Ch - 1
Earth as a Planet

Our Earth is the unique planet in the solar system due to the presence of life on it. The solar family includes the eight planets, their satellites, asteroids, meteorites, comets etc.

The planets in order to their distance from the sun can be divided into two categories :-

1. Inner planets - They are called terrestrial planets (earth like) as they are made up of rocks. The planets include Mercury, Venus, Earth and Mars which lie before the asteroid belt.

2. Outer planets - These planets are located after the asteroid belt and are made up of gases. They are also called Jovian planets (Jupiter like) since they are bigger in size they are named as gas giants.

Earth

i) The earth is third planet from the sun and the fifth largest in the solar system. It is located at a distance of 150 million km approximately away from the sun.

ii) It is known as a blue planet or a watery planet as 70% of its total area is covered by water.

iii) It rotates on an inclined axis and revolves around the sun in a fixed elliptical orbit.

Shape of the Earth

i) The shape of the earth is geoid or oblate spheroid. It means that there is a slight bulge at the equator and flattening at the poles.

ii) This shape is due to the speed of earth's rotation which is maximum at the equator and minimum at the poles.

Proof that Earth is spherical in shape

i) Sighting of a ship - While standing at the seashore, watching an approaching ship, we first see only its mast. As it comes closer we can see the deck in the middle, then its funnel and finally the hull comes into full view. This happens only when the earth's surface is curved. If the earth were flat, the entire ship would have been seen all at once.

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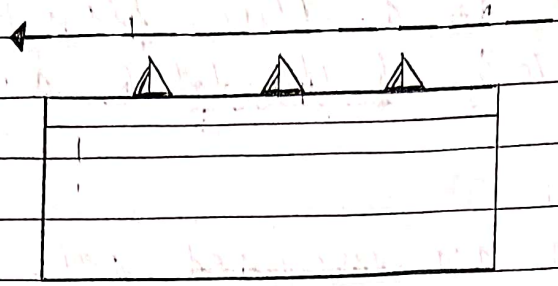
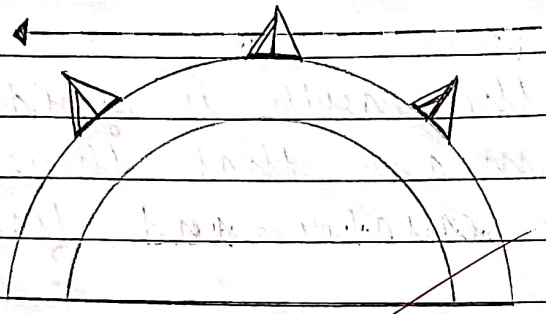


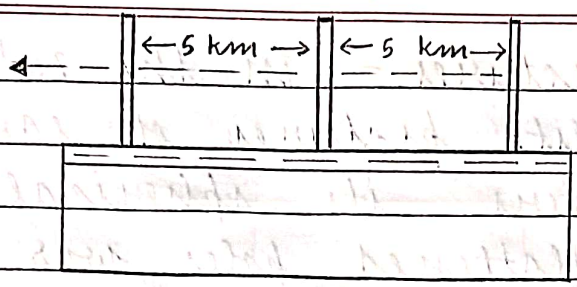
Flat Earth



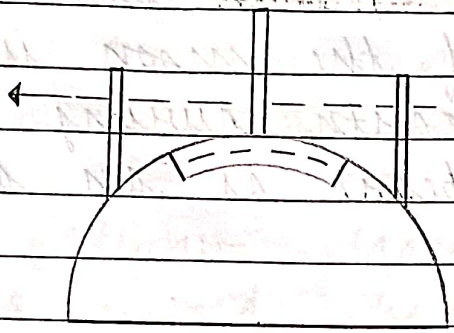
Spherical Earth

Sighting of a ship

ii) The Bedford Level Experiment - An experiment was carried out in the Bedford Level canal area in England. Three poles of equal length were fixed at an interval of 5 km. When the poles were viewed from one end, the middle pole appeared to be slightly higher than the other two poles. This could not have happened if the Earth had a flat surface.



