

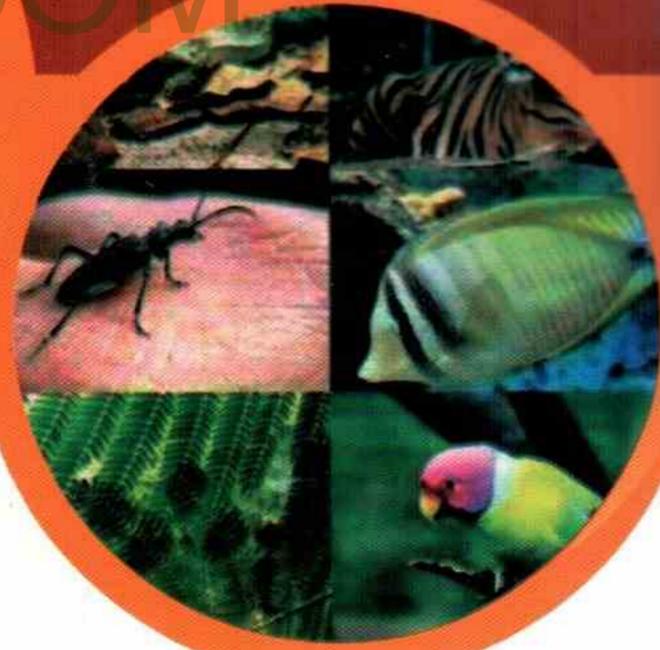
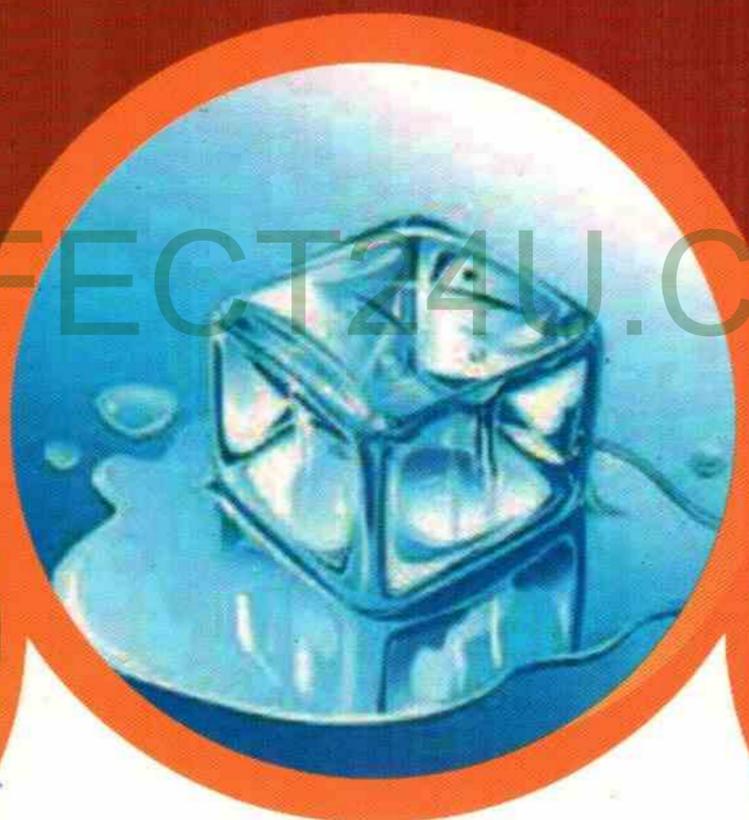
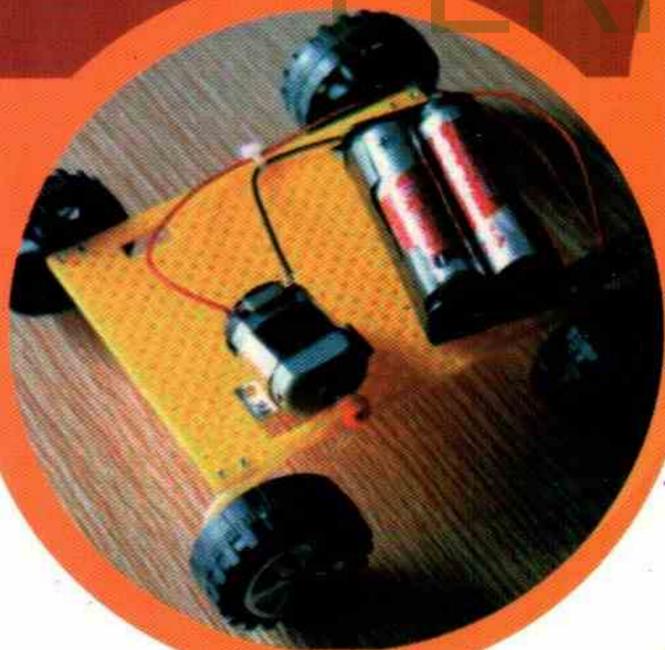
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# GENERAL SCIENCE

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**Khyber Pakhtunkhwa Textbook Board  
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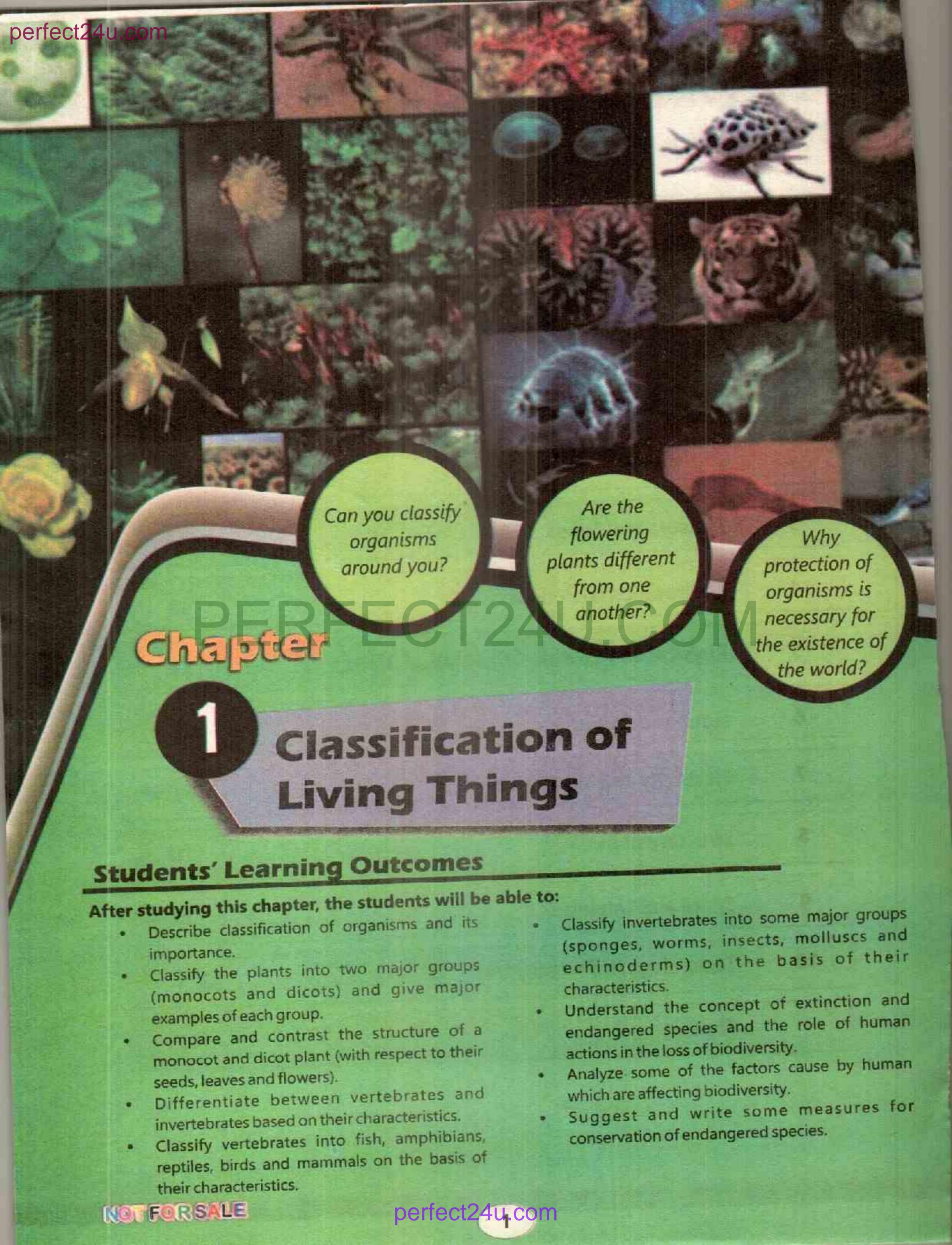
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Can you classify organisms around you?

Are the flowering plants different from one another?

Why protection of organisms is necessary for the existence of the world?

## Chapter

# 1

## Classification of Living Things

### Students' Learning Outcomes

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

- Describe classification of organisms and its importance.
- Classify the plants into two major groups (monocots and dicots) and give major examples of each group.
- Compare and contrast the structure of a monocot and dicot plant (with respect to their seeds, leaves and flowers).
- Differentiate between vertebrates and invertebrates based on their characteristics.
- Classify vertebrates into fish, amphibians, reptiles, birds and mammals on the basis of their characteristics.
- Classify invertebrates into some major groups (sponges, worms, insects, molluscs and echinoderms) on the basis of their characteristics.
- Understand the concept of extinction and endangered species and the role of human actions in the loss of biodiversity.
- Analyze some of the factors cause by human which are affecting biodiversity.
- Suggest and write some measures for conservation of endangered species.

## Classification of Organisms

There are numerous types of organisms found on our Earth. These organisms look different from each other, however, some have few similar characteristics.

### Activity 1.1

Write the names of the following organism in their respective groups on the basis of similar characteristics.

Guava, fowl, pigeon, mango, sparrow, snake, rose, crocodile, sunflower, lizard, cat, tiger, cow, tortoise, goat, dove. For example, rose, fowl, snake and goat have been placed in separate groups.

Group 1	Group 2	Group 3	Group 4
Rose, .....	Fowl, .....	Snake, .....	Goat, .....

Why did you put rose in one group and fowl in another group?

You placed the organisms of similar characteristics in one group. For example, you made a group of flowering plants with mango, guava, rose and sunflower. You made another group of organisms of other similar characteristics. For example, fowl, pigeon, dove, and sparrow as all of them have the same characteristics.

You have separated the organisms on the basis of similarities and differences. Thus, you have classified the organisms.

To put organisms into separate groups on the basis of similarities and differences is called classification of organisms.

### Importance of Classification

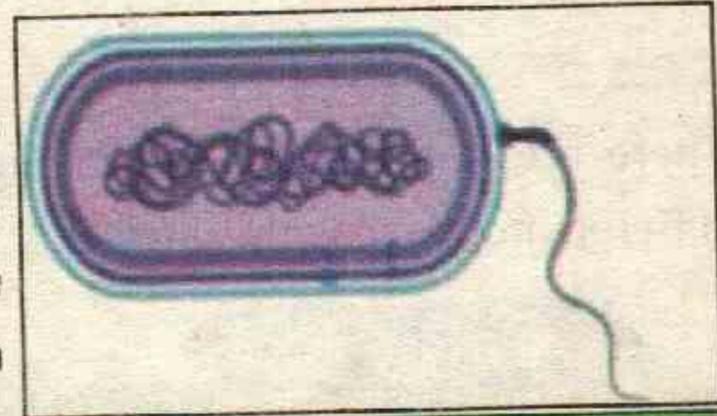
Due to classification we can determine the similarities and differences among organisms. Due to the structure and other characteristics of organisms we can identify and study them. We can also know the relationship among organisms.

### Five Kingdom System

The organisms have been divided into five kingdoms based on similarities and differences. Their names are: Monera, Protista, Fungi, Plantae and Animalia.

## 1. Monera

These are made of one cell. Their structure is also very simple. These include bacteria (singular: bacterium). Bacteria are found everywhere on the Earth. Some bacteria can prepare their own food. Others obtain food from other living organisms and dead bodies. Some bacteria cause diseases in plants and animals.

