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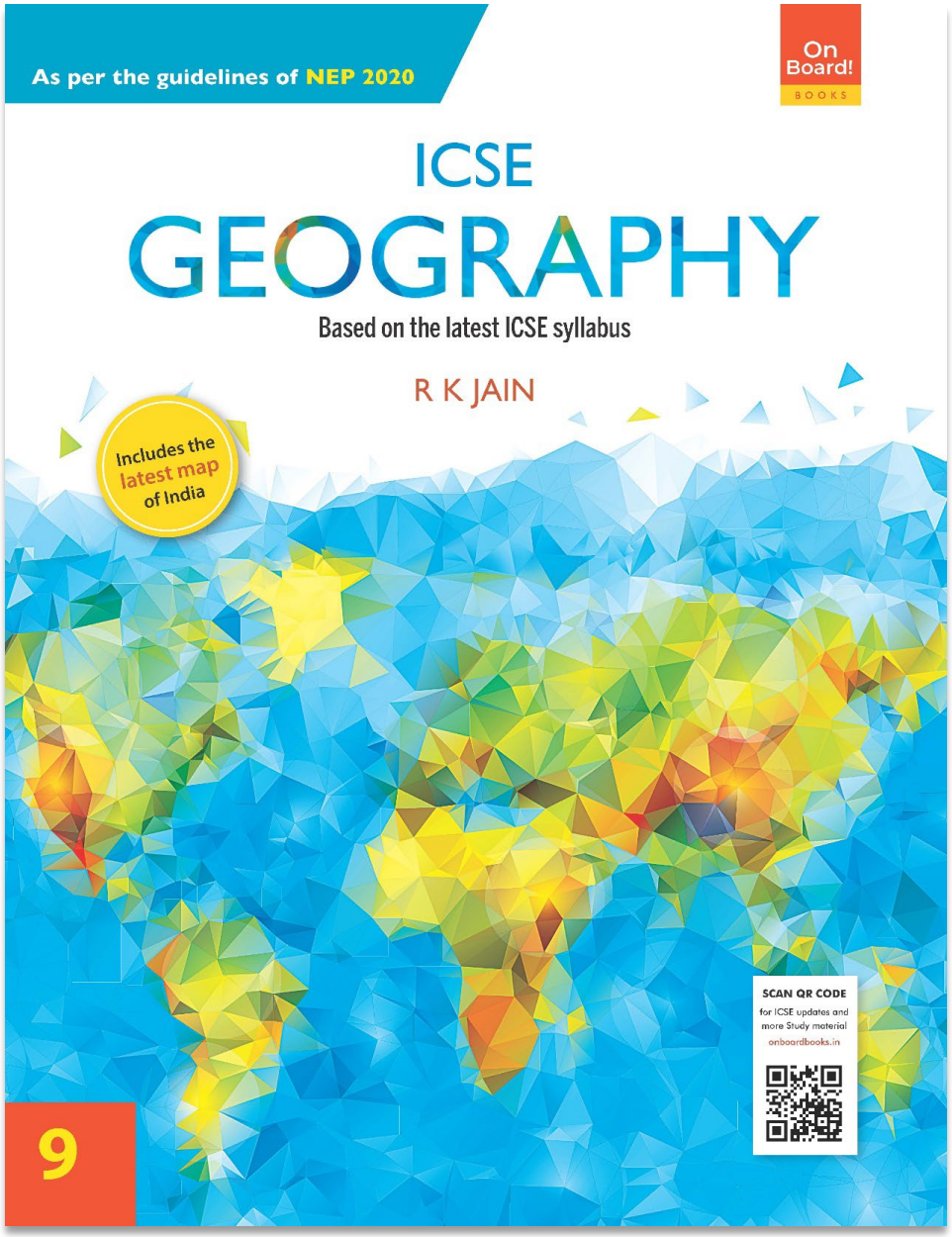
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CONTENTS