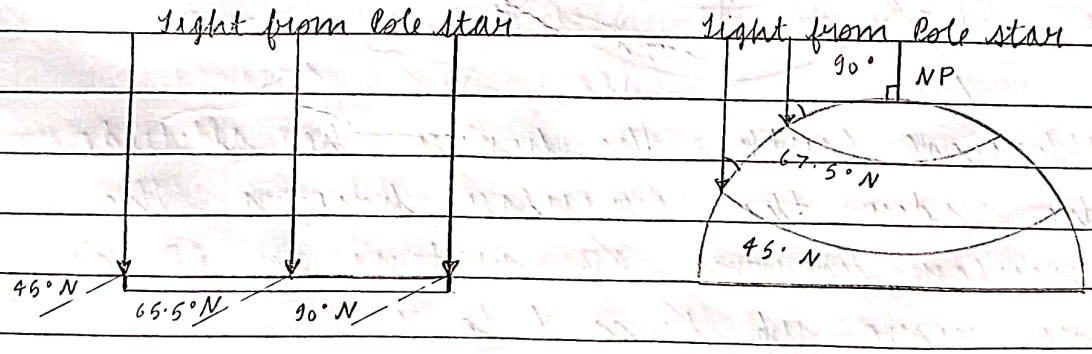
Flat Earth



Spherical Earth

Bedford level experiment

iii) Pole star - The Pole star can be seen at an angle of 90° at the North Pole. It lies in the line with the axis of the earth, and its angle decreases towards the equator. At equator the angle is 0°. This can happen only in an arc of a circle. If the earth were flat, the pole star would have the same height for all latitudes.

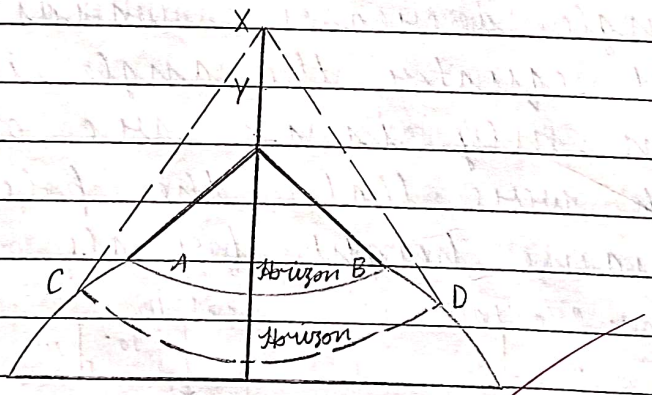


Position of the Pole Star

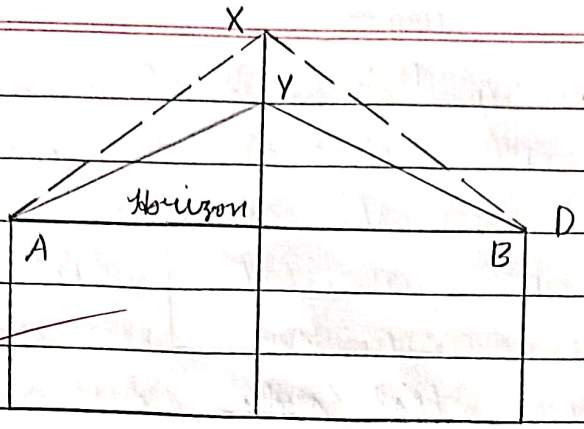
iv) Satellite pictures - In the 20th century, when satellite pictures of earth were fed into computers, its spherical shape with the flattened poles was confirmed.

v) Lunar eclipse - The shadow of earth on the surface of the moon is clearly visible from earth during lunar eclipse. It appears as an arc of a circle.

vi) Circular Horizon - The view of the earth's surface as seen from a height is circular. With increase in altitude the circular horizon also widens. Had the earth's surface been flat the horizon would have been the same irrespective of altitudes



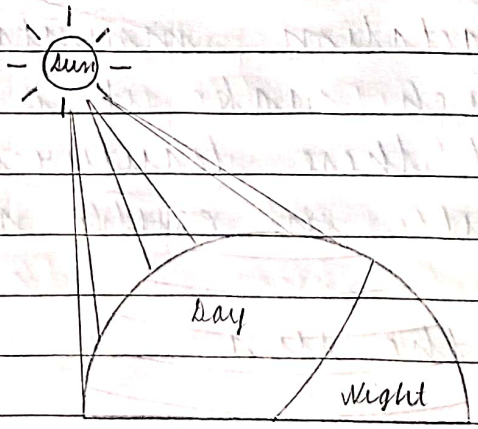
a) Spherical Earth : The higher the altitude, the wider the circular horizon. The circular horizon AB widens to CD as you move up from Y to X.



