Weathering

Exercises

I. Short Answer Questions.

Question 1.
What is weathering ?
Answer:
Weathering involves disintegration or decay of solid rock due to change in temperature and weather and their impact on the composition of rock.

Question 2.
Give one point of difference between physical and chemical weathering.
Answer:
Physical weathering does disintegration of rock without chemical reaction and the chemical weathering does change in chemical compounds within rock.

Question 3.
What is known as exfoliation ? Name the processes involved in it ?
Answer:
Sudden change in temperature causes fissures in the rocks through which water penetrates to motivate chemical weathering along with sudden contraction and expansion due to change in temperature peels out the upper layer of rock known as exfoliation.

Question 4.
Name the four processes involved in chemical weathering.
Answer:
These are solution, carbonation, oxidation and hydration.

Question 5.
What is known as oxidation ?
Answer:
It is the process of reaction of minerals present in rocks to atmospheric oxygen.

Question 6.
Briefly describe biological weathering.
Answer:
Biological weathering is done by animals, insects plants and man, because these break up the rocks through making holes, root channels and construction of building, canals etc.

Question 7.
What are exogenic forces ?
Answer:
These are the external forces that sculpture the surface features of the land.

Question 8.
What is called denudation ? Name the processes involved in it.
Answer:
Denudation is the wearing away of landmass by various agents as water, wind and ice through various processes like weathering, mass movement, erosion and transportation.

Question 9.
Name the two processes of gradation.
Answer:
Two processes are denudation and aggradation.

Question 10.
What is the chief characteristic of weathering in tropical climates ?
Answer:
Tropical climates are noted for distinct dry and wet season and high rate of evaporation. During rainy season the oxides of iron and aluminium are dissolved in water and mix up with the soil to form laterite soils.

Question 11.
What is known as mass wasting ?
Answer:
The movement of loose material derived from the bed rock through weathering is called mass wasting.

Question 12.
Name any two slow movements of mass wasting.
Answer:
Slow movements of mass wasting an be divided into two
main types — Creep and Solifluction.
Creep : The slow downhill movement of debris is called soil creep.
Solifluction : The water mixed with soil forms clay which moves as a thick viscous fluid.

Question 13.
Give one example of rapid mass movement.
Answer:
Rapid mass movement includes large amount of debris, soil, boulders and rock pieces etc, e.g. landslides and sheet erosion or displacement of the upper rock strata in large amount to uncover the rocks lying below.

Question 14.
What is known as Sheet Wash ?
Answer:
It is the rapid movement of rock debris etc in heavy amount taking the form of a thick sheet of thick fluid of soil and clay removing settlement and vegetation cover, too.

II. Give a technical term for each of the following :

Question 1.
Disintegration or decomposition of rock.
Answer:
Weathering.

Question 2.
Peeling off of the outer layer of rock through contraction and expansion.
Answer:
Exfoliation

Question 3.
Expansion of minerals in rocks on coming into contact with rainwater.
Answer:
Hydration.

Question 4.
The leveling of land surface by erosion and deposition.
Answer:
Gradation.

Question 5.
The process in which a landform of lower level is upgraded to a higher level.
Answer:
Aggradation.

III. Say whether the following are 'True' or 'False'.

1. Temperature is not a factor in physical weathering.
Answer. False

2. In dry climates mechanical weathering is dominant.
Answer. True

3. In Polar regions there is no chemical weathering.
Answer. True

4. External forces are engaged only in erosion.
Answer. False

5. Shear plane is the surface on which movement of a landslide takes place as a result of its breaking off.
Answer. True

IV. Long Answer Questions.

PQ. Describe the process of denudation and gradation.
Answer:
Denudation is the process of wearing away of rock-strata by water, wind and ice along with change in weather and temperature.
Gradation is the process of leveling down the whole landform gradually to ground level by various agents of change mainly water, (rivers), wind and ice (glaciers), etc.

