INSIDE OUR EARTH

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CHAPTER

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➢ INTRODUCTION

The earth is the only planet in the solar system which supports life. It is a dynamic planet, In which changes are constantly taking place. The three realms of our earth are **land** (lithosphere), **water** (hydrosphere) and **air** (atmosphere). What lies in the interior of earth has always been a mystery for most of us.

➢ STRUCTURE OF THE EARTH

The earth is made up of **concentric layers with** one inside another (just like in an onion). Three main layers of the earth are the **crust**, the mantle and the core.

(1) The crust :-

(i) The outermost and thinnest of all the layers.

(ii) It is also called **lithosphere**, as it is a sphere of solid rocks.

(iii) Its thickness is about 35-40 km on the continental masses and only about 5-10 km on the ocean floors.

(iv) The continental mass is made up of rocks and main mineral constitutents are silica and alumina (**SIAL**).

(v) The main constituents of the rocks of the oceanic crust are silica and magnesium (**SIMA)**.

(vi) The crust forms less than one per cent of the radius of th earth.

(2) The Mantle :-

(i) Lies just below the crust and it extends up to a depth of about 2900 km, below the crust.

(ii) At the depth of about 100-250 km, the mantle is partially molten.

(iii) This region is known as the **asthenosphere**.

(iv) The temperature in the mantle increases with the increase in depth, and ranges between 870ºC (upper layer) and about 2200ºC (lower layer).

(v) The density of the mantle varies between 3 g per cm^3 at the top and 4.5 g per cm^3 at the bottom.

(3) The Core :-

(i) The innermost layer of the earth and has a radius of about 3500 km.

(ii) It is the most inaccessible layer lying around the centre of the earth .

(iii) It is the heaviest part of the earth and is made up of nickel (Ni) and ferrous (Fe). Thus, it is alos called **NIFE**.

(iv) The estimated temperature is about 2200ºC to 5000ºC to.

(v) The layer is thought to be in the molten state, but the very high pressure keeps this layer firm and solid.

(vi) The density varies from 5 g per cm^3 to about 13.90 g per cm^3.

➢ ROCKS AND MINERALS

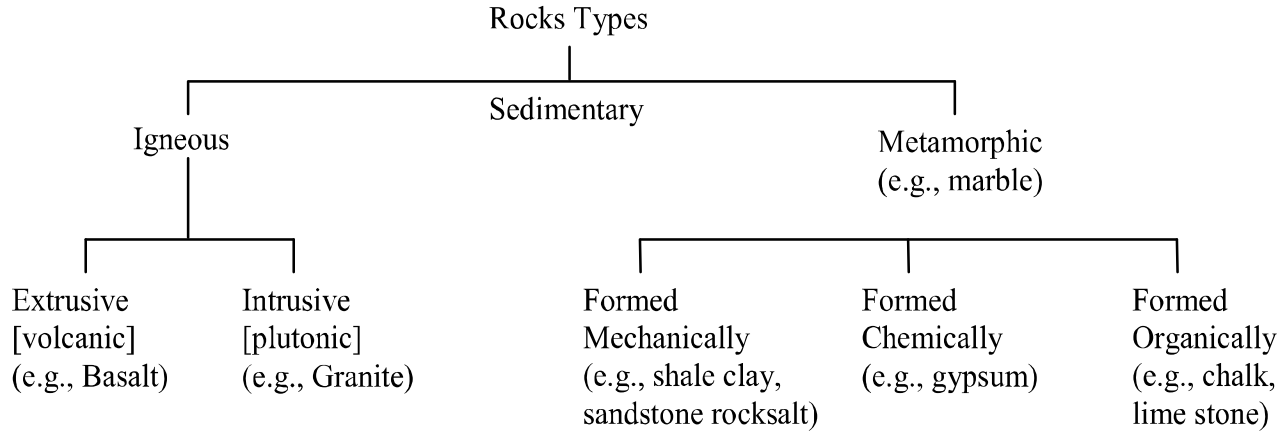
The lithosphere or the crust of the earth is made up of a large variety of rocks. The **rocks** are defined as any natural mass of mineral matter that makes up the crust of the earth. The rocks differ from one another in colour, structure, texture, mode of occurrence, etc. The scientists have recognised more than 2000 mineral elements in the rocks, but only a few are important. The crust of the earth contains more of silicon and aluminium.

According to the mode of formation, the rocks of the eath's crust are of the following three major types.

(1) The Igneous rocks

(2) The Sedimentary rocks

(3) The Metamorphic rocks



➢ THE IGNEOUS ROCKS

(i) The term 'igneous' has been derived from the Latin word '**ignis**' which means fire.

