MILKY WAY MEASUREMENTS

DIAMETER
100,000 light-years

THICKNESS AT THE CORE
10,000 light-years

NUMBER OF STARS
200-400 billion

NUMBER OF PLANETS
100 billion

SOLAR SYSTEM

SUN
Age : 4.5 billion years
Equatorial Diameter : 1,384,000 km.
Period of Rotation (at equator) : 25.38 days
Temperature : 15,000,000 °C (at core)
5,000 °C (at surface)
Density : 1.41 g/cm cube

VENUS
Avg. Dis. from Sun : 108 million km.
Equatorial Diameter : 12,110 km.
Density : 5.25 g/cm cube
Period of Rotation : 243 days
Time to Orbit the Sun : 224.7 days
No. of known Moons : None

MARS
Avg. Dis. from Sun : 228 million km.
Equatorial Diameter : 6,794 km.
Density : 3.39 g/cm cube
Period of Rotation : 24.6 hrs.
Time to Orbit the Sun : 687 days
No. of known Moons : 2

SATURN
Avg. Dis. from Sun : 1427 million km.
Equatorial Diameter : 1,20,500 km.
Density : 0.69 g/cm cube
Period of Rotation : 10.3 hrs.
Time to Orbit the Sun : 29.5 yrs.
No. of known Moons : 56

NEPTUNE
Avg. Dis. from Sun : 4497 million km.
Equatorial Diameter : 48,600 km.
Density : 1.64 g/cm cube
Period of Rotation : 18.5 hrs.
Time to Orbit the Sun : 164.8 yrs.
No. of known Moons : 13

MERCURY
Avg. Dis. from Sun : 58 million km.
Equatorial Diameter : 4,878 km.
Density : 5.43 g/cm cube
Period of Rotation : 58.6 days
Time to Orbit the Sun : 88 days
No. of known Moons : None

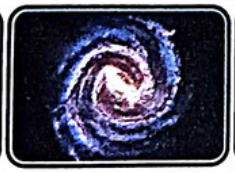
EARTH
Avg. Dis. from Sun : 150 million km.
Equatorial Diameter : 12,756 km.
Density : 5.52 g/cm cube
Period of Rotation : 23.9 hrs.
Time to Orbit the Sun : 365.26 days
No. of known Moons : 1

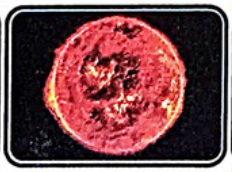
JUPITER
Avg. Dis. from Sun : 778 million km.
Equatorial Diameter : 1,42,880 km.
Density : 1.33 g/cm cube
Period of Rotation : 9.9 hrs.
Time to Orbit the Sun : 11.9 yrs.
No. of known Moons : 79

URANUS
Avg. Dis. from Sun : 2871 million km.
Equatorial Diameter : 51,400 km.
Density : 1.32 g/cm cube
Period of Rotation : 16.2 hrs.
Time to Orbit the Sun : 84 yrs.
No. of known Moons : 27

HOW OLD IS...


