

Chapter-5

Minerals and Rocks

1. Multiple choice questions.

Question 1(i).

Which one of the following are the two main constituents of granite?

- (a) Iron and nickel**
- (b) Iron and silver**
- (c) Silica and aluminium**
- (d) Iron Oxide and potassium**

Answer:

- (c) Silica and aluminium**

Question 1(ii).

Which one of the following is the salient feature of metamorphic rocks?

- (a) Changeable**
- (b) Quite**
- (c) Crystalline**
- (d) Foliation**

Answer:

- (a) Changeable**

Question 1(iii).

Which one of the following is not a single element mineral?

- (a) Gold**
- (b) Silver**
- (c) Mica**
- (d) Graphite**

Answer:

(c) Mica

Question 1(iv).

Which one of the following is the hardest mineral?

(a) Topaz

(b) Diamond

(c) Quartz

(d) Feldspar

Answer:

(b) Diamond

Question 1(v).

Which one of the following is not a sedimentary rock?

(a) Tillite

(b) Borax

(c) Breccia

(d) Marble

Answer:

(d) Marble

2. Answer the following questions in about 30 words.

Question 2(i).

What do you mean by rocks? Name the three major classes of rocks.

Answer:

The earth's crust is composed of rocks. A rock is made up by aggregate of one or more minerals. Rock may be hard or soft and in varied colors. For example, granite is hard, soapstone is soft. Gabbro is black and quartzite can be milky white. Rocks do not have a definite composition of mineral constituents. Feldspar and quartz are the most common minerals found in rocks.

There are many different kinds of rocks which are grouped under three families on the basis of their mode of formation.

They are:

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

Question 2(ii).

What is an igneous rock? Describe the method of formation and characteristics of igneous rock.

Answer:

The igneous rocks are formed when magma cools and solidifies. Igneous rocks form out of magma and lava from the interior of the earth, therefore, they are known as primary rocks.

Method of formation: When magma in its upward movement cools and turns into solid form it is called igneous rock. The process of cooling and solidification can happen in the earth's crust or on the surface of the earth. Igneous rocks are classified based on texture. The texture depends upon the size and arrangement of grains or other physical conditions of the materials. If molten material is cooled slowly at great depths, mineral grains may be very large. Sudden cooling (at the surface) results in small and smooth grains. Intermediate conditions of cooling would result in intermediate sizes of grains making up igneous rocks. Granite, gabbro, pegmatite, basalt, volcanic breccia and tuff are some of the examples of igneous rocks.

Features:

1. They are made up of solidified lava.
2. Liquid lava gets solidified by gradual cooling
3. They are compact
4. They do not have fossils.

Question 2(iii).

What is meant by sedimentary rock? Describe the mode of formation of sedimentary rock.

Answer:

The word 'sedimentary' is derived from the Latin word sedimentum, which means settling. All types of rocks of the earth's surface are exposed to denudational agents, and are broken up into various sizes of fragments. Such fragments are transported by different exogenous agencies and deposited.

These deposits through compaction turn into rocks. This process is called lithification. In many sedimentary rocks, the layers of deposits retain their

characteristics even after lithification. Hence, we see a number of layers of varying thickness in sedimentary rocks like sandstone, shale etc.

Question 2(iv).

What relationship explained by rock cycle between the major type of rocks?

Answer:

Rocks do not remain in their original form for long but may undergo transformation. Rock cycle is a continuous process through which old rocks are transformed into new ones. Igneous rocks are primary rocks and other rocks (sedimentary and metamorphic) form from these primary rocks. Igneous rocks can be changed into metamorphic rocks. The fragments derived out of igneous and metamorphic rocks form into sedimentary rocks.

Sedimentary rocks themselves can turn into fragments and the fragments can be a source for formation of sedimentary rocks. The crustal rocks (igneous, metamorphic and sedimentary) once formed may be carried down into the mantle (interior of the earth) through subduction process (parts or whole of crustal plates going down under another plate in zones of plate convergence) and the same melt down due to increase in temperature in the interior and turn into molten magma, the original source for igneous rocks.

3. Answer the following questions in about 150 words.

Question 3(i).

Define the term 'mineral' and name the major classes of minerals with their physical characteristics.

Answer:

A mineral is a naturally occurring organic and inorganic substance, having an orderly atomic structure and a definite chemical composition and physical properties. A mineral is composed of two or more elements. But, sometimes single element minerals like sulphur, copper, silver, gold, graphite etc. are found. There are at least 2,000 minerals that have been named and identified in the earth crust; but almost all the commonly occurring ones are related to six major mineral groups that are known as major rock forming minerals.

