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Earth's interior structure: Crust, Mantle and Core free pdf

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The interior structure and materials of the Earth

Earth's interior structure: we are going to study about lithosphere which is the most important component of our environment.

- "The solid outer crust of rocks forming the surface of the earth is called the lithosphere. "The word 'litho' means rock or stone and 'sphere' means domain. The term lithosphere thus can be described as 'rocksphere'.

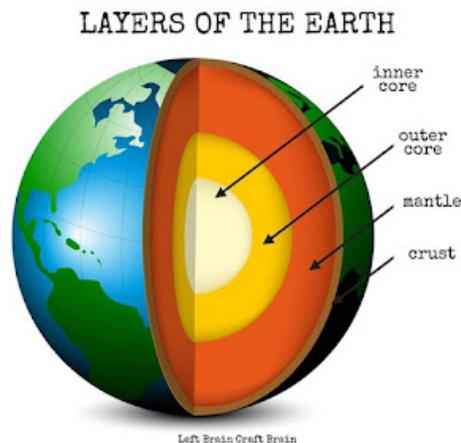
food supply also come from this sphere. For a better understanding of this outer shell of the earth one has to know some facts about the internal structure of the earth.

- The crust: The crust is the uppermost layer of the earth and is also called the lithosphere. It is made up of various types of rocks in solid form. The most important rocks forming the base of the lithosphere are the igneous rocks. The sedimentary and metamorphic rocks constitute a larger part of the lithosphere. The thickness of the crust varies between 6 km to 48 km. On the basis of its composition, the crust is divided into two parts. 1. Sial 2. Sima

Interior structure of the earth

Most of the scholars agree that the earth can be divided into three major layers:-

1. The crust
2. The mantle
3. The core



1. The crust:

1. The outer lighter part is the upper crust or the sial zone.
2. Silicon and aluminium are the two most important constituent elements of this outer part of the crust.
3. It is due to the dominance of these two minerals in this upper part of the crust that it is called 'sial' layer.



1. The mantle is the intermediate layer between the crust and the core of the earth. Having an average thickness of 29 km.
2. The upper part of this layer is known as asthenosphere.
3. This layer consists of mixed silicates and metallic minerals and the rocks in this part of the earth are in a plastic or molten state.
4. Mean density of this layer is 4.5 g/cm^3 . Due to its high density than that of the crust, the lithosphere is considered as floating over the asthenosphere.

3. The core:

1. The core of the earth has a radius of about 3,500 kilometres. Occupying the centre of the Earth this layer is also called the centrosphere.
2. The density of rocks in this part of the Earth is the highest. The major constituents of this layer are the metallic minerals like nickel (Ni) and iron (Fe) due to which the core is called Nife.
3. The temperature in the outer core is extremely high and all minerals melt at this high temperature due to a great pressure of the overlying strata. The rocks in the central part of the core behave more like solids rather than like liquid material.

Materials of the Earth :

Rocks and minerals:

- A rock can be defined as an aggregate of minerals.
- Earth is made up of rocks and minerals. The rocks forming the crust of the earth are in a solid state.
- Any mass of harder portion of the earth's crust can be called a rock. They make up most of the solid material of the lithosphere. It has no definite composition. Most of the rocks are mixtures of various minerals in different proportions.
- Rocks may be hard or soft. A mineral is a naturally occurring substance having a definite chemical composition and physical properties.
- A rock having a large proportion of a single main mineral so that the mineral concerned can be extracted economically from it is called an ore of the mineral. Magnetite, an ore of iron is an example of such rocks.

^ major types of rocks are:

1. Igneous rock
2. Sedimentary rocks
3. Metamorphic rocks

which of this broad groups can be further subdivided on the basis of their physical and chemical properties.

1. Igneous rocks:

Igneous rocks are those rocks which have solidified from the molten material for the lava ejected from the interior of the earth.

Due to high temperature in the interior of the earth the rocks are in a molten state. This molten material is called **magma**. This material is ejected from the interior of the earth to the surface through volcanic activity. The volcanic material may be in a solid or liquid state. Volcanic material that flows on the surface of the earth is called **lava**.

Igneous rocks are formed through deposition and solidification of volcanic material. Igneous rocks are the thermal origin. Since they were the first rocks to be formed so igneous rocks are also known as primary rocks.

Igneous rocks are generally hard, have no layers and do not contain fossils. Most of them besides being crystalline are impervious, water cannot percolate through them.

