

## Lesson - 6

## Rocks

The upper layer of the earth known as crust, is made of combination of different mineral elements. In simple language the word 'rock' is used for a hard substance but according to a geologist - All those substances which formed our earth's crust, no matter it may be as hard as granite or as soft as clay, are called rock. In a combined form the mixture of all the minerals in a solid form in crust is called 'Rock'. The types of rocks are as follows :

1. Igneous Rocks
2. Sedimentary Rocks
3. Metamorphic Rocks

**1. Igneous Rocks :** During the formation of the earth, the rocks formed by cooling and solidification of hot and liquid magma and lava, are called Igneous Rocks. These were the first rocks to be formed. That is why it is called 'Primary Rocks'. The initial crust of the earth is made up of Igneous Rocks. Therefore all the rocks are formed from Igneous Rocks. There are no fossils in these rocks. The upper most part of earth crust which is 16 km thick, contains 95% of Igneous Rock.

**Major characteristics of Igneous Rock**

1. These rocks do not have layers.
2. These rocks are non-porous.
3. These rocks are granular
4. There are no fossils in these rocks.
5. These rocks are very hard.
6. The effect of physical weathering is more than chemical weathering on these rocks.
7. Metallic minerals are found in these rocks.

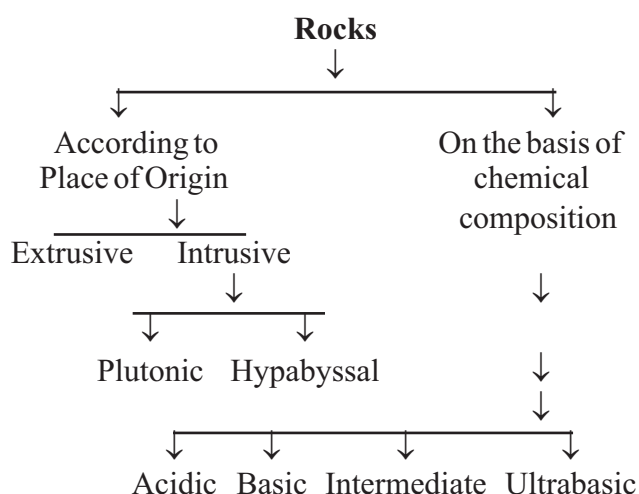
On the basis of composition, colour, size of particles, shape and place of origin, the igneous rocks are classified into following categories. (Table 6.1)

**1. Classification on the basis of place of origin.**

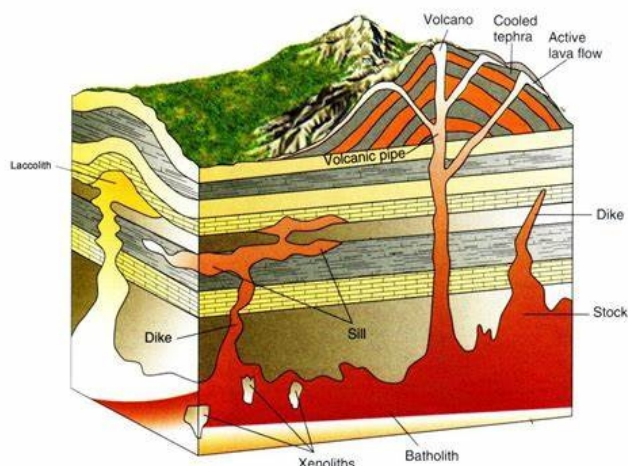
**(A) Intrusive Igneous Rocks :** These rocks are formed inside the earth's crust by solidification of magma. As the Igneous Rocks are cooled down slowly, very large size of crystals are formed. According to depth, it is of two types :

**(i) Plutonic :** These rocks are formed when the Magma gets cooled and solidifies at greater depths of the earth. Due to greater depths, the rocks get cooled down very slowly which causes formation of large size crystals. Granite is its perfect example.

**Table 6.1**  
**Classification of Igneous**



(ii) **Hypabyssal** : When the magma solidifies in cracks and joints in the layers of the earth's interior, these types of rocks are formed. The size of crystals as smaller in size as it cools down a little faster. In the form of Hypabyssal rocks, magma takes the shape of phacolith, Lacolith, Lopolith, Dyke, sill etc. (Fig. 6.1)



**Fig. 6.1 : Igneous Rock**

**(B) Extrusive Igneous Rocks** : The rocks are formed with the solidification of lava on the surface of the earth. As it cools down very fast, it has large size crystals. Grabb and Basalt are the best examples of Extrusive Igneous Rocks.

## **2. Classification on the basis of Chemical Composition :**

**(A) Acidic Rocks** : These rocks have more than 65% of Silica. These rocks are hard and strong Granite is its major example.

**(B) Basic Rocks** : The Silica content in these rocks varies between 45% to 55%. They are alkaline. Basalt and Grabb are its major example.

**(C) Intermediate Rocks** : In these rocks, the Silica content is in between the Acid and the Basic rocks. Diorite is its best example.

**(d) Ultra Basic** : Silica content in this rock is found less than 45% Peridotite is the main example of this type of rock.

### **Magma is of three types :**

1. Basaltic (Temperature : 1000° - 1200°C)
2. Andocitic (Temperature : 800° - 1000°C)
3. Rhyolitic (Temperature : 650° - 800°C)

## **Sedimentary Rocks :**

The forces of denudation have been working on the earth from the time of its origin in which due to weathering and erosion, the rocks are disintegrated at the same place of their occurrence or they are deposited at some other place. The loose material from different rocks like rock powder fossils of organisms and plants are deposited in layer after layer, led to the formation of sedimentary rocks. These rocks are extended over 75% of the entire surface of the earth.