... the Universe?
13.4 billion years

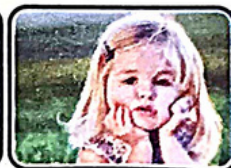

... the Milky Way?
10 billion years


... the Sun?
4.6 billion years


... the Earth?
4.54 billion years


... the Moon?
4.53 billion years


... life on Earth?
3.5 billion years


... Homo sapiens?
(the human species)
200,000 years

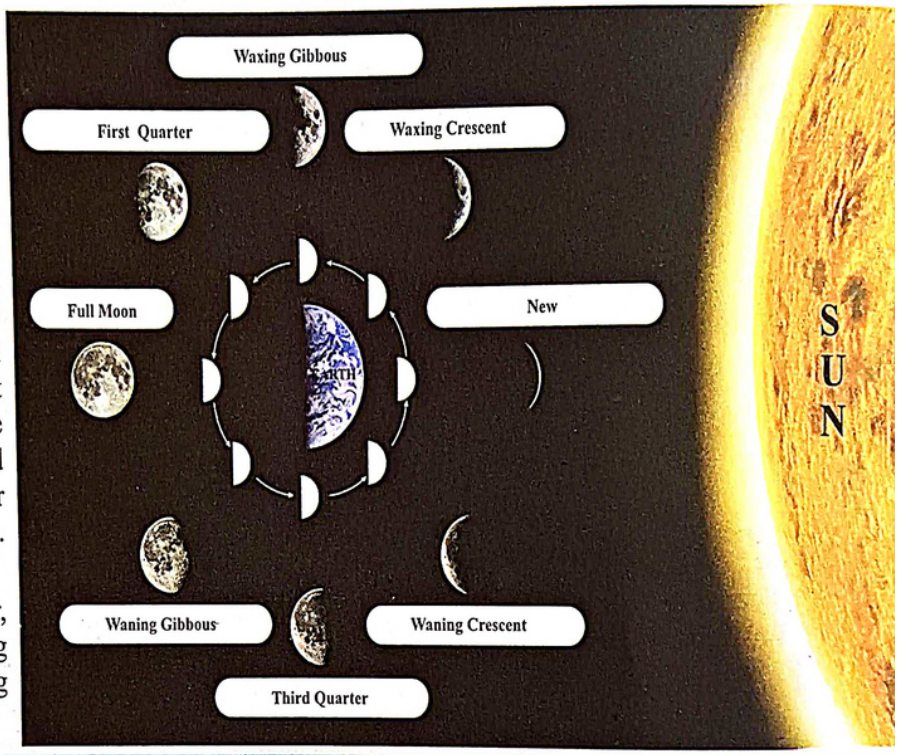
THE MOON

Moon, the Earth's only natural satellite, is a slightly egg-shaped ball, composed mostly of rock and metal. It has no liquid water, virtually no atmosphere, and is lifeless. The Moon shines by reflecting the light of the Sun. Although, the Moon appears bright to the eye, it reflects on an average only 12% of the light that falls on it. The diameter of the Moon is about 3,480 km, roughly around one-fourth of that of Earth, and its mass is only 1.2 percent of the Earth's mass. The average density of the Moon is only three-fifths that of Earth and gravity at the lunar surface is only one-sixth as strong as the gravity at sea level on Earth. The Moon moves in an elliptical (oval-shaped) orbit around Earth at an average distance of 3, 84,403 km and at an average speed of 3,700 km/h. It completes one revolution in 27 days 7 hours 43 minutes. For the Moon to go from one phase to the next similar phase as seen from Earth requires 29 days 12 hours 43 minutes, 11.6 seconds (29.5 days). This period is called as Lunar Month.

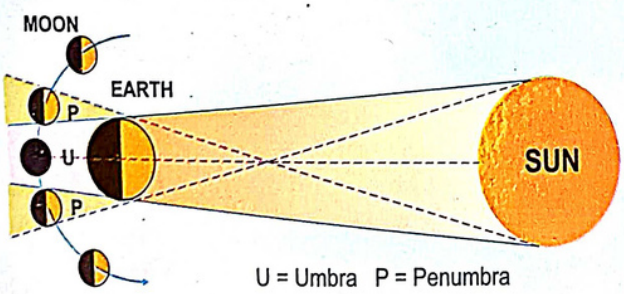
THE PHASES OF THE MOON

The appearance of changing shape of the illuminated (sunlit) portion of the Moon in the sky is called as its phase. The phases of the Moon depend on its position in relation to the Sun and the Earth. As the Moon revolves around the Earth, the illuminated parts of Moon's surface at different angles are visible. The Moon seems to grow from a thin crescent to a full disc (or Full Moon) and than shrink back to a thin crescent again, before vanishing for a few day. In all there are eight phases of the Moon, which are named after how much Moon is visible to us and whether the visible portion is increasing or decreasing. The eight phases are:

(1) New, (2) Waxing Crescent, (3) First Quarter, (4) Waxing Gibbous, (5) Full, (6)Waning Gibbous, (7) Third or Last Quarter, (8)Waning Crescent



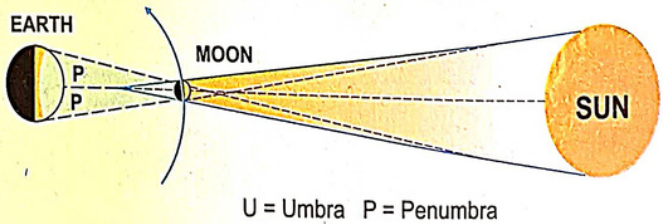
LUNAR ECLIPSE



A **Lunar Eclipse** occurs when Earth gets directly - or almost directly - between the Sun and the Moon, and Earth's shadow falls on the Moon. A Lunar Eclipse occur only during a Full Moon night, when Sun, Earth and Moon are aligned.

A totally eclipsed Moon is sometimes called a Blood Moon for its reddish colour, which is caused when Earth completely blocks direct Sunlight from reaching the Moon. Unlike a solar eclipse, which can only be viewed from a relatively small area of the world, a lunar eclipse may be viewed from anywhere on night side of the Earth.

SOLAR ECLIPSE



A **Solar Eclipse** occurs when the Moon passes between the Sun and the Earth. The Sun is blocked out by the Moon and cannot be seen from areas on the Earth that lie in the Moon's shadow. A Solar Eclipse can occur only during a New Moon, when the Sun and the Moon are in the conjunction as seen from Earth. In a total eclipse, the disk of the Sun is fully obscured by the Moon. In partial and annular eclipses only part of the Sun is obscured.

The Moon is about 400 times smaller than the Sun and is also 400 times closer to the Earth in comparison to the Sun. Due to this coincidence the Sun and the Moon appear to be of almost similar sizes when viewed from the Earth.

OUR EARTH

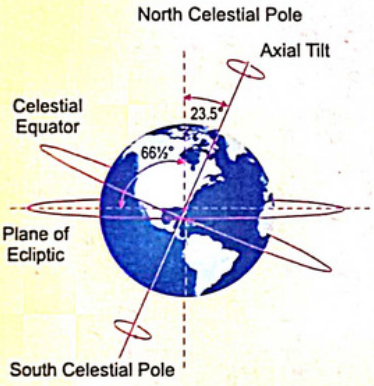
EARTH FACTS

Avg. Distance from Sun : 149,598,262 km.
Perhelion (Closest to Sun) : 147,098,291 km.
Aphelion (Farthest from Sun) : 152,098,233 km.
Equatorial Diameter : 12,756 km.
Density : 5.52 g/cm^3
Period of Rotation : 23.934 hrs.
Time to Orbit the Sun : 365.26 days
Equatorial inclination to orbit : 23.4393 deg.
Number of known Moons : 1

Earth, a unique planet with perfect conditions to sustain life is also known as 'Blue Planet', as it appears blue when seen from the space due to the presence of huge oceans of water covering over 70 per cent of its surface. It is also placed at perfect distance from the Sun that makes it not too hot or too cold and the presence of oxygen in the atmosphere has helped life to flourish here.