Igneous rocks are generally compact and do not get eroded rapidly. They therefore make good building materials. Granite, basalt, gabbro, feldspar, pumice and scoria are examples of these rocks. Ores of the most metallic minerals are

Characteristics of Igneous Rocks

1. These rocks are hard massive and compact.
2. These rocks are formed by the cooling and hardening of the earth material and size of rocks depends upon the rate of cooling of lava and magma.



2. Sedimentary rocks:

sedimentary rocks are formed through consolidation of sediments deposited in water bodies like rivers, lakes and seas. The sediments are derived by denudation of The rocks by agents of erosion like rivers, glaciers, winds and waves. These agents of erosion carry the eroded particles of rocks of the water bodies and deposit them there. Search deposited material is called **sediment**.

Sediment contains loose particles of gravel, sand, silt and clay in various proportions. over a period of time a significant thickness of sediments accumulates and it gets consolidated or compacted to form hard rocks. The consolidation of sediments takes place due to pressure of overlying materials and presence of cementing substances like lime.

As they are formed through the process of sedimentation the rope formed in this manner are called sedimentary rocks. They are also called secondary and derived rocks as they are derived from other rocks.

Characteristics of Sedimentary Rocks

1. Sedimentary rocks are found in layers so they are known as stratified rocks.
2. Most of these rocks contain fossils which are in the form of prints of leaves insects shells awesome hard part of all living things.
3. Sedimentary rocks have pores in which water can easily enter.
4. These do not have any type of crystals.
5. These rocks are prone to weathering because these are soft.
6. These hold reserves of coal, oil and natural gas.
7. The sedimentary rocks contain layers and they are generally soft.
8. They can be scratched easily. Most of them are porous and permeable. Very often the remains of plants and animals may get preserved in the layers of sediment.
9. Such remains are called fossils. Most of the fossils are found in sedimentary rocks.
10. Fossils help in determining the age of the sedimentary rock.

3. Metamorphic Rocks:



^ Metamorphism of rocks takes place when they are subjected to high temperature of pressure. Due to extreme pressure generating heat or by coming in contact with volcanic material the original minerals found in a rock are altered and new minerals are formed.

The joints in the rocks are pressed and often crystallization also occurs. These rocks are considered good for using as building materials as these are formed generally more compact harder and bulky than the original rock.

Metamorphic rocks may have layers but these layers are highly compressed generally fossils are not found in these rocks. Most of the metamorphic rocks are impermeable. The process of metamorphism may take a very long time. Under pressure or heat various sedimentary and igneous rocks are metamorphosed to produce new rocks.

Sand stone for example may be changed into quartzite, limestone into marble, clay and shale into slate, granite into gneiss, basalt into schist and coal into graphite.

Metamorphic rocks are associated with the number of valuable. Metallic minerals including gold and silver are often found in metamorphic rocks.

Characteristics of Metamorphic Rocks

1. These rocks are very hard and have close banded structure.
2. Metamorphic rocks are formed when igneous or sedimentary rocks are transformed by the action of intense heat and pressure.
3. The formation of metamorphic rocks takes place over a long period of time.

What are Minerals?

1. **"The individual chemical substances which make up rocks are called minerals."** Most of the minerals are naturally occurring inorganic substances.
2. A mineral may be made up of atoms of a single element or of more than one element combined together in a definite proportion.
3. Some of the minerals made up of a single element are sulphur, gold, diamond and graphite. Some examples of the minerals made up of more than one element are: quartz (SiO_2) haematite (Fe_2O_3), galena (PbS) and calcite (CaCO_3).



6. There are more than 2000 minerals present in the earth's crust. The formation of different minerals from the same elements tells us about the different conditions prevailing at different regions inside the earth where they are formed. for example the carbon atoms present in the upper part of the earth.
7. join to form a soft mineral called graphite having loosely held layers of carbon atoms. This tell us that the pressure and temperature are not very high where graphite mineral is formed inside the earth.
8. on the other hand the same carbon atoms present deep inside the earth join to form the hardest natural substance called diamond having strongly held carbon atoms. This tells us the presence of great pressure and high temperature deep inside the earth.
9. The two most abundant elements in the earth's crust are silicon and oxygen. **The compounds containing a metal silicon and oxygen joined together are called silicates.**
10. Silicates are the most common Rock forming minerals. For example the rocks like granite, sandstone and shale are all made up of silicate minerals. Infact granite, sandstone and shale are called silicate rocks.

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