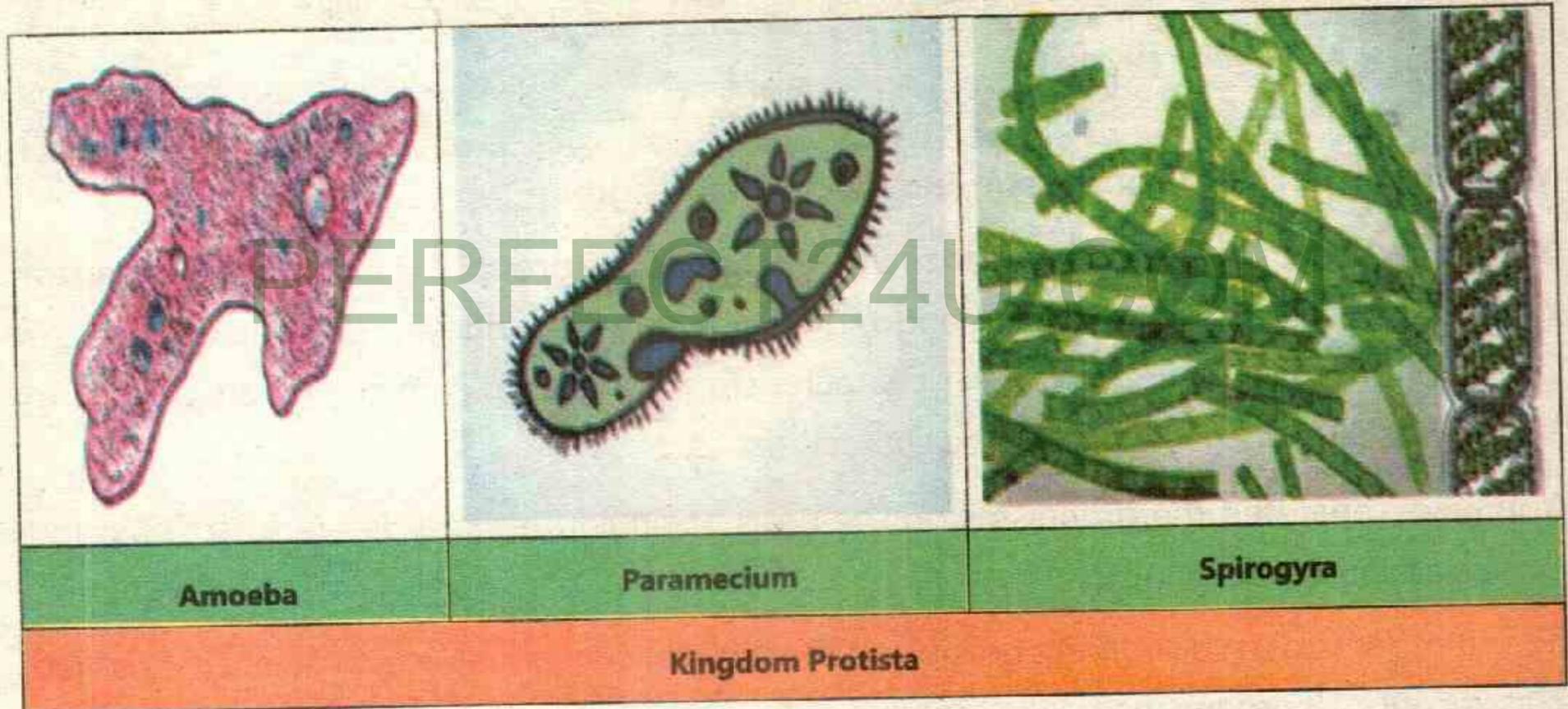


Bacterium

Kingdom Monera

## 2. Protista

Usually they live in water. It includes *Amoeba*, *Paramecium* and Algae e.g., *Spirogyra*. *Amoeba* and *Paramecium* are made of one cell. Algae may consist of one cell or many cells. These are found in rivers, ponds and ocean. They have chlorophyll.



Amoeba

Paramecium

Spirogyra

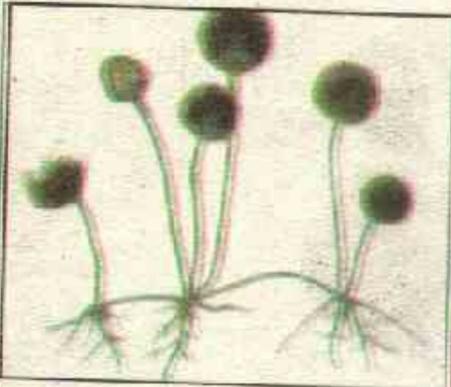
Kingdom Protista

## 3. Fungi

Some fungi are made of one cell. Many fungi are made up of more than one cell and are like filament. They need moisture for growth. They do not have chlorophyll, so they cannot make their own food. They absorb food from the place where they live. Yeast is a microscopic fungi. *Rhizopus* is also called black bread mold. It grows on moist bread and fruits. The mushrooms are umbrella like. They grow on the piles of rotten matter. Some fungi are very large e.g., Mushroom.



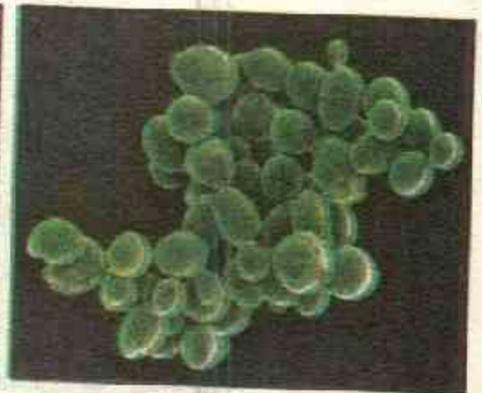
Mushroom



Rhizopus



Bracket Fungi



Yeast

### Kingdom Fungi

#### Do you know?

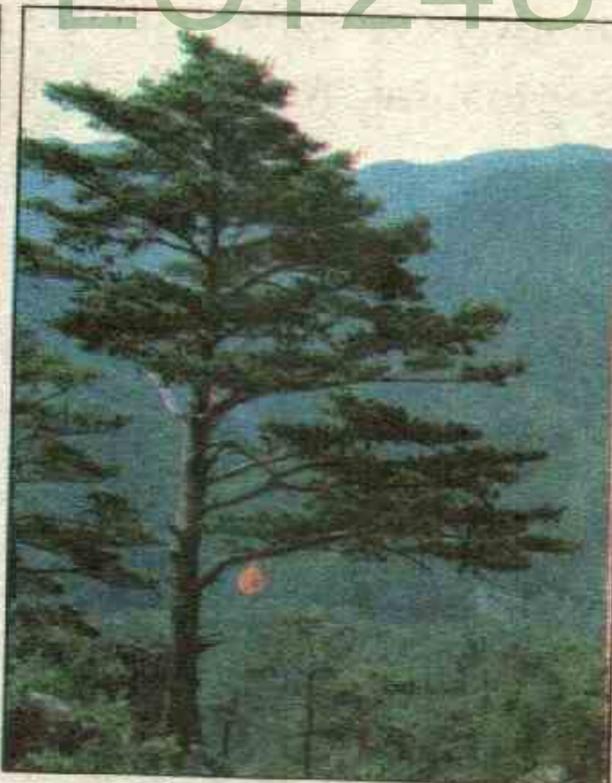
Some mushrooms can be eaten but some mushrooms are poisonous.

#### 4. Plantae

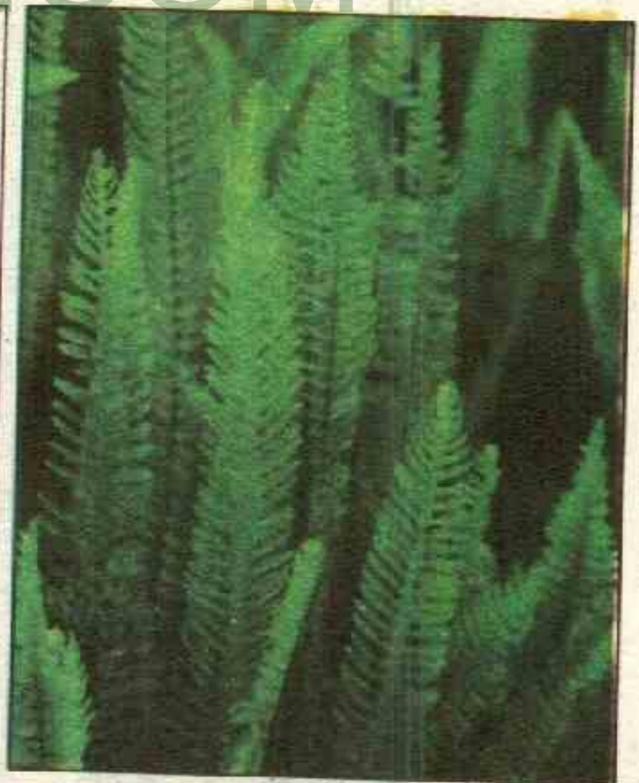
The organisms of this kingdom have ability to make their food by using the energy of the Sun, as they have chlorophyll. The organisms included in this are usually green in colour.



Flowering plant



Pine



Fern

### Kingdom Plantae

#### 5. Animalia

The organisms included in this kingdom are called animals. They do not have chlorophyll and they cannot make their own food. They can move usually from one place to another.

		
Rabbit	Duck	Crab
Kingdom Animalia		

**Point to Ponder!**

What is the difference between the paws of hen and duck?

**Classification and Characteristics of Flowering Plants**

**Activity 1.2**

Take the seeds of wheat, rice, maize, pea, bean and gram. Find out in which seed there is one cotyledon and in which seed there are two cotyledons. Write your observations.

**Monocot Plants**

The flowering plants whose seeds have one cotyledon are called monocot plants. Sugarcane, wheat, rice, bamboo, maize are the examples of monocot plants.

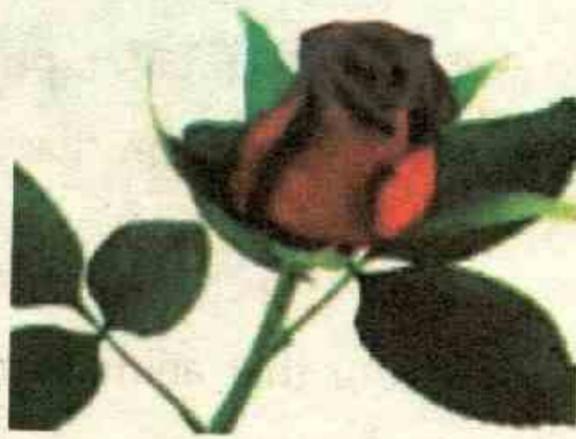
		
Bamboo	Sugarcane	Maize
Monocot Plants		

**Dicot Plants**

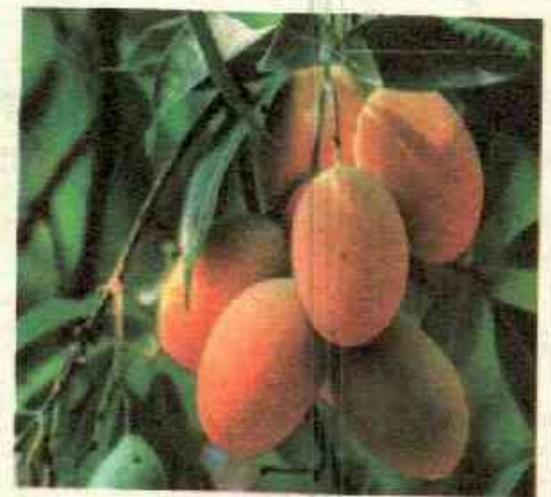
The flowering plants whose seeds have two cotyledons are called dicot plants. Mango, guava, rose, pea, etc. are the examples of dicot plants.



Pea



Rose

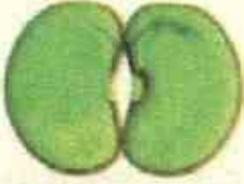


Mango

Dicot plants

## Activity 1.3

- Observe the leaves of monocot and dicot plants. What is the arrangement of veins in these leaves?  
In the leaves of a monocot plant, the veins are parallel to each other. The leaves of dicot plants have veins in the form of a net. The small leaves of a flower are called floral leaves.
- Take flowers of monocot and dicot plants and count the number of floral leaves. The number of floral leaves in a flower of monocot plant is three or multiple of three. The number of floral leaves in a flower of dicot plant is usually four or five or their multiple.
- The following are the main differences between monocot and dicot plants.

Part of Plant	Monocot Plant	Dicot Plant
Seed		
Leaf		
Flower		

**Activity 1.4**

1. Paste leaves of monocot and dicot plants in Scrapbook.
2. Paste dried and preserved flowering and non-flowering plants in scrapbook.

**Classification and Characteristics of Animals**

We have already studied in grade four that animals have been divided into two main groups i.e., the vertebrates and invertebrates.

**Activity 1.5**

Look at the pictures of pigeon and butterfly. What differences do you see between the two? Write your observations.



All vertebrates have an internal skeleton made of bones. Their body is divided into three main parts: head, abdomen and tail. The brain is present within the skull. They have the great ability to hear, see, smell, taste and feel. The blood circulates in the blood vessels of the body. The skin of vertebrates is covered with scales or feathers or hairs.

