

UNIT 3
PETROLOGY

TWO MARKS QUESTIONS AND ANSWERS

1. What is mean by Rock?

It is defined as “natural solid massive aggregates of minerals forming the crust of the earth”

2. Define Petrology?

The branch of geology dealing with various aspects of rocks such as their formation, classification and occurrence is called petrology.

3. Give the various types of rocks?

1. Igneous rock
2. sedimentary rock
3. Metamorphic rock

4. What is mean by magma?

The hot molten material occurring naturally below the surface of the earth is called magma.

5. Define Igneous rock?

All rocks that have formed from an originally hot molten material through the process of cooling and crystallization may be defined as Igneous rocks.

6. Give the various types of igneous rock?

1. Volcanic rock
2. Plutonic rock
3. hypabassal rock

7. Distinguish between monomineralic rock and polymineralic rock with example?

Monomineralic rock:

Rocks composed by a single mineral (e.g) pyroxenite which is composed at pyroxene only.

Polymineralic:

Rocks composed at more than one mineral and polymineralized rock. (e.g) Granite.

8. Differentiate: Plutonic rock and volcanic rock?

Igneous rocks which have formed at a depth are known as plutonic igneous rock. (e.g granite) and those formed from lava and formed mainly at the surface are known as volcanic igneous rock (e.g Basalt)

9. Define Texture of Igneous rock:

The term texture is defined as the mutual relationship of different mineralogical constituents of a rock. It is determined by the size, shape and arrangement of these constituents within the body of the rock.

10. Give the categories of Texture:

1. Equigranular texture
2. In equigranular texture
3. Directive texture
4. Inter growth texture
5. Intergranular texture

11. Distinguish between monomineralic rock and polymineralic rock with example:**Monomineralic rock:**

Rocks composed by a single mineral (e.g) pyroxenite which is composed of pyroxene only.

Polymineralic rock:

Rocks composed of more than one mineral are polymineralised rock. (e.g) Granite.

12. Define the structure of igneous rock?

These rocks are developed on a large scale in the body of an extrusion or intrusion, giving rise to conspicuous shapes or forms are included under the term structure.

13. What are the various types of structure in igneous rock?

The structures are:

1. flow structure
2. Pillow structure
- 3.ropy and blocky lava
4. Spherulitic structure
5. Orbicular structure

14. How will you distinguish the three kinds of rocks?

The igneous rocks are characterized by its hard, compact, massive, interlocking and strong structure.

The sedimentary rocks are characterized by its bedded or layered structure.

The metamorphic rocks are characterized by its banded or foliated structure.

15. Define Granite

It may be defined as plutonic light colored igneous rocks. These are among the most common igneous rocks. The word granite is derived from Latin word granum meaning a grain and obviously refers to the equigranular texture of the rock.

16. What are the various types of sedimentary structure?

Mechanical structure:

- i. Stratification or bedding
- ii. Lamination and cross bedding
- iii. Ripple marks
- iv. Rain marks
- v. Joints and cracks

Chemical structure:

- i. Concretionary structure
- ii. Oolitic structure
- iii. Geode structure

Organic structure

- i. Foot print of animals
- ii. Leaf impression of plants
- iii. Markings of insects

17. What is meant by facies? And types of facies

The concept of formation of a sedimentary rock in a particular type of environment is explained by the term facies.

Three kinds of facies

1. Continental facies
2. Transitional facies
3. Marine facies

18. What are the factors allowed in texture of sedimentary rocks?

The factors are:

- i. Origins of Grains
- ii. Size of grains
- iii. Shape of grains

- iv. Packing of grains
- v. Fabric of grains
- vi. Crystallization trend

19. Define the following term:

- i. Rudites
- ii. Arenites
- iii. Lutites

Rudites:

They are also called rudaceous and include all coarse grained rocks of heterogeneous composition. Rudites are made up of boulders, cobbles and pebbles collectively known as gravels.

Arenites:

These are also called arenaceous rocks. These are made up of sediments of sand grade (2 mm - / 16 mm)

Lutites:

These are also called argillaceous rocks. It may be defined as sedimentary rocks of the finest grain size.

20. Define conglomerates:

These are sedimentary rocks of clastic nature and also belong to the rudaceous group. They consist mostly of rounded fragments of various sizes but generally above 2mm. Cemented together by clays or mixed matrix.

21. What do you understand by metamorphism?

It may be defined as the response in solid rocks to pronounced changes of temperature, pressure and chemical environment. In other cases metamorphism means the partial or complete crystallization of a rock and the production of new structures.

22. What are the three kinds of metamorphism?

- 1. Thermal metamorphism
- 2. Dynamic metamorphism
- 3. Dynamothermal metamorphism

23. What is meant by metasomatism?

It may be defined as a metamorphic process involving essentially the formation of new minerals by the mechanism of chemical replacement of pre-existing minerals under the influence of chemically active fluids.

24. Define metamorphic rocks:

Metamorphic rocks are defined as these rocks which have formed through the operation of various types of metamorphic process on the pre existing igneous and sedimentary rocks involving changes in texture, structure and mineralogical composition.