ICSE GEOGRAPHY

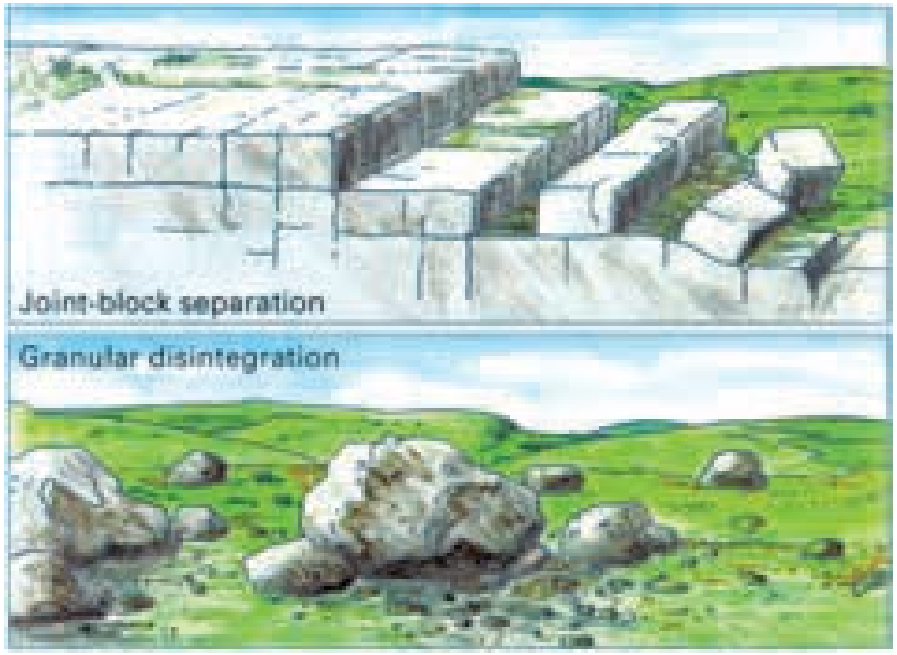
Class 9

Chapter 9: Weathering

The **tectonic forces** working in the interior of the Earth tend to cause differences in surface elevations. These are called constructive forces as they give rise to major landforms on the surface of the Earth.

The forces which originate on the surface of the Earth act in direct opposition to the tectonic forces. These external or **exogenic forces** tend to reduce the differences in surface elevations. The external forces work through the processes of **weathering**, **erosion**, **transportation**, **deposition**, etc. The Sun is the main source of energy for them.

The processes which tend to bring the surface of the lithosphere to a common level are known as gradation. The work of **gradation** is done by the processes of degradation and aggradation. Degradation is also known as **denudation** which means 'to lay bare'. The process of denudation includes **weathering** and **erosion**.



Bedrock disintegration

WEATHERING

The term weathering is used for the breaking up and decay of exposed rocks. The weathering of rocks is caused by changes in temperature, frost action, plants, animals and human activities.

The process which involves loosening, disintegration and decomposition of rocks at or near the Earth's surface is called weathering.

Factors Responsible for Weathering

The work of weathering depends mainly on the following factors.

1. The type of rocks
2. The climatic conditions
3. The type of vegetation cover
4. The slope of land
5. The exposure to Sun, wind and rain

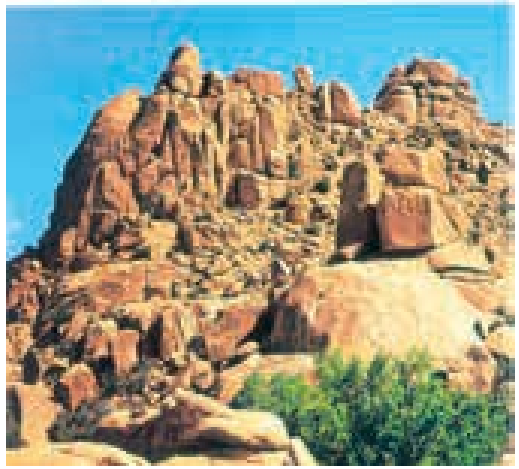
TYPES OF WEATHERING

The work of weathering is carried out in the following three ways.

1. Mechanical weathering – disintegration of rocks
2. Chemical Weathering – decomposition of rocks
3. Biological Weathering or Organic weathering

Mechanical Weathering

The mechanical weathering is responsible for the disintegration of rocks without changing their chemical composition. It is caused by changes in temperature, plants and animals.



Mechanical weathering

1. Block Disintegration: In the arid regions, the difference between the day and night temperatures is very high. During the daytime, the bare rocks are heated and their outer layers expand. At night, the rocks contract due to fall in temperature. The amount of expansion and contraction of the rocks is not the same. This leads to the development of cracks on the surface of rocks. Over a period of time, the rocks split up into blocks. This is known as block disintegration.

