



Have you ever dug below the Earth's surface? Is there only soil underneath?

From where does the water come in your home?

The water is evaporating from lakes, rivers and oceans. Why do they not become dry?

08

Structure of the Earth

Students' Learning Outcomes

After studying this chapter, the students will be able to:

1. Describe the structure of the Earth (i.e., crust, mantle and core) and the physical characteristics of these distinct parts.
2. Describe the sources of water on the Earth.
3. Identify similarities and differences among the different types of soil.
4. Investigate the composition and characteristics of different soils.

Our Earth is the only planet of the solar system where conditions are conducive for the existence of life. The air, water, soil, light and suitable temperature on the Earth provide basic requirements for the living environment. The growth of all living creatures on the Earth is possible due to them. What is the inner core of the Earth? Let us perform an activity to understand it.

Do you know?

The diameter of the Earth is 12,800 km and distance from the Sun is 150 million kilometre.

Structure of the Earth**Activity 8.1**

1. Take a hard boiled egg.
2. Cut it into two equal parts with the help of a knife.
3. Observe closely the inner part of the egg. How many layers do you see?
4. Which is the thinnest layer and where is it located?
5. Which part of the egg is the biggest?
6. What is there in the middle of the egg?

You have observed that there are three layers within the egg. The outermost thin layer is its rind. There is yolk in the middle of the egg and in between the two layers is its white layer.



According to geologists, the parts of an egg resemble exactly the inner structure of the Earth as shown in the figure. The rind of the egg is like crust, white part is like mantle and the yolk is like core of the Earth.

Crust

The outer shell of the Earth is called crust. It is that part on the Earth on which we live. This part contains lofty mountains, deep oceans, rivers, deserts, green fields, rural and urban dwellings. It consists of solid matter. The average thickness of the crust is about 5 km to 70 km. Even beneath the oceans, its thickness is about 5 km.

Mantle

The layer of the Earth under the crust is called mantle. This is the biggest part of the Earth by volume. Its thickness is about 3,900 km. This part is extremely hot and highly thick fluid

like honey. This comes out of the Earth's surface in the form of lava during volcano eruption.

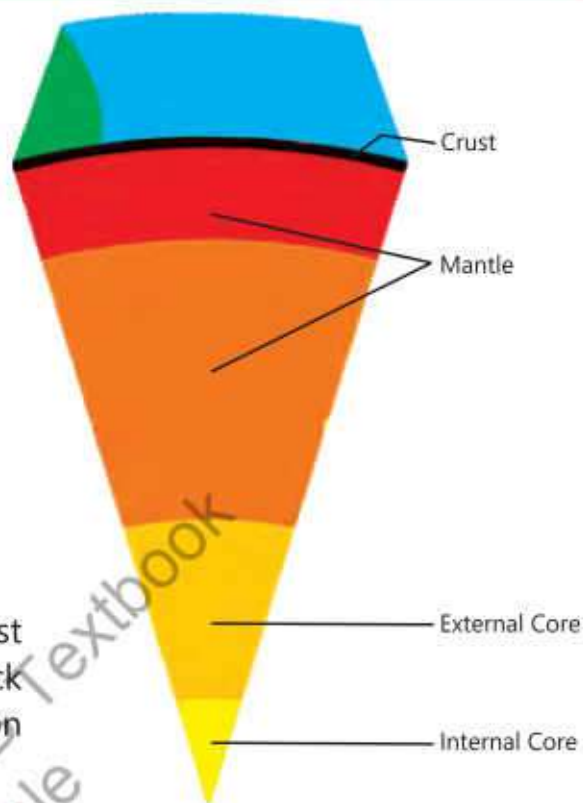
Core

The central part of the Earth is called the core. It is the hottest part of the Earth. Its temperature is about $5,000^{\circ}\text{C}$.