UNIT 3 PETROLOGY

1. What do you understand by the terms texture is igneous rocks?

It is defined as the mutual relationship of different mineralogical constituents in a rock. It is determined by the size, shape and arrangement of these constituents within the body of the rock.

a. Degree of crystallization:

All the constituent minerals may be present in distinctly crystallized forms and easily recognized by unaided eye in non-crystallized form.

b. Granularity:

This defines the grain size of the various components of a rock. Thus the rock texture is described as:

i. Coarse grained

ii. Medium grained

iii. Fine grained

c. Fabric:

This is a composite term expressing the relative grain size of different mineral constituents in a rock and well as degree of perfection in the form of the crystals.

Types of Texture:

These can be broadly divided into five categories.

- ⊙ Equigranular texture
- ⊙ In equigranular texture
- ⊙ Directive texture
- ⊙ Intergrowth texture
- ⊙ Intergranular texture

Equigranular Texture:

All these textures in which majority of consistent crystals of a rock are broadly equal in size. In igneous rocks these textures are shown by granites and felsites are often named as granitic and felsitic textures.

Inequigranular Texture:

The constituent minerals show marked difference in their relative grain size are grouped as inequigranular texture.

Directive Textures:

These textures that indicate the result of flow of magma during the formation of rock are known as directive texture.

Intergrowth Texture:

During the formation of the igneous rocks two or more minerals may crystallize out simultaneously in a limited space.

Intergranular Texture:

In certain igneous rock crystals formed at earlier stages may get to arranged that polygonal or triangular spaces are left in between them. This texture so produced is called an Intergranular structure.

2. Explain briefly about structure and forms of an igneous rock?

These rocks are developed on a large scale in the body of an extrusion or intrusion giving rise to conspicuous shapes or forms are included under the term structures.

Types

Igneous rocks can be broadly grouped under three headings.

a. Structure due to mobility of Magma (or) lava:

The mobility of Magma is responsible for a variety of structures that will acquire.

- © Flow structure
- © Pillow structure
- ©ropy and blocky lava
- © Spherulitic structure
- © Orbicular structure

Forms of igneous rocks

The cooled igneous masses occur in nature in a variety of shapes (or) forms. The igneous mass will acquire on cooling depends on a number of factors such as

- a. The structural disposition of the host rock
- b. The Viscosity of the magma
- c. The composition of the magma
- d. The environment of which injection of magma

Concordant bodies:

All those regions in which the magma has been injected and cooled along or parallel to the structural planes of the host rocks are grouped as concordant bodies. Most important concordant forms are sills, phacoliths, copoliths and laccoliths.

Sills

Sills are commonly subdivided into following types:

- a. Simple sills
- b. Multiple sills
- c. Composite sills
- d. Differentiated sills
- e. Interformational sheets

Phacoliths

These are concordant, small sized intrusive that occupy positions in the through and crests of bends called folds.

Lopoliths:

These igneous intrusions which are associated with structural basins, that are sedimentary beds inclined towards a common centre are termed or lopoliths.

Laccoliths:

Laccoliths are formed when the magma being injected is considerably viscous so that it is unable to flow and spread for greater distances.

Discordant Bodies :

Important types of discordant intrusion are dykes, volcanic necks, and batholiths

Igneous Extrusions:

The igneous extrusions do not show much complexity in their form. They generally occur as widely spread, extensive flows covering enormous area and the existing topography.

These may be layers of other sedimentary materials deposited during the volcanic intermissions which are called intertrappean layers.

3. Write short notes on:

- i. Granite
- ii. Syenite
- iii. Basalt
- iv. Gabbro.

Granite:

It may be defined as plutonic light color igneous rock. The word granite is derived from Latin word granum meaning a grain and refers to the equigranular texture of the rock.

Composition:

Quartz and Feldspar. Quartz is always recognized by its glassy lustre, high hardness, and cleavage less transparent. Feldspar may be of two varieties. The potash feldspar and soda bearing feldspar.

Texture:

Granites are generally coarse to medium grained, holocrystalline and equigranular rocks.

Types:

White mica, muscovite is present as a prominent accessory mineral. The granite may be distinguished as muscovite granite.

Use:

Granite finds extensive use in architectural and massive construction where they are found in abundance.

Syenites:**Definition:**

These are volcanic rocks in which plagioclase feldspar are the predominant constituents making the potash feldspar only a subordinate member.

Composition:

The most common feldspars of syenites are orthoclase and alite microcline, Oligoclase and anorthite are also present in subordinate amounts.

Texture:

Syenites show textures broadly similar to those of granites, that is they are coarse to medium grained holocrystalline in nature.

Gabbro

Definition:

These are coarse, grained plutonic rocks of basic character. Plagioclase feldspars, of lime – soda composition are the chief constituents of gabbros.

Texture:

Gabbro shows variable texture, generally coarse to medium grained, reaction rim structure is seen in some gabbros.

Types:

- i. Norite, ii. Gabbro, iii. Anorthosite, iv. Eucrite, v. Troctolite, vi. Dunite

Basalts

Definition:

Basalts are volcanic igneous rocks formed by rapid cooling from lava flows from volcanoes either over the surface (or) under water on oceanic floors.

