2 Inside Our Earth

Lesson Plan

Contents

- An overview of the interior of the Earth
- To understand what lies inside the Earth and the layers that compose it

Objectives

- To understand the interior of the Earth, and composition of the lithosphere
- To learn the constituents of the lithosphere
- To know about rocks and minerals and their significance
- To appreciate the rock cycle

Teacher's Aids

- Globe
- Clay models of the interior and crust of the Earth
- Pictures, atlas and wall maps
- Blackboard
- Internet

Tips for Teacher

- Explain what constitutes the interior of the Earth and how we learn about it.
- Describe and explain the Earth's crust, the lithosphere, and its composition.
- Describe the various types of rocks, their formation, location, etc., and their significance.
- Using the diagram given at page 13, explain the rock cycle, and make the students draw it.
- Students should be encouraged to know places, locations and their placement on the maps.

Background and Reading

- Read the lesson aloud and explain, sharing the aids, etc., pausing to examine and explain the data in the boxes.

- Particularly focus on the interior, the composition of rocks and their location, their significance and the rock cycle.

The Interior of the Earth

- Very high temperature – therefore, we study it through volcanic activity and seismic waves [earthquakes].

Layers

- Concentric layers – the crust, the mantle and the core

Lithosphere

- Crust – the topmost and thinnest layer – also called lithosphere – solid rock for 35-40 km on continental mass and about 5-10 km on ocean floors; forms less than 1% of the Earth's crust.
- Continental mass – rocks and minerals, mainly silica and alumina [SIAL]
- Oceanic crust – rocks and minerals, mainly silica and magnesium [SIMA]

Mantle

- Just below crust – extends to depth of about 2900 km – at depths of 100-250 km it is partially molten – called asthenosphere.
- Temperature increases with depth – ranges from 870° C [upper layer] to 2200° C [lower layer]
- Density – 3 g per cm^3 at top to 4.5 g per cm^3 at bottom.

Core

- Innermost layer – radius of about 3500 km – inaccessible – heaviest part of the Earth – made up of nickel [Ni] and ferrous [Fe] – called NIFE
- Estimated temperature – 2200° C to 5000° C
- Perhaps in molten state, but kept solid by high pressure
- Density – 5 g per cm^3 to about 13.90 g per cm^3.

Rocks and Minerals

- Any natural mass of mineral matter making the Earth's crust – large variety – colour, structure, texture, mode of occurrence, etc. – Over 2000 mineral elements but few important – silica and aluminium on crust.
- Three major types: Igneous, Sedimentary and Metamorphic

The Igneous Rocks

- Latin ignis means fire – Igneous rocks – associated with volcanic eruptions.

- Magma – hot molten material – in the Earth's interior – brought to surface during volcanic eruption – called lava – cools and solidifies into igneous rocks.
- First to be formed – called primary rocks.
- Two types: (a) Extrusive – formed by hot lava cooling rapidly on Earth's surface, solidifies into smooth, fine-grained structure, like basalt – as in Deccan Plateau.

  (b) Intrusive – formed when hot molten lava cools slowly deep inside crust and solidifies into coarse-textured hard rocks like granite – used for making grinding stones, etc. – found in all continents.
- Hard, smooth, fine-grained, compact or with large crystals – no fossil remains of animals or plants – silicate minerals and most of the metals like iron, aluminium, gold, etc.

The Sedimentary Rocks

- Exposed igneous rocks broken down by weathering into small fragments – called sediments – carried away and deposited by agents of gradation [rivers, glaciers, wind and sea waves]
- Loose deposited sediment compresses and hardens due to weight of new layers – cemented together – form sedimentary rocks – secondary rocks derived from igneous, metamorphic and other sedimentary rocks.
- Softer than igneous – may contain fossils of plants and animals – mostly formed under water – have horizontal layers.
- Widespread and cover most of Earth's surface – extensive landforms – coal and petroleum, most important products.

The Metamorphic Rocks

- Metamorphose means to change forms – igneous and sedimentary rocks change under great heat and pressure to form metamorphic rocks.
- Minerals in them change form under high temperature and pressure: limestone $\rightarrow$ marble; clay $\rightarrow$ slate.
- Generally hard and have specific gravity.

Significance of Rocks

- Of great use because composed of various minerals.
- Soils derive from weathering of rocks.
- Building material derived from rocks – roads, houses, buildings, bridges, etc.
- Source of metals like iron, copper, gold, silver, etc.
- Source of fossil fuels like coal and petroleum.

The Rock Cycle

- It is the change of one type of rock into another type under certain conditions in a cyclic manner.

- Hot molten magma → [cools and solidifies] Igneous Rock → [weathering breaks it into fragments – carried and deposited by agents of gradation] Sedimentary Rock → [heat and pressure] Metamorphic Rock → [heat and pressure – melts the rocks] Magma → and the cycle begins again.
- Explain the Rock cycle using the diagram at page 13.

Assessment Corner

Oral Assignment

A. Ask for answers at random from the students. Confirm the right answers. Let them write down the correct answers if they like in their books.

Written Assignment

B–G. The teacher has two options – (i) Either do these exercises orally first and then ask the students to write them down. OR (ii) Ask the students to write the answers on their own. Then the teacher can announce the correct answers to the students and ask their partners to cross-check them.

In either case, the answers can be written as homework and the teacher can check them in the class.

Think Tank

G. HOTS questions: Discuss the questions in class and let students write the answers to H and I as homework. Teacher should assess individual work.