

## UNIT 1 GENERAL GEOLOGY

### 1) Write notes on Lithosphere.

Litho is a Greek word, which means stone. Accordingly the lithosphere is the part of the earth, which is solid crust. The thickness of lithosphere is approximately 50 km. The crust thickness is not the same at all places. It is thicker in the continent and thinner on the ocean floors. Lithosphere is a source of various minerals. It contains variety of landforms such as mountains, plateaus, valleys, plains.

### 2) What is meant by NIFE?

The central part of the earth is called Core or barysphere. It has thickness of 2900km. This layer is made of very hard mineral like Nickel (Ni) and iron (Fe) and so it is called NIFE (Ni + Fe). Here there is intense heat and pressure and this region is elastic and viscous in nature.

### 3) Distinguish between SIAL and SIMA.

The upper most layer is called the crust of the earth. It has a thickness of 50 km and thus the crust is made of two layers. Silica (Si) and Aluminium (Al) are the elements found in the first layer. Therefore this layer is called SIAL (Si + Al). This layer is also called 'Granitic layer.'

Below the SIAL lies a layer called SIMA which composes of silica (Si) and Magnesium (Mg). This layer is also called Basaltic layer.

### 4) What are plates?

The surface of the earth is the crust of the earth. It is made of interlocking pieces called plates. The continents and oceans rest in these places and are separated by wide cracks. The plates move constantly.

### 5) What is meant by atmosphere?

The outer gaseous part of the earth starting from the surface and extending as far as 700 km and even beyond is termed atmosphere. It makes only about one-million part of the total mass of the earth.

### 6) Define sea floor spreading.

Divergent boundaries occur at Oceanic ridges. In the process of plate separation, the magma rises up from the asthenosphere and fills the gap they created. In this way new crust is created along the trailing edges of the diverging plates. This phenomenon is called sea floor spreading.

### 7) What are the subdivisions in geology?

The subdivisions are:

- a) Physical geology
- b) Geomorphology
- c) Mineralogy
- d) Petrology
- e) Historical geology
- f) Economic geology
- g) Geohydrology
- h) Engineering geology
- i) Metrology

**8) What is meant by engineering geology?**

Engineering geology may be defined as that of applied sciences which deals with the application of geology for a safe, stable land economical design and construction of a civil engineering project.

**9) Define seismology.**

Seismology is a branch of geophysics that deals with the study of elastic waves within the body of the earth during an earthquake. ie. The study of earthquake is called seismology.

**10) Give the two types of discontinuity.**

There are two important discontinuities:

- Mohorovicic or Moh discontinuity
- Gutenberg or Oldharm discontinuity

**11) Define denudation.**

It is general term used when the surface of the earth is worn away by chemical as well as mechanical actions of physical agents and the lower layers are exposed. This happens when the rocks were exposed for a sufficient length of time to the attacks of physical agents.

**12) What is mean by continental crust?**

The continental crust consists of two layers separated by a well-defined discontinuity known as conard discontinuity. The layers have been defined on the basis of seismic wave's velocities and densities.

In the upper layer the velocity of seismic waves corresponds to the velocity found by experimental to be characteristic of granite. Hence they are called as Granitic or sialic layer.

**13) What is mean by physical weathering?**

It is a physical breakdown of rock masses under the attack of certain atmospheric agents. A single rock block is broken gradually into smaller irregular fragments and then into particles of still smaller dimensions. Temperature variations are irresponsible to a great extent of physical weathering.

**14) Give the example for chemical reaction in chemical weathering?**

1.  $2\text{CaCO}_3 + \text{H}_2\text{O} + \text{CO}_2 \text{ ----- } 2 \text{Ca} (\text{HCO}_3)_2$   
Calcium bicarbonate (Soluble)
2.  $\text{CaSO}_4 + 2 \text{H}_2\text{O} \text{ ----- } \text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$   
Gypsum
3.  $2\text{KAISI}_3\text{O}_8 + 2 \text{H}_2\text{O} + \text{CO}_2 \text{ ----- } \text{H}_4\text{Al}_2\text{Si}_2\text{O}_9 + 4\text{SiO}_2 + \text{K}_2\text{CO}_3$   
Kaolin                      Quartz              Potassium carbonate

**15) Define deflation.**

Deflation is the process of simply removing the loose sand and dust sized particles from an area, by fast moving winds. Wind deflation can successfully operate in comparatively dry regions with little or no rainfall and where the mantle is unprotected due to absence of vegetation.