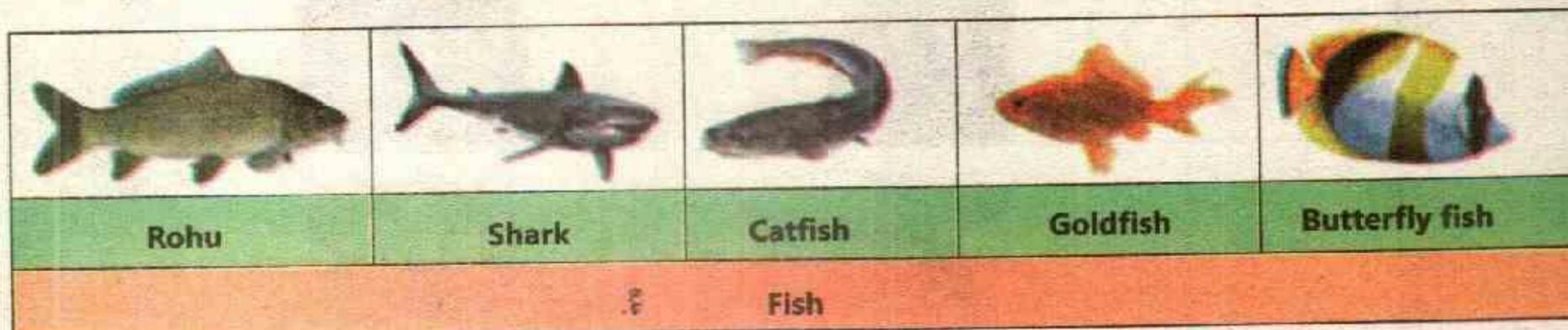
Various types of invertebrates are found on the Earth. They do not have any type of bone inside the body. The body structure of invertebrates is of various types. Some are flat, some are round and some are segmented. The body parts of invertebrate are different in different groups.

**Classification of Vertebrates**

The vertebrates have been divided into five groups i.e. fish, amphibians, reptiles, birds and mammals.

**Fish**

Fish live in water. Both ends of their body are pointed. The middle part is broad and thick i.e.



the body is boat shaped. This body shape is most suitable to swim. They have scales on their skin. Fish breathe through gills. Fish have fins and tail which help to swim. Reproduction in fish takes place through eggs. Their body temperature depends on the temperature of their surroundings.

**Amphibians**

Amphibians can live on land and also in water. They respire through lungs and skin. Usually their skin is moist and loose. They live on land but lay eggs in water. Their body temperature depends on the temperature of their surroundings. Their development takes place in water. Frog, toad, salamander, newt are the examples of amphibians.



**Point to Ponder!**

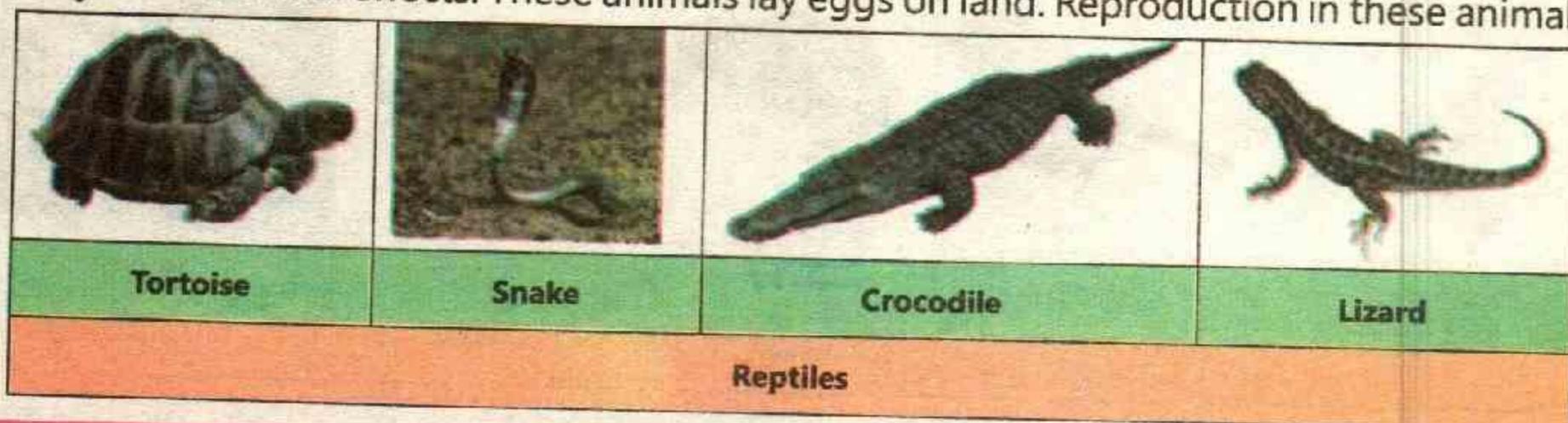
What is the difference between a toad and a frog?

**Do you know?**

Why could amphibians not flourish in the whole world? They are not found in desert and snow because they cannot go away from water. They depend on water for reproduction and development.

**Reptiles**

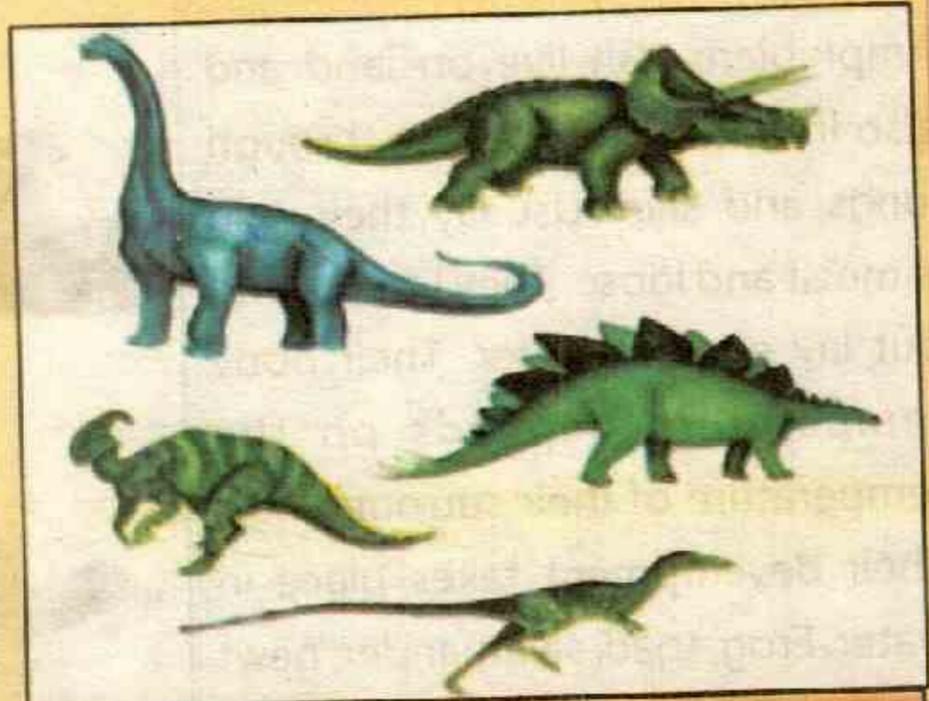
Reptiles are called creeping animals. Their skin is thick, coarse and dry which protect their body from external effects. These animals lay eggs on land. Reproduction in these animals



takes place through eggs. Their body temperature depends on the temperature of their surroundings. Lizard, crocodile, snake, tortoise are the examples of reptiles.

**Do you know?**

1. Dinosaurs were the largest reptiles of the ancient times but they have become extinct.
2. Compared to the amphibians, the reptiles flourished all over the world because they do not depend on water for reproduction.

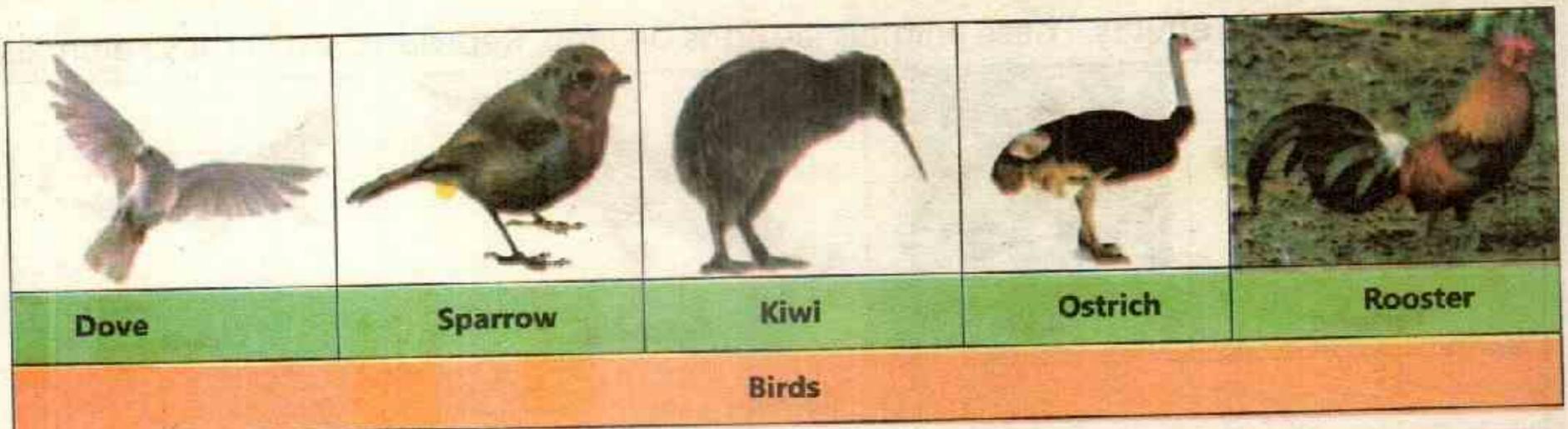


Dinosaurs

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**Birds**

The birds have feathers and beak. Their bones are hollow, thus their weight is less. Along with lungs, they have air sacs. Birds can fly in air. Some birds can swim in water e.g. duck. Some birds cannot fly and are called running birds e.g., Kiwi, Ostrich. All birds lay eggs. The birds that live in water have webbed feet e.g., duck. Their body temperature does not depend on the external environment. Sparrow, pigeon, kiwi, rooster, dove, parrot and ostrich are the examples of birds.



**Do you know?**

The largest flying bird is eagle which lives on high trees or rocks. Humming bird is the smallest bird. Hawk is hunter bird. Penguin is a bird that lives on snow. Woodpeckers live in the holes that they make in tree trunks.



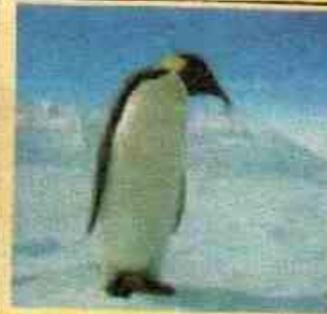
Hawk



Hummingbird



Eagle



Penguin



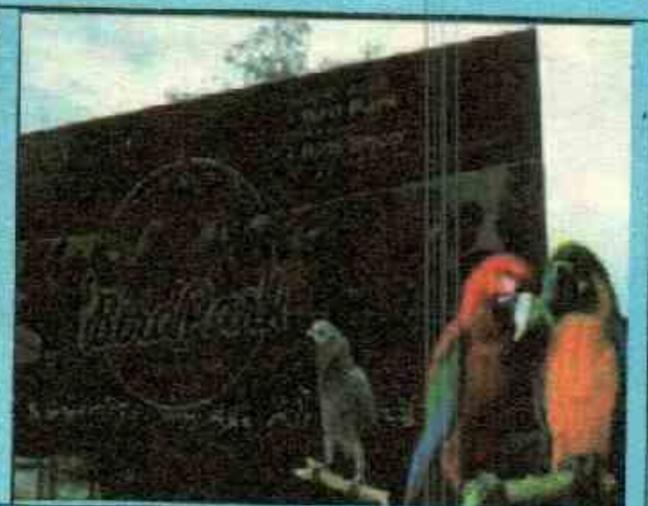
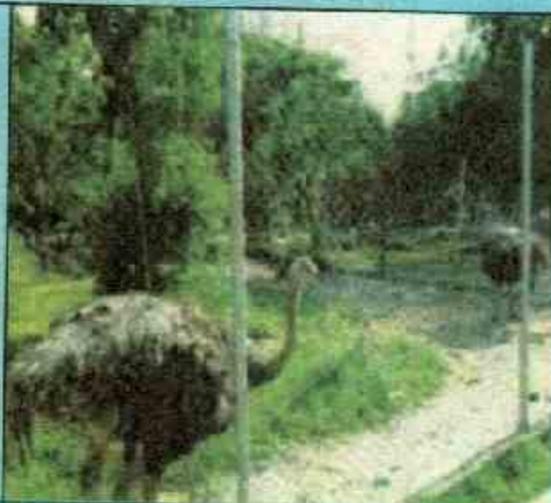
Woodpecker

**For Your Information**

1. Birds have evolved from a generation of carnivore (meat eating animals) dinosaurs.
2. How are the birds different from reptiles? The body temperature of birds does not depend on the temperature of external environment, so they remain active round the year. They show parental care. They make nests to live. They migrate from one place to other.

**Interesting Information**

The bird park is called Aviary. There is a bird park in Islamabad at Lake View Park adjacent to Rawal Lake. It is the largest bird park of Pakistan. There are 280 types of birds in this aviary.



