Unit - 1

Rocks and Soils

Learning Objectives

- To understand the nature of rocks, their types and uses.
- To identify the different types of rocks.
- To study about the nature of soil and its composition
- To understand the importance of soil conservation

QYIJGQ

Introduction

Have you ever noticed any mountains or rocks nearby your location or during your travel? Have you ever been to any hill station during your vacation? Do you know how they originated on the earth surface? Do you know what kinds of material are used in the construction of temples, buildings, roads, flyovers etc. In this lesson, we will learn about rocks and soils.

In lower classes, we have studied about four realms of the earth, namely lithosphere, hydrosphere, atmosphere and biosphere. Lithosphere is the upper most and significant layer of the earth. It is composed of solid rocks and unconsolidated materials. The literal meaning of lithosphere is "**The sphere of rock**".

DO YOU KNOW?

Petrology is a branch of geology which deals with the study of rocks. '**Petrology**' is derived from the Greek word "**Petrus**" refers to rock and "**Logos**" refers to study

Find out

What is the base of the house made up of ?

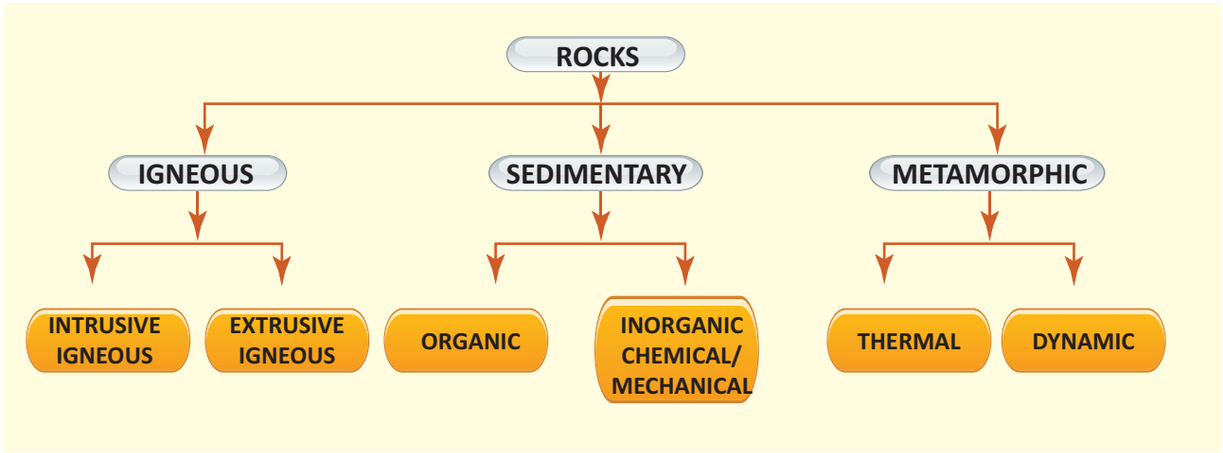
Rocks

The rocks are the solid mineral materials forming a part of the surface of the earth and other similar planets. The earth's crust (Lithosphere) is composed of rocks. A rock is an aggregate of one or more minerals. Rock is an important natural resource and is found in solid state. It may be hard or soft in nature. An estimation reveals that there are 2,000 different types of minerals found on the earth surface out of which only 8 basic minerals commonly found all over the earth. Minerals are chemical substances which exist in nature. They may occur either in the form of elements or compounds.

Classification of Rocks

According to the mode of formation the rocks are classified into three types as follows.

1. **Igneous Rocks**
2. **Sedimentary Rocks and**
3. **Metamorphic Rocks**



Igneous Rocks

The igneous rocks are formed by the solidification of molten magma. These rocks are also called as the '**Primary Rocks**' or '**Parent Rocks**' as all other rocks are formed from these rocks.