**16) What are Barchans?**

The barchans are crescent or half moon shaped dunes of variable size. Their 'horns' point in the downward direction. Their height may vary from 15-200 mts. And width from a few to 1000s meter. They have a gentle windward slope and steeper leeward slope.

**17) Define the terms**

- i) Focus
- ii) Epicentre

**Focus:**

The exact spot underneath the earth's surface, at which an earthquake originates, is known as its focus.

**Epicentre:**

The earthquake then moves in the form of wave which are spread in all directions. These waves first reach the point at the surface, which is immediately above the focus or origin of the earthquake. This point is called epicentre.

**18) What are the causes of earthquake?**

The earthquake may be caused due to various reasons:

- Earthquakes due to superficial movements.
- Earthquake due to volcanic eruptions.
- Earthquake due to folding or faulting

**19) Define aquifer and the names the types of aquifers.**

Groundwater occurs in permeable geologic formations is known as aquifers.i.e formations having structures has permit appreciable water to move through them under ordinary field conditions. Aquifers may be classes as unconfined and confined, depending upon the presence or absence of a water table.

**20) What do you understand by spheroidal weathering?**

When weathering occurs, part of the disintegrated rock material is carried away by running water or any other transporting agent. Some of them are left on the surface of the bedrock as residual boulders. These boulders are then rounded off to spheroidal cores by the simultaneous attack of eroding agents on all sides. It is often seen that these boulders have an onion like structure. This kind of weathering is called spheroidal weathering.

**21) Write short notes on:**

- \*) **Porosity**
- \*) **Permability**

**Porosity:**

The portion of a rock or soil not occupied by solid mineral matter may be occupied by ground water. These spaces are known as voids, interstices, pores or pore space. The interstices can act as ground water conduits; they are characterized by their size, shape, irregularity, and distribution.

**Permability:**

The groundwater is stored in the pores of a rock and will hence be available in the groundrocks. The porosity of the rock, thus defining the maximum amount of water that can be stored in the rock. This is called permeability.

**22) What is mean by water table?**

The depth to upper surface of zone of saturation in free ground water is called water table. In other words, a static level of water in wells penetrating the zone of saturation is called water table.

**23) What are the movements of the oceans?**

There are three movements of oceans:

- i) Waves
- ii) Tides
- iii) Currents.

Waves are only the rise and fall of water caused by the action of the winds. There is no movement forward. These are at the surface and not at great depth.

Currents are rivers in the sea. The water moves forward and falls at the depth as well. These are caused by the unequal temperature of equator and Polar Regions.

Tides are the rise and fall of seawater occurring twice in a lunar day.

**24) Explain the wenner's formula to determine resistance.**

For the wenner arrangement the apparent resistivity  $\rho = 2\pi \frac{x}{3} \frac{V}{I}$

Where,  $X/3$  = the distance between adjacent electrodes.

$V$  = Voltage difference between the potential electrodes.

$I$  = Applied current.

**25) Distinguish between magnitude and intensity of the earthquake.**

Intensity of an earthquake may be defined as the ratio of an earthquake based on actual effects produced by the quakes on the earth.

Magnitude (M) of a tectonic earthquake may be defined as the rating of an earthquake based on the total amount of energy released when the over strained rocks suddenly rebound causing the earthquake.

**UNIT 1****GENERAL GEOLOGY****1. Write short notes on:**

- ✓ **Crust**
- ✓ **Mantle**
- ✓ **Core**
- ✓ **Stratosphere**
- ✓ **Atmosphere**

**Crust**

- i. Early in the 20<sup>th</sup> century the reality of earth crust was demonstrated by a scientist named Mohorovicic.
- ii. He noted that in measurements of seismic wave arriving from an earthquake, those focus lay within 40km of the surface, seismographs within 800 km of the epicentre.
- iii. Recorded two distinct sets of P and S-waves.