The core consists of two parts:

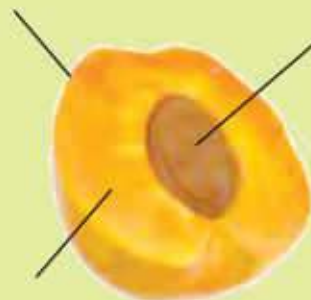
- Internal Core
- External Core

Owing to extreme pressure, internal core is almost solid whereas external core is in the form of a thick black molten fluid which contains elements like iron and nickel.



Quick Quiz

A peach is cut into half. Label its parts showing resemblance with the structure of the Earth. Match the resemblance of its peel, pulp and seed with the parts of the Earth.



Do you know?

The soil on the Earth's surface is formed by a very slow process of rock weathering. It takes about 1,000 years to make only a 5 cm thick layer of soil.

Interesting Information

Although the volume of internal core of the Earth is 16% of the total volume of the Earth but its weight is 33% of the total weight of the Earth. It means that the internal core is made of very heavy material.

Importance of Water

Water is a precious gift of nature. We cannot think of life on Earth without it. The 71% of the Earth surface is covered by water. About 2% of the water is frozen in the form of glaciers. About 97% is the salted water in the oceans. It is not drinkable. The fresh water available to

mankind is about 1%. There is acute shortage of water in many parts of the world. It is essential that we do not waste water.

Activity 8.2

Divide students into two groups. One group should make a chart of the sources of water and other group prepares chart about the uses of water. Hang the charts in classroom and discuss their contents.

Sources of Water

The water on the Earth is found in all the three states i.e. solid, liquid and gas. The sources of fresh water are glaciers, rain, lakes, springs and underground water.



Sources of Water

Interesting Information

The rain water which is absorbed by ground, passes through many layers of the Earth and becomes a part of underground water. It is filtered by various layers and becomes clean drinkable water.

Point to Ponder!

How do we use underground water? Make a list from your observations in your homes, school and the surrounding environment.

Quick Quiz

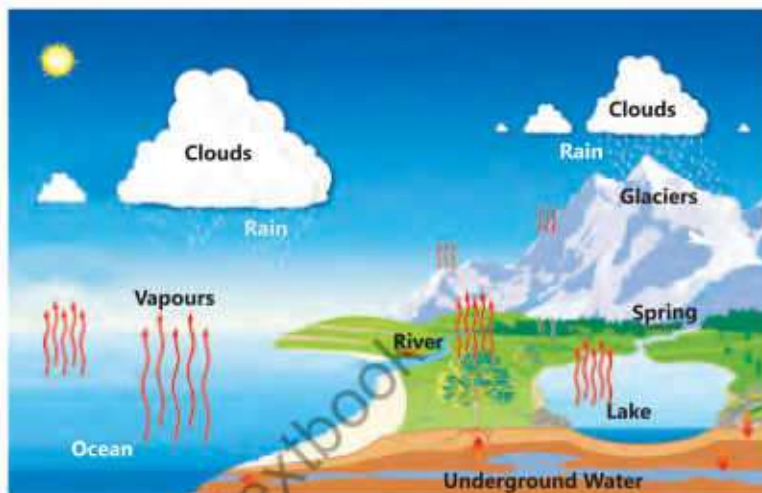
What are the sources of water in your school and home?

Water Cycle

The rivers are filled up with water from rains and melting of ice and glaciers in the mountains every year in the summer season. This water finally falls into the oceans. Have

you ever thought that in this way the oceans should be over filled. But this does not happen.

Water undergoes in a big cyclical process called the water cycle. The warmth of the Sun evaporates water from water bodies to form clouds. The clouds release water as rain or snow. The rain water again flows through the lakes, streams and rivers and finally to the sea. Some water of the rain is absorbed by land and becomes part of the underground water. The process repeats again and again. This is how the total amount of water on the Earth does not change.



Soil

Major part of the Earth is made up of rocks. Rocks are often broken down by strong sunshine, severe rains and fast winds blowing over thousands of years. This is a very slow process called weathering. This process converts rocks into small particles causing the formation of soil on the Earth's surface. Soil is composed of the small broken particles of rocks, minerals, water and air, etc. The upper part of the crust is made of this soil. It supports the growth of crops, vegetation and plants which are essential for the existence of life on the Earth just like air and water. What is in the soil? Let us explore.