## Mammals

These animals give milk. They have fur or hair on their body. Mammals give birth to their young ones and feed them on milk. The body temperature of mammals does not depend on the temperature of the external environment. Horse, cow, goat, tiger, cat and human are the examples of mammals.

			
Horse	Lion	Cow	Cat
Mammals			

### Interesting information

1. **Polar bear** lives in the snowy regions of the North Pole. Its body has a thick covering of fur.
2. **Elephant** lives in hot climate so its body is not covered by thick layer of hair or fur.
3. **Bat** is a flying mammal.
4. **Platypus** is a mammal. The female lays eggs and feeds milk to the young ones.
5. **Kangaroo** keeps its newborn babies in external pouch on the belly.

				
Polar bear	Elephant	Bat	Platypus	Kangaroo

### Interesting Information

Among the vertebrates in the world, birds and mammals are the largest groups. What is the reason? The reason is that both show parental care. You might have seen how hen and cats take care of their young ones.

**Activity 1.6**

Paste pictures of different animals in the scrapbook. Divide them into vertebrates and invertebrates. Also write which of these animals are found in Pakistan.

**Classification of Invertebrates**

The major groups of invertebrates are sponges, worms, insects, molluscs (mollusks) and echinoderms.

**1. Sponges**

These are aquatic animals and most of them live in ocean. They are of various colours. They usually remain attached to the stones, etc. The body is full of pores externally and canals internally. Water enters through the pores and exits through a large pore. If any body part breaks, they can form it again.



Sponges

**2. Worms**

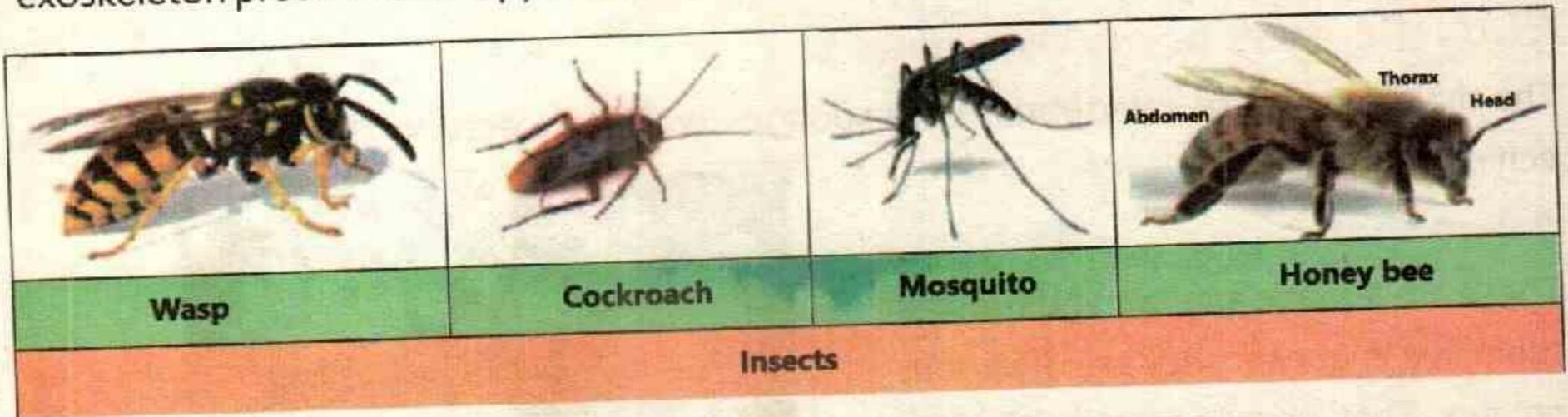
Worms are soft bodied animals. Their body is round and cylindrical. They have no legs. The body of some worms are segmented e.g., earthworms and tapeworms. The body of some worms are not segmented e.g., flatworms and roundworms.

<p>Earthworm</p>	<p>Ascaris (Roundworm)</p>	<p>Liverfluke (Flatworm)</p>
<p>Worms</p>		

Chapter 1

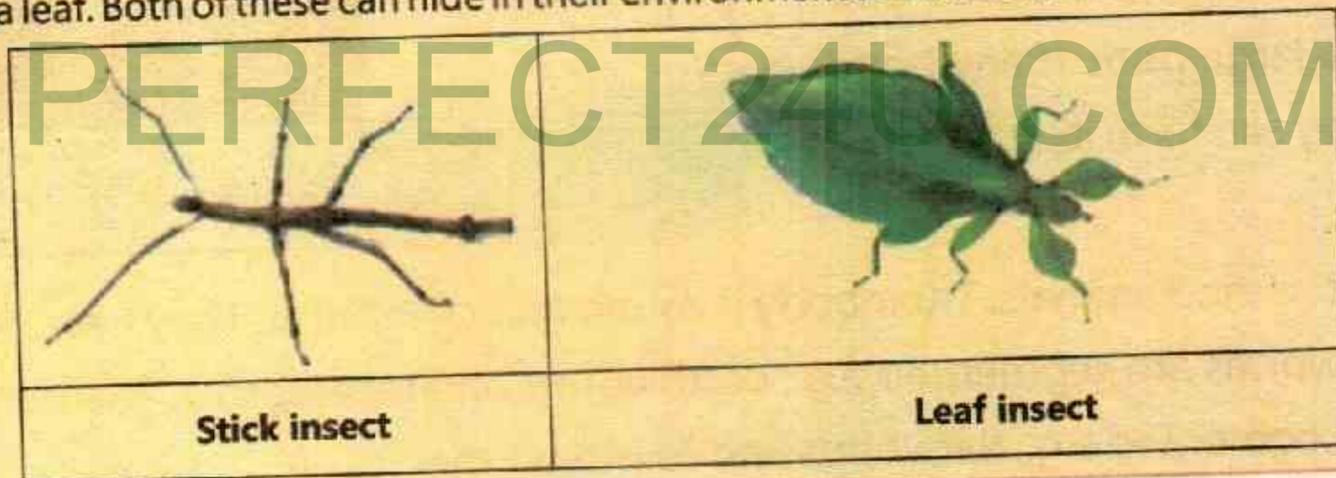
**3. Insects**

The insects are invertebrates with jointed legs. Their body is segmented. The body is divided into three parts: head, thorax and abdomen. The number of legs is six or three pairs. The external surface of the body is hard, which is called exoskeleton. The exoskeleton protects and supports the body.



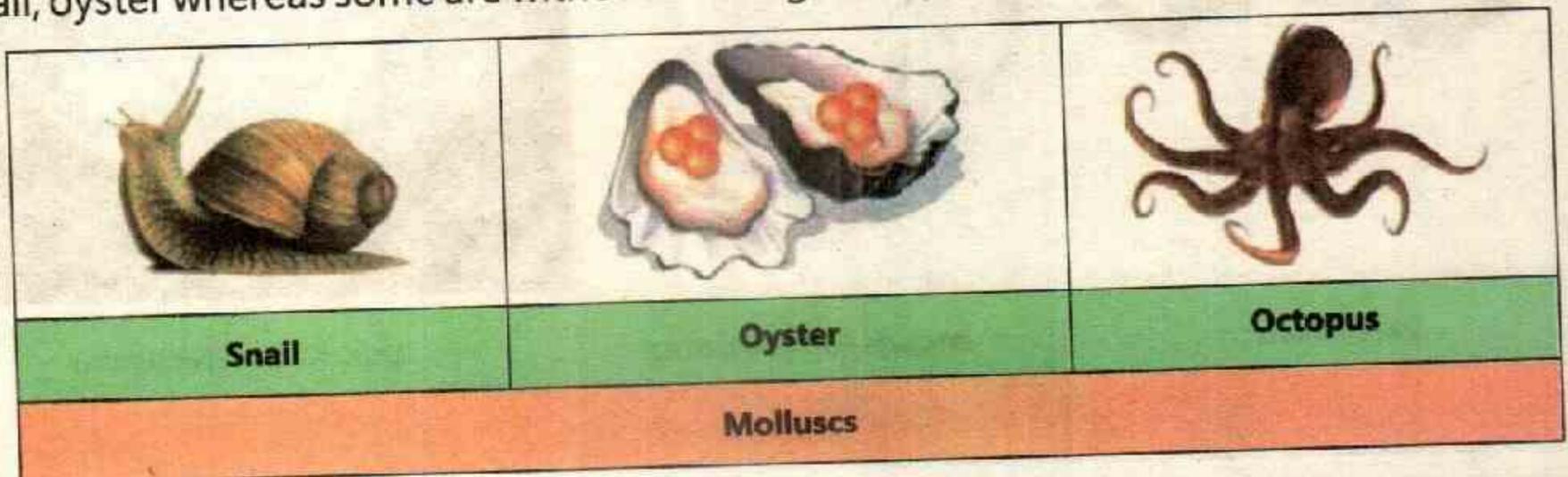
**Do you know?**

Stick insect looks like a stick and is green or brown in colour. It is also known as walking stick. Leaf insect looks like a leaf. Both of these can hide in their environment so as to remain hidden from the enemy.



**4. Molluscs**

They are soft bodied animals. They live in pond, lake, river, ocean and on land. They move freely or remain attached to anything. Body of some molluscs is covered with shell e.g., snail, oyster whereas some are without shell e.g., octopus.



**For Your Information**

When a grain of salt or sand enters in the body of oyster (a type of molluscs) then the process of pearl formation begins around it. It takes years to form a pearl.

**5. Echinoderms**

These animals are found only in the ocean. They do not have any head. The animals may be disc or star shaped. The body has a spiny covering.

**Biodiversity**

As we have read in previous class, the number of kinds of living things present at a particular place is called biodiversity. The type of plants and animals no longer found in this world are called extinct e.g., dinosaurs. Many organisms that are very likely to become extinct in near future are called endangered organisms such as Bengal tiger, Panda etc. There are many endangered animals in Pakistan e.g., snow leopard, green turtle, hawk, Indus dolphin, markhor, etc.

**Activity 1.7**

Take a chart paper. Cut picture of various plants and animals from old newspapers or magazines and paste on the chart paper. You have placed all the organisms together at one place, what is it? This is biodiversity.



## Human Impact on Biodiversity

The forests are being cut for cultivation and urbanization (extension of cities) which has destroyed the habitats of animals. Secondly human act of excessive hunting has made animals endangered.

### Do you know?

1. Pine trees in Bunair (KPK), Juniper in Ziarat (Balochistan) and Mangrove at the seashores in Sindh are disappearing at a fast rate.
2. Indus Dolphin is blind but it can differentiate between light and darkness. Due to construction of dam at Indus River the number of dolphins have declined. Now they are found only between Jinnah and Kotri barrages.



Indus dolphin

## Conservation of Biodiversity

For the conservation of biodiversity trade of endangered animals has been regularized. To save the habitats the number of game reserves has been increased. National parks have been made all over the world where endangered animals are kept.

### Do you know?

A game reserve (also known as a game park) is a large area of land where wild animals live safely. In some game reserves, animals are hunted in a controlled way.

### For Your Information

Mangroves are small trees that grow in coastal areas. They protect shorelines from being damaged. They act as nurseries for marine animals such as fish, crabs, prawns, etc. The Government of Pakistan earns foreign exchange from the export of these animals. It reduces the smoke and pollution of the city. Conservation of mangroves is very necessary.



Mangroves

## Key Points

- Due to classification, organisms can be identified and their relationships can be known.
- To divide the organisms into groups on the basis of similarities and differences is called classification of organisms.
- The large groups of organisms are called kingdoms.
- The five kingdoms are Monera, Protista, Fungi, Plantae and Animalia.
- Bacteria are example of Monera. Yeast, *Rhizopus*, Mushrooms are examples of Fungi.
- All the plants are included in kingdom Plantae and animals in kingdom Animalia.
- The two groups of flowering plants are monocot and dicot plants.
- Bamboo, sugarcane, maize, wheat, rice, etc. are examples of monocot and mango, guava, pumpkin, rose, etc. are the examples of dicot plants.
- There is difference between the seeds, leaves and flowers of monocot and dicot plants.
- Animals have been divided into two groups the vertebrate and invertebrate.
- The major groups of vertebrates are Fish, Amphibians, Reptiles, Birds and Mammals.
- Some major groups of invertebrates are Sponges, Worms, Insects, Molluscs and Echinoderms.
- The number of kinds of organisms found at any particular place is called biodiversity.
- Conservation of biodiversity is necessary because many organisms are now endangered.
- Cultivation, urbanization and deforestation have destroyed the habitats of organisms. By conserving biodiversity, the organisms can be saved from extinction.



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

Vertebrate, Invertebrate, Monocot and Dicot	1. <a href="https://www.youtube.com/watch?v=7DqsZbSdbrk">https://www.youtube.com/watch?v=7DqsZbSdbrk</a>
Animals	2. <a href="https://kids.nationalgeographic.com/animals/">https://kids.nationalgeographic.com/animals/</a>

## Exercise

### 1. Tick (✓) the correct option.

i. Which one of the following is the foot of an aquatic bird?



