Earth's Structure

Exercises

I. Short Answer Questions

Question 1.
Name the sources of information about forces operating inside the earth.
Answer:
Information about forces operating inside the earth is taken by the study of seismic waves, materials thrown up by volcanoes and the evidence from the theories of the origin of the earth.

Question 2.
In which part of the earth is NIFE found ? What it is composed of ?
Answer:
NIFE is found in the inner core of die earth. NIFE is composed of Nickel (Ni) and Iron (Fe), being heavy metals and having high density, these are found deep inside the earth.

Question 3.
What are the consequences of the pressure and temperature in the interior of the earth ?
Answer:
Due to the extreme temperature of 2200° C, every matter is in liquid and gaseous state in the interior core, the temperature in the mantle ranges from 870° C to 2200° C, so things are in semi – liquid to liquid state, the crust, a layer of 60 km, breadth, is made of solid rocks with a density of 2 – 3, g/Cm^3. The density goes on increasing to 3-4g/Cm^3 in the mantle and 10-13 g/Cm^3 in the core.

Question 4.
What is the lithosphere ?
Answer:
The crust is called Lithosphere made of solid rocks with a thickness of 60 km. below high mountains and 6-12 km below the oceans.

Question 5.
Name the three layers of the earth's interior.
Answer:
The three layers of earth's interior are:

1. Core
2. Mantle

3. Crust

Question 6.
State two chief characteristics of the earth's crust.
Answer:
The crust is made of solid rocks and divided into oceans and continents.

Question 7.
Describe the mantle. State its two chief characteristics.
Answer:
Mantle lies between 60 – 2900 km. depth. It is divided into two parts namely upper mantle and lower mantle, which are in the form of solid rocks and semi-molten rocks respectively.

Question 8.
Where is asthenosphere found ? In which form does it exist ?
Answer:
At the depth of 100 – 250 km. The mantle is partially molten and known as asthenosphere, with a temperature of 1100°C.

Question 9.
Write one difference between Moho Discontinuity and Gutenberg Discontinuity.
Answer:
Moho Discontinuity is the boundary between crust and mantle and Gutenberg Discontinuity is the boundary between mantle and core.

Question 10.
Why is the earth's interior in most part found in a solid state despite great heat and pressure ?
Answer:
The solid state of the inner core is due to high density and pressure which have compressed molten rock material and keep this layer firm and solid in some parts due to high pressure inspite of the temperature of 5000°C.

Question 11.
Name two types of earth movements.
Answer:
Two types of movements are due to isostasy and tectonic plates. Isostasy is the process of natural balance between different landforms and the sliding movement of the tectonic plates of the earth's crust.

Question 12.
What is Geology ?
Answer:
Geology is the science dealing with the origin and types of rocks found in the interior of the earth.

II. Give reasons for each of the following

Question 1.
The study of meteorites helps scientists to know about the interior of the earth.
Answer:
At the time of the origin of the earth every planet and meteorites were floating in the space and the materials of the earth were same as that of the meteorites. So, the scientists can calculate the composition of rocks ofthe earth by studying the materials found in the meteorites.

Question 2.
Temperature starts rising gradually towards the interior of the earth.
Answer:
Due to enhancing density and pressure the temperature goes on increasing gradually towards inside of the interior of the earth.

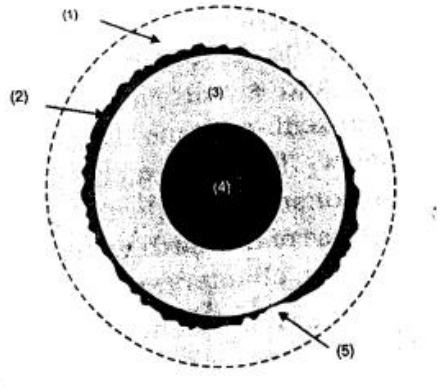
Question 3.
The asthenosphere is in a semi-molten state.
Answer:
At the depth of 100 – 250 km the mantle is partially molten and known as asthenosphere due to the temperature around 1100°C along with greater pressure and density.