Question 1.
Define weathering and describe the chief characteristics of weathering.
Answer:
Weathering is the process of breaking down of rocks but not its removal. It is described as disintegration or decomposition of a rock in size by natural agents at or near the surface of the earth.
Chief characteristics of weathering are disintegration of rocks, chemical change in rocks, change in the surface of land, formation of soil, several processes involved in weathering like temperature and weather change and reactions, transportation of rock material from one place to another resulting in formation of large plains like Northern plain of India.

Question 2.
Distinguish between physical and chemical weathering.
Answer:
Physical Weathering :

1. Rock disintegration without any change in chemical constituents of rocks takes place.
2. Factors such as temperature, moisture, pressure cause physical break-up of rocks.
3. It takes place in hot dry and cold areas due to rapid temperature changes.
4. Rocks are affected to great depths.
5. Its agents are temp erature and moisture.

Chemical Weathering :

1. Mineral in rocks are dissolved or altered.
2. Temperature, moisture, etc., cause minerals in rocks to dissolve in water or convert them into other minerals.
3. It takes place in hot and humid areas due to chemical action of minerals in rocks.
4. It mostly takes place near the surface of the earth.
5. Its agents are solution, oxidation, carbonation and hydration.

Question 3.
Describe chemical weathering mentioning the processes involved in it.
Answer:
Chemical weathering takes place with the help of agents as water, wind and various organic acids, reacting in the chemical composition of rocks which are then disintegrated. Four main processes are solution by dissolving salts in the rocks with water, carbonation works with the reaction of carbon dioxide with rocks, oxidation takes place through atmospheric oxygen reacting with minerals present in rocks, hydration is evident by mixing of rainwater with minerals in rocks, which expand by this and become heavy.

Question 4.
What is biological weathering ? State the main agents of biological weathering.
Answer:
Biological weathering is weathering caused by plants and animals. Plants and animals release acid forming chemicals that cause weathering and also contribute to the breaking down of rocks and landforms. It is also known as Organic weathering. Its main agents are animals, insects, plants and man. In all the cases, however, both physical disintegration and / or chemical decomposition are involved. Their role can be explained as follows :

1. **Animals and Insects :** Animals like rabbits, worms, moles and insects bring large quantities of fine material to the surface. Burrowing animals help to loosen the surface materials around the rocks facilitating their physical disintegration. Upon death, the decaying physical also provide many chemicals and acids for rock disintegration.
2. **Vegetation :** Roots of large trees reach deep into rocks and cause physical disintegration due to pressure. Most of : vegetation, however, prevents disintegration of rocks because it binds the surface layer and does not allow exposure of rocks beneath to the elements of weathering.

Question 5.
Describe the chief characteristics of weathering in different climates.
Answer:
Equatorial region is noted for more active chemical weathering due to excess of temperature and water ; tropical region is remarkable for formation of laterite soil by

mixing of oxides of iron and aluminium in the soil due to change in heating and much evaporation.

Question 6.
State and explain the classification of mass movements.
Answer:
Mass movements are divided into slow and rapid movements. Slow movement includes Creep, movement of soil and debris and Solifluction or clay formation Rapid movement includes landslide, Earth Flow or heavy thick paste of soil down the slope, Mud Flow in the areas without vegetation cover and Sheet Wash in the form of large sheet flow snatching a thick rock strata uncovering the rocks below. It may also take place by human activities of settlement.
Mass movement has built many remarkable landforms as Himalayan lakes, Terraces, escarpment etc.

Practice Questions (Solved)

Question 1.
Name two processes involved in denudation.
Answer:
Weathering and Erosion.

Question 2.
What does the term denude mean ?
Answer:
To lay the rocks bare.

Question 3.
What is weathering ?
Answer:
Breaking up of rocks by agents related to atmosphere.

Question 4.
Name the gases involved in the process of chemical weathering.
Answer:
Weak acids, oxygen, carbon dioxide, hydrogen.