Igneous rock

The word **Igneous** is derived from the Latin word '**Ignis**' means '**fire**'

Characteristics of Igneous Rocks

1. These rocks are hard in nature
2. These are impermeable
3. They do not contain fossils
4. They are associated with the volcanic activities
5. These rocks are useful for construction works

Types of Igneous Rocks

Igneous Rocks are of two types. They are:

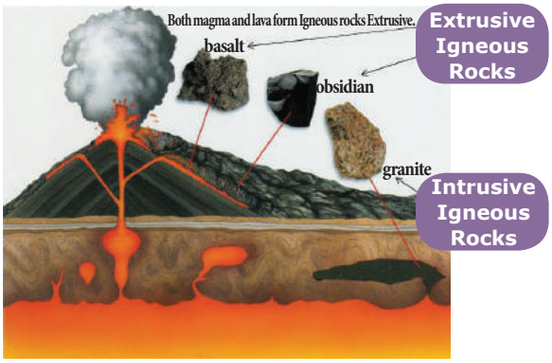
1. Extrusive Igneous Rocks
2. Intrusive Igneous Rocks

1. Extrusive Igneous Rocks

Can you visualize the lava comes out from a volcano? Lava is actually a fiery red molten magma comes out from the interior of the earth on its surface. After reaching the earth surface the molten materials get solidified and form rocks. Rocks formed in such a way on the crust are called Extrusive igneous rocks. These rocks are fine grained and glassy in nature due to rapid solidification. Basalt found in the north western part of peninsular India is the example for this type of rock.

2. Intrusive Igneous Rocks

The molten magma sometimes cools down deep inside the earth's crust and becomes solid. The rocks formed this way is called '**Intrusive Igneous Rocks**'. Since the cool down slowly and form crystals. Hence they are called 'crystalline rocks'. Intrusive Igneous rocks are two types. They are, 1. Plutonic rocks 2. Hypabysal rocks. The deep seated rocks are called 'Plutonic rocks' and the ones formed at shallow depths are called 'Hypabysal rocks'. Granite, Diorite and Gabbro are the example of plutonic rocks and dolerite is an example of hypabysal rocks.



Extrusive & Intrusive Igneous rocks

Some major **Active Volcanoes**: Mount Vesuvius, Mt. Stromboli and Mt. Etna in Italy and Mauna Loa and Mauna Kea in Hawaii Islands.

Sedimentary Rocks

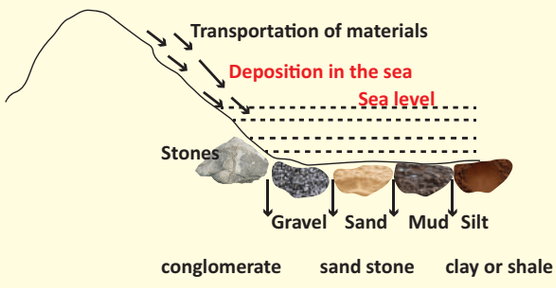
Sedimentary Rocks

The word **'Sedimentary'** has been derived from Latin word **'Sedimentum'** means settling down. The sedimentary rocks are formed by the sediments derived and deposited by various agents. Due to high temperature and pressure, the undisturbed sediments of long period cemented to form sedimentary rocks. Sedimentary rocks consist of many layers which were formed by the sediments deposited at different periods. As it consists of many strata, it is also known as **'Stratified rocks'.**

Sedimentary rocks are the important source of natural resources like coal, oil and natural gas.

Characteristics of Sedimentary rocks

1. They have many layers.
2. They are non-crystalline rocks.
3. They contain fossils.
4. They are soft and get eroded easily



Formation of Sedimentary Rocks

Oldest sedimentary rocks of the world has been identified in Greenland and estimated as 3.9 billion years old.

Types of Sedimentary Rocks

1. Organic Sedimentary Rocks

These rocks are formed as a result of the decomposition of dead plants and animals. It contains fossils. Chalk, Talc, Dolomite and Limestone rocks are of this category.

2. Mechanical Sedimentary Rocks

These rocks are formed due to the disintegration of igneous and metamorphic rocks. The natural agents erode and transport these rocks and deposit them at some places. After a long period of time, they cemented to form rocks. Sandstone, Shale and Clay are the examples of rocks of this type.

3. Chemical Sedimentary rocks

These are formed by precipitating of minerals from water. It is formed usually through evaporation of chemical rich solutions. These rocks are also called as evaporates. Gypsum is an example of this kind.

Metamorphic Rocks

The word Metamorphic is derived from two Greek words "Meta" and "Morpha", Meta means change and Morpha means shape. When Igneous and sedimentary rocks subject to high temperature and pressure, the original rocks get altered to form a new kind of rock called metamorphic rocks. Metamorphism is of two types. They are

1. Thermal Metamorphism
2. Dynamic Metamorphism

If the change in the rocks is mainly caused by high temperature, the process is called as 'Thermal Metamorphism'.