Activity 8.3

1. Take a sample of soil from your school garden.
2. Spread it on a white paper or chart. Look at it through a magnifying glass.
3. Are there some living organisms / insects?
4. Do you see some dead vegetation matter?
5. Are there some grains of rocks / minerals?
6. Do you feel moisture in the soil?



All these items are called components of the soil.

For your Information

Humus is the organic matter produced by the decay of vegetables, plants and dead animal matter. It retains moisture in the soil and makes the soil fertile.

Activity 8.4

1. Put a sample of soil in a glass bottle or a jar. Pour some water in it.
2. Shake well to mix the soil and water and place it on the table. Observe it after two hours.
3. Do you observe different layers? What is at the bottom of the jar?
4. What do you see above it in the roily water?
5. What is floating on the surface of water?



You will observe that the lowest most layer consists of gravel then sand, above it is sticky type soil suspended in water and the top surface is a layer of dead vegetation matter.

Characteristics of Soil

The top layer of soil contains sufficient amount of humus. It is grey in colour. Below it is a layer of subsoil which contains clay. Its colour is brown or reddish. The lowest layer consists of gravel. The soil of different places may differ in particle size, weight, moisture, colour and texture.

Activity 8.5

1. Collect samples of soil from three different places.
2. Observe each sample on the basis of their properties and write it in the specific column. Rub the soil sample with your fingers to know about its texture.

Properties	Sample 1	Sample 2	Sample 3
i. Texture (coarse, smooth, soapy, sticky, silky, etc.)			
ii. Colour (grey, dark grey, bluish grey, reddish, greenish, brown, etc.)			
iii. Size of Particles (larger, smaller, smallest)			

Properties	Sample 1	Sample 2	Sample 3
iv. Weight (heavy, light, lightest)			
v. Moisture (damp or dry)			
vi. The place of the sample (garden, barren, canal side)			

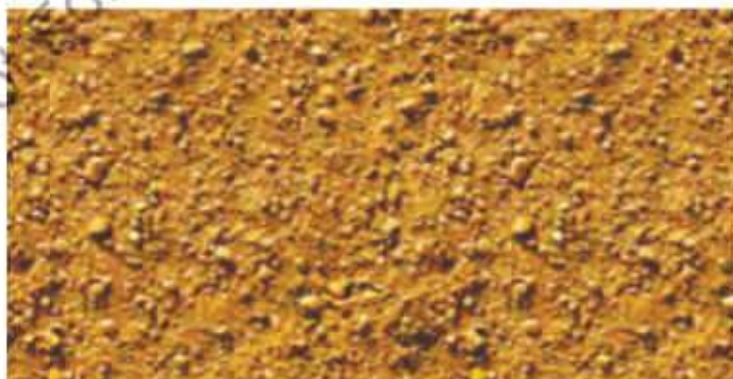
Types of Soil

You have analyzed the soil samples collected from different places. You have found that the soil samples are different from each other. Basically there are three types of soil:

1. Clay
2. Sand
3. Silt

1. Clay

Clay particles are very small in size. The soil is soft, sticky and brownish in colour. It can hold more water. It is very hard when dry. It is difficult to plough through it. The wet clay can be moulded into any shape. It retains its shape when dried and becomes more harder. It is used to make bricks and pottery.



Clay

2. Sand

Sand consists of bigger particles of grey colour and light in weight. Water is drained through it rapidly. It consists of mostly silica grains. The sand soil feels gritty and coarse. Plants do not grow well in it as compared to other soil. It is found on coastal areas or river beds.



Sand

3. Silt

Silt is a mixture of sand, clay and humus. It is very useful for gardening, growth of plants and crops. The texture is smooth and silky. It can hold more water than sandy soil. The moisture present in this soil provides water and minerals to plants. It also holds strongly the plant roots.



