Study's Note

GEOGRAPHY

CLASS – VII CHAPTER-2

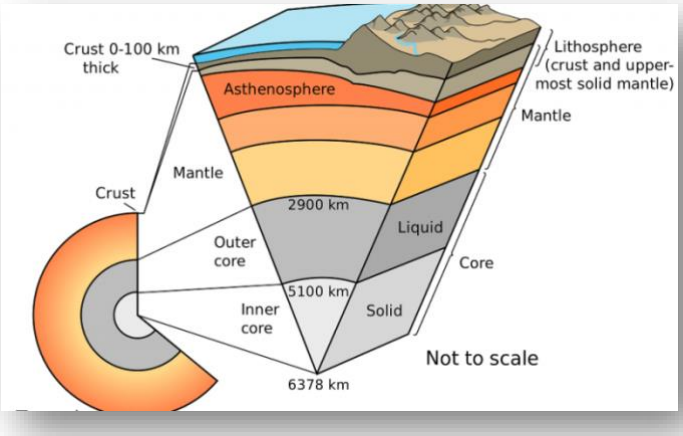
INTEIOR OF EARTH

What should you understand about the interior of the earth?

- It is not possible to know about the earth's interior by direct observations because of the huge size and the changing nature of its interior composition.
- It is an almost impossible distance for the humans to reach till the centre of the earth (The earth's radius is 6,370 km).
- Through mining and drilling operations we have been able to observe the earth's interior directly only up to a depth of few kilometers.
- The rapid increase in temperature below the earth's surface is mainly **responsible for setting a limit to direct observations inside the earth.**

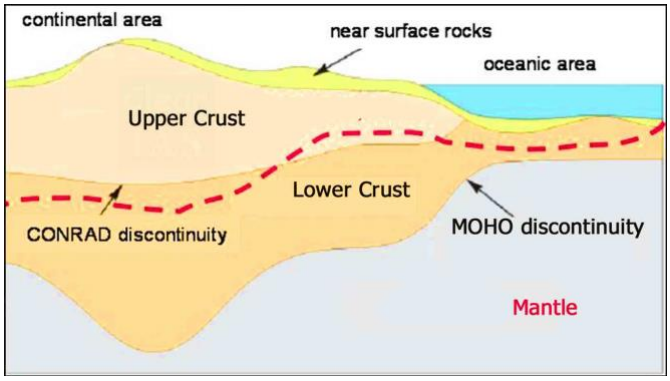
Structure of the earth's interior

Structure of earth's interior is fundamentally divided into three layers – **The crust, The mantle and The core**.



The Crust

- It is the outermost solid part of the earth, normally about 8-40 kms thick.
- It is brittle in nature.
- Nearly 1% of the earth's volume and 0.5% of earth's mass are made of the crust.
- The thickness of the crust under the oceanic and continental areas are different. Oceanic crust is thinner (about 5kms) as compared to the continental crust (about 30kms).
- Major constituent elements of crust are Silica (Si) and Aluminium (Al) and thus, it is often termed as **SIAL** (Sometimes SIAL is used to refer Lithosphere, which is the region comprising the crust and uppermost solid mantle, also).



The mantle:-

- The portion of the interior beyond the crust is called as the mantle.
- The discontinuity between the **crust and mantle** is called as the **Mohorovich Discontinuity or Moho discontinuity.**
- The mantle is about 2900kms in thickness.
- Nearly 84% of the earth's volume and 67% of the earth's mass is occupied by the mantle.

The major constituent elements of the mantle are Silicon and Magnesium and hence it is also termed as **SIMA**

- The uppermost solid part of the mantle and the entire crust constitute the **Lithosphere**.
- The **asthenosphere** (in between 80-200km) is a highly viscous, mechanically weak and ductile, deforming region of the upper mantle which lies just below the lithosphere.
- The asthenosphere is the main source of magma and it is the layer over which the lithospheric plates/ continental plates move (plate tectonics).