If the change in the rock is mainly caused by high pressure, the process is called as 'Dynamic Metamorphism'.

One of the world wonders Taj Mahal in India was built with White Marbles a metamorphic rock.

Metamorphic Rock

Formation of Metamorphic Rocks from Igneous rocks

1. Granite into gneiss caused by dynamic metamorphism.
2. Basalt into slate caused by thermal metamorphism.

Formation of Metamorphic Rocks from Sedimentary rocks

1. Sandstone into quartz caused by thermal metamorphism.
2. Shale into slate caused by thermal metamorphism.

Characteristics of Metamorphic Rocks

1. Metamorphic rocks are mostly crystalline in nature.
2. They consist of alternate bands of light and dark minerals.

Rock cycle

Igneous rocks are the primary rocks formed first on the earth. These rocks are weathered, eroded, transported and deposited at some places to form sedimentary rocks. The Igneous and Sedimentary rocks are changed into metamorphic rocks under the influence of temperature and pressure. The metamorphic rocks are also get disintegrated and deposited to form sedimentary rocks. Formation of igneous rocks take place when there is an outflow of molten materials. Like this, the rocks of the earth crust keeps on changing from one form to another form under various natural forces and agents. The endless process is referred as **Rock Cycle**.

Quartzite and Marble are the rocks commonly used for construction and sculpture works. Marbles are widely used for making beautiful statues and decorative items such as vase, tiny gift articles and grinded marble is used to produce plastics, paper etc.,

Uses of rocks

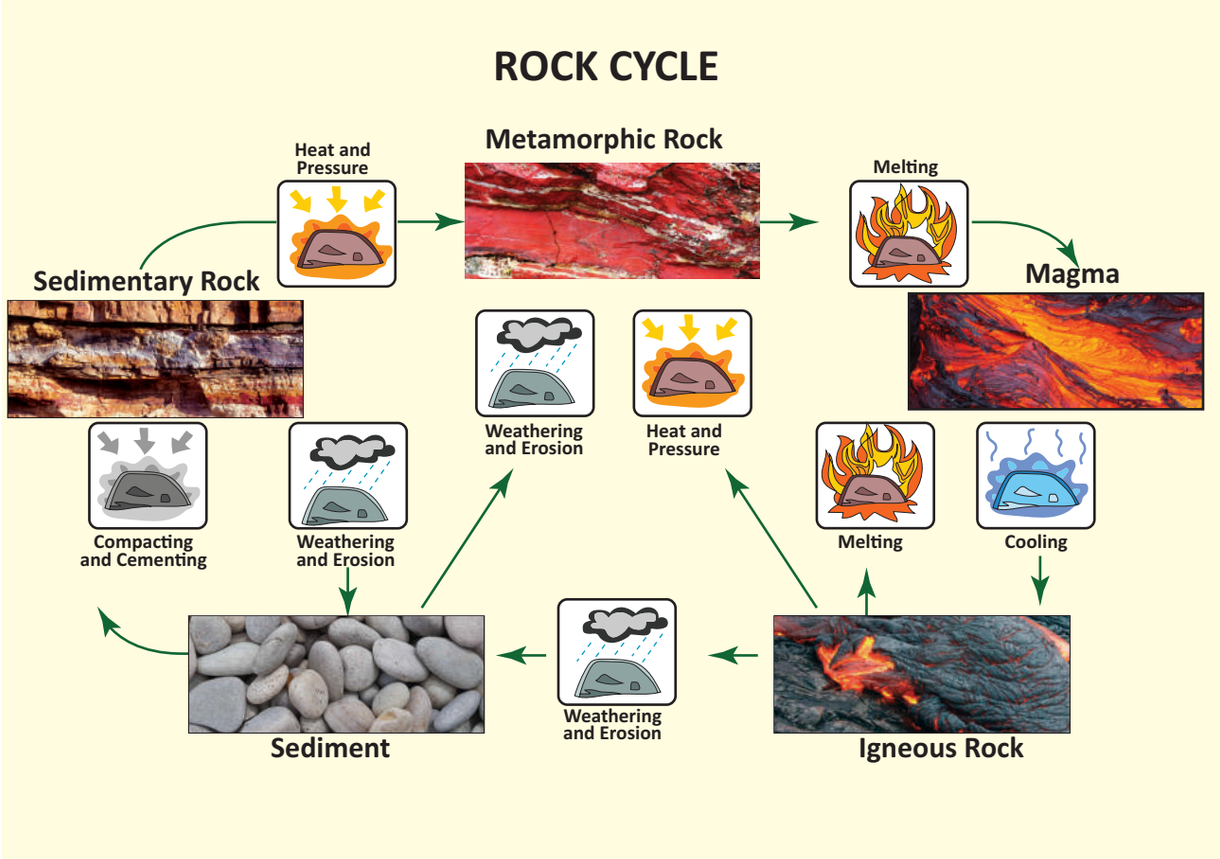
Rocks have been used by mankind throughout the history. Rocks are highly valuable and important to almost all aspects of our economy. The minerals and metals in rocks have been found essential to human civilization. Rocks are used for many purposes in our life and some of them are given below