Silt

Do you know?

Soil contains water and air which are essential for life. It is home of many living organisms such as earthworms, insects, beetles, rats, rabbits and many others.



Point to Ponder!

In fact the brick wall is made of clay. How?

Similarities and Difference among Different Types of Soil

Activity 8.6

Make groups each consisting of 4 to 5 students. After a discussion on the characteristics of different soils, some groups make a chart of similarities and others on differences. Hang the charts in the classroom. The students should move around to see the work of other groups on the charts.

Do you know?

The bacteria and other microorganisms in the soil convert the wastes of living animals and dead plants into useful nutrients. They increase the fertility of the soil.

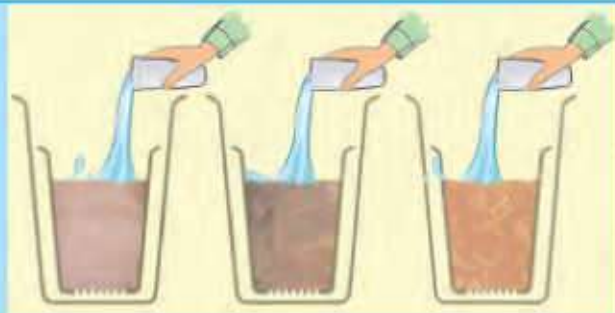
Absorption of Water by Soil

Which soil absorbs more water? Let us explore.

Activity 8.7

1. Arrange different types of soil (sandy, silty and clay).
2. Take three Styrofoam or plastic cups, make a drainage hole at the bottom of each cup.

3. Fill the three cups with each sample of soil.
4. Place each cup in a bigger beaker in order to collect the water as it drips through the soil.
5. Add the same measured quantity of water in each cup.
6. Allow all samples to remain undisturbed for about 10 minutes.
7. Measure the quantity of water that dripped from each cup using a graduated cylinder.



Record your observations in the following table by copying it in your notebook.

Description	Sandy Soil	Silty Soil	Clay Soil
1. Quantity of water added			
2. Quantity of water that dripped through			
3. Quantity of water that is absorbed			

What did you observe? You will see that water drained rapidly through sandy soil. The drainage of water through silty soil is less than the sandy soil whereas more water is absorbed by clay.

Interesting Information

Clay is useful to make pottery, sand for glass and silt is good for cultivation.

Key Points

1. There are three parts of the Earth on the basis of its structure.
2. The outer layer is known as crust. It consists of sea and solid rocks.
3. The middle layer is mantle. It consists of extremely hot thick fluid.

4. The core is the central part of the Earth. It is the hottest and heaviest part of the Earth.
5. Oceans, glaciers, rivers, lakes, springs and underground water are sources of water.
6. There are three types of soil; sand, clay and silt.
7. Clay is useful to make pottery, sand for glass and silt is good for cultivation.
8. The decayed matter is called humus. It makes the soil fertile.



Weblinks: Use the following weblinks to enhance your knowledge about the topics in this chapter.

Structure of the Earth	1. https://www.natgeokids.com/uk/discover/geography/physical-geography/structure-of-the-earth/
How soil reduces changes in weather?	2. https://video.nationalgeographic.com/video/0000015b-a120-d835-ad5b-b32aef720000

Exercise

1. Tick (✓) the correct answer.

- i. The outer layer of the Earth is called:
 - (a) external core
 - (b) mantle
 - (c) crust
 - (d) inner core
- ii. What are the main types of the soil?
 - (a) silt, sand and rock
 - (b) clay, humus and sand
 - (c) sand, silt and clay
 - (d) silt, humus and clay
- iii. Which type of soil is good for growth of plants?
 - (a) sand
 - (b) silt
 - (c) clay
 - (d) rock
- iv. What is the role of living organisms in the soil?
 - (a) making soil soft and airy
 - (b) making soil hard
 - (c) making soil unfit for cultivation
 - (d) making the air dry
- v. The amount of fresh water on the Earth is:
 - (a) about 1%
 - (b) about 30%
 - (c) about 70%
 - (d) about 97%
- vi. What is important in the natural manure?
 - (a) minerals
 - (b) the decayed matter
 - (c) sand
 - (d) salts