Question 4.
The inner core is in a solid state.
Answer:
The high pressure in the interior core keeps this layer firm and solid in some parts, in spite of the temperature as high as 5000°C.

Question 5.
The continents are placed above the oceans.
Answer:
The density of continents is lesser than the layer supporting the ocean beds, so the continents came floating upwards at the time of the formation and solidification of the earth, as the lighter things come upwards floating over the heavier things i. e. Sial is lighter than Sima

III. Long Answer Questions

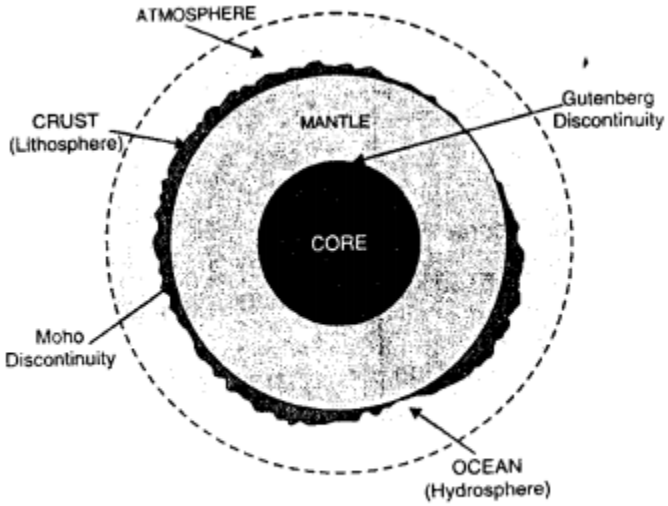
Question 1.
Look at the figure on the side and answer the questions:



(a) Label the parts : (1), (2), (3), (4) and (5).
(b) Name the state (solid, liquid or gas) in which each part exists.

Answer:
(a)

1. Atmosphere
2. Lithosphere
3. Mantle
4. Core
5. Hydrosphere.



Layers of the Earth

(b)

1. Atmosphere — Gas
2. Lithosphere — Solid
3. Mantle — Semi-solid
4. Core — Molten state or liquid
5. Hydrosphere — Liquid (water)

(c) What part is suitable for human habitation? Why? Ans. Outer part of the earth is suitable for human habitation due to favourable conditions for survival, i.e. atmosphere for air, Lithosphere for settlement due to ideal temperature and land, hydrosphere for hydrological cycle for providing rainfall and fresh water bodies on the earth and oceans for navigation and trade routes etc.

Question 2.
Describe the layers of the interior of the earth and their chemical composition.
Answer:
The interior of the earth is divided into three major parts i.e. crust, mantle and core. The crust consists of majority of, silica and aluminium and is called 'SIAL', mantle is called SIMA due to the majority of silica and magnesium and is called SIMA, which makes the bed of oceans and the core is called NIFE with excess of Nickel and Iron (Ni + Fe).

Question 3.
There are two transitional zones between the two consecutive layers of the interior of the earth. Name them and state their chief characteristics.
Answer:
The transitional zone between crust and mantle is Moho Discontinuity which is the dividing zone between solid and semi-solid state of rocks due to the increasing temperature as the depth increases. The boundary between mantle and core is known as Gutenberg Discontinuity, below this zone both density and temperature going on increasing. The density is more than 13 and temperature is more than 2200°C.

Question 4.
Explain the layers of the interior of the earth with reference to the following :

(a) Depth,
(b) Temperature
(c) Density.

Answer:
Crust :

(a) Depth 35-50 km below continents and 6-12 km. below the oceans.
(b) Temperature — Less than 870°C
(c) Density — 2.7 g/Cm^3 – 5.5 g/Cm^3.