The Core:-

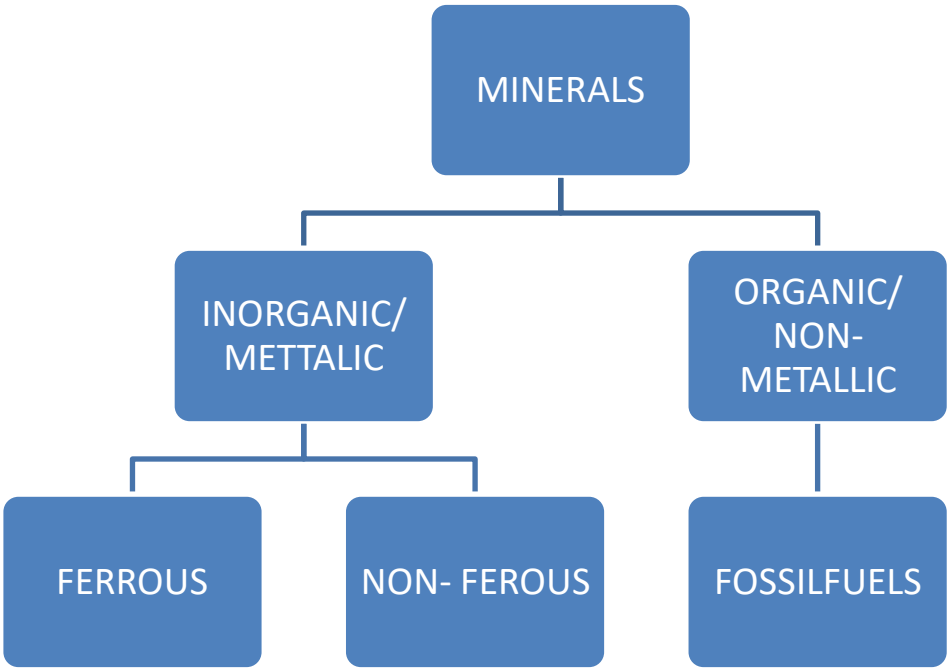
- It is the innermost layer surrounding the earth's centre.
- The **core is separated from the mantle by Guttenberg's Discontinuity**.
- It is composed mainly of iron (Fe) and nickel (Ni) and hence it is also called as **NIFE**.
- The Core consists of two sub-layers: the inner core and the outer core.
- The inner core is in solid state and the outer core is in the liquid state (or semi-liquid).

Barysphere is sometimes used to refer the core of the earth or sometimes the whole interior.

Rocks :- Earth's crust is composed of rocks. It's an aggregate of one or more minerals. Rocks do not have definite composition of mineral constituents. However, feldspar and quartz are the most common minerals found in rocks. Petrology is science of rocks. It is a branch of geology. A petrologist studies rocks in all aspects – composition, texture, structure, origin, occurrence, alternation and relationship with other rocks.

Mineral:- Minerals are an important part of our everyday life and make up most of the earth they are defined as *naturally occurring* substances that have a crystalline structure.

Before learning about the different types of minerals, we must first understand what are minerals. They are formed by geological processes and are usually inorganic and Organic in nature. There are also few **inorganic materials, like silver, gold, diamond etc and in organic like coal, petroleum, and natural gas** in the earth's crust. Today, there are more than thousands of minerals recognized but only some of them are common.



1. Metallic Minerals

Metallic minerals exhibit luster in their appearance and consist of metals in their chemical composition. These minerals serve as a potential source of metal and can be extracted through mining. **Examples of metallic minerals are Manganese, iron ore and bauxite are Metallic minerals and be divided into ferrous and non-ferrous metallic minerals.**

Ferrous minerals are one that contains iron and nonferrous are one that does not contain iron.

2. Nonmetallic minerals

Non-metallic minerals are minerals which either show a non-metallic luster or shine in their appearance. Extractable metals are not present in their chemical composition. Limestone, gypsum, and mica are examples of non-metallic minerals. Bauxite ore mostly exists in deeply weathered rocks. Volcanic rocks contain bauxite deposits in some regions. Iron metal extracted from iron ore. It never exists in pure form and has to be extracted from iron ore by eliminating the impurities. Gold is the oldest and most precious element to be known. Manganese ore is a silvery brittle or grey-white metallic ore occurs in many forms and found worldwide.

TYPES OF ROCKS

Based on their mode of formation, there are three different types of rocks:

•**Igneous rocks** – solidifies from magma and lava.

•**Sedimentary rocks** – the result of deposition of fragments of rocks by exogenous processes.

•**Metamorphic rocks** – formed out of existing rocks undergoing re-crystallization.

Igneous rocks

Igneous rock is formed when magma cools and solidifies, it may do this above or below the Earth's surface.

•Magma can be forced into rocks, blown out in volcanic explosions or forced to the surface as lava.