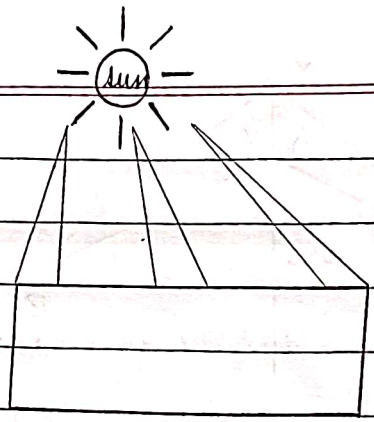
b) Flat Earth : Irrespective of the altitude, the visible horizon is the same

vii) Circumnavigation - Magellan's ship Victoria completed a round-the-world voyage in 1511. His ship returned to the same place from where it had started (Spain). It proved beyond doubt that the earth's surface is round.

viii) Sunrise and Sunset - Since the earth rotates from west to east, people in the east can see the sun earlier than those in the west that is the time of sunrise and sunset is different at different places on the earth. Had the earth been flat the time of sunrise and sunset would have been the same all over the earth.



Spherical Earth



Flat Earth

Sunrise and Sunset occurs at different timies at different places.

ix) The Earth as a heavenly body - All the planets in the solar system have a spherical shape due to their continous rotation. Since our earth also belongs to this family, it cannot be an exception.

The final evidence of earth having an spherical shape is obtained from the recent photographs taken from space.

The Earth As a Home for Humankind

Our Earth is a unique planet having instinct features such as oceans, continents, vegetation, mountains, rivers etc. which make it a habitable place. Some of these features that make life possible on earth are:

Distance from the sun -

i) Our earth is at an optimum distance

from the sun. Hence, its neither too hot nor too cold.

ii) As the earth is neither too far nor too close to the sun the temperature here is suitable for all life forms to exist.

Temperature -

i) Due to its optimum distance from the sun, the earth maintains an average temperature of 17°C which is suitable for life to exist.

ii) If the average temperature on the earth changes by a few degrees, many species would perish due to extreme heat or cold.

Atmosphere -

i) Atmosphere is the layer of air surrounding the earth. Its a mixture of life supporting gases such as nitrogen, oxygen, carbon dioxide and other gases such as helium, argon, etc.

ii) The ozone gas present in the atmosphere protects the earth from harmful ultraviolent radiation.

iii) Our earth receives heat through solar

radiation and loses heat through terrestrial radiation. Our atmosphere maintains a balance between them and moderates the temperature so that the earth does not become very hot during the day or very cold at night.

Water -

i) The distribution of land and water on the earth is in a ratio of 3:7 which is responsible for moderating the climate conditions on the earth.

ii) If there would have been more land than water, days would have been extremely hot and nights more cold.

iii) Water which is essential for all life forms to exist on earth is available in all the three states. There is a balance in the process of evaporation, condensation and precipitation which maintains hydrological cycle on earth.

Solid crust or lithosphere -

i) The earth has a solid crust made up of rocks called lithosphere (lith means rocks).

ii) Weathering of these rocks forms soil which

is rich in nutrients, necessary for the growth of plants.

iii) Plants support all forms of life directly or indirectly.