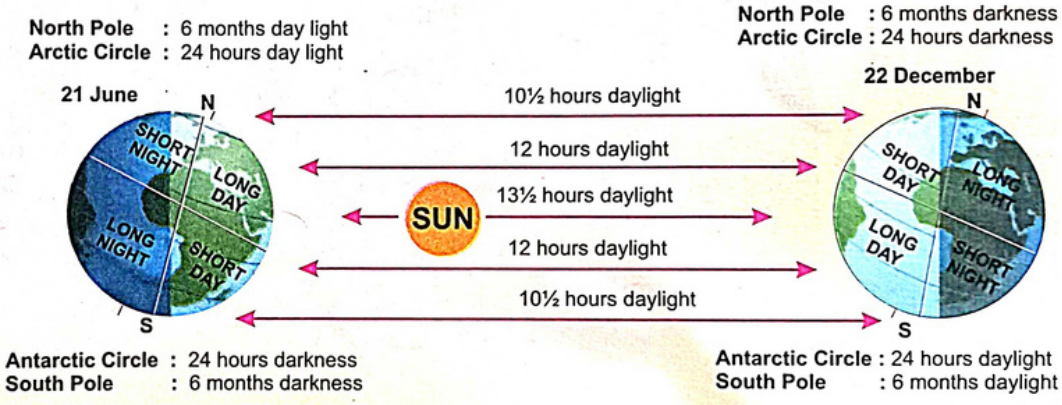
MOTIONS OF THE EARTH

The Earth has two types of motions, namely **rotation** and **revolution**. Rotation is the movement of the Earth on its axis. The movement of the Earth around the sun in a fixed path or orbit is called revolution. The axis of the earth which is an imaginary line makes an angle of 66½° with its orbital plane. The plane formed by the orbit is known as the orbital plane. The Earth receives light from the sun. Due to the spherical shape of the Earth. Only half of it gets light from the Sun at a time the portion facing the sun experiences day while the other half away from the sun experiences night. The Earth takes about 24 hours to complete one rotation around its axis. The period of rotation is known as the Earthday. This is the daily motion of the Earth.

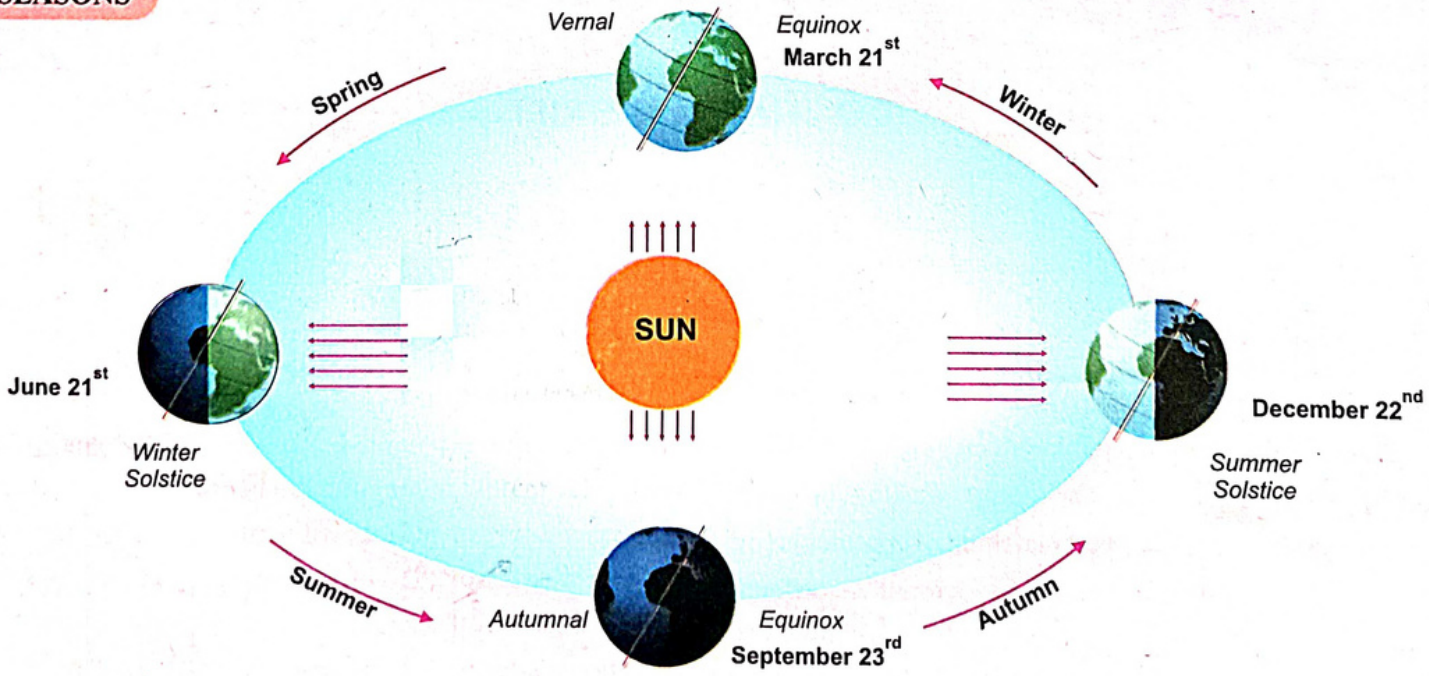


Inclination of the Earth's Axis and the Orbital Plane

DAY & NIGHT



THE SEASONS



SPHERES OF THE EARTH

BIOSPHERE :

It includes all the living things such as plants, animals, people, insects, microbes, etc., thriving on the planet Earth.