Question 5.
In which region underground water is an effective agent of denudation.
Answer:
Underground water is an effective agent of denudation in limestone regions.

Question 6.
Name few well known physical features caused by chemical weathering.
Answer:

1. Limestone and chalk landforms of Karst region of Yugoslavia.
2. Weathering of granite rocks in Malaysia.

Question 7.
Why is mechanical weathering also known as physical weathering ?
Answer:
Because it involves physical disintegration of rocks. Physical disintegration is quickest when rock is already weakened by chemical weathering. So it is primarily known as mechanical weathering.

Question 8.
What is weathering ? Illustrate the process graphically.
Answer:
The break-down but not removal of rocks is called weathering. It is a process of wearing away of land through forces of nature like weather, running water, ocean currents etc. Weathering is a single process and takes place in air.

Question 9.
Distinguish between :

1. **Weathering and Denudation**
2. **Loess and Alluvium.**

Answer:

1. **Weathering and Denudation :** Weathering is a process 4 of gradual disintegration of rocks by atmospheric or weather forces. Denudation is a process of wearing away of land and it includes weathering also.
2. **Loess and Alluvium :** Alluvial soils are formed by depositional activity of running water and loess by wind. Alluvium contains high mineral and humus content, and loess is highly permeable.

Question 10.
On what factors does the weathering depend ?
Answer:
Weathering depends upon :

- structure of rocks
- climate
- vegetation

- topography and slope of land.

Question 11.
What do you understand by Denudation ?
Answer:
Denudation is a general term which covers all the agents causing destruction or the wearing away of the rock surface of the earth together with their transportation and final deposition.

Question 12.
Name any two agents of denudation.
Answer:

1. The weather in which the chief agents are heat and cold which did water and frost
2. The running water

Question 13.
Name the gases which help in chemical weathering.
Answer:
The following atmospheric gases help in the process of chemical weathering:

1. Oxygen
2. Hydrogen
3. Carbon dioxide

Question 14.
What is humus ? How is it formed ? What is its significance in soil formation ?
Answer:
Humus : Humus is a dark substance formed in soils. It is a dead organic matter formed by decay of animals and plants. Trees, shrubs, grass and bacteria help in the formation of humus. In warmer climates, humus is destroyed by countless bacteria. In colder areas soils are rich in humus and it is collected in the soil. Tropical humid soils are poor in humus because it is consumed by bacteria.
Humus is vital to the fertility of soils. It provides nitrogen, phosphorus and calcium to the soils. It sustains other forms of life. It helps the weathering of minerals to add to fertility of soils. It increases water holding capacity of soils.

Question 15.
What is a badland topography ?
Answer:
A highly dissected land surface is known as badland. In sloping areas, gully erosion results in soil erosion. These gullies develop a ravine land a badland topography. This topography consists of ridges, earth pillars, ravines, escarpments, etc. This topography is found in Chambal Valley of Madhya Pradesh in India.

Question 16.
Explain the processes of physical weathering giving examples.
Answer:
The disintegration of the bedrock due to changes in temperature and freezing action of water by mechanical process is called physical weathering e.g. frost or snow lying between the cracks forces to expand the rocks cracks which helps in disintegration. Besides this, the change in temperature does the expansion and contraction of rocks resulting in breaking the rocks into smaller pieces.

Question 17.
Distinguish between the following

(a) 'Weathering' and denudation.
(b) 'Mechanical Weathering' and 'Chemical Weathering'.
(c) Sheet erosion and gully erosion.

Answer:
(a) Weathering :

- Weathering is the physical and chemical weathering of rocks due to mechanical and chemical action of water, wind and ice.

Denudation :

- Denudation includes both weathering and erosional proceses by which the natural agents of change (water, wind and ice), continously try to change the face of the earth.

(b) Mechanical Weathering :

- It is done by the change in temperature and action of ice which breaks the rocks into small pieces.

Chemical Weathering :

- It is done by oxidation hydration, carbonation and solution etc chemical processes which causes the breaking of rocks.