•The atoms and molecules of melted minerals are what make up magma.

•These atoms and molecule rearrange themselves into mineral grains as the magma cools, forming rock as the mineral grains grow together.

•There are over 700 different types of igneous rocks.

Intrusive Rocks:- Rocks formed inside the Earth. When molten material is solidifies inside the crust before reaching the earth's surface:- Example:- Granite

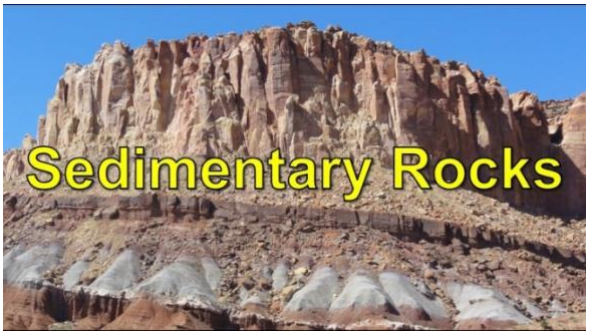
Extrusive Rocks:- Igneous Rocks formed on the earth surface. When Lava make in way to earth crust and cools on the earth surface. Example:- Basalt

•**Examples** of igneous rocks include basalt, granite, pumice, obsidian, tuff, diorite, gabbro and andesite.

•Basalt forms the metamorphic rock granulite when subjected to extreme heat and pressure over time (metamorphism).

Sedimentary rocks

Sedimentary rocks are formed by sediment that is deposited over time, usually as layers at the bottom of lakes and oceans.



•This sediment can include minerals, small pieces of plants and other organic matter.

•The sediment is compressed over a long period of time before consolidating into solid layers of rock.

•Sedimentary rocks forms layers called strata which can often be seen in exposed cliffs.

•Sedimentary rocks cover the majority of the Earth's rocky surface but only make up a small percentage of the Earth's crust compared to metamorphic and igneous types of rocks.

•**Examples** of sedimentary rocks include limestone, sandstone, mudstone, greywacke, chalk, coal, claystone and flint.

•Limestone forms the metamorphic rock marble when subjected to extreme heat and pressure over time (metamorphism).

•Sandstone forms the metamorphic rock quartzite.

•Mudstone forms the metamorphic rock slate.

•Chalk is a soft, white form of limestone.

•Flint is a hard, sedimentary form of the mineral quartz.

Metamorphic rocks – formed out of existing rocks undergoing re-crystallization.

Metamorphic rocks have been changed over time by extreme pressure and heat.

•Metamorphic rocks can be formed by pressure deep under the Earth's surface, from the extreme heat caused by magma or by the intense collisions and friction of tectonic plates.

•Uplift and erosion help bring metamorphic rock to the Earth's surface.

•Dynamic metamorphism: mechanical disruption due to breaking without any appreciable chemical changes

Examples of metamorphic rocks include anthracite, quartzite, marble, slate.

Metamorphic rocks forms to another rock due to heat, pressure and time For example:-

Anthracite is a type of coal with a high carbon count, few impurities and with a high lustre (meaning it looks shiny).

•Marble is a metamorphic rock that is formed from the sedimentary rock limestone.

•Quartzite is a metamorphic rock that is formed from the sedimentary rock sandstone.

•Slate is a metamorphic rock that is formed from the sedimentary rock mudstone.

•Diamond is a metamorphic rock that is formed from the sedimentary rock of coal.

Rock Cycle

The rock cycle is a basic concept in geology that defines the laborious transitions through geologic time among the three main rock types:

- Igneous rocks
- Sedimentary rocks
- Metamorphic rocks

- ✓ Rocks do not remain in their original form for a long period as they undergo a transformation.
- ✓ This cycle is an uninterrupted process through which old rocks are converted into new ones.
- ✓ Igneous rocks are primary rocks.
- ✓ These rocks can be changed into metamorphic rocks.
- ✓ Sedimentary and metamorphic rocks form from these primary rocks.
- ✓ The fragments evolved out of metamorphic rocks and igneous again form into sedimentary rocks.
- ✓ Sedimentary rocks themselves can develop into fragments.
- ✓ The crustal rocks -igneous, metamorphic and sedimentary-once formed may be carried down into the interior of the earth through subduction.
- ✓ In this process, parts or entire crustal plates subduct under another plate and the same melt at high temperature in the interior.
- ✓ This results in the formation of molten magma, the unique source for igneous rocks.