Rocks are useful for making

1. Cement
2. Writing chalk
3. Fire
4. Building materials
5. Bath scrub
6. Kerb stone
7. Ornament
8. Roofing materials
9. Decorative materials
10. These are valuable source of minerals such as gold, diamond, sapphire etc.

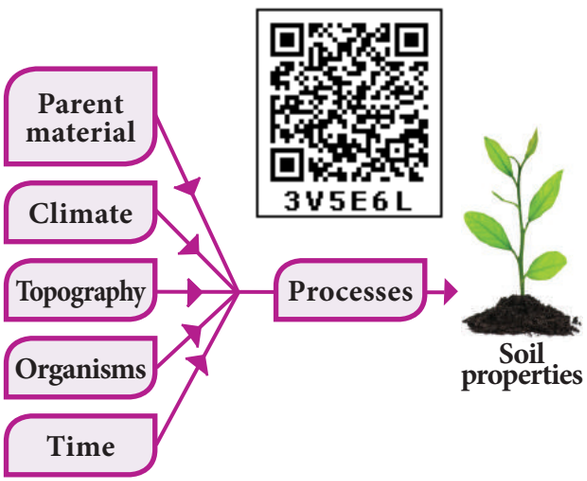
ACTIVITY

Collect different types of rocks and display them in the class room



Rock Cycle

Soil and its Formation

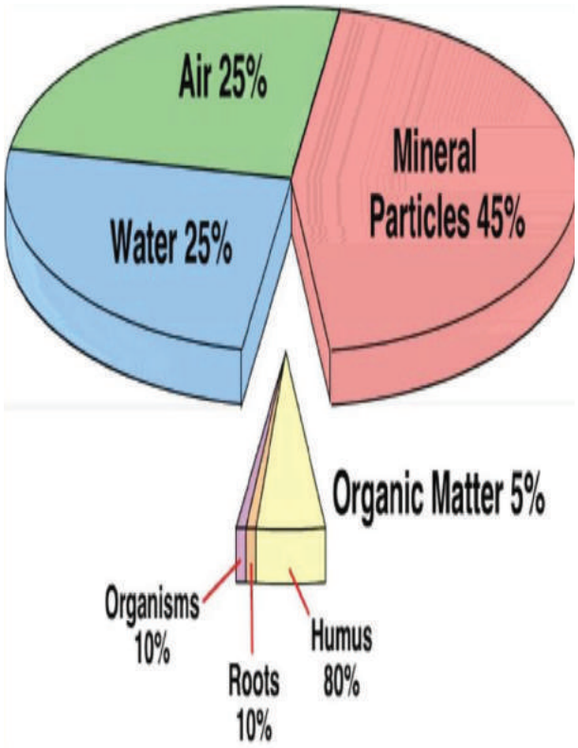


Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life. **Soil** minerals form the basis of soil. It forms on the surface of the earth. It is known as the '**skin of the earth**'. Soils are formed from rocks (parent material) through the **processes** of weathering and natural erosion. Water, wind, temperature change, gravity, chemical interaction, living organisms and pressure differences all help break down parent material. It leads to the formation of loose material. In course of time, they further break down into fine particles. This process release the minerals locked in the rock fragments. Later on, the vegetative cover which develop in that region forms humus content in the soil. This way the soil gets matured gradually.