There are two types of crust:

- (a) Continental crust- The layers have been defined on the basis of seismic waves velocities and densities.
- (b) Oceanic crust- The earth's crust beneath the oceans consist of a low velocity layer of deep sea sediments about 300-400m thick in pacific and 600-700 m in the Atlantic.

**Mantle:**

- i. Mantle is made up of extremely basic material called aptly ultra basic that is very rich in iron and magnesium but quite poor in silica.
- ii. The material of the mantle is believed to be variably viscous in nature

**Core:**

- a. It is the third and the innermost structural shell of the earth as conclusively proved by the seismic evidence.
- b. It starts at a depth of 2900 km below the surface and extends right up to the centre of the earth, at a depth of 6370km.

**Stratosphere:**

- i. It is the second layer of the atmosphere starting from the tropopause and extending up to an average height of 50km
- ii. The ozone layer starts at a height of 9km above the surface and continues up to 35km. The maximum concentration of ozone in this layer is estimated at a height of 20-25km.
- iii. The upper boundary of the stratosphere is called Stratopause.

**Atmosphere:**

- a. The outer gaseous part of the earth starting from the surface and extending as far as 700km and even beyond is termed atmosphere.
- b. It makes only about one million part of the total mass of the earth.

**2) Explain briefly about Branches of geology?****Physical geology:**

This is also variously described as dynamic geology, geomorphology etc.  
It deals with:

Different physical features of the earth, such as mountains, plateaus, valleys, rivers, lakes, glaciers and volcanoes in terms of their origin and development.

The different changes occurring on the earth surface like marine transgression, marine regression, formation or disappearance of rivers, springs and lakes.

**Mineralogy:**

This deals with the study of minerals.

Minerals are basic units with different rocks and ores of the earth are made up of.

Details of mode of formation, composition, occurrence, types, association, properties, uses etc. of minerals form the subject matter of mineralogy.

**Petrology:**

Petrology deals with the study of rocks.

The earth's crust also called lithosphere is made up of different types of rocks.

Hence petrology deals with the mode of formation, structure, texture, composition, occurrence, and types of rocks.

**Structural geology:**

The rocks, which from the earth's crust, undergo various deformations, dislocations and disturbances under the influence of tectonic forces.

The result is the occurrence of different geological structures like folds, fault, joints and unconformities in rocks.

The details of mode of formation, causes, types, classification, importance etc of these geological structures from the subject matter of structural geology.

**Economic geology:**

Minerals can be grouped as general rock forming minerals and economic minerals.

Some of the economic minerals like talc, graphite, mica, asbestos, gypsum, magnesite, diamond and gems.

The details of their mode of formation, occurrence, classification, association, varieties, concentration, properties, uses from the subject matter of economic geology.

**Stratigraphy:**

The climatic and geological changes including tectonic events in the geological past can also be known from these investigations.

This kind of study of the earth's history through the sedimentary rock is called historical geology.

It is also called stratigraphy (Strata = a set of sedimentary rocks, graphy description).

**3) Write a critical essay on weathering and its significance in engineering construction?**

Weathering is defined as a process of decay, disintegration and decomposition of rocks under the influence of certain physical and chemical agencies.

**Physical weathering:**



It is the physical breakdown of rock masses under the attack of certain atmospheric agents.

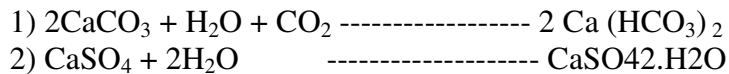
A single rock block is broken gradually into smaller irregular fragments and then into particles of still smaller dimensions.

It is the most active in cold, dry and higher areas of the earth surface Temperature variations are responsible to a great extent of physical weathering.

### **Chemical weathering:**

The chemical decomposition of the rock is called chemical weathering which is nothing but chemical reaction between gases of the atmosphere and minerals of the rocks.