HYDROSPHERE :

It includes the water that covers around 71 % of Earth's surface. It includes oceans, rivers, lakes, rain, snow, glaciers and ice caps.

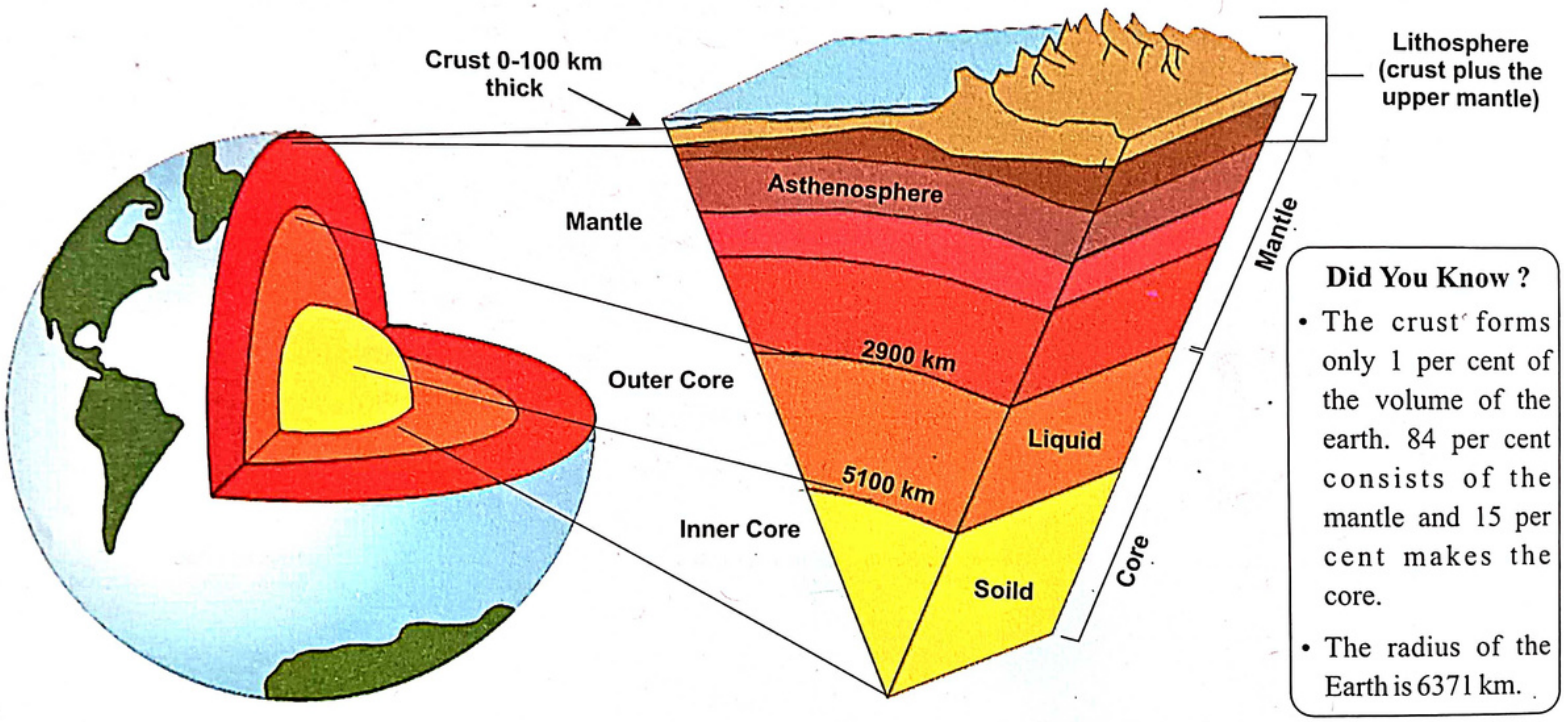
LITHOSPHERE (GEOSPHERE):

It comprises the crust and the upper mantle of the Earth, which is further divided into oceanic and continental lithosphere.

ATMOSPHERE :

It is a protective blanket of gases, including water vapours, oxygen etc. surrounding the Earth.

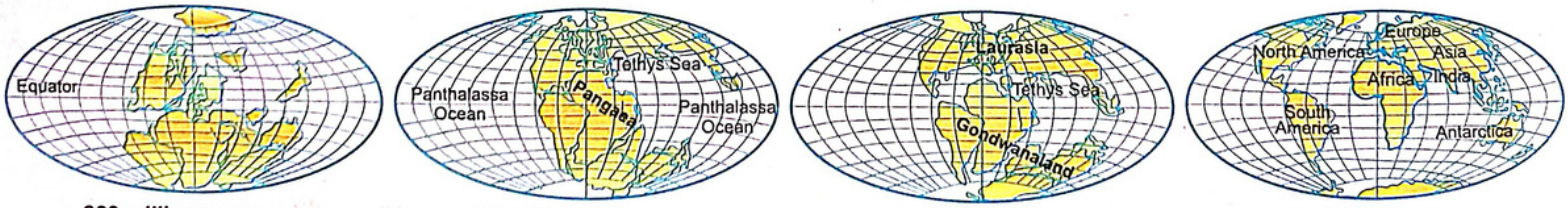
THE STRUCTURE OF THE EARTH



Did You Know ?