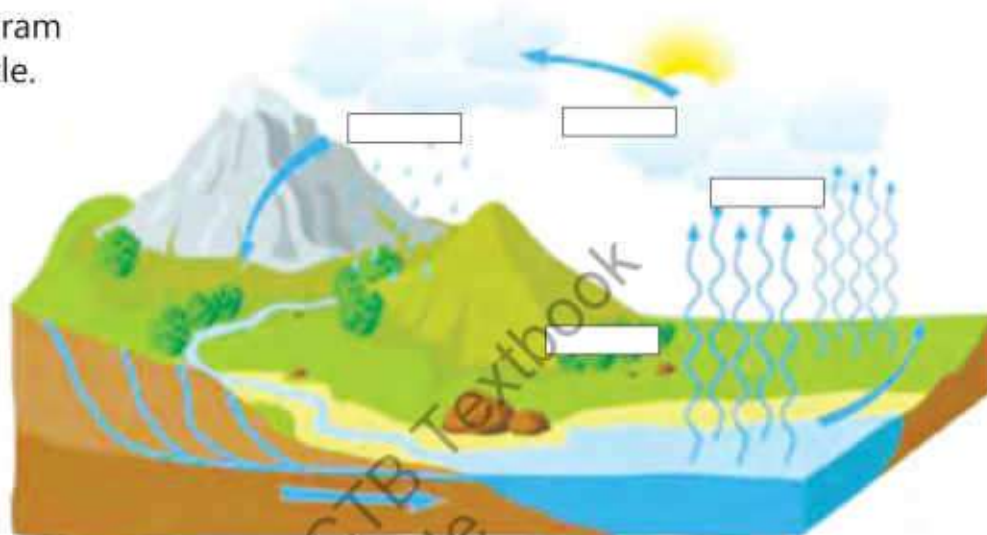
2. Write short answers.

- i. What is the outer layer of the Earth called? What is its importance in our life?
- ii. Which soil is useful to make pottery? What are its properties?

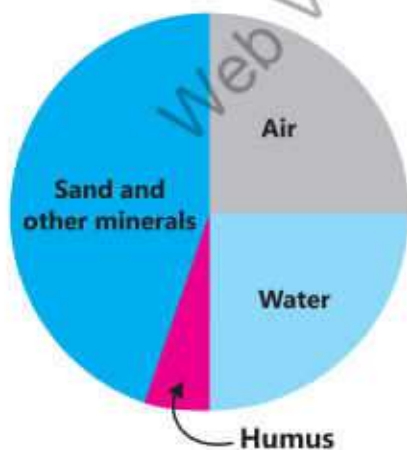
- iii. Which matter is obtained from decayed plants and insects?
- iv. What part of the Earth's surface consists of oceans? Why can we not drink sea water?
- v. Where is the water found in the form of solid, liquid and gas (vapours)?

3. Constructed Response Questions:

- i. Label the diagram of the water cycle.



- ii. Which soil is used to plaster the village houses? Which property of the soil is useful to do so?
- iii. How do the plant roots and other creatures inside the Earth breathe?
- iv. Estimate the components of silt (fertile soil) from the given figure.



Components	Percentage
Air	
Water	
Humus	
Sand and other minerals	

4. Investigate:

You have heard the devastation caused by floods. What is its reason? How can the surplus water of floods be made useful?

5. Project:

- i. Find out from the plant nursery or a gardener which soil is useful for growing plants? Prepare such soil in pots in your home or school. Grow plants by putting seeds in that soil.
- ii. Collect samples of sand, clay and silt from various places. Mix a little water in each sample. Which soil can be shaped into a lump? Make simple toys or pots from this soil. Dry them in the Sun. Colour their surfaces and place them on the shelf in the classroom.

Web Version of PCTB Textbook
Not For Sale