australia	5.2	7,699,000	18.3
Antartica	9.6	13,600,000	18.3

Note: Australia with New Zealand, Tasmania, New Guinea and the Pacific Islands (Micronesian, Melanesian an Polynesian islands) is called Australasia by some geographers while some others call it Oceania.

Continents - Highest and Lowest Points

Continents	Highest point	in metres	Lowest points in metres (from sea-level)	
Asia	Everest	8,848	Dead Sea	-396.8
Africa	Kilimanjaro	5,894	Lake Assai	-156.1
North America	Mckinley	6,194	Death Valley	-85.9
South America	Aconcagua	6,960	Valdes Penin	-39.9
Europe	Elbrus	5,663	Caspian Sea	-28.0
Australia	Kosclusko	2,228	Lake Eyre	-15.8
Antarctica	Vinson Massif	5,140	-	-