- The crust forms only 1 per cent of the volume of the earth. 84 per cent consists of the mantle and 15 per cent makes the core.
- The radius of the Earth is 6371 km.

CONTINENTAL DRIFT

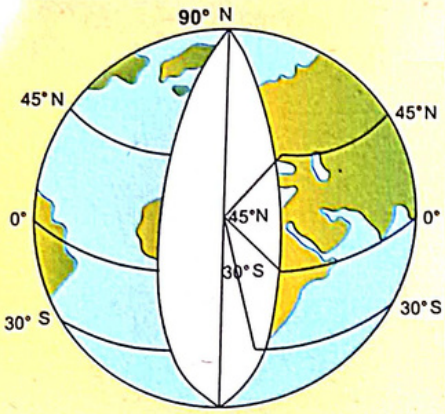


360 million years ago | 180 million years ago | 120 million years ago | 60 million years ago

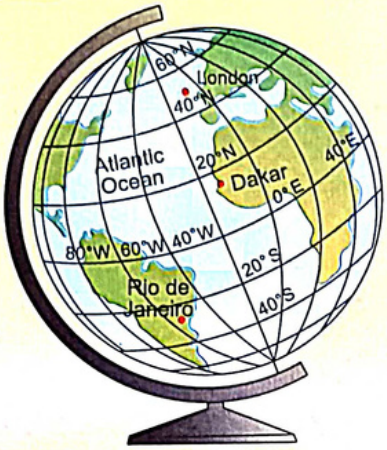
The movement of lithospheric plates underlying the continents is known as Continental Drift. The theory was first proposed Alfred wegener in 1912 to explain matching of continents (jig-saw fit), fossils and similar rock formations found on different continents.

A supercontinent named Pangaea or Pangea came into existence mainly in the southern hemisphere of the Earth with the assembling of earlier continents around 335 million years ago. It was surrounded by a superocean known as Panthalsa. The Pangaea broke up in three major phases, resulting in the creation of the present-day continents and oceans.

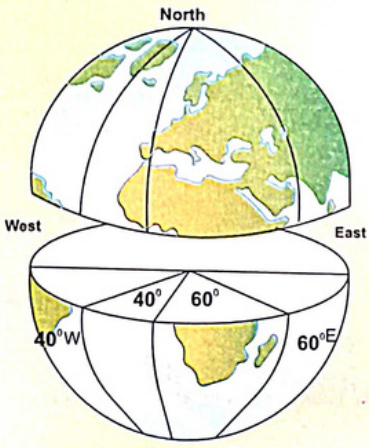
THE EARTH'S GRID SYSTEM



Latitude



The Earth's Grid System



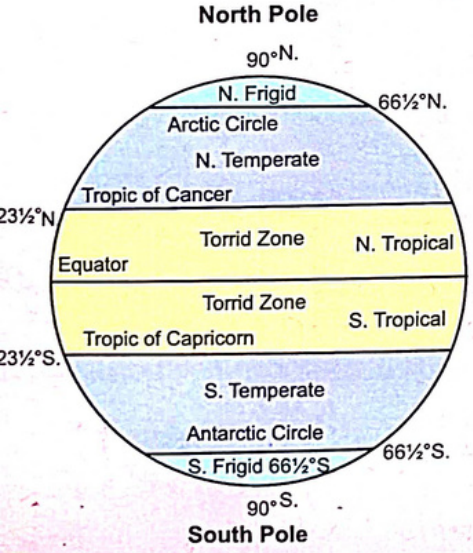
Longitude

Latitudes and longitudes are the imaginary lines drawn on the Earth for the convenience of locating points on its surface.

Latitude : It is the imaginary horizontal line around the Earth. The Equator, the central latitude is the 0° line bisecting the Earth into two equal halves, the Northern Hemisphere and Southern Hemisphere. It is the reference plane for all the latitude circles, which are drawn horizontally at an interval of 1° from 0 to 90°. The circles get smaller and smaller as one ascends or descends from the equator and the parallels of 90° North and 90° South are merely two points on the globe, which are called the North Pole and the South Pole. The important parallels marked on the globe are -

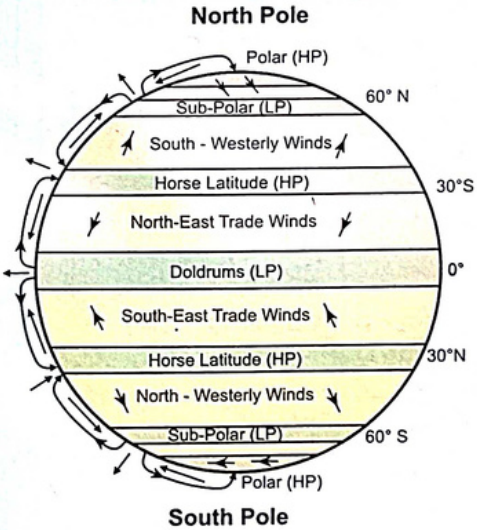
Longitude : The imaginary vertical lines connecting the North and South Poles are known as Meridians of Longitude. The 0° longitude or the Prime (Greenwich) Meridian divides the Earth into two vertical halves (The Eastern and the Western Hemispheres) and serves as the base for numbering of meridians of longitude lying on either side - east or west. In all, there are 360 meridians of longitude at an interval of one degree each including the 0° or Prime Meridian, that passes through Greenwich near London (U.K.). There are 180 meridians on the either side (East and West) of Prime Meridian. Each degree equals to 111 km. on the Equator.