Block disintegration

2. Granular Disintegration: The rocks are composed of a variety of minerals which react to heat differently. The rocks also expand and contract at different rates. This causes a series of joints and cracks in the outer rock layers. The rocks are broken into pieces and fragments, which have angular shapes. This is known as granular disintegration.

3. Exfoliation: The rock masses are generally poor conductors of heat. The outer layers expand more than the inner layers. This can completely loosen the outer rock layers. In due course of time, the outer loose layer may peel off from the main rock mass in the form of thin shells. This type of weathering is called exfoliation.

Exfoliation.

Chemical Weathering

The processes which cause rocks to decay or decompose are known as chemical weathering. The process of chemical weathering is promoted by high temperature and abundant moisture. The work of chemical weathering is carried out through solution, oxidation, carbonation and hydration.

Chemical weathering

1. Solution: Solution is the first step in the chemical decomposition and disintegration of rocks. Some minerals in the rocks get dissolved in water and are removed in solution. The solubility of the minerals and rocks depends on the nature of rocks. **For example** rock salt, limestone and gypsum are easily soluble in water.

2. Oxidation: The atmospheric oxygen in the presence of moisture enters into chemical union with minerals, especially those with iron contents. It causes the rusting of iron, which leads to decay and decomposition.

3. Carbonation: Rainwater when mixed with carbon dioxide in the atmosphere, becomes a light carbonic acid. It acts on chalk, limestone, marble and gypsum. In the process, the carbonates are converted into bicarbonates, which are easily soluble in water. This process is known as carbonation.

4. Hydration: The chemical union of water with a mineral is called hydration. Feldspar, a silicate of aluminum, is found in almost all the rocks. On its chemical combination with water, the feldspar increases in volume. It exerts pressure and the outer shell gets detached by the mechanical force of expansion. Whatever is left behind is kaolin, a mixture of sand and clay.

Biological Weathering

The biological weathering or organic weathering involves both physical disintegration and chemical decomposition of rocks. It is carried out through plants, animals and human beings.

1. Human Beings: Nowadays, human beings have become the most powerful agent of weathering and erosion. Mining activities for extraction of minerals, blasting of hills and ridges by dynamites for road and dam construction and mineral extraction, quarrying for industrial and building raw materials, etc. result in the disintegration of rocks.

2. Plants: The roots of the plants penetrate through the cracks made originally by physical disintegration of rocks. These roots, while moving downwards, are able to widen the cracks and finally the rocks split apart.

Weathering due to plant action

3. Animals and Insects: The burrowing animals such as earthworms, ants, rats, etc. help in loosening the rocks by bringing rock particles from the lower layers of the Earth crust to the surface. Now, the other agents can easily remove these rock fragments

EFFECTS OF WEATHERING

- Rocks are disintegrated and decomposed due to the work of different processes of weathering. They produce a large amount of rock waste. Normally the wastes lie over the unweathered fresh rock and are called **regoliths**.
- The weathered rock material is very useful in the process of soil formation, and can also expose mineral deposits
- Weathering can cause damage to human settlements in the foothill zones when the mass movement of rock waste come down the hill slopes.
- The rapid rate of weathering, due to deforestation in hilly areas, can cause overloading of rivers and retard their flow. This can also cause rapid rate of siltation of river beds.
- Continuous removal and transfer of disintegrated and decomposed rocks through landslides, rockfall, rock slides, etc. can cause lowering of the height of the affected areas and also help in the evolution and formation of various landforms.

WEATHERING IN DIFFERENT CLIMATIC REGIONS

The effects of weathering on rocks vary according to the prevailing climatic conditions in that area. The climatic conditions play an important role in different weathering processes.

1. The Equatorial Regions experience hot and humid climate almost throughout the year. In such conditions, the chemical weathering is more rapid and continuous.

2. The Tropical Regions have a distinct dry season and wet season. The evaporation is high and oxidation of iron and aluminium takes place. In this region weathering helps in the formation of laterite soils.

3. In Desert Regions, the climate is hot and dry. In such areas mechanical weathering is common. In some semi-arid regions, some chemical weathering also takes place.

4. In Temperate Regions, frost is the most powerful agent of mechanical weathering. Chemical weathering through solution is more effective in the limestone areas.

5. In Polar Regions, the climate is very cold throughout the year. The permanent snow cover prevents the weathering of rock surface. At some places, due to frost action, mechanical weathering can occur.

THANK YOU