Some major minerals and their characteristics:

1. Feldspar: Silicon and oxygen are common elements in all types of feldspar and sodium, potassium, calcium, aluminium etc. are found in specific feldspar variety.
2. Quartz: It is one of the most important components of sand and granite. It consists of silica. It is a hard mineral virtually insoluble in water.

3. Pyroxene: Pyroxene consists of calcium, aluminum, magnesium, iron and silica. Pyroxene forms 10 per cent of the earth's crust.
4. Amphibole: Aluminium, calcium, silica, iron, magnesium are the major elements of amphiboles. They form 7 percent of the earth's crust.
5. Mica: It comprises of potassium, aluminium, magnesium, iron, silica, etc. It forms 4 per cent of the earth's crust.
6. Olivine: Magnesium, iron and silica are major elements of olivine. It is used in jewellery. It is usually a greenish crystal, often found in basaltic rocks.
7. Metallic Minerals: These minerals contain metal content and can be sub-divided into three types:
 - a. Precious metals,
 - b. Ferrous metals
 - c. Non-ferrous metals.

Question 3(ii).

Describe the nature and mode of origin of the chief types of rock at the earth's crust. How will you distinguish them?

Answer:

The earth's crust is composed of rocks. A rock is made up by aggregate of one or more minerals. Rock may be hard or soft and in varied colours. For example, granite is hard, soapstone is soft. Gabbro is black and quartzite can be milky white. Rocks do not have definite composition of mineral constituents. Feldspar and quartz are the most common minerals found in rocks.

There are many different kinds of rocks which are grouped under three families on the basis of their mode of formation. They are:

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

1. Igneous Rocks: The igneous rocks are formed when magma cools and solidifies. Igneous rocks form out of magma and lava from the interior of the earth, therefore, they are known as primary rocks. When magma in its upward movement cools and turns into solid form it is called igneous rock. Intermediate conditions of cooling would result in intermediate sizes of grains making up igneous rocks. Granite, gabbro, pegmatite, basalt, volcanic breccia and tuff are some of the examples of igneous rocks.

2. Sedimentary Rocks: The word 'sedimentary' is derived from the Latin word sedimentum, which means 'settling'. All types of rocks of the earth's surface are exposed to denudational agents, and are broken up into various sizes of fragments.

Such fragments are transported by different exogenous agencies and deposited. These deposits through compaction turn into rocks. This process is called lithification. In many sedimentary rocks, the layers of deposits retain their characteristics even after lithification. Hence, we see a number of layers of varying thickness . in sedimentary rocks like sandstone, shale, etc.

3. Metamorphic Rocks: The word 'metamorphic' means 'change of form'. These rocks form under the action of pressure, volume and temperature (PVT) changes. Metamorphism occurs when rocks are forced down to lower levels by tectonic processes or when molten magma rising through the crust comes in contact with the crustal rocks or the underlying rocks are subjected to great amounts of pressure from overlying rocks.

Question 3(iii).

What are metamorphic rocks? Describe the types of metamorphic rock and how are they formed?

Answer:

The word metamorphic means 'change of form'. These rocks form under the action of pressure, volume and temperature (PVT) changes. Metamorphism takes place when rocks are forced down to lower levels by tectonic processes or when molten magma rising through the crust comes in contact with the crustal rocks or the underlying rocks are subjected to great amounts of pressure by overlying rocks. Metamorphism is a process by which already consolidated rocks undergo recrystallisation and reorganisation of materials within original rocks.

Mechanical disruption and reorganisation of the original minerals within rocks because of breaking and crushing without any appreciable chemical changes is called dynamic metamorphism. The materials of rocks chemically alter and recrystallise due to thermal metamorphism.

There are two types of thermal metamorphism:

1. Contact metamorphism: In contact metamorphism the rocks come in contact with hot intruding magma and lava and the rock materials recrystallise under high temperatures. Quite often new materials form out of magma or lava are added to the rocks.

2. Regional metamorphism: In regional metamorphism, rocks undergo recrystallisation due to deformation caused by tectonic shearing together with high temperature or pressure or both.

During metamorphism in some rocks grains or minerals get arranged in layers or lines. Such an arrangement of minerals or grains in metamorphic rocks is called foliation or lineation. Sometimes minerals or materials of different groups are arranged into alternating thin to thick layers appearing in light and dark shades. Such a structure in metamorphic rocks is called banding and rocks displaying banding are called banded rocks. Types of metamorphic rocks depend upon original rocks that were subjected to metamorphism. Metamorphic rocks are classified into two major groups foliated rocks and non-foliated rocks. Gneissoid, granite, syenite, slate, schist, marble, quartzite etc. are some examples of metamorphic rocks.