(c) Sheet Erosion :

- Sheet Erosion causes washing out the upper layer of soil and vegetation cover due to heavy rainfall or floods.

Gully Erosion :

- Through gully erosion deep cuts, cracks and trenches are carved in the soil-bed, These tend to be deeper channels known as 'gullies'.

Question 18.
What do you understand by the following terms :

(a) Exfoliation
(b) Regolith
(c) Oxidation
(d) Carbonation
(e) Desilication
(f) Humus

Answer:

(a) Exfoliation — It is the process of scaling off the curved outer shells of the rock. Exfoliated dome-shaped rocks are largely found in great deserts.
(b) Regolith — It is the loose material created by the weathering of rocks i.e. small pieces of rocks.
(c) Oxidation — Formation of oxygen compounds with the contact of air with rocks e.g. iron-oxide etc. is known as oxidation.
(d) Carbonation — Formation of carbon compounds with the contact of air with rocks e.g. Calcium Carbonate, which is easily carried on by ground water.
(e) Desilication — The solution of silica of the rocks with water is called desilication.
(f) Humus — It is the decayed vegetation material found in the soil.

Question 19.

(a) What are different types of soil according to their texture ?
(b) How are the different kinds of soils in Temperate zones formed ?

Answer:
(a) According to the texture (sizes of the soil particles), the soil is divided into three main types i.e. Clay, loam (silt) and sandy loam (sand gravel), the diameter of soil particles ranges from .0002 mm to more than 2 mm. Soil structure refers to the physical arrangement of the soil.
(b) The kinds of temperate zone soils may be classified as follows.
Name :

1. Podzol
2. Cheronozems region

3. Brown and Grey soils
4. Chestnut soils

Region :

1. Cool and cold coniferous forest
2. Grassy steppes and semi arid lands
3. Deciduous forest region of high and middle latitudes
4. Arid margins of steppes.

Question 20.
Rewrite the following sentences, choosing the right word from those given in brackets :
Answer:

- (**Humus** / Regolith) is produced by the decayed organic material, including dead leaves, stems roots, living bacteria, fungi, worms and other organisms.
- (Weathering / **Denudation**) refers to the gradual disintegration and decomposition of rocks which lie exposed to the elements of weather.
- (Young / **Mature**) soils are those which are undisturbed by erosion or deposition.
- (**Hydration** / Carbonation) occurs when the water itself combines chemically with some element or mineral.
- (Oxidation / **Solution**) is the chemical process in which some of the minerals are dissolved by the water.

Question 21.
Define the following terms briefly :

(a) Soil texture
(b) Soil structure
(c) Soil profile
(d) Soils
(e) Chernozems

Answer:

(a) Soil texture — It is the make up of the soil referring to the sizes of the soil particles.
(b) Soil structure — The structure of the soil may be blocky, granular, prismatic or columnar and platy which decides the movement of the soil water.
(c) Soil profile — The vertical structure of the soil from the bedrock below upto the surface soil is called the soil profile.
(d) Soils — The soils are the aggregate of loose, unconsolidated material along with micro-organism mineral compounds, humus etc.
(e) Chernozems — are the richest soils found in the grassy steppes and are best for wheat cultivation.

Question 22.
What are the various factors governing the formation of soil ? Which one is the most important and why ?
Answer:
The factors influencing the formation of soils are the parent rock, topography, vegetation, climate and time span. Out of these climate is the most important because it controls the type of weathering the first step of the soil formation process.