A



B



C



D

ii. The cat belongs to which group?

- |                |              |
|----------------|--------------|
| (a) Amphibians | (b) Reptiles |
| (c) Birds      | (d) Mammals  |

iii. A fish respire through which organ?

- |              |           |
|--------------|-----------|
| (a) Gills    | (b) Lungs |
| (c) Air sacs | (d) Skin  |

iv. What is the number of cotyledons in a gram seed?

- |           |          |
|-----------|----------|
| (a) One   | (b) Two  |
| (c) Three | (d) Four |

v. Out of these which group is found only in ocean?

- |                 |                |
|-----------------|----------------|
| (a) Fish        | (b) Insects    |
| (c) Echinoderms | (d) Amphibians |

### 2. Write short answers.

- i. Define biodiversity.
- ii. State the importance of classification.
- iii. Write the differences between:
  - (a) Worms and Insects
  - (b) Amphibians and Reptiles
- iv. What is the similarity between Fungi and Animals?
- v. Write one characteristic and one example of Monera and Protista.

**3. Constructed Response Questions:**

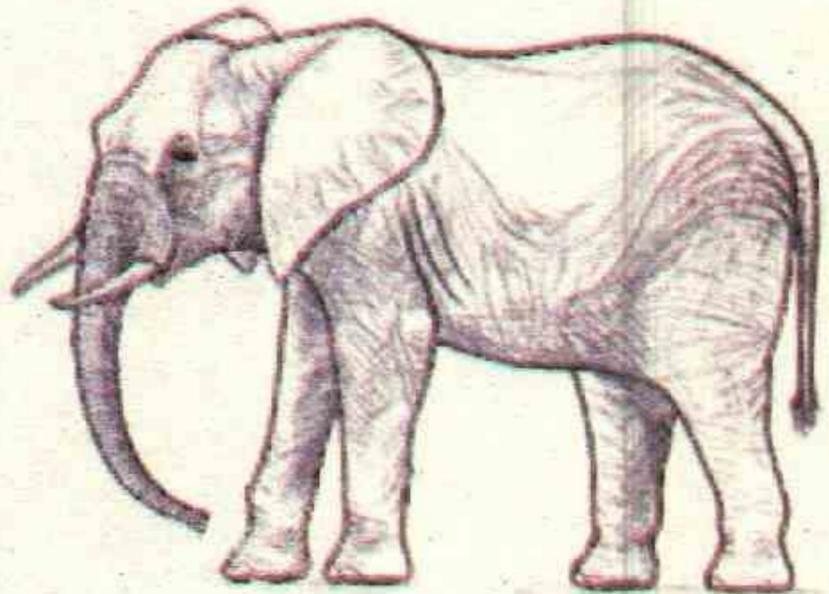
- i. Some animals have internal skeleton of cartilage such as Shark and Sting Ray. They feed on other animals by predation. What is the importance of cartilage in their life?

**4. Investigation:**

- i. Why the body of zebra has black and white stripes?



- ii. Why are the ears of elephant large?



- iii. Investigate about the factors responsible for the extinction of biodiversity.
- iv. Give an example of extinct and endangered animals. Investigate what types of animals are most likely to be extinct?

**5. Project:****Album of Animals****Required Materials:**

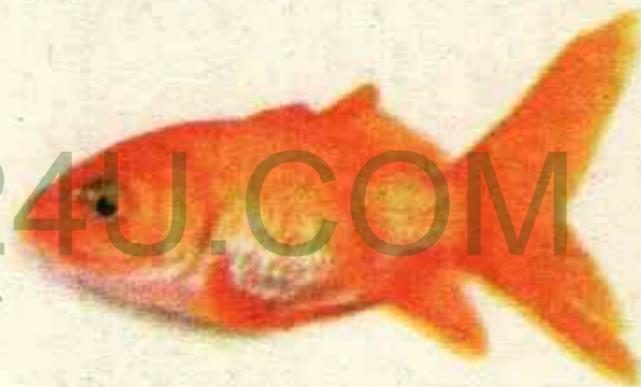
- |      |                             |     |                  |    |       |
|------|-----------------------------|-----|------------------|----|-------|
| i.   | Old newspaper and magazines | ii. | Scissors         |    |       |
| iii. | Gum                         | iv. | Coloured markers | v. | Album |

**Procedure:**

- i. Cut pictures of two animals from each of the five groups of vertebrates. The pictures can also be obtained from internet.
- ii. Paste the pictures on album.
- iii. Write characteristics of each animal with its picture.

**Example:**

- It has fins and tails.
- Its body has scales.
- Its body is boat-shaped.





*Do all the organisms are just those which we see?*

*Are all the invisible organisms harmful?*

*Why is it necessary to brush the teeth after meals?*

# Chapter

# 2

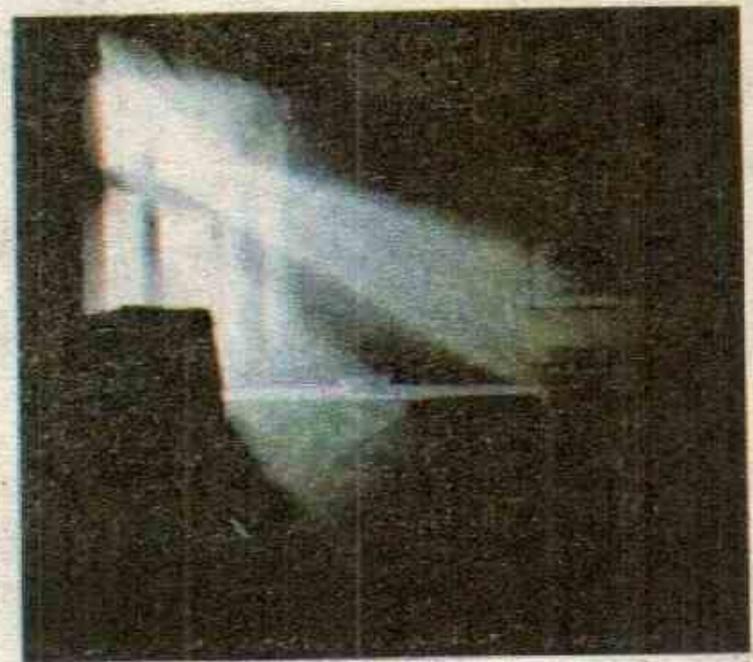
# Microorganisms

## Students' Learning Outcomes

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

- Define and describe microorganisms.
- Identify the main groups of microorganisms and give examples for each.
- Highlight the role of microorganisms in decomposition and discuss its harmful and beneficial effects.
- Recognize some common diseases caused by microorganisms of each group.
- Recognize that microorganisms get transmitted into humans and spread infectious diseases.
- Discuss and deduce advantages and disadvantages (any three) of microorganisms by using some daily life examples.
- Suggest preventive measures to protect themselves from these infections.

You must have observed dust particles in the beam of light that enters a dark room. Have you ever thought that our eyes cannot see very tiny objects? There are lot of organisms present in our environment that we cannot see with naked eyes? To see such things, we need a special instrument called microscope. The objects that cannot be seen by human eyes are visible as large and clear objects under the microscope.



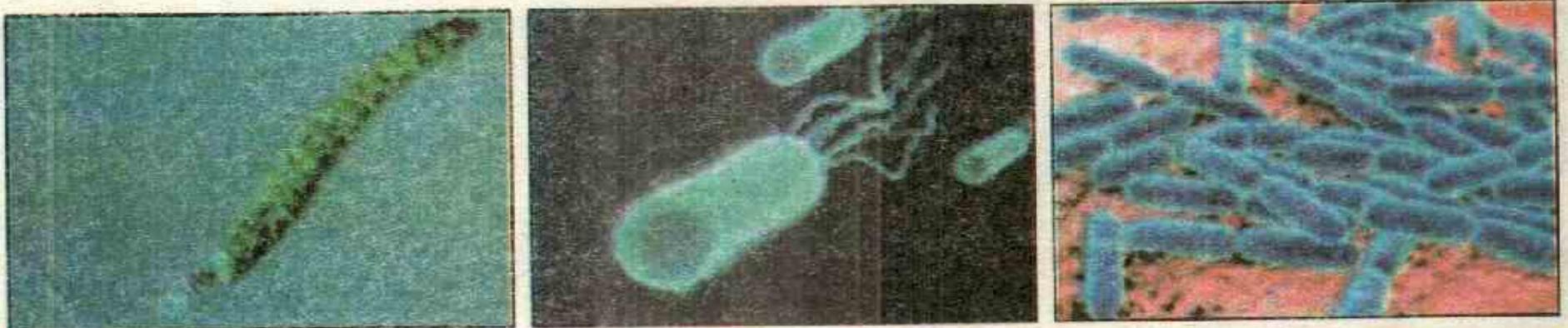
### Activity 2.1

To make a simple microscope you will need a plastic cup, thin plastic sheet, rubber band, scissors and water. With the help of scissors make a hole at the base of the plastic cup so that you may put any tiny object into it. Put the thin plastic sheet over the cup and tie it properly with the rubber band. Put a drop of water over the plastic sheet. Put any tiny object at the base of the cup and observe it. You will see the object many times larger.



## Microorganisms

All those tiny organisms that can only be seen under microscope are called microorganisms. The



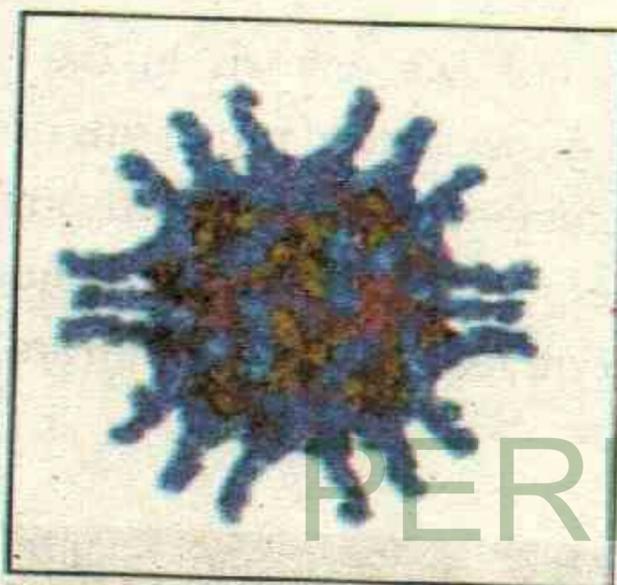
Microorganisms

## Main Groups of Microorganisms

There are many types of microorganisms. They are divided into various groups on the basis of their size, structure and need of food. Viruses and bacteria are the main groups of microorganisms. Some fungi are very small and these are also included in microorganisms.

### 1. Viruses

Viruses are very tiny infectious particles. They are the link between living and nonliving things. They can reproduce only within an organism. Out of the body of organism, they are nonliving. They are very harmful to living organisms. They cause diseases in human beings, animals and plants. For example, they cause hepatitis, polio, flu etc. in humans.



Polio virus



Corona virus



Bacteriophage virus

Viruses

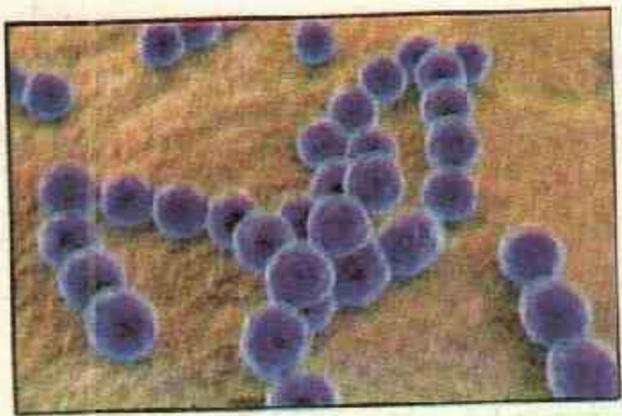
### 2. Bacteria

Bacteria are single-celled organisms. They are found in every type of environment. They are found in air, water, soil and inside living things. Few bacteria are harmful to organisms. They cause diseases in plants, animals and human e.g. pneumonia, tuberculosis, diarrhea etc. A large number of bacteria are useful for humans. Some bacteria help in the digestion of food and absorption of food components in our small intestine.

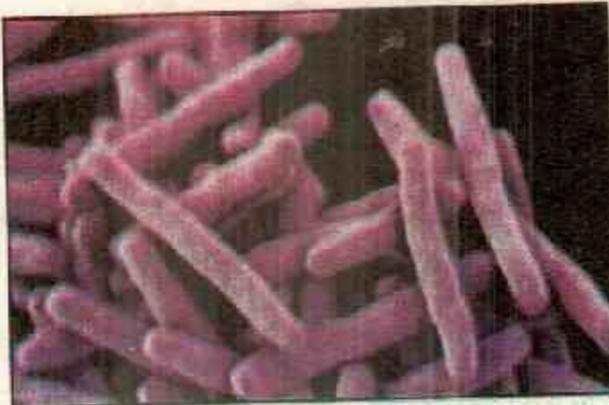
#### Interesting Information

1. The bacteria which are beneficial for us are called useful bacteria. The number of harmful bacteria is very less.
2. The number of bacteria in your body is more than the cells of your body.
3. The number of bacteria in a small spoon of soil is almost equal to the number of the people living in the continent of Africa.

