

ENGINEERING GEOLOGY

UNIT – I PHYSICAL GEOLOGY

1. Write short notes on Mercalli Scale.

The intensity of earthquake can be measured with the help of Mercalli scale. Their measurements are expressed for degree of vibration.

2. Define Plate Tectonics.

Plate Tectonics is based primarily due to seismic and geomagnetic activities. In this concept, the upper part of the earth up to a depth of 100 km is actually divided into seven to ten major blocks called plates.

3. Write notes on Fluvial Glacial drift.

This is also called Stratified Drift. In this accumulation, Melt water plays a prominent part in their deposition. These deposition exhibit a definite sorting according to grain size of the particles like stream deposits.

4. Define weathering. Name the different types of weathering.

The term weathering means, the process of physical breaking up (ie, Disintegration) and chemical breaking up (ie, Decomposition) of rock occurring simultaneously.

5. Define Continental Drift.

Accumulation of glacial debris directly from glacial melt waters are collectively called continental drift.

6. Write short notes on Moraines.

Moraines may be defined as accumulation of glacial debris (fragments of rocks, sand) that are found either on the base of an existing glacier or at various places along a glacial valley. These materials are mostly unsorted and form a till type deposit.

7. Define Physical Geology.

It deals with various processes of physical agents, such as Wind, Running water, Glaciers and Sea water.

8. Define Structural Geology.

It deals with arrangement or architecture of rocks. It also includes the factors like folds, faults and joints.

9. Define Field Geology.

It deals with study of rocks along with their structural behavior and mineralogical composition in the field.

10. What is meant by physical weathering?

Disintegration of physical breaking up of the rocks is called physical weathering. The main agents involved are wind, Running water and glaciers. It is most active in cold, Dry and higher areas of earth surface.

11. Explain deflation in erosion in wind.

In this process, loose particles are removed by flowing winds. The blowing wind lifts up the loose, Dry and incoherent rock particles, except hard and compact masses, which remain in their original position.

12. What are the factors that depend on the intensity of running water?

Velocity of the water, Nature of the soil over which the water runs, Load conditions of the rainy water.

13. Define divergent movement.

The boundaries of two adjoining large plates move away from each other thereby creating a gap through this gap the hot lava comes out.

14. Define convergent movement.

The boundaries of two large plates move towards each other plate and push the latter upwards in from of the mountain.

15. What are the factors depends on the intensity of wind erosion?

Nature of region over which the wind flow, Velocity of the wind.

16. Define till.

It is also called unstratified drift and its most common form of glacial deposit. The dense deposited till thoroughly compacted is known as tillite.

17. What are the types of moraines?

Lateral moraines, Mediam moraines, end moraines, Grand nes, Drammlins.

18. Explain kames.

These are low stratified or layered hills occurring in isolated patches in deserts. Kames are characterized with rounded outlines and steep slopes on sides.

19. Define eskers.

These are narrow long ridges of poorly stratified drift with steeply sloping sides and zigzag outline.

20. Define aquifer.

It is defined as a rock mass, a layer or formation which is saturated with ground water and yielding the stored water at economical costs when tapped. The quality is dependent on the amount of water bearing capacity rate of yield gravels etc.

UNIT- 2 MINERALOGY

1. What is meant by faces?

A crystal may be defined as a solid regular, polyhedral form bounded by smooth geometrical surfaces called faces.

2. Define crystallography.

Crystallography is that branch of science which deals with all the aspects of crystals that is their formation from the melts their internal structure and their external shape or morphology.

3. Define Crystal faces

Any crystal will have one or more types of external surface which may be regular or modified geometrical figures such as a square, a rectangle, a trapezium or a rhombus, such an external regular surface on a crystal is called faces.

4. Define Interfacial angle.

There are always a number of faces on a crystal. The angle at which any two adjacent faces are placed on the crystal with respect to each other is called an interfacial angle.

5. What is meant by element symmetry?

Symmetry is a property of fundamental importance for a crystal. It can be studied with reference to three different characters, commonly called elements of symmetry.