Question 23.
Match the following pairs correctly

A	B
(a) A soil formed at a place or a particular site.	Alluvium
(b) Over a long period of time this soil become mature.	Transported soil
(c) It is most fertile soil when renewed every year.	Podzol
(d) This soil is found is cool or cold humid areas.	Residual

Answer:

A	B
(a) A soil formed at a place or particular site.	Residual
(b) Over a long period of time this soil become mature.	Transported soil
(c) It is the most fertile soil when renewed every year.	Alluvium
(d) This soil is found is cool cold humid areas.	Podzol

Question 24.
Explain the processes of physical weathering giving examples.
Answer:
Physical weathering : It is also called Mechanical weathering. It includes the breaking up of rocks without changing their composition. It means disintegration of rocks by mechanical means. This type of weathering results from the action of temperature changes, frost, wind and rainfall. It is important in dry areas.
The change in temperature causes the bare rocks to expand when warmed by the sun,

and contract when night falls and their heat is lost by radiation. The mineral grains of a bed rock expand or contract at different rates as a result of heating or cooling. This causes the breaking of rock into fragment of grains.

Question 25.
Distinguish between the following :

(a) Weathering and Denudation
(b) Physical Weathering and Chemical Weathering.
(c) Sheet erosion and Gully erosion.
(d) Granular Disintegration and Block Disintegration.
(e) Solution and Hydration
(f) Erosion and Weathering.

Answer:

(a) Weathering : 'Weathering' means the disintegration and decay of the rocks cover of the earth's surface. It is an action which affects rocks in the place where they are. The rate of weathering will depend on the climate of the region, on the kind of rock, on its chemical composition, on its hardness and structure which may allow water to penetrate easily into it.
Denudation : Denudation is a general term which covers all the agents causing destruction or the wearing away of the rock surface of the earth together with their transportation and final deposition.
(b) Physical weathering : It is also called Mechanical weathering. It includes the breaking up of rocks without changing their composition. It means disintegration of rocks by mechanical means. This type of weathering results from the action of temperature changes, frost, wind and rainfall. It is important in dry areas.
Chemical weathering : The decomposition of rocks by chemical processes is called chemical weathering. This type of weathering produces a chemical change in minerals of rocks. It results from the action of weak acids and atmospheric gases like oxygen, carbon dioxide, hydrogen. It involves the process of oxidation, carbonation, solution and hydration. It is important in hot humid areas.
(c) Sheet Erosion : When the vegetation cover of an area is removed, the rain, instead of sinking into ground, washes the soil down slope. Each succeeding rain-storm washes away a thin layer of absorbed top soil. This is known as Sheet Erosion.
Gully Erosion : When rain falls more heavily, the flow off storm water finds its way down hill in a series of channels.
Every fresh down pour widen and deepens the channels which develop into gullies. Gullies cut up agricultural land into small fragments and make them finally unfit for cultivation. This type of erosion is known as Gully Erosion.
(d) Granular Disintegration ; The temperature changes during summer and winter lead to expansion, due to heating and contraction, due to cooling. Different minerals present in the rocks may have different rates of expansion and contraction. For example dark coloured minerals will absorb more heat and expand to a greater extent than light

coloured minerals. Such alternating expansion and contraction between day and night leads to a break up of the rock into different minerals. This type of weathering is called granular disintegration.
Block disintegration : A rock may split along joints or fissures by the repeated freezing of water in cracks or other openings, because water expands nearly one-tenth of its volume when it freezes. It is followed by melting during daytime repeatedly. This type of weathering is called block disintegration because the rock is split into rectangular block along the joints.
(e) Solution : It is the chemical process in which the soluble minerals are dissolved by water entering into rocks through crevices. The dissolved minerals are removed with the flow of water resulting in the break up of the rock. Rock-salt and gypsum weather away chemically because of this process. Since silica is highly soluble in water, and silica is found in so many rocks, this process is also known as Desilication.
Hydration : It is the process by which some minerals in crystalline form absorb water and become a powdery mass. Feldspar, a common rock forming crystalline mineral absorbs water and becomes a mass of clay by the process of hydration. The other minerals present along with feldspar get separated into loose particles and the rock breaks up.

(f) Erosion and Weathering :
Erosion :

1. Erosion includes the work of weathering away of rocks of the earth.
2. It involves motion.
3. River, glacier, wind are its main agents.