HEAT ZONES OF THE EARTH

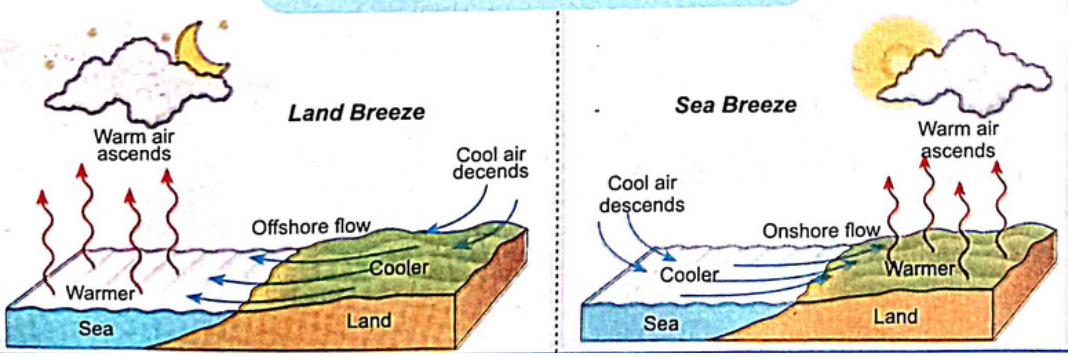


The mid-day Sun is exactly overhead at least once a year on all latitudes in between the Tropic of Cancer and the Tropic of Capricorn. This area, therefore, receives the maximum heat and is called the **Torrid Zone.** The mid-day Sun never shines overhead on any latitude beyond the Tropic of Cancer and the Tropic of Capricorn. The angle of the Sun's rays goes on decreasing towards the poles. The areas bounded by the Tropic of Cancer and the Arctic Circle, and the Tropic of Capricorn and the Antarctic Circle in the Southern Hemisphere, have moderate temperatures. These are, therefore, called **Temperate Zones.** The very cold areas beyond arctic and Antarctic Circle are called Frigid Zones.