6. Write note on a plane of symmetry.

Any imaginary plane passing through the centre of a crystal in such a way that it divides the crystal in two exactly similar halves is called a plane of symmetry.

7. Write notes on a plane of symmetry.

It is defined as an imaginary line in a crystal passing through its centre in such a way that when a crystal is given a complete rotation along this line a certain crystal face comes to occupy the same position at least twice.

8. Write notes on a center of symmetry.

A crystal is said to pass a centre of symmetry if an imaginary line from some definite face, edge or corner on one side of the crystal through its center, another exactly similar face or edge or corner is found on the other side at an equal distance from the center.

9. Define parameters.

The relative intercepts made by a crystal face on the three crystallographic axes known as parameters.

10. Define indices.

In common practice the relationship of a crystal face with the crystallographic axes is expressed in simple whole numbers which are called indices.

11. Define symbol.

It is the simplest and the most representative indices for a set of similar faces that constitute a crystallographic form.

12. What are the types of forms?

Holohedral form, hemihedral form, hemimorphic form, enantiomorphic form, fundamental form, open and closed form.

13. Name the physical properties of minerals?

Colour, lustre, Streak, Hardness, Cleavage, Parting, Fracture, Tenacity, Structure, Specific gravity, form, Miscellaneous.

14. What is meant by luster?

It is defined as the shine of a mineral. It is technically defined as the intensity of reflection of light from the mineral surface and depends at least on three factors.

15. What is meant by Streak?

It is an important and diagnostic property of many colored minerals. It is defined as the colour of the finely powdered mineral as obtained by scratching or rubbing the mineral over a rough unglazed porcelain plate. The plate is often named as streak in a geology laboratory.

16. What is meant by luster?

It is defined as the resistance which a mineral offers to an external deformation action as scratching, abrasion, rubbing or indentation.

17. What is meant by Cleavage?

It is defined as the tendency of a crystallized mineral to break along certain definite directions yielding more or less smooth, plane surfaces.

18. What is meant by Fracture?

The appearance of broken surface of a mineral in a direction other than that of cleavage is generally expressed by the term fracture.

19. Define coal

Coal is a sedimentary formation, which are obtained largely from vegetable matter. It is the world's largest and leading mineral fuel than petroleum.

20. Define Petroleum

Petroleum is liquid oil having a complex mixture of a variety of hydrocarbons and small quantities of sulphur, nitrogen and oxygen. It is one of the important fuels of the 20th century and has become a necessity of the modern civilization.

UNIT 3 PETROLOGY

1. Define Igneous Rocks?

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

2. Define about Hypabyssal Rocks

These Igneous Rocks are formed at Intermediate depths, generally up to 2 Km, below the surface of earth and exhibit mixed characteristics of volcanic and plutonic rocks. Porphyries of various compositions are example of Hypabyssal Rocks.

3. Define Texture of Igneous Rocks

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

4. What are the factors Explaining Texture?

- a) Degree of Crystallization Holocrystalline, Holohyaline.
- b) Granularity Coarse grained, Medium grained, Fine grained.
- c) Fabric Panidiomorphi, Allotrimorphic, Hypidiomorphie.

5. Define Equigranular and Inequigranular Texture

All those textures in which majority of constituent crystals of rock are broadly equal in size are described as equigranular textures. All those textures in which majority of constituent minerals show marked difference in their relative grain size are grouped as inequigranular textures.

6. Define Structure of Igneous Rocks

Those feature of Igneous Rocks that are developed on a large scale in the body of an extraction or intrusion giving rise conspicuous shapes or forms are included under the term structures. They may be so well developed as to be recognized easily on visual inspection or they become apparent only when this section of such rocks is examined under microscope. In latter case they are termed microstructure.

7. What are the numbers of factor depending on Igneous Rocks?

- a) The structural deposition of the host rock (also called country rock).
- b) The viscosity of the magma or lava.
- c) The composition of the magma or lava.
- d) The environment in which injection of magma or eruption of lava place.

8. Define Volcanic Necks

In some cases, vents of quiet volcanoes have become sealed with the intrusion, such intrusion are termed volcanic Necks or Volcanic Plugs. These masses may be circular, semicircular or irregular and show considerable variation in their diameter.