Composition:

Basalts are commonly made up of calcic plagioclase feldspars and a number of ferro – magnesian minerals like augite, hornblende. In fact many types of basalts are distinguished on the basis of the type and proportion of Ferro magnesian minerals in them.

Occurrence:

The basaltic rocks form extensive lava flows on the continents and also on the oceanic floors in almost all the regions of the world.

4. Explain briefly about Formation and Texture of sedimentary rocks?

Sedimentary rocks are also called as secondary rocks. This group includes a wide variety of rocks formed by accumulation, compaction and consolidation of sediments.

Formation:

The process of formation of sedimentary rocks is ever prevailing. The sediments so produced are transported to the settling basins such as sea floors where they are deposited, get compacted and consolidated and finally transformed into a cohesive solid mass.

Sedimentary rocks are broadly grouped into three classes on the basis of their mode of formation.

- ⊖ Mechanically formed (or) clastic rocks
- ⊖ Organically formed rocks
- ⊖ Chemically formed rocks.

A. Clastic (Mechanically) formed rocks:

- a. Decay and disintegration
- b. Transport of sediments
- c. Gradual deposition
- d. Diagnosis

B. Chemically formed (non- clastic) rocks:

Water is a great solvent. Water from rains, springs streams, rivers, lakes and underground water bodies dissolves many compounds from the rocks with which it comes into contact.

In all cases a stage may be reached when the dissolved salts get crystallized out either through evaporation or through precipitation.

C. Organically formed rocks:

These extensive water bodies sustain a great variety of animal and plant life. The hard parts of many sea organisms are constituted chiefly of calcium and magnesium. Limestones are the best examples of organically formed sedimentary rock

Textures of sedimentary rocks:

This texture is determined by at least six contributing factors.

- i. Origin of Grains
- ii. Size of Grains
- iii. Shape of Grains
- iv. Packing of Grains
- v. Fabric of grains

5). Explain classification of sedimentary rocks giving suitable examples?

It has been variously classified on the basis of their mineralogical composition, environment of deposition, mode of formation and textural and structural features.

There are two main divisions:

- 1) Clastic
- 2) Non-clastic

1. Clastic rocks:

These are also called mechanically formed or detrital rocks and include all those sedimentary rocks that have been formed from pre existing rocks by operation of fine process.

1. Weathering
2. erosion
3. transport
4. deposition
5. diagenesis.

B. non clastic rocks:

This group includes all those sedimentary rocks that have been formed by anyone of following two processes.

1. Operation of simple chemical process
2. Accumulation of hard parts of organism

Chemically formed rocks:

On the basis of their chemical composition, these rocks are further sub-divided into following groups.

- i. Siliceous Deposit
- ii. Carbonate deposit
- iii. Ferruginous Deposit
- iv. Posphatic deposits:
- v. Organic deposits:

6. Write short notes on:

- i. Breccia
- ii. Conglomerate
- iii. Sand stone
- iv. Lime stone

Breccia:

It is a mechanically formed sedimentary rock. It consists of angular fragments of heterogenous composition embedded in a fine matrix of clayed material.

The angularity of the fragments indicates that these have suffered very little or even no transport after their disintegration from the parent rocks.

Types:

- a. Basal Breccia
- b. Fault Breccia

Conglomerates :

These are clastic nature and also belong to rudaceous group. They consist mostly of rounded fragments of various sizes but generally above 2 mm.

The roundness of gravels making the rock is a useful characteristic to differentiate it from breccias in which the fragments are essentially angular.

Types:

- i. Basal conglomerates, ii. Glacial conglomerate, iii. Volcanic conglomerate

Sand stones:

These are mostly composed at sand grade particles that have been compacted and consolidated together in the form of beds in basins of sedimentation.

Composition:

Quartz (SiO_2) is the most common mineral making the sand stones. Beside, quartz, minerals like feldspars, micas, garnet and magnetite may also be found in small proportions in much sandstone.

Texture:

Sand stones are in general medium to fine grained in texture. The individual grains may be round or angular in outline, loosely packed or densely packed and in sample or interlocking arrangement.

Colour:

Sandstones naturally occur in a variety of colours, red, brown, grey and white being the most common colours.

Types:

- i. Siliceous sand stones, ii. Calcareous sand stones, iii. Argillaceous sandstones

Lime stones

Definition:

These are the most common sedimentary rocks from the non clastic group and are composed chiefly of carbonate of calcium with subordinate proportions of carbonate of magnesium.

Composition:

Pure limestone is invariably made up of mineral calcite (CaCO_3). In the limestone rock formations, however, presence of dolomite $\text{CaMg}(\text{CO}_3)_2$, quartz, (SiO_2) feldspar minerals and Iron Oxide is rather a common feature.

Texture:

The most important textural feature of limestones is their fossiliferous nature. Other varieties of limestones show dense and compact texture. Some may be loosely packed and highly porous. Others may be compact and homogenous.

Types:

1. Chalk
2. Shelly limestone
3. Argillaceous limestone
4. Lithographic limestone