### **Characteristics :**

1. There are many layers in these rocks.
2. These rocks have porous.
3. Fossils are found between layers of the rocks.
4. These rocks undergo weathering at faster pace.
5. These rocks are almost soft.

These rocks are formed of different types of sediments and many factors are responsible for its formation. Therefore the basis of classification of rocks are as follows : (Table 6.2)

## **(1) Classification on the basis of type of sediment in formation of rocks.**

**(A) Clastic Rocks** : The sediments or loose material during weathering and erosion, are deposited in form of layers. with time, it combines to form sedimentary rocks, sand stones, conglomerate, Clay and Loess are its major examples.

**(B) Organic Rocks** : The fossils of animals and plants are dominant in composition of this type of rocks. It is further divided into three types.

### **(i) Limestone Rocks :**

The remains of the creatures with limestone content and the limestone dissolved in water, forms these types of rocks. Dolomite is this type of rock.

**(ii) Carbonaceous Rock** : On burying of the layers of sediments of vegetation in tropical areas these rocks are formed. Rocks including coal are included in this category.

**(C) Chemically formed sedimentary rocks** : When there are soluble rocks in the way of flowing water, the water dissolves the soluble rocks and carries it along with it and deposit it at some other place, through which these rocks are formed. clay, soapstone, rocksalt are its major examples.

## (2) Classification on the basis of composition.

**(A) Aqueous Rocks :** These rocks are formed in aquatic regions because of deposition of sediments. On the basis of location of deposition, these are of three types : sea rocks, lake rocks and riverine rocks.

**(B) Aeolian Rocks :** These rocks are formed because of transportation and deposition of sediments by wind. Loess is its best example.

**(C) Glacial Rocks :** These rocks are formed with deposition of pebbles and boulders transported and deposited by Glaciers. These are called Moraines.

**Metamorphic Rocks :** Rocks which are formed because of changes in its structure and properties without undergoing disintegration or dissolution are called Metamorphic rocks. These rocks may be original, igneous, sedimentary or metamorphic. This metamorphism may be due to water, heat or pressure or by all three.

### Characteristics of Metamorphic rocks :

1. These are secondary rocks as they are metamorphism or change in form of other rocks.
2. These rocks are comparatively harder and more than consolidated.
3. It has dominance of metallic minerals. Thus they have more economical value.
4. These rocks are non-porous rocks. They are simply divided into following divisions :

**1. Thermal Metamorphism :** During the volcanic eruption when the lava travels through volcanic vent, the nearby rocks get metamorphised due to extreme heat. This is called Thermal Metamorphism.

**2. Dynamic or Regional Metamorphism:** This type of metamorphic activity takes place in a larger region in which both contraction and heat effect the rocks. This type of metamorphism occurs in the region of folded mountains.

**3. Hydro Metamorphism :** In this type of metamorphism the liquid formed by mixing of water with chemical substances brings change in the mineral of the rock. It is called Hydro Metamorphism.

**4. Thermo Hydro Metamorphism :** When

there is hot water on the rocks then due to heat and pressure rocks get metamorphosed.

### Classification of Metamorphic rocks :

The original rocks which are changed into metamorphic rocks, are classified as follows :

S.No.	Original Rocks	Metamorphic Rock
1.	Igneous Rocks	
	1. Granite	Gneiss
	2. Basalt	Amphibolite
	3. Gabbro	Serpentine
2.	Sedimentary Rocks	
	1. Sandstone	1. Quartzite
	2. Limestone	2. Marble
	3. Shale	3. Slate
	4. Coal	4. Graphite, Diamond
3.	Metamorphic rocks	
	1. Slate	1. Schist
	2. Schist	2. Phyllite

### Important Points

1. The solid mixture of different minerals on earth's crust is called rock.
2. Rocks are of three major types - Igneous, Sedimentary and Metamorphic.
3. The cooling down of magma and its solidification at the time of origin of the earth is called Igneous rocks.
4. Igneous rocks do not have fossils, layers and are non-porous.
5. Sedimentary rocks consist of layers, fossils and porous. These are comparatively softer.
6. Due to the effect of water heat and pressure, the original rocks change its forms and are called metamorphic rocks. These rocks are more consolidated and have more metallic minerals.

### Exercise

#### Multi Choice Questions

1. Which of the following is an igneous rock:  
(A) Gneiss (B) Marble  
(C) Diamond (D) Slate

2. Original rock is :  
 (A) Igneous            (B) Stratified  
 (C) Sedimentary      (D) Metamorphic
3. The rocks which do not contain fossils are:  
 (A) Sedimentary      (B) Secondary  
 (C) Igneous            (D) Metamorphic
4. Which of the following is a metamorphic rock:  
 (A) Granite            (B) Marble  
 (C) Basalt              (D) None of the above
5. Which of the following is a sedimentary rock:  
 (A) Granite            (B) Limestone  
 (C) Basalt              (D) Marble

**Very Short Type Questions :**

6. Give two examples of Igneous rocks?
7. What is a rock?
8. Give the metamorphic form of any two sedimentary rocks.
9. Define the term rock.
10. Define sedimentary rock.

**Short Type Questions :**

11. What are the characteristics of Igneous rocks?
12. Give the characteristics of Sedimentary rocks?
13. Write the characteristics of Metamorphic rocks.
14. Write the names of the metamorphic rocks formed of Sedimentary rocks?
15. Write the names of metamorphic rocks formed from Igneous rocks.

**Essay Type Question :**

15. Classify rocks and describe in detail about metamorphic rocks.
16. Classify & describe igneous rocks.
17. Classify Sedimentary rocks and describe them in detail.

**Answer Key**

1. D 2. A 3. C 4. B 5. B