Weathering :

1. Weathering is the breaking of rocks by elements of atmosphere.
2. It involves no motion.
3. Temperature, frost, wind, plants and animals are its main agents.

Question 26.
What do you understand by the following terms :

(a) Exfoliation
(b) Regolith
(c) Oxidation
(d) Carbonation
(e) Weathering
(f) Humus
(g) Soil profile
(h) Landslide
(i) Soil texture

(j) Gradation
(k) Frost action

Answer:

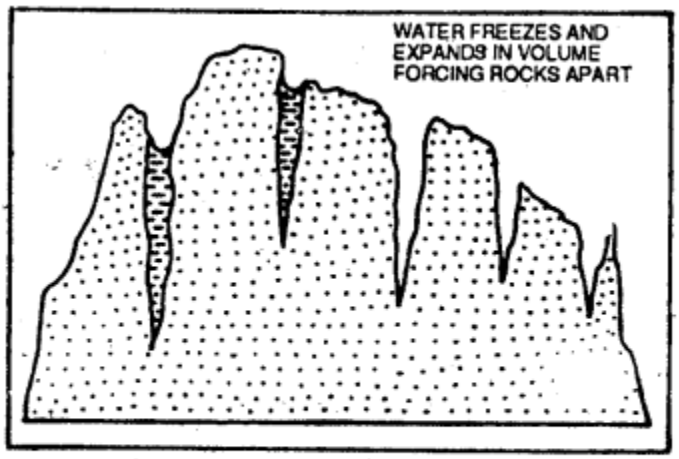
(a) Exfoliation : When the rock consists of homogeneous minerals the thin surface layer of rock absorbs heat during the day and expands, while during the night, this surface layer contracts. In a few days the rock breaks up or peels off into layers. This type of weathering is called exfoliation.
(b) Regolith : The loose material which has resulted from the breaking down of bed rocks is called Regolith.
(c) Oxidation : The Atmospheric oxygen combines with minerals of rocks especially iron compounds to fonn oxides. The rocks begin to decay and crumble to a powdered mass of brown dust. This process is known as oxidation.
(d) Carbonation : The process of absorption of carbon dioxide from the atmosphere by minerals present in the rocks is called carbonation.
(e) Weathering : The disintegration or decay of rocks on the surface of the Earth due to atmospheric conditions is called weathering.
(f) Humus : The organic matter present in the soil is called humus.
(g) Soil profile : The vertical cross section of soil is called soil profile.
(h) Landslide : Sudden movement of weathered particles down the slope is known as landslide.
(i) Soil texture : Soil textures refers to size of the particles comprising the soil.
(j) Gradation : The process of erosion, transportation and deposition of rock material is called deposition.
(k) Frost action : The freezing of water in the cracks and openings of rocks during the night leading to the splitting up of the rocks is called frost action.

Question 27.
Account for the two types of weathering.
Answer:
Weathering may be :

1. **Mechanical :** weathering is the disintegration of rocks by mechanical forces, without chemical changes.
2. **Chemical :** weathering is the gradual decomposition of the rock owing to the reaction and combination of the constituent minerals of the rock with oxygen or carbon dioxide present in the atmosphere. In Chemical weathering the presence of water is essential.

Question 28.
Describe how changes of temperature lead to weathering.
OR
How do changing temperature lead to weathering ?

Answer:
The alternate action of heat and cold helps in weathering of rocks. For example, during the day, the rocks expand by heat and they contract due to cold during night. It tends to loosen the particles of rock and it begins to disintegrate because every rock is composed of different minerals, which are affected differently due to changes in temperature and therefore the component parts of the rock begin to lose cohesion.