9. Define Sedimentary Rocks

Sedimentary are also called secondary Rocks. This group includes a wide variety of rocks formed by accumulation, compaction and consolidation of sediments; particles are remaining of organisms in suitable environment under ordinary condition of temperature and pressure.

10. What are the Structures Sedimentary Rocks?

a) Mechanical Structures Stratification, Lamination, Cross Bedding, Graded Bedding, Mud Cracks, Rain Prints, Ripple Marks.

b) Chemical Structure Concretionary Structure, Oolitic and Pisolitic Structures, Nodular Structure, Geode Structure.

c) Organic Structures.

11. What is the Classification of Sedimentary Rocks?

a) Clastic Rocks Gravels Boulders, Cobbles, Pebbles. Sands Coarse Sands, Medium Sands, Fine Sands Silts Clays Rudites, Arenites, Lutites.

b) Non Clastic Rocks Chemically formed rocks Siliceous Deposits, Carbonate Deposits, Ferruginous Deposits, Phosphatic Deposits, Evaporites. Organic Deposits

c) Miscellaneous Deposits.

12. Define metamorphic changes.

All the changes in the body of rocks that are due to variations in the factors of pressure, temperature and chemical environment are known as metamorphic changes and the process itself is termed metamorphism.

13. What are the kinds of Metamorphism?

Three major kinds of Metamorphism differentiated on the basis of dominant factors are thermal metamorphism, dynamic metamorphism and Dynamothermal metamorphism

14. Define Metamorphism

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

15. What is the factor which depends on effects of Metamorphism?

a) The types of rocks involved in the process

b) The kind of metamorphism that is predominant in the process.

16. Define Metamorphic Rocks

Metamorphic rocks are defined as those rocks in which have formed through the operation of various types of Metamorphism processes on the pre-existing rocks involving either textural or structural changes or changes in mineralogical composition or reconstitution in the both the directions.

17. Define Stress minerals.

Those minerals which are produced in the metamorphic rocks chiefly under the influence of factor are known as stress minerals.

18. Define Slate

Slate is an extremely fine grained metamorphic rocks characterized by a slaty cleavage by virtue of which it can be split in to thin sheets parallel smooth surfaces, The slaty cleavage is due to parallel arrangement of platy and flaky operating during the process of metamorphism.

19. Define Schist?

Schist is megascopically crystalline metamorphic rocks characterized by typical schistose structure. The constituent platy and Flaky minerals are mostly arranged in irregular parallel layers or bands.

20. Define Granites

Granite 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 rocks.

UNIT 4

STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD

1. Define Dip

The inclination of the bedding planes, with the horizontal, is called dip and is always expressed in degrees.

2. Define true dip

It is the maximum inclination of bedding planes with the horizontal, or in other words it is the inclination of the direction of which water would flow, if poured on the upper surface of the bed.

3. Define apparent dip

The inclination of the bedding planes, with the horizontal, in any other direction, other than the direction of the true dip, is known as the apparent dip. The value of apparent dip is always less than the true dip.

4. Define strike

It is the direction, measured on a horizontal surface, of a line formed by the intersection of dipping bed with the horizontal plan. It is always expressed in terms of main direction i.e., is North, South, East or West.

5. What is meant by folds?

The earth's crust is tilted out of the horizontal and is bent into folds. Such a fold may range from a microscopic crinkle to great arches and troughs even up to 100 kms across. A set of such arches and troughs is called a fold.

6. What is meant by Anticline and Syncline?

When the beds are unfolded in an arch-like structure, it is called an anticline. When the beds are down folded in trough like structure, it is called a Syncline. It may be noted that in an anticline the oldest rock is in the centre, whereas in a syncline the youngest rocks are in the centre.

7. Mention the Causes of folding

The interior of the earth is getting cooler and cooler day by day, which is sure to cause some shrinkage in the earth's crust. This shrinkage is responsible for the compressive and shearing stress to be developed within the earth's crust. Some time these stresses are small in magnitude but go on exerting pressure for a sufficient length of time and result in buckling or folding of the layers of the earth's crust.