(ii) The igneous rocks are associated with volcanic eruptions.

(iii) The hot molten material, called **magma**, is found at great depths in the interior of the earth.

(iv) The magma is brought on the surface of the earth during the volcanic eruptions.

(v) When the molten magma (now called **lava**) cools and solidifies, the igneous rocks are formed.

(vi) These rocks were first to be formed and are called the **primary rocks**.

(vii) The igneous rocks are hard, smooth, finegrained, compact or have large crystals.

(viii) These rocks do not have fossils of animals or plants.

(ix) The igneous rocks have silicate minerals and most of the metals, such as iron, aluminium, gold, etc. are found in them.

(x) The igneous rocks are of two types –(A) The Extrusive Igneous rocks, and (B) The Intrusive igneous rocks.

(A) The Extrusive Igneous rocks :-

(i) Formed by the cooling of molten lava on the surface of the earth.

(ii) The hot lava cools down rapidly and becomes solid.

(iii) These rocks are smooth and have a fine grained structure, such as **basalt.**

(v) The Deccan plateau of India is made up of basalt rocks.

(B) The Intrusive Igneous rocks :-

(i) Formed when the hot molten magma cools down and solidifies deep inside the crust of the earth.

(ii) The slow rate of cooling forms coarse textured hard rocks with large crystals, such as **granite**.

(iii) The grinding stones are generally made of granite.

➢ THE SEDIMENTARY ROCKS

(i) When the igneous rocks are exposed on the earth's surface, they are broken down by the agents of weathering into small fragments. The small fragments, called **sediments**, are carried away and deposited by the agents of gradation, such as rivers, glaciers, wind and sea waves.

(ii) The loose deposited sediments are compressed and hardened due to the weight of new layers of sediments. The sediments are cemented together to form sedimentary rocks. The sedimentary rocks are the **secondary rocks** as they are formed by the solidification of sediments derived from igneous, sedimentary or metamorphic rocks.

(iii) The sedimentary rocks are softer than the igneous rocks and may also contain fossils of plants, animals and other organisms that once lived on them.

(iv) These rocks are mostly formed under water and have horizontal layers.

(v) The sedimentary rocks are most widespread and cover about 75 percent of the surface area of the earth.

(vi) These rocks can create extensive landforms.

(vii) Coal and petroleum are the most important products derived from the sedimentary rocks.

(viii) Sandstone is made from grains of stone.

➢ THE METAMORPHIC ROCKS

(i) The term 'metamorphic' has been derived from '**metamorphose**', which means change in form. The rocks which were once igneous and sedimentary can change under great heat and pressure into metamorphic rocks.

(ii) The minerals in the rocks may change their composition and texture under high temperature and pressure.

(iii) **For Example,** the limestone can change into marble and clay can change into slate.

(iv) The metamorphic rocks are generally hard and have high specific gravity.

➢ SIGNIFICANCE OF ROCKS

(i) The rocks are of great use as they are composed of various minerals.

(ii) Soils are derived from the weathering of rocks.

(iii) Almost all types of building materials needed for making roads, houses, buildings, bridges, etc. are derived from rocks.

(iv) Rocks are a source of metals like iron, copper, gold, silver, etc.

(v) Some minerals are used as fossil fuels such as coal and petroleum.

(vi) They are also used in industries-Iron, Aluminium.

➢ ROCK CYCLE

(i) The change of one type of rock into another type of rock under certain conditions in a cyclic manner is called the **rock cycle.**

(ii) The hot molten magma cools and solidifies to form igneous rocks.

(iii) The different agents of weathering break the igneous rocks into small fragments.

(iv) These small fragments of igneous rocks are carried and deposited by the agents of gradation to form sedimentary rocks.