PRESSURE AND WIND BELT

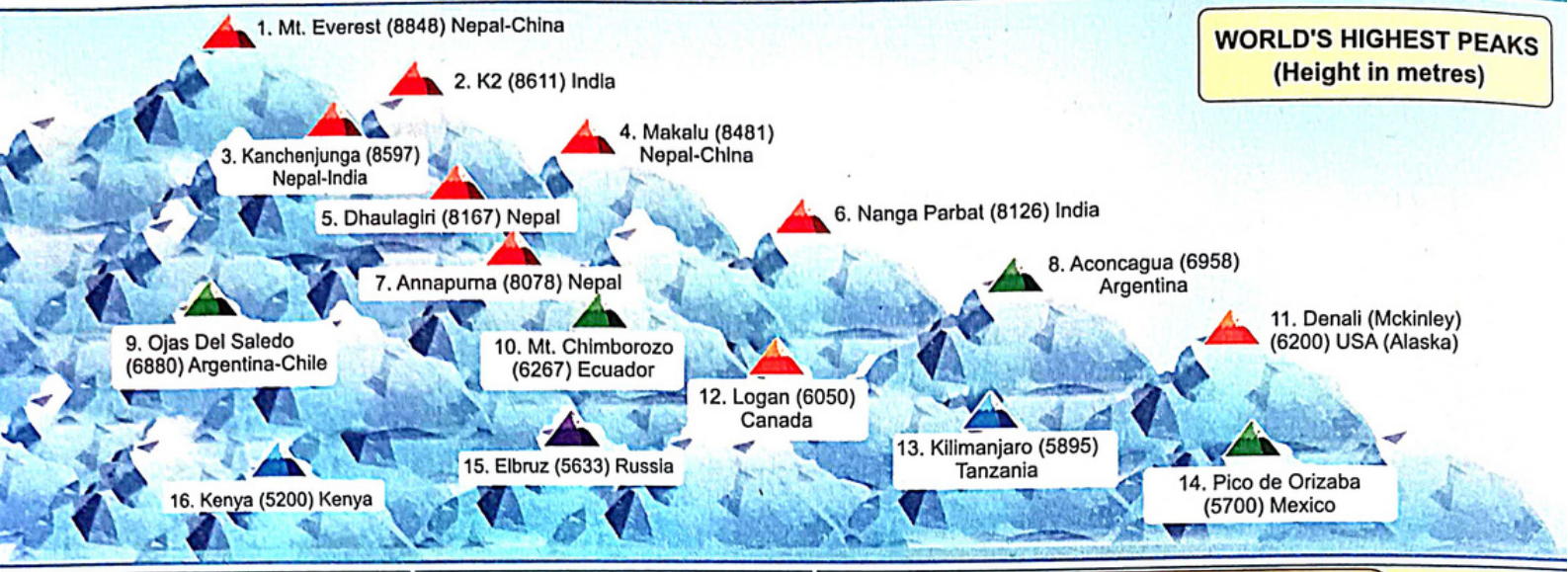


LAND BREEZE AND SEA BREEZE

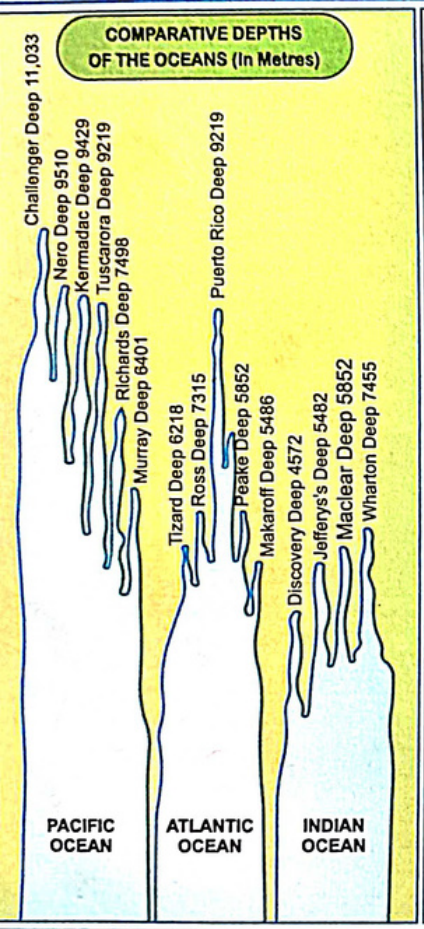


This phenomenon of convection current is experienced in the coastal areas, due to the difference in heating and cooling of the land and water. During the day the land heats up faster than the sea. Thus, the warm air, on land rises up and creates a low pressure area, whereas the sea is relatively cool and the pressure over it is relatively high. Thus, pressure gradient from sea to land is created and the cold wind blows from the sea to the land as the Sea Breeze.

WORLD'S HIGHEST PEAKS (Height in metres)

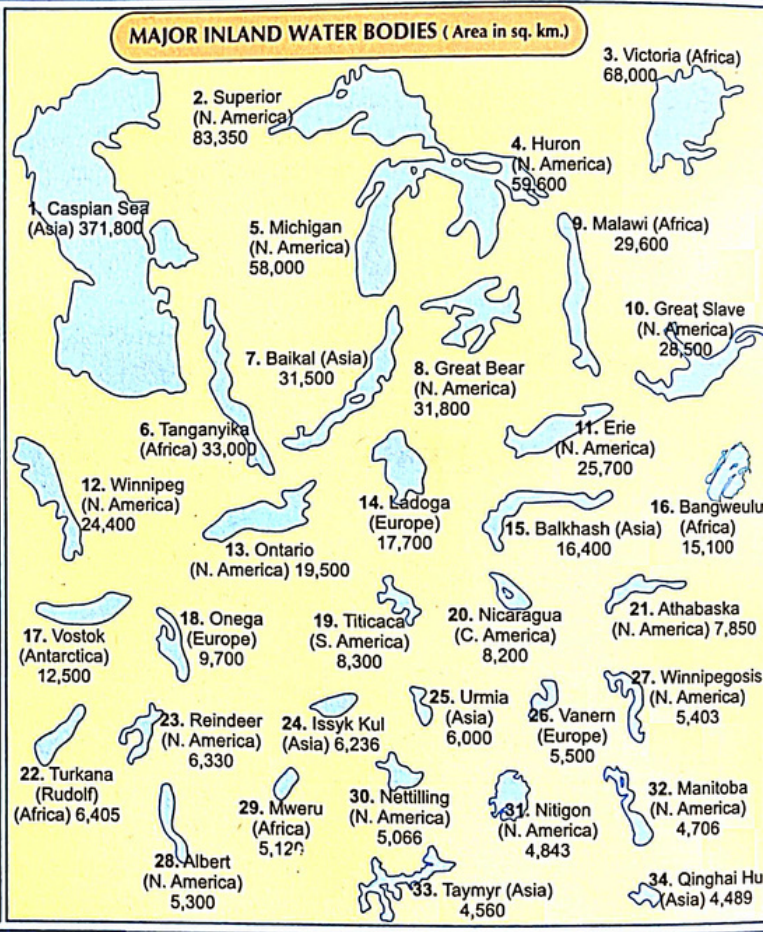


COMPARATIVE DEPTHS OF THE OCEANS (In Metres)

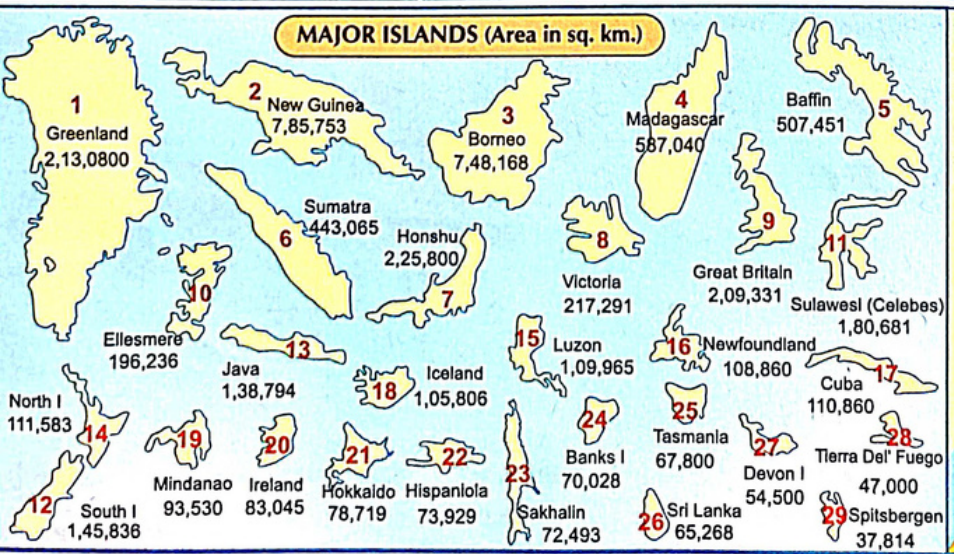


COMPARATIVE LENGTHS OF IMPORTANT RIVERS (In Km.)