8. What are types of folds?

a) Symmetrical fold b) Asymmetrical fold c) Overturned fold d) Isoclinal fold e) Recumbent fold f) Plunging fold g) Open fold h) Closed fold
i) Anticlinorium j) Synclinorium k) Dome l) Basin m) Nonocclinal fold.

9. Define Faults

Faults are fractures, along which the movement of one block with respect to other, has taken place. This movement may vary from a few centimeters to many kilometers depending upon the magnitude of the stresses, and the resistance offered by the rocks.

10. Mention the Causes of Faulting

The interior of the earth becoming cooler day by day, which is sure to cause some shrinkage in the earth's crust. This shrinkage is responsible for the stress to be developed within the earth's crust. These stresses, when greater in magnitude exert so much pressure that the layers of the earth's crust are folded due to compressive stresses and afterwards when the stresses are released, fractures are formed. If the stresses still continue, the blocks move up or down

along the fault plane depending upon the direction of stresses and their intensity. Such a fracture, along which a movement has taken place, is called a fault.

11. What are the classifications of faults?

Faults are classified on the basis of their apparent displacement, ie, the direction of movement, of one block, with respect to the other along the fault plane.

12. What are the criteria for the recognition of a fault?

- 1) Discontinuity of strata
- 2) Repetition and omission of strata
- 3) Physiographic features
- 4) General.

13. What is meant by Joints?

When sufficient tensile stress is developed between two successive points, a crack is developed at right angle to the direction of the stress, such cracks are called joints.

14. What is meant by Master joints?

The joints always occur in sets and groups. A set of joints means, joint occurring in the same dip or strike. A group of joints means a few sets of joints having almost the same trend. If a few sets or groups of joints appear for a considerable length in a rock, such joints are called major joints or master joints.

15. Define out crop

A little consideration will show that the out crop of a rock is affected by the angle of dip also. If a rock has a vertical dip then the outcrop will be less, than that when the same rock is dipping at some angles.

16. What are the different forms of out crops?

- a) Outlier b) Inlier c) Unconformity d) Overlap e) Cross bedding.

17. Define overlap

An overlap is particular type of an unconformity, in which the overlying strata extends so as to overlap the underlying strata.

18. Define cross bedding

Sedimentary beds or layers are generally parallel to one another. But, sometimes, it has been observed that the beds lie slightly oblique to the major bedding planes.

19. What are the classifications of joints?

- a) Geometrical classification Strike joints, Dip joints, Oblique joints
- b) Genetic classification Tension joints, shear joints

20. What are the methods of Geophysical Exploration?

Depending upon the type of energy field used, the following methods may be used. Seismic method, Electrical method, Gravitational method, Magnetic method, Radiometric method, Geothermal method.

UNIT-5

APPLICATIONS OF GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING

1. Define satellite imageries.

The satellite imageries can either be read manually like aerial photographs, or with the help of computers.

2. Define remote sensing.

Every object on earth emits its own internal energy according to its molecular and atomic structure, in addition to reflecting sun light during the day time. This radiations can be registered by sensors in several Wavelengths, including those in the infrared and microwave regions of the spectrum. When such sensors are installed on aircrafts or on satellites they can record the earth's

objects from far off distances. Such distant (Remote) acquisition of information about the objects on the earth's surface is known as remote sensing.

3. What is meant by aerial photography & Imageries?

The photographs of the earth taken from aircrafts are called the aerial photographs, while the pictures taken from the satellites are called the imageries.

4. Define aerial photographs.

Aerial photographs of the region are taken by cameras placed in the aircrafts. Aerial photos give three dimension of the photographed area. These photos contain a detailed record of the ground at the time exposure.

5. What is meant by geographic information system?

The modern computers can process maps and data with suitable computer programmer. The process of integrating and analyzing various types of data with the help of computer is known as geographic information system.

6. What are applications of remote sensing?

General geological mapping, mineral prospecting, petroleum exploration, ground water exploration, engineering .uses of site rocks, disaster studies, coastal geological studies.