World Soil Day is observed on 5th December, every year

Soil Composition

The basic components of soil are mineral, organic matter, water and air. It consists of about 45% mineral, 5% organic matter, 25% of water and 25% air. It is only a generalized fact. The composition of soil varies from place to place and time to time.



Soil Composition

Soil profile

The soil profile is defined as the vertical section of the soil from the ground surface and extends downwards.

ACTIVITY

Collect sample of soils from your place and exhibit in the class room.

Classification of soils

Soils are classified on the basis of their formation, colour, physical and chemical properties. Based on these, soil is classified into six major types. They are: Alluvial soil, Black soil, Red soil, Laterite soil, Mountain soil, Desert soil

Alluvial soils

These soils are found in the regions of river valleys, flood plains and coastal regions. These are formed by the deposition of silt by the running water. It is the most productive of all soils. It is suitable for the culitivation of sugarcane, jute, rice, wheat and other food crops.

Black soils

These soils are formed by weathering of igneous rocks. Black soil is clayey in nature. It is retensive of moisture. It is ideal for growing cotton.

Red Soils

These soils are formed by weathering of metamorphic rocks and crystalline rocks. The presence of iron oxide makes this soil brown to red in colour. It is usually found in semi-arid regions. It is not a fertile soil. It is suitable for millet cultivation.

Laterite soils

These are the typical soils of tropical regions. These soils are found in the regions which experienced alternate wet and dry condition. As these soils are formed by the process of leaching, it is in fertile. It is suitable for plantation crops like tea and coffee.

Mountain soils

These soils are found over the slopes of mountain. Soils in these regions are thin and acidic. However characteristic of soil differs from region to region based on the altitude.