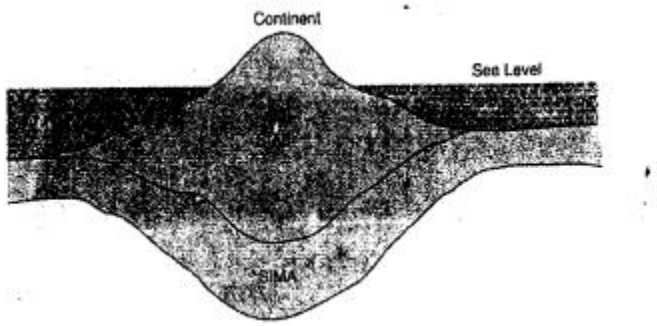
Mantle :

(a) Depth — 50 – 2900 km.
(b) Temperature — 1500° C – 2200°C
(c) Density — 3 g/Cm^3 – 4.5 g/Cm^3

Core :

(a) Depth — 2900 km – 3500 km
(b) Temperature — 2200°C – 5000°C
(c) Density — 10.0 g/Cm^3 – 13.6 g/Cm^3.

Question 5.
Study the figure on the side and answer the questions:



(a) What is known as Sial ? How deep is the area marked by Sial ?
(b) What role does Sima play ?
(c) Why is the expression 'Nife' so called ?
(d) Which layer is responsible for earth's magnetic field ? Why?
(e) What happens to the continents if there is an earthquake?

Answer:

(a) Sial is the upper layer or crust of the earth. The name Sial is based on the excess of Silica and Aluminium. The depth of Sial is 60 km.
(b) Sima is the second layer of earth which gives support to the ocean beds. There is the excess of Silica and Magnesium.
(c) 'Nife' means Nickel (Ni) and Iron (Fe) due to the majority of Nickel and Iron in the core,
(d) Core of earth is responsible for earth's magnetic field because it is composed of iron and nickel which is responsible for earth's magnetism. Magnetic field is oriented towards North and South Poles.
(e) Several drastic changes may occur during the earthquake. It depends on the intensity of the earthquake. If intensity is 8 or more buildings may break up, casualties and major changes on the landforms as broad breaking gaps, origin or disappearing of several small islands.

Practice Questions (Solved)

Question 1.
Which are the two most abundant chemical elements in the Earth's crust ?
Answer:
Oxygen and Silicon.

Question 2.
Why does the Sun not rise at the same time everywhere in the world ?
Answer:
If the Earth were flat, the whole world would have the sunrise and sunset at the same time. As the Earth is spherical and rotates from West to East, places in the East see the Sun earlier than the places in the West.

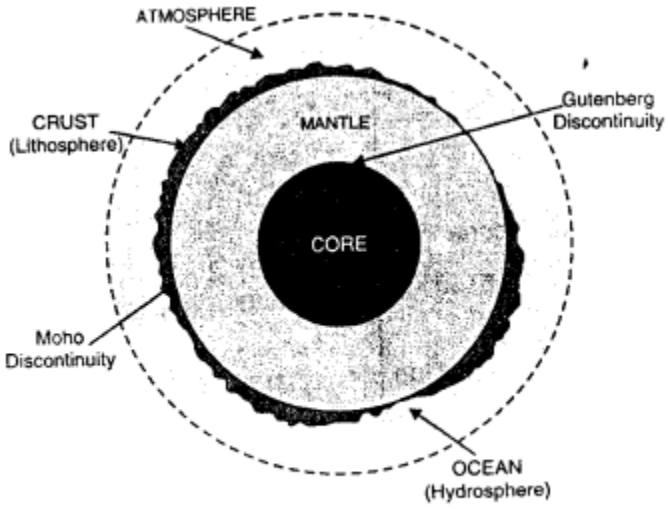
Question 3.
"The whole of the approaching ship is not visible at one time." Why ?
Answer:
The Earth has a spherical snape. Along its curved surface, the appearance of a ship is gradual. We see first the smoke, then the mast and then the hull. If the Earth were flat, the entire ship would be seen all at once.

Question 4.
"Even when the Earth is spherical, it appears to be flat." Discuss.
Answer:
The actual shape of the Earth is spherical. The curvature of the Earth is small as compared to its big size. For a small area upto 100 sq. miles, this curvature is negligible. Therefore, it appears flat.

Question 5.
Why is the Earth slightly flattened at the poles ?
Answer:
The Earth is not a perfect sphere. It is slightly flattened at both the poles. It is due to the centripetal force produced by the rotation of the Earth.