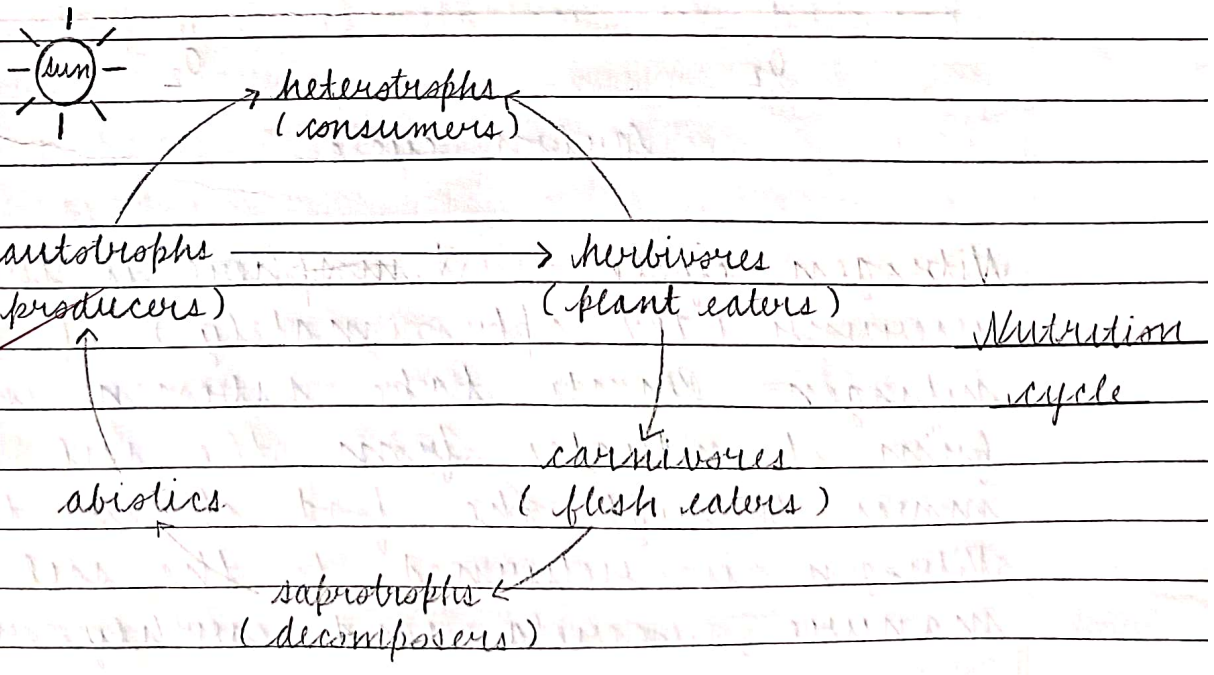
Biosphere -

i) Biosphere is a narrow zone of contact and interaction between the atmosphere, changes by a few lithosphere and hydrosphere.

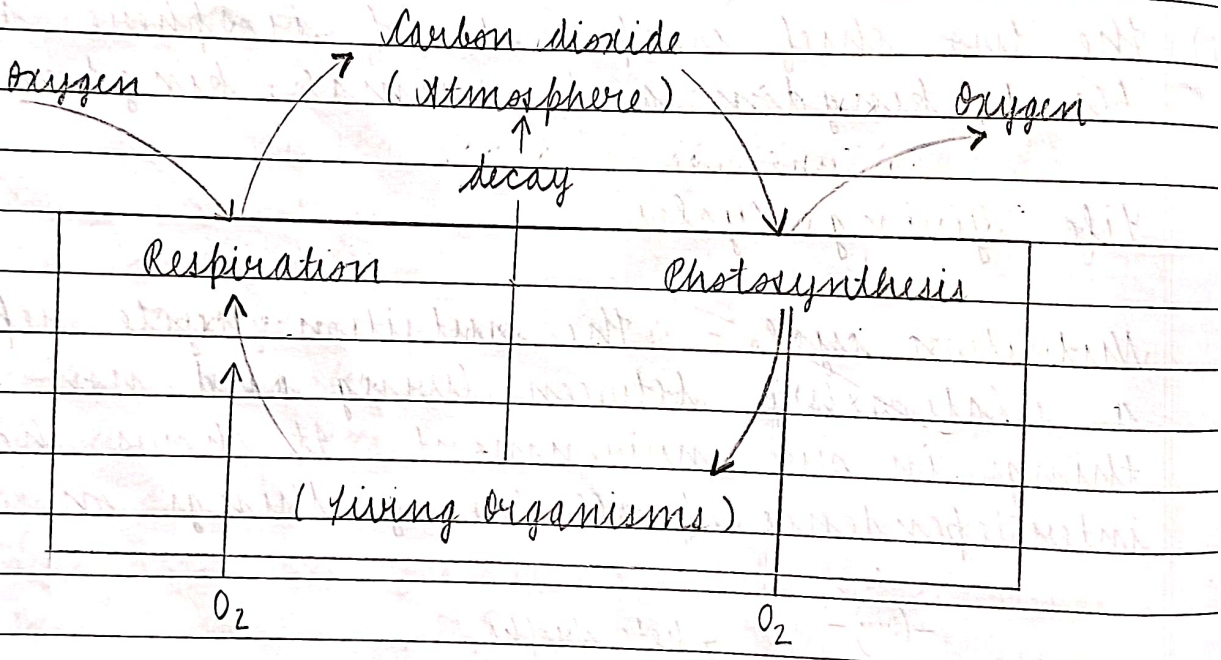
ii) The two chief components of biosphere are - plant kingdom and animal kingdom.

