

# Unit 1 : Water Education

## Chapter 4 : Soil and rock type

Due to the geographical diversity of India, the land in each region is different. The soil is found at the top of the earth's surface, then after digging the soil layers, first there is muddy soil (loam) and then compact basalt rocks beneath it.

### **Black Basalt :**

In Maharashtra, Black Basalt is mostly found in the form of layers in horizontal, slightly sloped areas. These layers of Black Basalt formed as the lava erupted billions of years ago and cooled on the ground.



### **1.4.1 Black Basalt**

A layer usually has two parts. The first, a homogeneous Black Basalt, the second porous, filled with green-white pebbles. Each

such layer can be at least five meters to a maximum of thirty five meters thick. Between two layers of such Black Basalt, reddish-brown or rarely greenish-brown layer, with a thickness of one to five meters, called "Ocher /Red bole/ Red Layer" is formed. In some places, a layer of gray-white ash is formed by the accumulation of ash in lava eruptions.

Although Black Basalt is the major rock in Maharashtra, the other types of rocks that can be seen are the eroded, metamorphic rocks of this rock. Such as loam, man-limestone, sandstone and laterite (Jaambha) rocks.

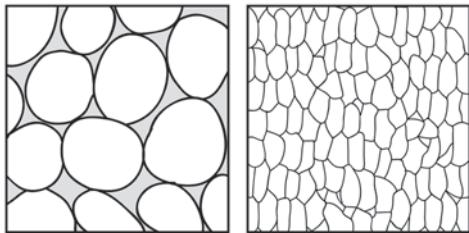
### **Internet My Friend :**

Using the internet, collect pictures of various rocks as above and create an informative presentation and present it to the class.

These types of rocks are very important in terms of groundwater holding capacity, so when finding out groundwater, considering groundwater recharge, a special study of the porosity and permeability of these rock types is necessary. The ability to carry fluids( gas and liquid) through the rocks without any change in the original form is called permeability. If a drift is carried through a rock at a certain time, it is called permeable rock, and if the amount of fluids( gas and liquid) carried across is negligible, it is called impermeable rock.

### **Rock porosity:**

The porosity of a rock is the proportion of volume of the cavity in it to the total volume. The porosity of the rock can be estimated by examining the rock samples. While handling the rock samples, it is not possible to see the cavities with naked eyes.



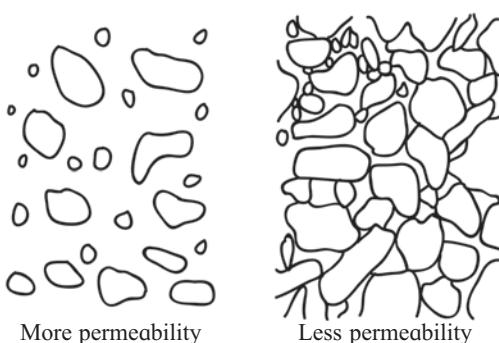
### 1.4.2 Black Basalt

Rock	Porosity (%)	Rock	Porosity (%)
Black Compact Basalt	0.14 – 1	Sand stone	10 -30
Vesicular Amygdaloidal Basalt (Manjrya)	3 - 5	ocher/ Red bole/ Red Layer	35
Hard muddy (loam)	1 - 8	Silt	35
Soft muddy (loam)	2 - 14	Sandy-Silt	45 – 50
Limestone	14	Clay	45 – 50

### The permeability of the rock :

In terms of groundwater, it is not enough just to have porosity in the rocks, but also the important property required is permeability. For example, there is a big difference in the velocity of water flow between clay and silt with similar porosity. In short, more water flows through the rocks where the permeability is higher.

Permeability can be measured by taking a sample of cylindrical rock 20 mm in diameter and 40 mm high. When sampling a rock, it should be taken in one direction only. Fill a large calibrated container with distilled water and keep it for 6-8 hours. Then you will see that the water in the container has decreased which can be measured on the scale.



### 1.4.3 Permeability of rocks

### Fracture :

The cracking properties of the Black Basalt, the degradation of certain minerals, the effect of sunlight-cold-rain, the temperature imbalance, the chemical reaction of water and the pressure on the ground and the small-large weatherings caused by the inner cavities, the combined effect of all these factors is fractures.

### Soil :

The process by which rocks are transformed into soil is called weathering of rock. Due to the constant changes in air, water, temperature and pressure, rocks and boulders break up, erode and eventually turn into fine particles and become soil.



### 1.4.4 Weathering of rocks

Soil is made up of rocks, gravel, sand, fine clay, and organic matter. The soil particles vary in size, e.g.

1. Clay: Smaller than 0.0002 mm.
2. Silt: 2.022 mm. - 0.05 mm.
3. Sand: 0.5 mm. - 2 mm.
4. Stone: Greater than 2 mm.

#### Internet My Friend :

Get information about these types of soil like, 1. Silt soil 2. Red soil 3. Black / Regur soil 4. Sandy soil 5. Yellow soil 6. Rocky soil. Explain the relationship between fertility and soil type.

#### Try it out :

1. Observe open terrain in dry river basins, mining areas, near hills and observe weathering.
2. Perform experiments to measure their porosity and permeability.

#### Humus formation in the soil :

The remains of plants and animals are mixed in the soil. The microorganisms in it cause the decomposition of these remains. It produces nitrogenous compounds and increases soil fertility. The soil formed from the decomposition of plant and animal remains is called humus. Soil is a hotbed of microorganisms. Numerous types of microorganisms are found in the soil. It takes approximately 800 to 1000 years for a 2.5 cm thick layer of fertile soil to form naturally.

#### Importance of soil :

1. The soil supports the plants.
2. Various minerals, nutrients required for plant growth are obtained from soil.
3. The soil stores the water required for the growth of plants.
4. The soil is also home to a variety of microorganisms that are essential for plant growth.

#### Can you tell ?

1. What type of rock is there in your taluka-district?
2. Study the soil type in your area.
3. Visit the soil testing center in the city.

#### Exercise

1. How is black basalt formed?
2. What are the main components of black basalt?
3. Explain the main process of erosion.
4. State the types of soil particles?
5. How does soil help land fertility?