Question 6.
Explain briefly the structure of the earth.
OR
Discuss the structure of the earth giving details about each of its layers and arguments in support of your contention.
Answer:
The structure of the earth means the interior of the earth.
The entire earth is composed of three zones

1. Lithosphere
2. Mesosphere and
3. Barysphere.



Layers of the Earth

(i) The Crust or Lithosphere It is the outermost layer. Its thickness varies from 8 to 60 kms. It is solid and is formed largely of igneous rocks. The crust consists of two layers.

1. a lower, continuous layer of basaltic (mafic) rocks and
2. and upper layer of granitic (felsic) rock, which constitutes bulk of continents. It is absent in ocean basins. These parts of the crust forming the continents are much thicker than the crust under the oceans. Its main universal constituents are Silica and Aluminium. It is collectively known as 'SIAL'. It has an average density of 2.7. The lower layer has an average density of 3.0. It main mineral constituents are

Silica (SI) and Magnesium (MA) and is therefore called 'SIMA'. Since the SIAL is lighter than the SIMA, the continents can be said to be floating on the layer of denser SIMA.

(ii) Mantle or The Mesosphere Beneath the crust or Lithosphere lies the Mantle or Mesosphere. Its thickness is 2840 km. Its density is 3.1 to 5.0. It depth is 2900 km. It is again divided into two sub layers.

1. the internal Silicate layer (SIMA). Its thickness is 1140 km and density varies from 3.1 to 4.75 and
2. Mixed layer of metals and silicates. Its thickness is 1700 kms. and density is 4.75 – 5.0.

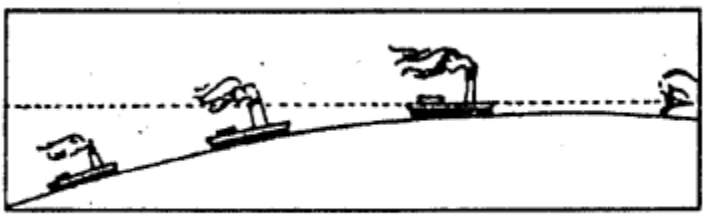
(iii) Core or the Barysphere It is the central nucleus. It is made up of dense rock materials – Nickel and Iron. It is also called the layer 'NIFE'. Its thickness is 3471 km (radius of core). It is again divided into two sub-layer

1. The outer core is liquid or plastic in nature and
2. Inner core (Barysphere) which is solid and rigid because of tremendous overlying pressure. The density of core is 5.1 to 13.

Question 7.
Where is Mantle located in the Earth ?
Answer:
The Mantle or Mesosphere is located between 2850 – 2900 km beneath the earth crust.

Question 8.
Describe any three experiments to prove the Spherical Shape of the Earth.
Answer:

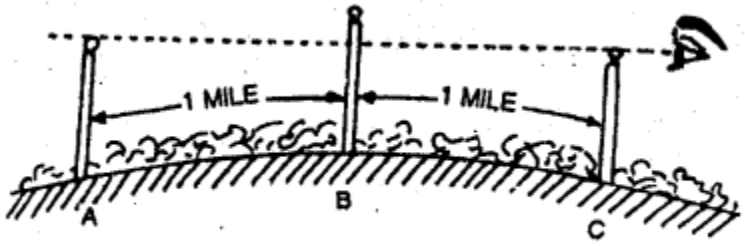
1. If you observe a ship approaching sea coast, the top of the mast is seen first and the hull, lower parts are seen gradually. Due to the curvature of the Earth, the whole ship is not seen at one time.



Bedford level experiment.

2. Fix three poles of equal length at equal distance on the ground. These do not give a horizontal level. The top of the middle pole looks higher than the other two poles due to the curvature pf the Earth. This experiment was done by Mr A.R. Wallace

on Bedford canal.



Bedford level experiment

3. If you look around at the Earth's horizon (where Earth and sky appear to meet), it will everywhere and always appear circular. It widens with increasing altitude due to Spherical Earth.

Horizon