Life - giving cycles

Nutrition cycle - The nutrition cycle represents a relationship between living and non-living things in our environment. It shows the interdependence of all living things on earth.



Carbon cycle - Carbon is the basic raw material of all life. All living things contain carbon. The major reservoir of carbon is the atmosphere where it exists as carbon dioxide (CO_2). Atmospheric carbon dioxide is taken by plants. Carbon is replenished through forests, burning of fossil fuels and respiration of animals. Any imbalance of carbon in the atmosphere heats up the earth and leads to global warming.

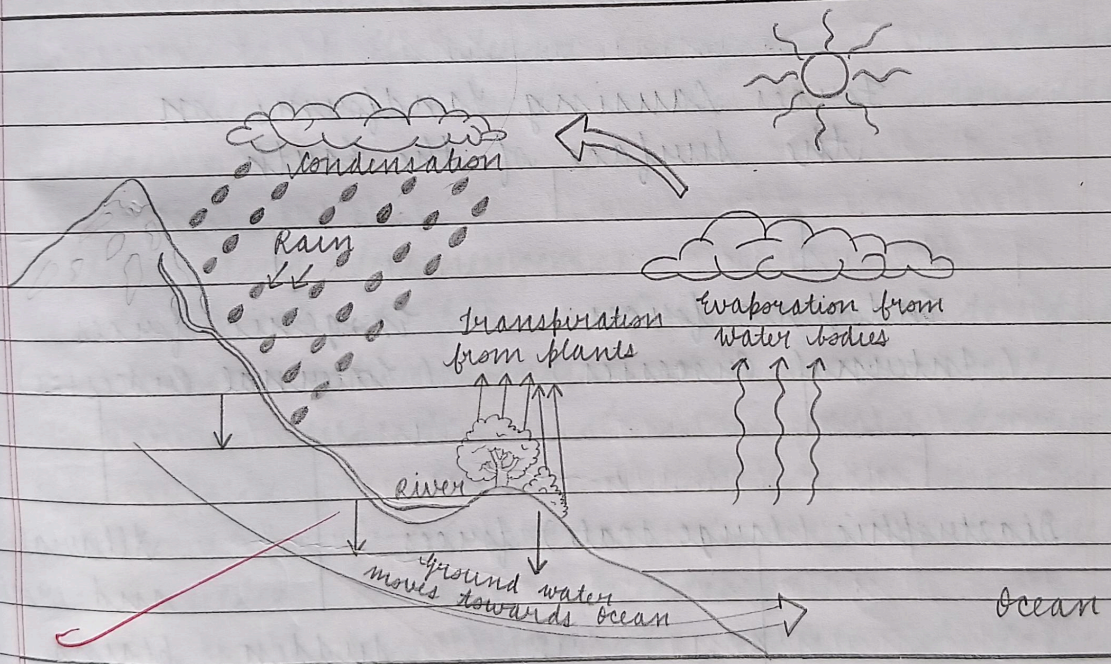


Carbon cycle

Nitrogen cycle - Atmosphere is the largest reservoir (78% approximately) of free nitrogen. Plants take nitrogen in the form of nitrates from the soil and it moves through the food chain to animals. Nitrogen is returned to the soil through manure, excreta and earthly remains of

plants and animals, and micro-organisms.

Oxygen cycle - Living things take in oxygen from the atmosphere. They use it to release energy from the food they eat. Oxygen is also used together with carbon, hydrogen and nitrogen to build new molecules in their bodies. Oxygen is released back into the atmosphere by green plants during photosynthesis and by plants and animals as part of carbon dioxide.



Watercycle - the movement of water between the Atmosphere, Hydrosphere and Lithosphere