6. Geomorphic processes

1. Multiple choice question

(i) Which one of the following processes is a gradational process?

(a) Deposition
(b) Diastrophism
(c) Volcanism
(d) Erosion

Answer: (d) Erosion

(ii) Which one of the following materials is affected by hydration process?

(a) Granite
(b) Clay
(c) Quartz
(d) Salts

Answer: (b) Clay

(iii) Debris avalanche can be included in the category of:

(a) Landslides

(b) Slow flow mass movements

(c) Rapid flow mass movements

(d) Subsidence

Answer: (c) Rapid flow mass movements

2. Answer the following questions in about 30 words

(i) It is weathering that is responsible for bio- diversity on the earth. How?

Answer: Weathering processes are responsible for breaking down the rocks into smaller fragments. Biomes and biodiversity is a result of forests and forests depend upon the depth of weathering mantles.

(ii) What are mass movements that are real rapid and perceptible? List.

Answer: Mass movements transfer the mass of rock debris down the slopes under the direct influence of gravity. These include creep, flow, slide, and fall.

(iii) What are the various mobile and mighty exogenic geomorphic agents and what is the prime job they perform?

Answer: Weathering, mass movements and erosion, transportation as well as deposition are the main mobile and mighty exogamic geomorphic agents. All these agents bring geomorphic changes on the surface of the earth.

(iv) Is weathering essential as a pre-requisite in the formation of soils? Why?

Answer: Soil formation depends first on weathering. It is this depth of the weathered material, which is the primary input for soil to form.

3. Answer the following questions in about 150 wor

(i) "Our earth is a playfield for two opposing groups of geomorphic processes." Discuss.

Answer: The earth's crust is dynamic and ever changing. All changes take place under the influence of certain forces working continuously within the earth as well as over the surface of the earth. The forces working over the earth's surface are known as exogamic forces, while those working within the earth are called androgenic forces. The exogamic forces cause degradation of relief of elevations and aggradations of basins on the earth's surface. The phenomenon of wearing down of relief variations of the surface of the earth by exogamic forces is known as gradation. Androgenic forces working inside the earth bring about the variations in the surface relief.

It may be sudden forces like earthquakes, volcanoes, etc., in general, the endogenic forces are mainly land hurtling forces and exogenic forces are mainly land wearing forces.

(ii) Exogenic geomorphic processes derive their ultimate energy from the sun's heat. Explain.

Answer: Exogenic forces act on the surface of the earth. All exogenic forces such as weathering and denudation derive their energy from the sun. Sunlight causes air to move, water to evaporate, and ocean waves to rise. These moving fluids like water, wind and waves, etc., attack the solid surface, eroding it, carrying the broken pieces far away, and depositing them to fill low places in the landscape. Weathering is a process of the breaking of rocks by static agents of weather. In this process, the rocks are disintegrated by physical forces and decomposed by chemical action. Agents of physical weathering such as insulation, frost, etc., wholly depend upon energy derived from the sun. The agents of denudation like river, glacier, wind, sea waves, etc., also derive their energy from the sun.

(iii) Are physical and chemical weathering processes independent of each other? If not, why? Explain with examples.

Answer: Weathering is action of elements of weather and climate over earth materials. Physical and chemical weathering processes are not independent of each other, rather work of agents of physical and chemical weathering are interdependent. Chemical weathering is brought about by oxidation, carbonation, hydration and solution. The agents of physical weathering, like unloading and expansion, temperature changes and expansion, freezing, thawing and frost weathering, and salt weathering, easily break these decayed and decomposed rocks. Chemical weathering depends upon the work of physical weathering because physical weathering prepares ground for agents of chemical weathering to work. For example, agents of physical weathering like variation in temperature, freezing, thawing and frost wedging, salt weathering, etc., break the rocks and agents of chemical weathering can easily work on them.

(iv) How do you distinguish between the process of soil formation and soil forming factors? What is the role of climate and biological activity as two important control factors in the formation of soils?

Answer: Soil is a dynamic medium in which many chemical, physical, and biological activities go on constantly. The process of soil formation begins with the breaking of rocks into small pieces by various agents of weathering and erosion. This rock material contains a mixture of minerals. Later on, decaying plant remains are also mixed in it. This is known as humus and forms organic part of the soil. Animals and insects with microorganism like bacteria also form organic matter.

Soil also holds water, which provides life to plants and trees. Plant roots penetrate down, burrowing animals bring up particles, mass of material becomes porous and sponge like with a capacity to retain water and to permit the passage of air and finally a mature soil, a complex mixture of mineral and organic products forms. There is air in the open spaces within the soil containing more of carbon dioxide and also oxygen and nitrogen. Thus, soil is the final product of the interactions between the weathering of underlying rock, the climate, plants and the

activities of millions of insects and microorganism. All these physical, chemical and the biological activities build up the soil layer over a long period of time.

Factors of Soil Formation: Five basic factors control the formation of soils:

(i) parent material;
(ii) topography;
(iii) climate;
(iv) biological activity;
(v) time

The role of climate and biological activity are followings:

1. The climate of an area is a major active factor in soil formation. In dry climates, because of high temperature, evaporation exceeds precipitation and hence ground water is brought up to the surface by capillary action and in the process, the water evaporates leaving behind salts in the soil.
2. Biological activity includes the effect of vegetation, bacteria, and animals. The vegetative cover and organisms that occupy the parent materials help in adding organic matter, moisture retention, nitrogen etc. Dead plants provide humus, which increases soils' fertility. Bacteria also changes nitrogen from air into a chemical form, which is usable by different plants. That is why bacteria are termed as nitrogen- fixing agents. Burrowing animals like ants, rodents, termites, etc., also help also help in mixing and creating new contacts between air, water and minerals in the earth materials.