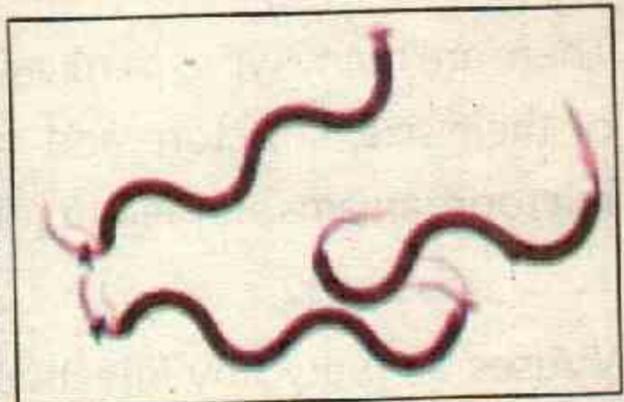
On the basis of shape, bacteria are divided into three types: round, rod-shaped and spiral.



Round



Rod-shaped

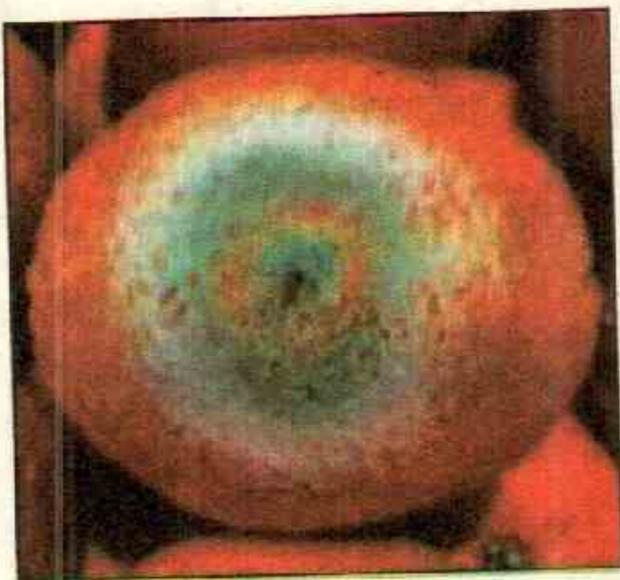


Spiral

Shapes of Bacteria

### 3. Fungi

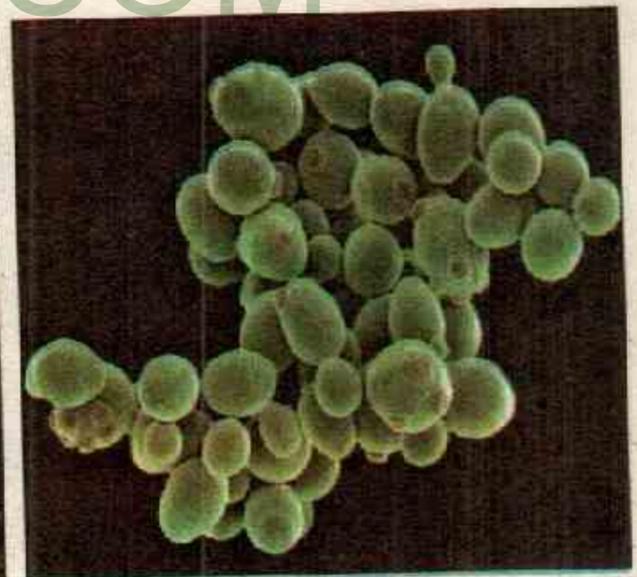
Fungi are simple organisms that are neither like plants nor like animals in their characteristics. They cannot make their own food. They often grow on dead organisms or decaying matter. They decompose dead matter into simple materials. Then they absorb these simple materials as their food. Some fungi obtain their food from living plants and animals and cause diseases in them e.g., ringworm, athlete's foot. Yeast and *Penicillium* are the examples of fungi.



Mold on orange



Mushroom



Yeast

Fungi

#### Interesting Information

More than 100 types of mushrooms have the ability to glow, like firefly.



#### Point to ponder!

1. Do you think that viruses are living organisms. Why?
2. In what types of environment bacteria live?

## Role of Microorganisms as Decomposers

During decomposition, bacteria and fungi break the organic molecules of food and dead bodies into simple components. The organisms which do decomposition are called decomposers. The rate of decomposition increases with increase in temperature, humidity and oxygen. Sometimes, this process become troublesome for us. But this process is also useful to us.

### Useful Effects of Decomposition

By decomposition, the complex matter present in the dead bodies of plants and animals breaks into simple components. During this process, carbon dioxide and nitrogen gases are released back into the environment. The producers use these simple materials again to make their food. In this way they recycle the matter of abiotic and biotic components of the environment. If decomposers do not exist then it is impossible to breakdown dead organisms into their simple components to make these a part of ecosystem.

#### Point to Ponder!

What if there were no decomposers in the world?

### Harmful Effects of Decomposition

Microorganisms damage food and wood by the process of decomposition. Because of them milk is spoiled, bread gets mold, fruit and vegetables are decomposed.



Harmful Effects of Decomposition

## Diseases Caused by Microorganisms

Many microorganisms can cause diseases in plants and animals. The microorganisms that cause diseases in their hosts are called pathogens. The diseases that occurs due to them are called infections or infectious diseases. The infectious disease can spread quickly from one organism to the others.

**Diseases Caused by Viruses:**

Hepatitis, Flu, Polio, COVID-19, Measles, Mumps, etc.

**Diseases Caused by Bacteria:**

Pneumonia, Typhoid, Cholera, Tuberculosis, etc.

**Diseases Caused by Fungi:**

Ringworm, Athlete's foot, Smut, Rust



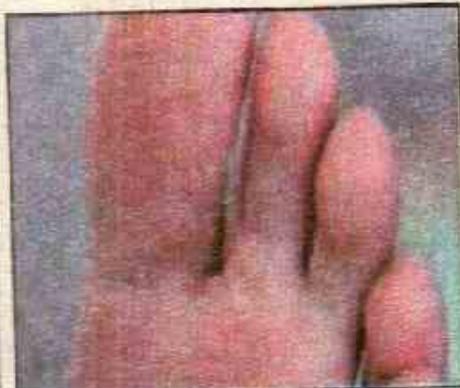
A polio patient



Rust



Smut



Athlete's foot



Ringworm

Diseases caused by fungi

**Activity 2.2**

When a boy came home from school, he felt hunger. He saw raw chicken in the kitchen. He took a piece of chicken, put pepper and salt on it, cooked and ate it while watching TV. At midnight the boy got up due to diarrhea, fever and stomach pain. In his school, there was an epidemic of diarrhea. So, his mother met the principal of the school. She asked the principal about what did the boy eat during the break? The principal informed her that he would find out whether the boy fell ill due to eating something in the school or not.

**In your opinion why did the boy fell ill?**

**Spread of infectious Diseases and Transmission to Humans**

The five main ways for the transmission of infectious diseases are air, water, food, animals and direct contact.

### 1. Airborne Diseases:

When a patient of any particular infectious disease coughs, sneezes or talks then some viruses and bacteria are released out of his mouth and dispersed in the air. When a healthy person breathes in this air, these pathogens enter his body and he becomes sick. Such infectious diseases are called airborne diseases e.g. COVID-19, flu and TB.

### 2. Waterborne Diseases:

The pathogens of some diseases are transmitted through water. Such disease occur when someone uses polluted water for drinking or in cooking. Diarrhea, typhoid, some diseases of eyes and skin are waterborne diseases.

### 3. Food-borne Diseases:

Pathogens of some diseases are present in contaminated food. On eating such types of food these pathogens enter human body and cause diseases e.g. cholera, hepatitis, typhoid, etc.

### 4. Animal-borne Diseases:

Some animals also transmit pathogens from one human to the others. For example, when mosquito bites and sucks blood of a patient of malaria or dengue, it takes pathogens from patient. When it bites a healthy person, it transmits those pathogens into him.

### 5. Transmission of Diseases through Direct Contact:

Some diseases are transmitted by shaking hands or by touching articles used by the patient. COVID-19, flu and hepatitis are examples of such diseases.

#### Activity 2.3

Do you want to know how far the germs can travel on coughing and sneezing? For this you will need a balloon, tiny pieces of paper or glitters. Put the tiny pieces of papers inside the balloon. Then inflate the balloon and close the mouth of the balloon with two fingers. Open the mouth of the balloon. What happened?

The pieces of paper scattered out of the balloon. In the same way, the germs are spread on coughing or sneezing.



## Useful Role of Microorganisms in Everyday Life

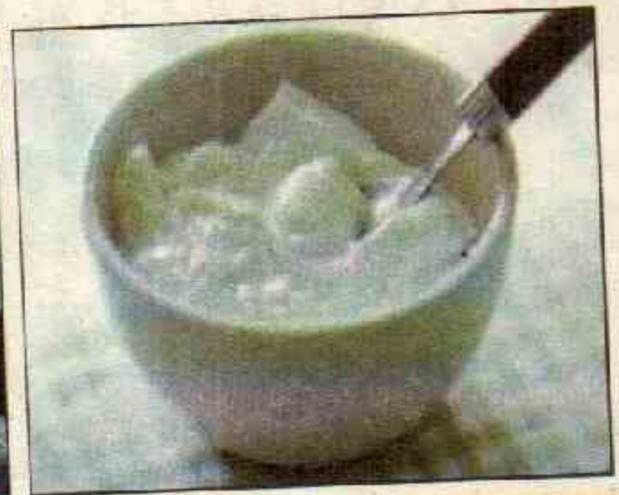
All microorganisms are not harmful. The following are some benefits of microorganisms in everyday life:

### 1. Making Food Items

Bacteria and Yeasts are used in making food items. Yeasts are used to make bread and cheese. While bacteria are used in making yoghurt.



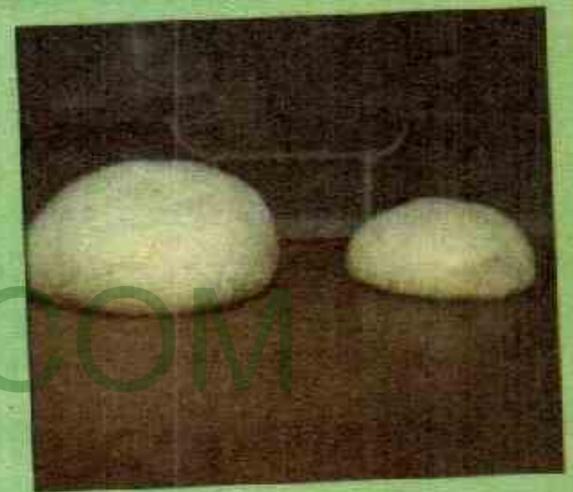
Use of yeast to rise the dough



Use of bacteria in making yoghurt

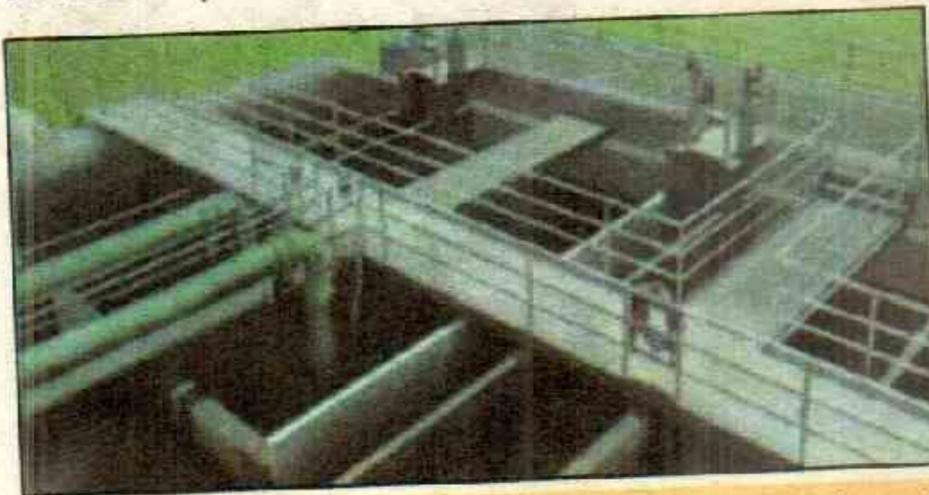
### Activity 2.4

1. Take flour in a pot. Mix yeast, sugar and water in it and make a dough.
2. Take same quantity of flour in another pot. Mix only sugar in it and make a dough.
3. Note the quantity of flour in both pots and leave them for an hour.
4. After one hour, observe the quantity of flour in both pots.
5. In which pot, the dough has risen? What is its reason? Why was sugar added along with yeast?