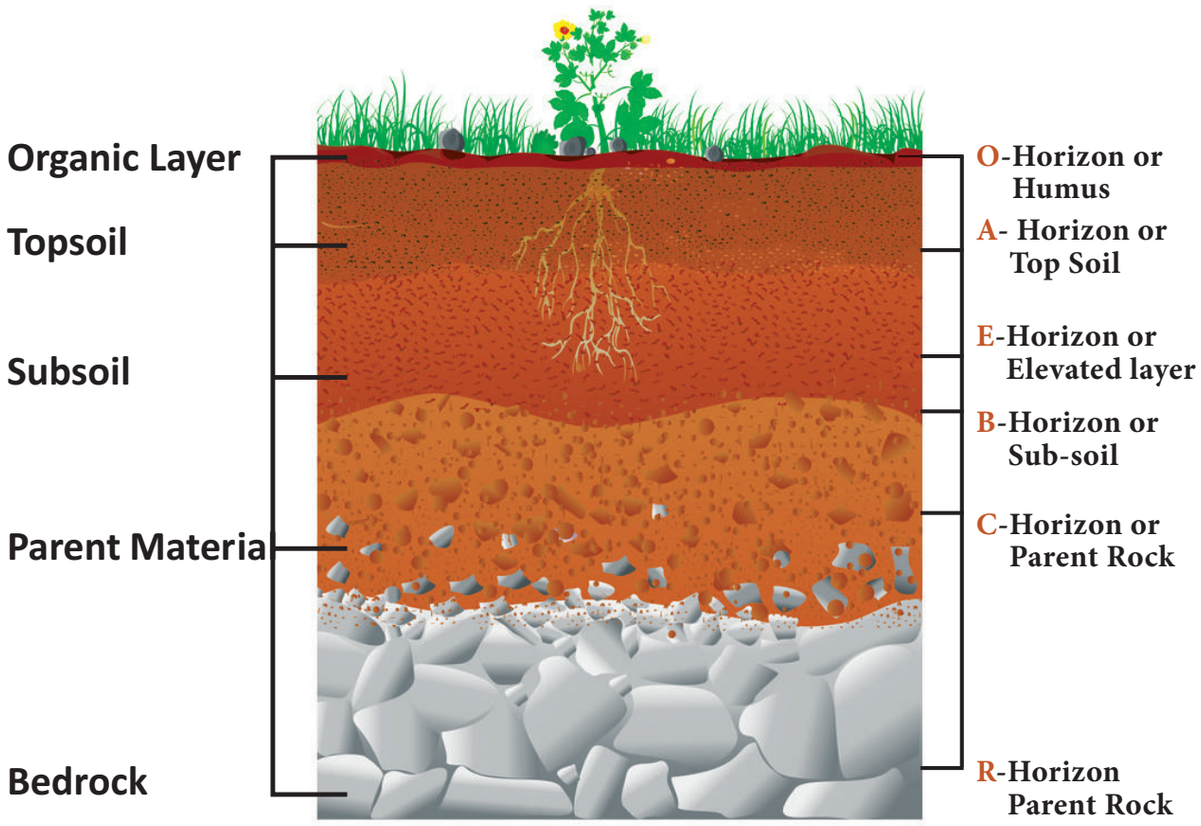
Desert soils

These are sandy soil found in the hot desert regions. These soils are porous and saline. Since it is infertile agriculture in these soils are not so successful.

Soil Erosion

Soil erosion is the removal or destruction of the top layer of soil by natural forces and human activities. Soil erosion reduces the fertility of soil which in turn reduces the agricultural productivity. Running water and wind are the major agents of soil erosion. Sheet erosion, Rill erosion and Gully erosion are the major types of soil erosion.

LAYERS OF SOIL



Layers of Soil

Layers of soil	
O-Horizon or Humus	This layer is dominated by organic material (leaves, needles, twigs, moss and lichens).
A- Horizon or Top Soil	It is a part of top soil, composed of organic matter mixed with mineral matter.
E- Horizon or Elevated layer	E-Stands for elevated layer. This layer is significantly leached of clay, iron, and aluminum oxides, which leaves a concentration of ore
B- Horizon or Sub-soil	This layer reflects the chemical or physical alteration of parent material. Thus iron, clay, aluminum and organic compounds are found accumulated in this horizon.
C- Horizon or Parent Rock	Partially weathered parent material accumulates in this layer.
R- Horizon Parent Rock	This layer consists of unweathered part of bed rock.

Soil conservation

Soil conservation is the process of protecting the soil from erosion to maintain its fertility. The methods that are widely practiced for conserving soil are afforestation, controlled grazing, construction of dams, Crop rotation, Strip farming, contour ploughing, terrace farming, checking shifting cultivation, wind break etc.,

How long does it take to form soil?

The time needed to form a soil depends on the Climate. The environments which is characterized by mild climate, takes 200-400 years to form one cm of soil and in wet tropical area, soil formation is faster and takes upto 200 years. To become a well matured soil, it takes about 3000 years.

Uses of soils

Soil is one of the important natural resource. It is a basic requirement for plant growth and supports various life forms on the earth.

- The minerals present in the soil enhance and nourishes the crops and plants.
- It is used in making of ceramics or pottery.
- It is a source of material for construction and handicraft works.
- It acts as natural filter of water and purifies it.
- Soil supports ecosystem and play an important role in land management.

Rocks and soils are the important renewable natural resources. Both of them play an important role in everyday life of human beings as well as economic development. Nowadays rock-based companies are in increase which provide employment to a sizeable population. Soils attract human settlement and other economic activities. As India is an agricultural country, the proper management of soil resource will lead to sustainable food production besides its use for various other purposes. So, the soil resources must be conserved.

Recap

- A rock is an aggregate of one or more minerals.
- The word **'Sedimentary'** has been derived from Latin word **'Sedimentum'** means settling down.
- Igneous rocks are the primary rocks formed first on the earth.
- Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life.

GLOSSARY		
Crust	Outermost layer of the earth	புவியின்மேலோடு
Lava	Hot molten rock erupted from a volcano.	லாவா
Magma	Hot fluid or semi-fluid material found beneath the earth crust.	பாறைக் குழம்பு
Rock cycle	The continuous process of transformations of rocks from one form to another.	பாறை சுழற்சி

Evaluation

I Choose the correct answer

1. Which of the following is known as sphere of rocks
   a) Atmosphere b) Biosphere
   c) Lithosphere d) Hydrosphere

2. World soil day is observed on
   a) 15th August
   b) 12th January
   c) 15th October
   d) 5th December

WHB4SC

3. Fossils are found in
   a) Sedimentary rocks
   b) Igneous rocks
   c) Metamorphic rocks
   d) Plutonic rocks
4. The top layer of soil is called as
   a) organic layer or humas
   b) topsoil
   c) subsoil
   d) bedrock
5. Ideal soil for growing cotton is
   a) Red soil b) Black soil
   c) Alluvial soil d) Mountain soil
6. The major components of soil is
   a) Rocks b) Minerals
   c) Water d) All the above
7. Which one of the following is the most widespread most and productive category of soil
   a) Alluvial soil b)Black soil
   c) Red soil d) Mountain soil

II Fill in the blanks

1. Scientific study of rocks is called _____.
2. _____ soil is highly suitable for millets cultivation.
3. The "skin of earth" is _____.
4. _____ is the kind of metamorphic rock using which Taj Mahal was built.
5. _____ is known as the primary rocks.