7. What are geological considerations involved in the construction of buildings?

Basic requirements of a building foundation, building foundation on soils, building foundation carried to the deep hard rocks, building founded on surface bed rocks, types of settlement in buildings.

8. What are the characteristics of air photos?

Shape and size, flight and photo data, scale.

9. What are the kinds of air photos?

Vertical air photos, oblique air photos, anusaics, photostrips, stereoprain.

10. Define stereo meter

The instrument is used under a mirror stereoscope for measuring heights and areas of objects from air photos.

11. What is mean by measuring dots?

A stereo meter consists of two small Tran's parent glass or plastic plates attached to a long metallic bar. A clear dot is etched on earth of the plates called "measuring dots".

12. Define land slide.

A land slide is a slow or sudden downhill movement of slope forming rock and soil materials under the force of gravity.

13. Mention the Places in which land slide occur.

They occur in hill valley slopes, sea coasts, river banks and bends, on the slopes of volcanic cones and in earth quake prone areas. They also occur under water as on lake or sea floor.

14. What are the classifications of landslides?

Presence or absence of a definite slip plane, materials involved and their water content, kind and rate of movement.

15. What are the parts of atypical slides?

Crown, scrap, head, slip plane, flanks, transverse ridges, fool, toe, length, width, height, depth.

16. What are the types of landslides?

(1) Slides: Translational, Rotational (2) Falls (3) Flows Slow, Soil creep, Rock creep (4) Complex slides.

17. What are the characteristics of land slide?

- 1, Steep scraps in their upper parts and irregular ridges and furrows at lower parts.
- 2, Landslides vary in extent from several square meters to several kilometers. It is thickness may several meters.
- 3, Land slide velocities ranges from very small movement to more than 100 km/h.

18. What are the causes of land slides?

- a) Natural causes. 1, Internal factors. 2, External factors.
- b) Man induced causes.

19. What are the Geological considerations involved in Road cutting?

- a. Topography
- b. Litho logical characters
- c. Structural features of the rocks
- d. Ground water conditions

20. What are the structural features of tunnel sites?

- a. Dip and strike
- b. Folds
- c. Faults
- d. Joints.

PART-B

UNIT I

1. What is meant by weathering? Describe its effects on rocks and their constituents.
2. Write an essay on 'River as a Geological Agent'
3. Describe the various methods adopted in coastal protection.
4. Discuss the various theories that explain the origin of the earth.
5. Write a essay on the interior of the earth.
6. Give an account on views of the age of the earth.
7. Write notes on: a) Exfoliation b) River Piracy c) Differential Erosion d) Runoff
e) Barchans f) Atoll g) Spit and bar h) Seismogram and seismograph i) River terraces.
8. Give a detailed account of the following: a) Formation of soils. b) Reclamation of desert lands c) Coral Islands
9. Distinguish between the following group of features:
(a) a young and mature valley, (b) a glaciated and river valley
(c) a submerged and emerged coast line

UNIT II

1. Describe the tests you would perform in trying to identify a mineral in the field.
2. What are the rock forming minerals? Give a general account of their Chemical and Physical properties.
3. Define the term 'crystal'.
4. What are symmetry elements in crystals?
5. Describe the following groups of minerals a) Quartz group b) Felspar group c) Mica group
6. Compare and contrast the minerals of Pyroxene group to that of Amphibole group.
7. Write short notes on :
a. kinds of luster b) Twincrystals c) Moh's scale of hardness d) Flourescence
e) Cleavage and parting f) Walker's steelyard balance.
8. Mention the most distinguishing physical properties of the following minerals.
9. Amethyst, Olivine, Talc, Labradorite, Galena
10. Explain how you will distinguish the following pairs of minerals.
a.Pyrite and chalcopyrite, b. Beryl and Apatite c.Hornblende and Augite
d. Calcite and Gypsum e. Muscovite and talc
11. Give the principle ores, their physical properties, Chemical composition and distinguishing characters of the following metals.
a.Iron b. Copper c. Manganese d. Zinc e. Aluminum f. Lead