Chemical weathering is essentially a process of chemical reactions between gases of the atmosphere and the surface rocks. For example:



### **Engineering importance of rock weathering:**

For the construction engineer it is always necessary to see that:

- To what extent the area under consideration for a proposed project has been affected by weathering and
- What may be possible effects of weathering processes typical of the area on the construction materials?

### **4) Give an account of geological work of wind explaining briefly some major geological features?**

The earth is surrounded by an envelope of gases called the atmosphere.

The movement of the atmosphere in a direction parallel to the earth surface is wind. i.e the air in motion is called wind whereas the vertical movements of the atmosphere are termed as air currents.

### **Erosion by wind and developed features:**

Wind erosion is generally caused by two erosion processes:

- i) Deflation ii) Abrasion.

#### **Deflation:**

Deflation is the process of simply removing the loose sand and dust sized particles from an area, by fast moving winds.

**Abrasion:**

The wind loaded with such particles attains a considerable erosive power which helps a considerable erosive power which helps in eroding the rock surfaces by rubbing and grinding actions and produce many changes. This type of wind erosion is known as abrasion.

**Transportation by wind:**

The total sediment load carried by a wind can be divided into two parts.

- a) Bed load
- b) Suspended load

**Deposition of sediment by wind and the developed features:**

The sediments get dropped and deposited forming what are known as Aeolian deposits. There are two types of Aeolian deposits;

- a) Sand dunes
- b) Loess

**5) Write short notes on**

- a) Hydraulic action
- b) Cavitation
- c) Abrasion
- d) Attrition
- e) Corrosion

**Hydraulic action:**

It is the mechanical loosening and removal of the material from the rocks due to pressure exerted by the running water.

**Cavitation:**

It is distinct and rare type of hydraulic action performed by running water. It is particularly observed where river water suddenly acquires exceptionally high velocity such as at the location of a waterfall.

**Abrasion:**

It is the principal method of stream erosion and involves wearing away of the bedrocks and rocks along the banks of a stream or river by the running water with the help of sand grain, pebbles and gravels and all such particles that are being carried by its as load.

**Attrition:**

This term is used for wear and tear of the load sediments being transported by a moving natural agency through the process of mutual impacts and collisions which they suffer during their transport

**Corrosion:**

The slow built steady chemical action of the stream water on the rocks is expresses by the term corrosion. The extent of corrosion depends such on the composition of rocks and also on the composition of flowing water.

**6) Explain the causes, classification of earthquake?****Causes of earthquake:****1. Earthquakes due to superficial movements:**

The feeble earthquakes are caused due to superficial movements.i.e, dynamic agencies, and operation upon surface of the earth.

**2. Earthquake due to volcanic eruptions:**

Most of the volcanoes erupt quietly and as consequence, initiate no vibration on the adjoining area.

There may be still a volcanic eruption may cause a severe vibration on the adjoining area and have really disastrous effects.

**3. Earthquake due to folding or faulting:**

. If the earthquakes are caused due to folding or faulting then such earthquakes are more disastrous and are known as tectonic earthquakes and directly or indirectly change the structural features of the earth crust.

**Classification of earthquakes:**

Earthquakes are classified on a no. of basis. Of these the depth of focus, the cause of origin and intensity are important.

**a) Depth of focus:**

Three classes of earthquakes are recognized on this basis, shallow, intermediate and deep seated.

In the shallow earthquakes the depth of focus lies anywhere up to 50 km below the surface. The intermediate earthquakes originate between 50 and 300 km depth below the surface.

**b) Cause of origin:**

Tectonic earthquakes are originated due to relative movements of crystal block on faulting, commonly, earthquakes are of this type.

Non tectonic earthquakes: that owes their origin to causes distinctly different from faulting, such as earthquakes arising due to volcanic eruptions or landslides.

**C) Intensity as basis:**

Initially a scale of earthquakes intensity with ten divisions was given by Rossi and ferel, which was based on the sensation of the people and the damage caused.

However it was modified by Mercali and later by wood and Neumann.