Frost action cause weathering

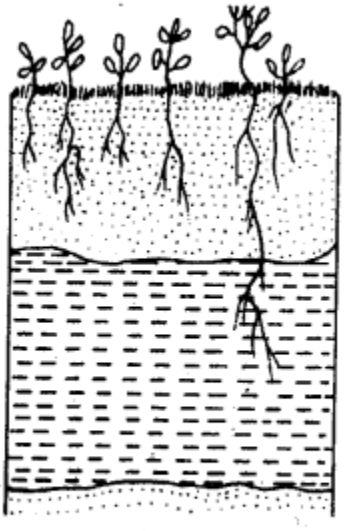
Frost action cause weathering

Question 29.
How does frost action cause weathering ?
Answer:
In the middle latitudes, temperature may be above freezing point of water during day time and below freezing point during the night. Water present in the joints and fissures in the rocks, gets frozen into ice during the night. Freezing of water results in expansion in volume and the fissures widened.
It is followed by melting during day time repeatedly. It is called block disintegration because the rock is split into rectangular blocks along the joints. Frost action is most common in the tropical regions and in high mountains all the year round.

Question 30.
Name the different processes of chemical weathering.
Answer:
Different processes of chemical weathering are as follows :

1. Solution
2. Hydration
3. Oxidation
4. Carbonation

Question 31.
Describe the work of plants as agents of weathering.
Answer:
Plants protrude their roots through joints in the rocks and as the plant grows, the joints in the rocks get widened. The widening of joints allows water to seep through. Seepage of water may cause chemical weathering or frost action. Decay of plant remains like flowers, leaves, etc., result in the formation of organic acids which may react with minerals present in the rocks. The leads to chemical weathering.



Weathering by Plants

Question 32.
Which human activities lead to weathering of rocks ?
Answer:
Following human activities lead to weathering of rocks :

1. Mining
2. Quarrying
3. Deforestation

When trees are cut the binding action of the roots of the trees is no longer present. Rocks get exposed to sun and rain and weathering takes place rapidly. Mining and quarrying exposes bare rocks on the surface and these get weathered quickly.

Question 33.
State the effects of weathering.
Answer:
Effects of weathering :

1. It causes landslides.
2. It causes mud flow, that is, the flow of weathered material, soggy with water, deacon a hillside or a slope.
3. Weathering breaks down the particles of rocks gradually and makes it easy for rivers and other agents of denudation to transport them down the slope. It exposes the rock to further weathering. Thus weather assists the agents of denudation.
4. Weathering assists the formation of soils.

Question 34.
Give reasons for the following :

1. Change of temperature leads to physical weathering.
2. Presence of water aids chemical weathering.
3. Human activities encourage weathering.
4. Climate is the most important factor of soil formation.
5. Farmers are encouraged to adopt soil conservation methods.
6. A soil dominated by clay makes tilling difficult.
7. Grassland soils are less acidic than forest soils.

Answer:

1. Change of temperature leads to physical weathering because it leads to expansion due to heating and contraction due to cooling.
2. Presence of water aids chemical weathering because it dissolves soluble minerals present in the rocks.
3. Human activities encourage weathering because these activities expose rocks to sun and rain due to which weathering takes place rapidly.
4. Climate is the most important factor of soil formation because it controls the type of weathering of the parent rock arid availability of soil moisture for plants and micro-organisms.
5. Farmers are encouraged to adopt soil conservation methods because it protects the top layer of the soil.
6. A soil dominated by clay makes tilling difficult because it is sticky and tough.
7. Grassland soils are less acidic than forest soils because grasses are heavy feeders on the bases.

Question 35.
Explain the following terms.

1. Colloids
2. Bases

Answer:

1. **Colloids :** Colloids are extremely tiny particles which are so small that they can not be seen by optical microscope ‘ and remain suspended indefinitely in water. They have the property of being electrically charged and can attract and hold ions of calcium, magnesium and potassium, known as bases. These bases are required by plants for their growth. – Soil colloids are also useful in holding water in the soil. When present in large quantities, they make the soil sticky and tough so that it is difficult to cultivate.
2. **Bases :** Ions of calcium, magnesium and potassium are known as bases. They are required by the plants for their growth.