### 2. Cleaning of Environment

You know that some bacteria can decompose dead bodies. Such bacteria can also be used to decompose toxic materials present in sewerage and industrial waste water.



Cleaning of Environment

### 3. Making of Medicines

Many microorganisms are used for making medicines. Fungi and bacteria are used to make antibiotics. These medicines are used to kill or inhibit the growth of disease causing bacteria.

#### Do you know?

Penicillin was the first antibiotic. It was derived originally from a type of fungi, known as *Penicillium*.



#### Activity 2.5

1. Take a deep plate and pour water so that one inch of your finger dips into it.
2. Now spray powdered black pepper on it.
3. Dip your finger into it. The black pepper will adhere to your finger.
4. Put a good quantity of soap on your finger. Again dip the finger into water. This time, the black pepper will move away from your finger.
5. Soap repels the germs in this manner.



### Preventing the Infections

Following are the ways to prevent infections:

1. It is essential to wash hands before cooking and eating food and after using toilets.
2. Avoid touching your eyes and mouth, as these are the points for germs to enter your body.
3. Get vaccinated at proper time. It is the important way to prevent many diseases.
4. Stay at home if you have signs and symptoms of an infection so that you can take rest and prevent others from infection.
5. In case of any injury, cover the wound immediately with bandage and consult a physician.

#### Point to Ponder!

Can you tell more steps to prevent infection?

### Key Points

- All those tiny organisms that can be seen only under the microscope are called microorganisms.
- Viruses, bacteria and fungi are the major groups of microorganisms.
- Viruses are very tiny infectious particles.
- Bacteria are single-celled microorganisms found in all types of environment.
- Fungi are simple unicellular or multicellular organisms.
- Some microorganisms do decomposition. They breakdown the complex matters of dead bodies into simple components.
- The five major sources of the transmission of infectious diseases are air, water, animals, food and direct contact.
- Many microorganisms are used to make medicines.
- In order to prevent infections, we should keep ourselves neat, clean and get vaccinated at proper time.
- Food items of daily use e.g., yoghurt and bread are prepared by using microorganisms.



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

Microorganisms	1. <a href="https://www.nationalgeographic.org/media/misunderstood-microbes/">https://www.nationalgeographic.org/media/misunderstood-microbes/</a>
Yeast	2. <a href="https://kidsdiscover.com/teacherresources/science-of-yeast-for-kids/">https://kidsdiscover.com/teacherresources/science-of-yeast-for-kids/</a>

## Exercise

### 1. Tick (✓) the correct answer.

- i. Mushrooms belong to which group of microorganisms?
 

a) Virus	b) Fungi
c) Bacteria	d) Protozoa
- ii. What is the cause of the polio disease?
 

a) Protozoa	b) Virus
c) Fungi	d) Bacteria
- iii. Penicillium is an example of which group?
 

a) Protozoa	b) Fungi
c) Bacteria	d) Virus
- iv. The food is contaminated due to the presence of \_\_\_\_\_ in the environment.
 

a) moisture	b) microorganisms
c) air	d) heat
- v. Which one of the following is not a microorganism?
 

a) Bacteria	b) Virus
c) Protozoa	d) Ant

### 2. Write short answers.

- i. What is a pathogen? How does it enter in the bodies of organisms?
- ii. Why are some bacteria and fungi called decomposers?
- iii. Write two benefits and two harmful effects of bacteria.
- iv. How does the microorganism yeast work to soften and rise dough of flour?
- v. How does a mosquito transmit disease?

### 3. Constructed Response Questions:

The soil of forests of hot climate is always hot and moist, whereas the soil of forests

of cold climate is cold and dry. Out of these two areas where the decomposition of fallen leaves will happen more quickly? Explain.



Forest of hot climate



Forest of cold climate

#### 4. Investigate:

- i. "All microorganism are harmful and cause diseases". Prove that this idea is incorrect.
- ii. Many people use antibacterial soap to kill the bacteria present on their hands. But due to excessive use of soap, the chance of getting infection increases instead of decreasing. Why does it happen?

#### 5. Project:

The effect of quantity of sugar on the release of carbon dioxide from yeast.

#### Requirements:

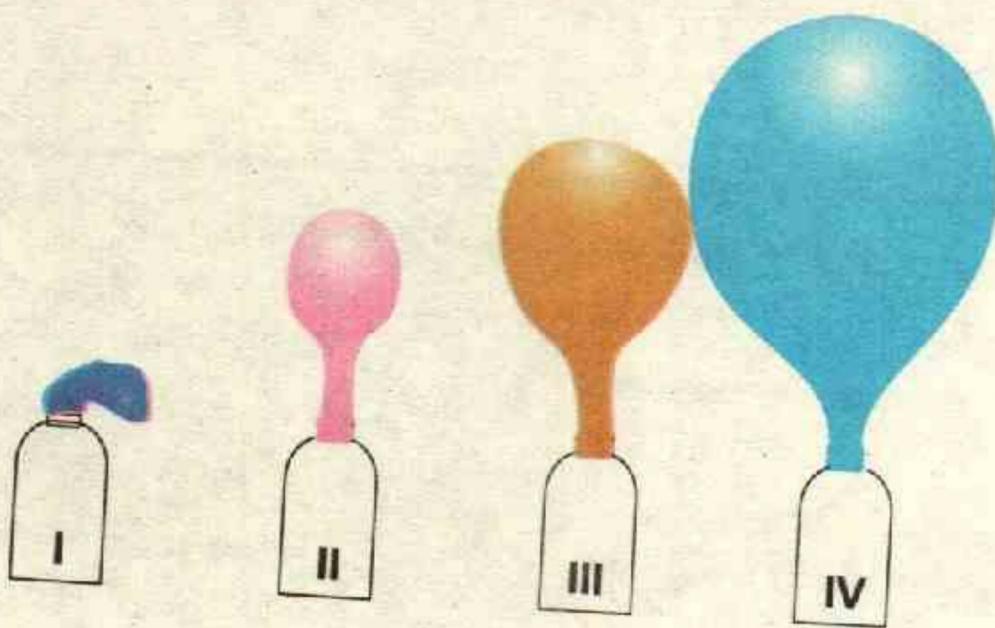
- i. Teaspoon
- ii. Rubber band
- iii. Balloons
- iv. Transparent bottles of one litre (4 number)
- v. Marker
- vi. Yeast
- vii. Sugar
- viii. Warm water

**Procedure**

- i. Take four transparent plastic bottles and label them as I, II, III and IV. Add a teaspoon of yeast in each bottle.
- ii. Add sugar in each bottle as per given table. Do not add sugar in the first bottle.

Bottle	Amount of Sugar (Teaspoons)
I	0
II	1
III	2
IV	3

- iii. Pour half cup of hot water in each bottle. Immediately, put a balloon at the mouth of each bottle and bind it strongly with rubber band.
- iv. Shake each bottle strongly so that its contents can mix up.
- v. Leave all the bottles in this condition for twenty minutes.
- vi. Then observe:
  - a. Which balloon inflated the most?
  - b. In which bottle, most carbon dioxide gas was produced?





Why do the butterflies sit on flowers?

What will happen if all flowers vanish?

Are new plants grown only by using seeds?

## Chapter

# 3

## Flowers and Seeds

### Students' Learning Outcomes

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

- Examine and describe the structure of flower.
- Define pollination and describe its types with examples.
- Define reproduction and differentiate between sexual and asexual reproduction in plants.
- Describe the structure of a seed and demonstrate its germination.
- Compare and contrast the structure and function of a gram and maize seed.
- Illustrate the conditions necessary for seed germination.

## Flower

When you go to a garden, the colourful flowers attract your attention. Have you ever thought what these flowers are for? Apart from pleasing your eyes with their colours, in what other process of nature are they used?

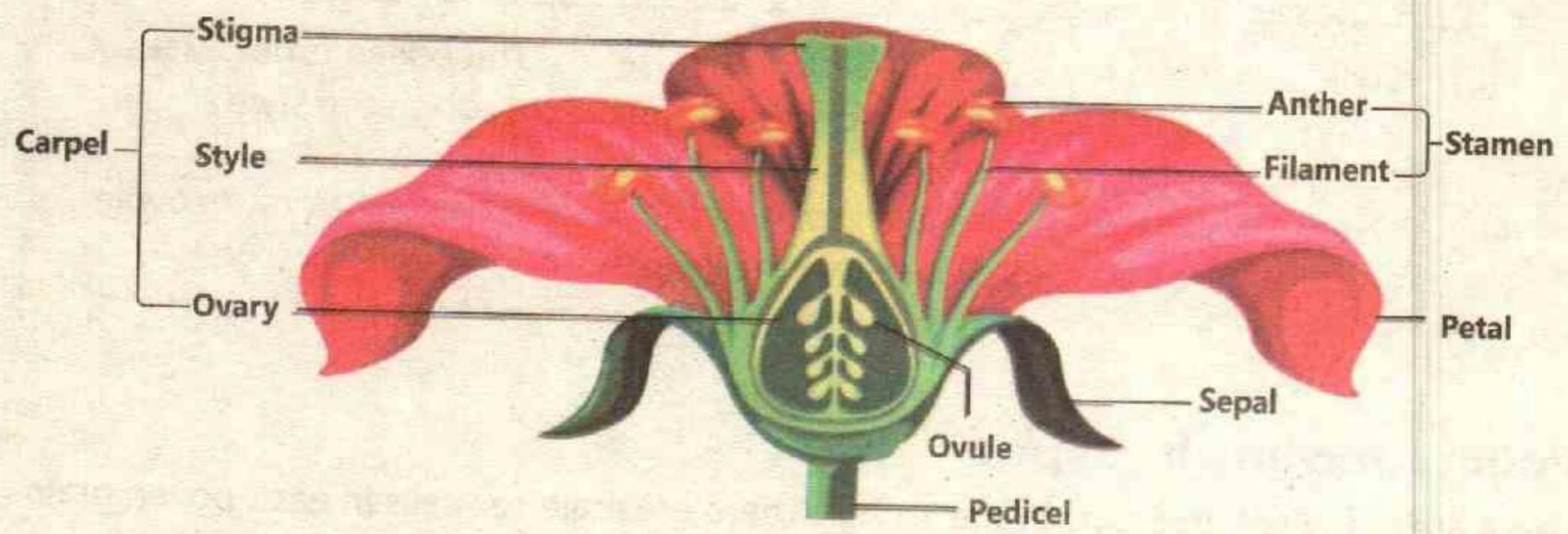


### Activity 3.1

Take a large flower. Separate its various parts with the help of tweezers. Keep the identical parts separate and draw their sketches. In this way, it will be easier for you to understand the structure of flower.

### Structure of a Flower

Flower is a very important and attractive part of the plant. In some plants there is only one flower at a stalk e.g. rose. Some flowers are produced in bunches e.g., mustard. The stalk of the flower is called pedicel. The flower has four parts at the pedicel. These occur in the form of four whorls. The four parts of flower are sepals, petals, stamens and carpel.



Structure a of flower

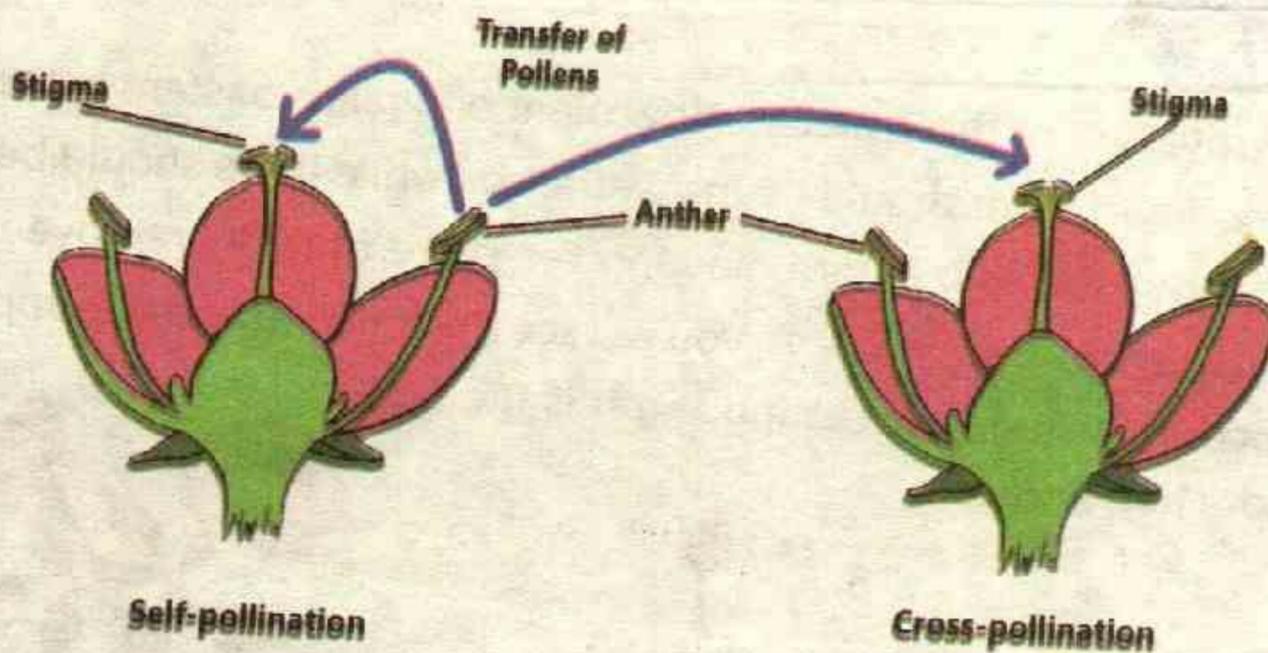
No.	Name	Characteristics	Functions
1	Sepals	These are green leaflets. Sepals form the first whorl.	They protect the internal structures.
2	Petals	These are coloured leaflets. Petals form the second whorl.	They attract insects and birds towards the flower.
3	Stamen	It is the third whorl. It consists of anther and filament.	It is the male reproductive part.
3(a)	Anther	It is round or oval sac-shaped structure, which is usually yellow in colour.	Here, pollen grains are formed.
3(b)	Filament	It is a long stalk-shaped structure.	It gives support to the anther.
4	Carpel	It makes the fourth whorl in the flower. It consists of stigma, style and ovary.	It is the female sexual reproductive part.
4(a)	Stigma	It is bottle-shaped part of the carpel.	Pollen grains adhere to it and germinate to form the pollen tube.
4(b)	Style	It is neck-shaped part of the carpel, which is below the stigma.	The pollen tube passes through the style.
4(c)	Ovary	It is an oval-shaped part of the carpel, which is below the style.	It has one or more ovules.