MAJOR INLAND WATER BODIES (Area in sq. km.)



MAJOR ISLANDS (Area in sq. km.)



FIVE LARGEST DESERTS

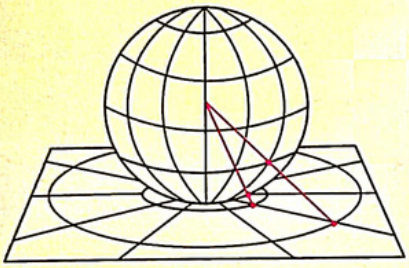
1. ANTARCTICA DESERT (Cold) 14.8 million sq. km.
2. SAHARA DESERT 9 million sq. km.
3. ARABIAN DESERT 2.3 million sq. km.
4. GOBI DESERT (Cold) 1.3 million sq. km.
5. KALAHARI DESERT 0.9 million sq. km.

Map Projections : A globe is the only accurate map of the world. It is impossible to make an accurate map of the curved surface of the Earth on a flat sheet of paper. If we take the peel of an orange and spread it out flat, there will be always some distortion at the edges. In the same way if we take a piece of paper and try to spread it around a globe, we cannot do so without crumbling it at the edges. If the area is small, the problem may not be great but if the area is large such as for any continent; the problem will be difficult and we may face biggest problem if we have to make the map of the whole world. Cartographers, over the years, have struggled hard to find a proper solution to this complex problem of preparing maps which conform as accurate as possible with shape, size, area and scale of all or part of the world.

The science of map projections gives various solutions to this complex problem in which the impossible can be approximated. A projection may not give true solution but one can get near solution at least. Any drawing of globe's regular network of meridians and parallels on a flat surface is called a projection. Imagine there is a transparent globe with light inside it. This light projects the meridians and parallels on a flat on to a sheet of paper where these can be copied. And in practice, this is done mathematically by cartographers. In order to make inaccuracies as small as possible, various map projections are used. There is no single map projection which is better than others. Each projection has certain advantages as well as certain limitations. A projection suitable for Asia may not be good for polar regions. There are four main kinds of projections which are commonly used in most of the Atlases and they are Cylindrical projection, Conical projection, Zenithal projection and Conventional projection .

ZENITHAL PROJECTIONS

Zenithal Projections :
These projections are also known as horizontal or azimuthal projections. These are suitable for maps of polar regions. This projection is developed by projecting the surface of a globe on a flat surface that touches the globe at a single point. The point of the projection is called an eye point and may be on the globe itself, inside it, or some distance from it.

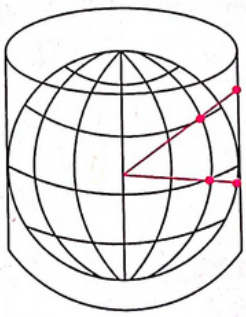


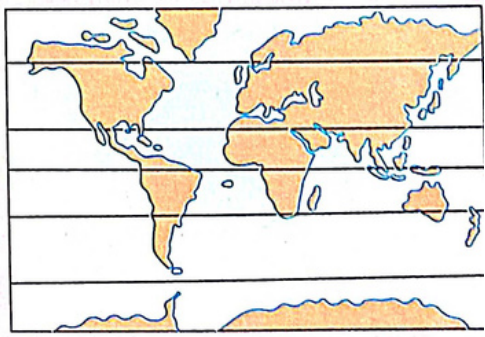
CONICAL PROJECTIONS

Conical Projections :
Here we imagine as if a cone of paper is fitted round the globe with apex of the cone being kept above the pole. The line along which the cone touches the globe is called "standard parallel". The straight lines radiating from apex of the cone are called longitudes and the concentric circles are called latitudes. This projection is suitable for maps of middle latitudes, countries of part of one hemisphere. Also these maps have remarkably little scale error.

CYLINDRICAL PROJECTIONS

Cylindrical Projections :
This is the simplest projection with evenly spaced network of meridians and parallels. In this projection, we imagine a globe surrounded by a cylinder of paper and the point of the surface of the globe are developed on the paper. When the paper is unroled there is a map of nearly the whole world, but it is impossible to show the poles on such map. The main cylindrical projections are Mercator's and Gall's. This projection is used for showing directions correctly but there is more exaggeration away from the Equator.





CONVENTIONAL PROJECTIONS

Conventional Projections : There are many other projections, purely conventional in design and are constructed by mathematical calculations. These a prepared to meet some special requirement. Some well known projections under this category are : 1. Globular projection 2. Star projection 3. Sinusoid projection 4. Sinusoidal Interrupted Projection 5. Homolographic projection 6. Mollweide's Projection 7. Interrcepted Mellweide's 8. Hammer's.

Mollweide's Projections :
It is also known as Homolographic projection and is an equal area projection. This modern projection is very popular for making world maps.

Goode's Interrupted Projection :
This is also an equal area projection. It is usually used in interrupted fro only. It combines equality of areas with little distortion in shape.