III State whether the following statements are true or false

1. Igneous rocks are called primary rocks.
2. Slate is formed from shale.
3. Red soil is formed by the process of leaching.
4. M-sand is used as alternative for natural sand in construction.
5. Volcanic mountains are covered with sedimentary rocks.

IV Match the following

1)

A.	Granite	1.	Bed rock
B.	Soil layer	2.	Plutonic rock
C.	Barren island	3.	Strip farming
D.	Soil conservation	4.	Active Volcano

	A	B	C	D
a)	2	1	4	3
b)	2	1	3	4
c)	4	3	2	1
d)	3	4	2	1

2)

A.	Basalt	1.	Anthracite
B.	Limestone	2.	Extrusive igneous
C.	Coal	3.	Metamorphic rock
D.	Gneiss	4.	Sedimentary rock

	A	B	C	D
a)	2	4	3	1
b)	2	4	1	3
c)	3	1	2	4
d)	3	1	4	2

V Choose the incorrect statement from the following

1. a) Igneous rocks are called the primary rocks.
   b) Soil is the product of weathering of rocks.
   c) Sedimentary rocks are the hardest ones.
   d) Deccan plateau is the region of Igneous rocks.
2. a) Soil erosion decreases its fertility.
   b) Dynamic metamorphism is caused by high temperature.
   c) Soil is a renewable source.
   d) Humus is a part of the top layer of soil.

VI Consider the following statements and choose the right option from the given ones

1) **Statement (1):** Sedimentary rocks consist of many layers.
   Statement (2): Sedimentary rocks are formed by the sediments deposited at different points of time.
   a) 1 and 2 are correct and 2 explains 1
   b) 1 and 2 are correct but, 2 does not explain 1

c) 1 is correct but, 2 is incorrect

d) 2 is correct but, 1 is incorrect.

VII Give reasons

1. Chemical sedimentary rocks are found in the beds of reservoirs.
2. Igneous rocks are found in the regions of volcanoes.

VIII Distinguish between

1. Metamorphic rock and sedimentary rock.
2. Soil conservation and Soil erosion.

IX Answer briefly

1. How are igneous rocks formed?
2. Describe about the composition of soil.
3. Define 'rock'.
4. State the types of soils.
5. What is soil conservation?

X Answer in a Paragraph

1. Explain the process of soil formation.
2. Classify and explain the rocks.
3. Give an account on different layers of soil.
4. Classify and explain the soil.

XI Activities

1. Complete the following table with the help of internet source

Rocks	Mode of formation	Characteristics	Examples	Uses

2. **Exhibition:** Collect the soil samples of different types and display them with their names in the classroom .
3. **Group Discussion:** Natural sand is replaced by M-sand in construction.

1. Status -

2. Advantages -

3. Disadvantages -

REFERENCE BOOKS

1. *Physical geography*-Dr.Shanti swaroop.
2. *Outlines of General Geography* - By E.O. Robinson, M.A.
3. Text book in Geography for class VIII-Social science Resource and development - NCERT-New Delhi.
4. Geography for UPSC Civil Service Preliminary Examination - By Surender Singh.
5. School Atlas Book - Tamilnadu Text Book Corporation.

INTERNET RESOURCES

- *www.Fert.nic.in*
- *www.greathimalayannationalpark.org*
- *www.csmrs.gov.in*

ICT CORNER

Rocks and Soils

Steps

- Open the Browser and type the URL given below (or) Scan the QR Code.
- Click the '**Begin**' button, start your rock collection
- Click '**Add to rock collection**' one by one
- Go to '**identify rock types**' and play the game

Website URL:

http://www.learner.org/interactives/rockcycle/index.html

B360_8_SOCIAL_EM