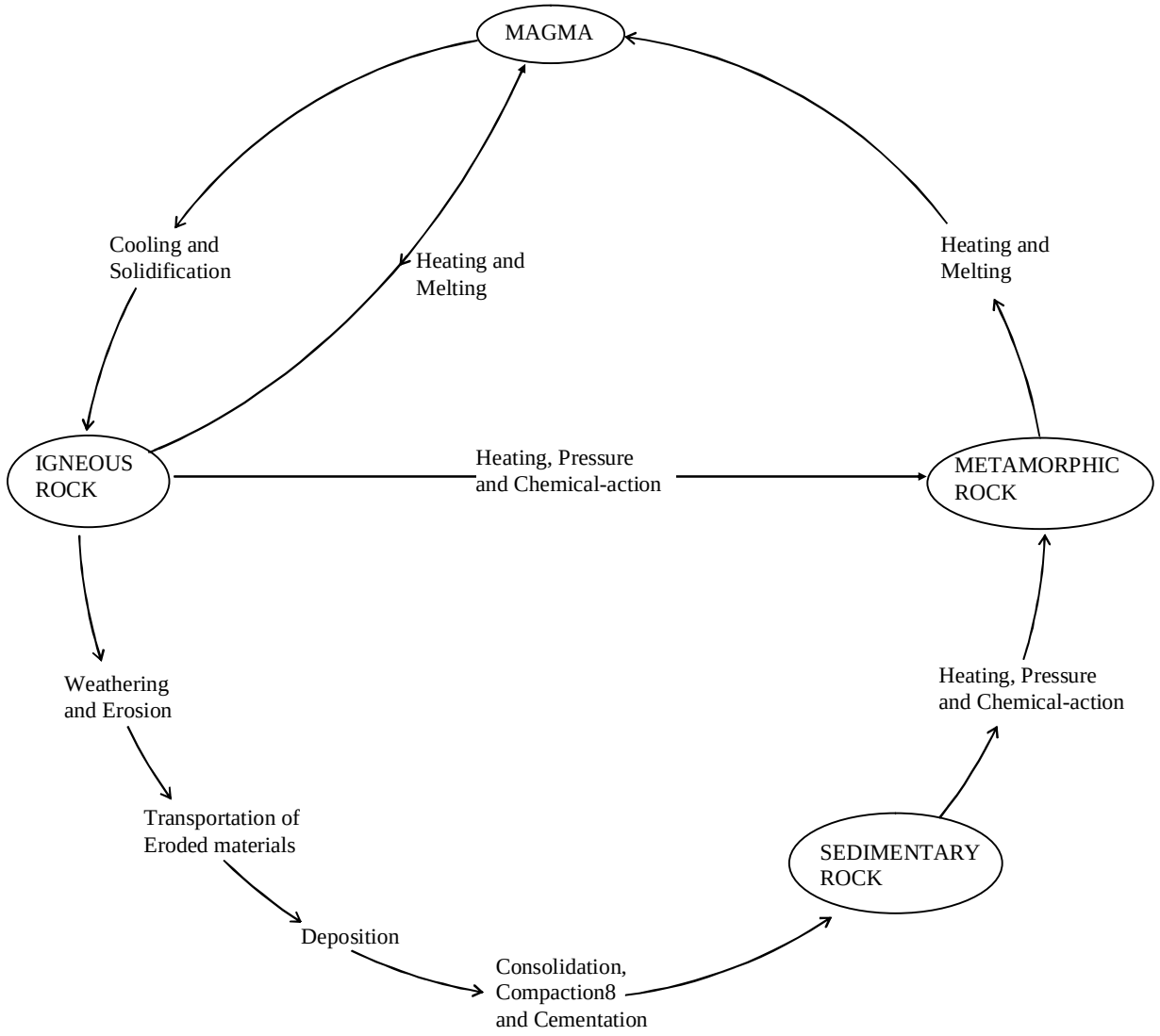
(v) The igneous and sedimentary rocks thus formed can be subjected to great heat and pressure.

(vi) This can change them into metamorphic rocks.

(vii) At many places, the great heat and pressure can melt the metamorphic rocks to form the molten magma.

(viii) This molten magma can cool down and become to form igneous rocks again.

- ❖ The rock cycle derives energy from inside the earth and also from the Sun.
- ❖ The rock material of the earth is never lost in the rock cycle.
- ❖ The rock cycle on the earth's surface has neither a beginning nor an end



FLOW CHART OF ROCK CYCLE

➢ ROCK DISTRIBUTION IN INDIA

(i) Granite is found in Rajasthan, Madhya Pradesh, Chota Nagpur Plateau, Karnataka. Tamil Nadu Andhra Pradesh and Deccan trap region (Maharashtra).

(ii) Sandstone occurs in Vindhyachal and Aravali ranges. Limestone occurs widely in peninsular India. Coal mines occur in the basins of rivers Godavari. Mahanadi and Damodar, Marble is found in Rajasthan . The Indo-Ganetic plain is of sedimentary accumulation.

(iii) Rocks have great economic value. The cotton soil found in the Deccan trap is a product of extrusive igneous rocks. Other soils like alluvium are also result of disintegrated rocks. Stones used in construction of houses and roads, dams, etc. are all rock products. Rocks are source of previous and useful metals. Iron ore, bauxite, copper, lead, zinc and gold are found in igneous rocks. Non-metallic minerals include sulphur which is used for medicinal purposes. Coal and Petroleum are important sources of energy.