### Pollination and its Types

There are many pollen grains in the anther. There are male sex cells in each pollen grain. During reproduction, pollen grains are transferred from the anther of flower to the stigma. This process is called pollination. There are two types of pollination i.e. self pollination and cross pollination.

**Self-Pollination:**

If pollen grains are transferred from the anther of a flower to the stigma of the same flower (A) or to the stigma of other flower of the same plant (B), it is called self pollination. It takes place in pea, cotton and tomato, etc.



(A & B) Self pollination, (C) Cross pollination

**Cross Pollination**

If pollen grains are transferred from the flower of one plant to the stigma of the flower (C) of another plant (of the same type), it is called cross pollination. It takes place in maize, papaya, rose, etc.

**Do you know?**

1. There may be more than one carpels in a flower e.g. China rose.
2. Most of the pollination takes place through insects and air. The structure of wind-pollinated flowers is different from insect-pollinated flowers. Other than wind and insects, pollination also takes place through bats and water.

**Point to Ponder!**

Why is cross pollination must for papaya plants?

**Types of Reproduction in Plants**

The main difference between living and non-living things is the ability of reproduction. The life span of living things is limited. Sooner or later, they die. However, the life continues on the Earth. How? The living things have a characteristic. They produce new organism of their kind so that their generation continues.

There are two types of reproduction in plants:

- (a) Asexual reproduction      (b) Sexual reproduction

### Asexual Reproduction in Plants

#### Activity 3.2

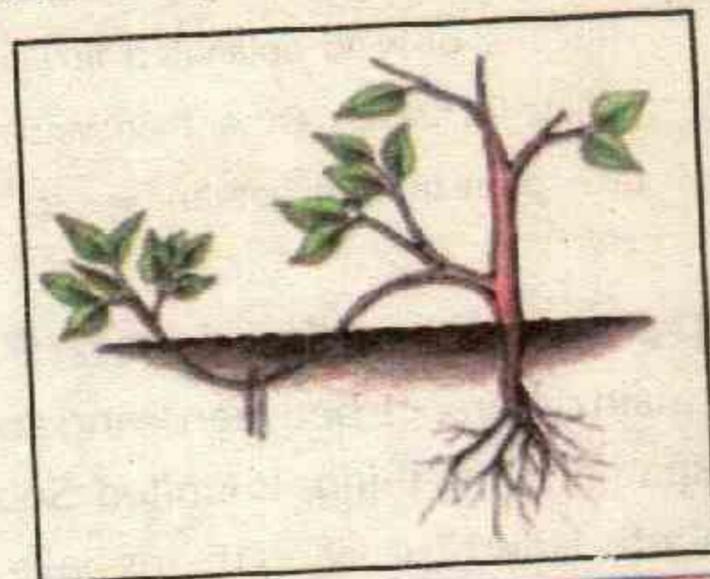
Cut the rose stem into two or three pieces. Now plant one piece of stem in the soil of a pot. At least two nodes of stem should be inside the soil while there should be buds on the part which is above the soil. Before planting the piece of stem, remove its leaves. Then pour water in the pot. After few days, you will see that new leaves have appeared on the stem. This process is called stem cutting and it is the type of asexual reproduction in plant.



In asexual reproduction only one plant produces new plants. Flowers do not take part in this type of reproduction. The other parts of the plant e.g., root, stem and leaves give rise to new plant. The plants produced from these parts have a great similarity with the parent plant. Layering, bulb, tuber, etc., are the ways of asexual reproduction.

#### I. Layering

Often some branches of shrubs become buried in the soil. It is called layer. A layer produces new roots. When we cut and separate it from the plant, it develops into a new plant. This process is called layering. Layering is also done artificially. Breeding of lemon, jasmine, lychee is done by layering.



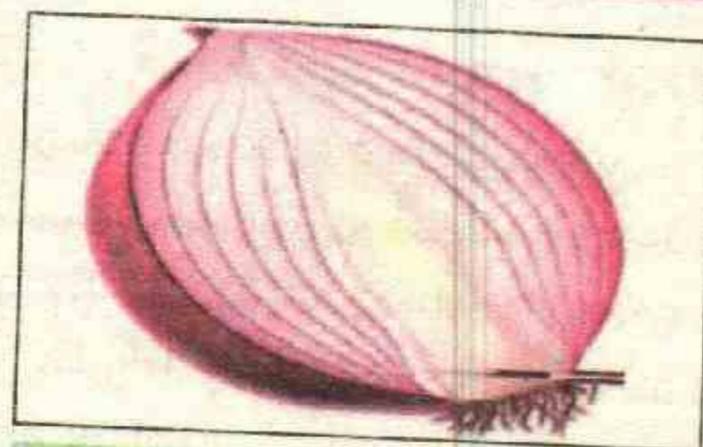
Layering

**ii. Bulb**

Observe an onion and a garlic. Where is their stem? Their short stem is located at the base. The other part of a bulb consists of thick fleshy leaves. At the start of suitable season, roots develop from the stem. When we cut the base with roots and bury it in the soil, it develops into a new plant.

**iii. Tuber**

It is the underground thick stem of plant. Its example is potato. It has 'eyes' on it, which are actually buds. When the pieces of potato having eyes, are buried in the ground, new plants develop from them.



**Bulb**

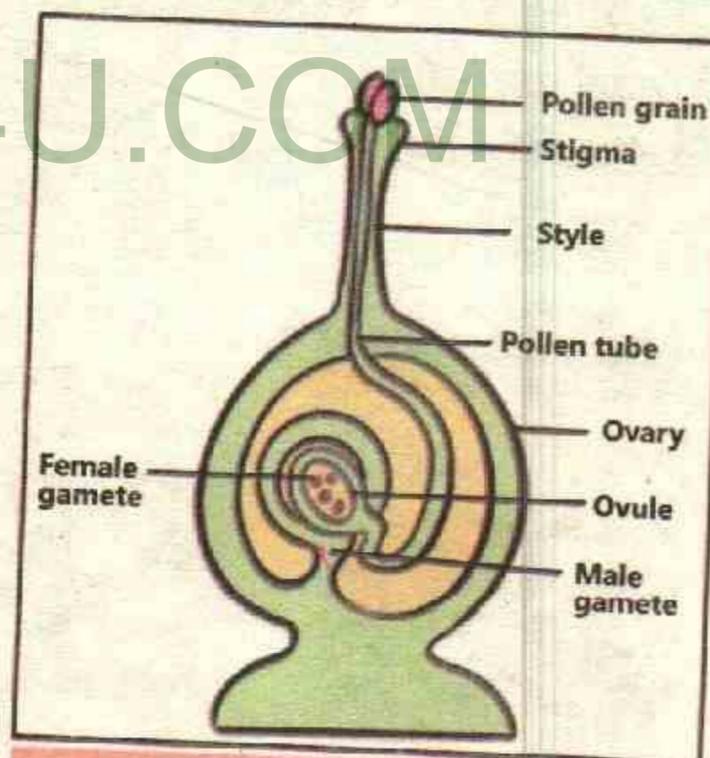


**Tuber**

**Sexual Reproduction in Plants**

In flowering plants, sexual reproduction takes place through flowers. As a result of pollination, the pollen grain reaches stigma. Here, it germinates and forms a thin tube in the style called pollen tube. After passing through the style, pollen tube reaches the ovary. Then it enters the ovule.

Male gametes are formed in the pollen tube and female gametes are formed in the ovule. The male and female gametes fuse to form a zygote. The zygote divides many times to form the embryo. Then the ovule becomes seed and ovary ripens to form the fruit.



**Sexual reproduction in plant**

Sexual Reproduction	Asexual Reproduction
It involves two parents.	It involves one parent.
Male and female gametes fuse to form new plant.	There is no fusion of male and female gametes.
New plants do not completely resemble to their parents	New plants completely resemble to their parent.
It is a slow process.	It is a quick process.

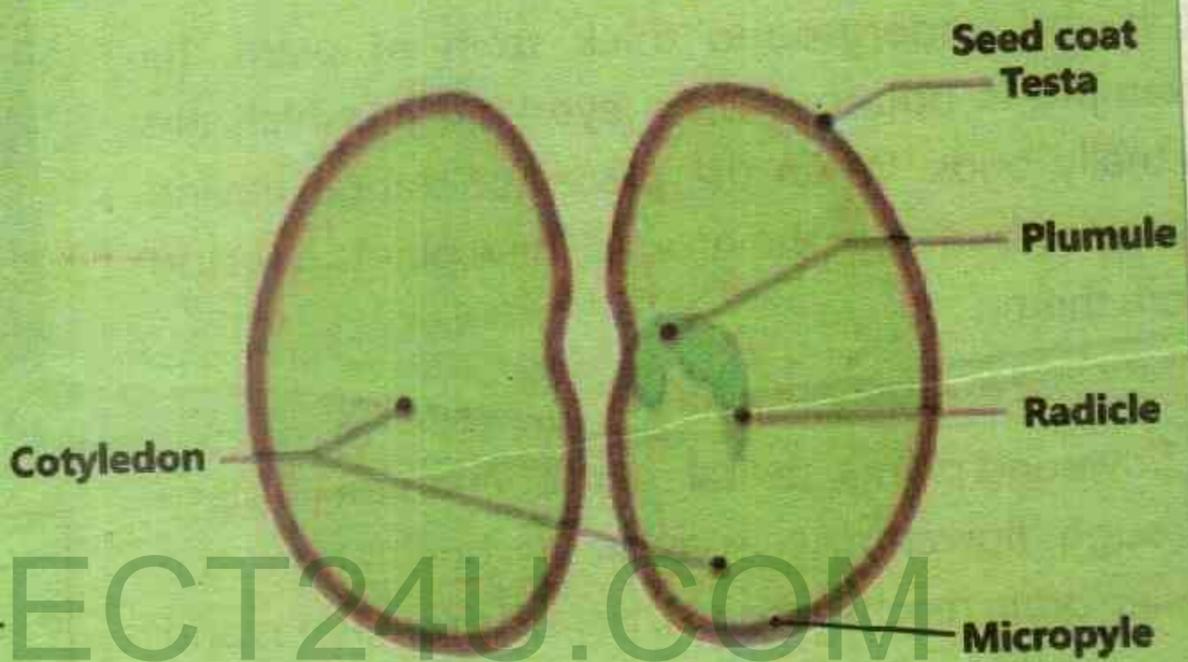
## Structure of Seed

The outer covering of seed is called seed coat or testa. It protects the tiny embryo which is present inside seed. There is a pore on seed coat. It is called micropyle. Embryo consists of cotyledons, which store food. The axis of embryo is between the two cotyledons. The end of axis towards the pointed end of seed is called radicle. When seed germinates, its radicle forms roots. The other end of the axis is called plumule. It gives rise to the shoot.

### Activity 3.3

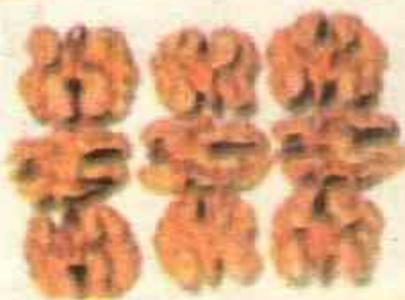
Study the internal structure of bean seed:

1. Remove the seed coat.
2. Open the seed longitudinally. How many cotyledons did you see?
3. Draw the longitudinal section of the seed on your notebook.



### Do you know?

Can you tell the names of the seeds?



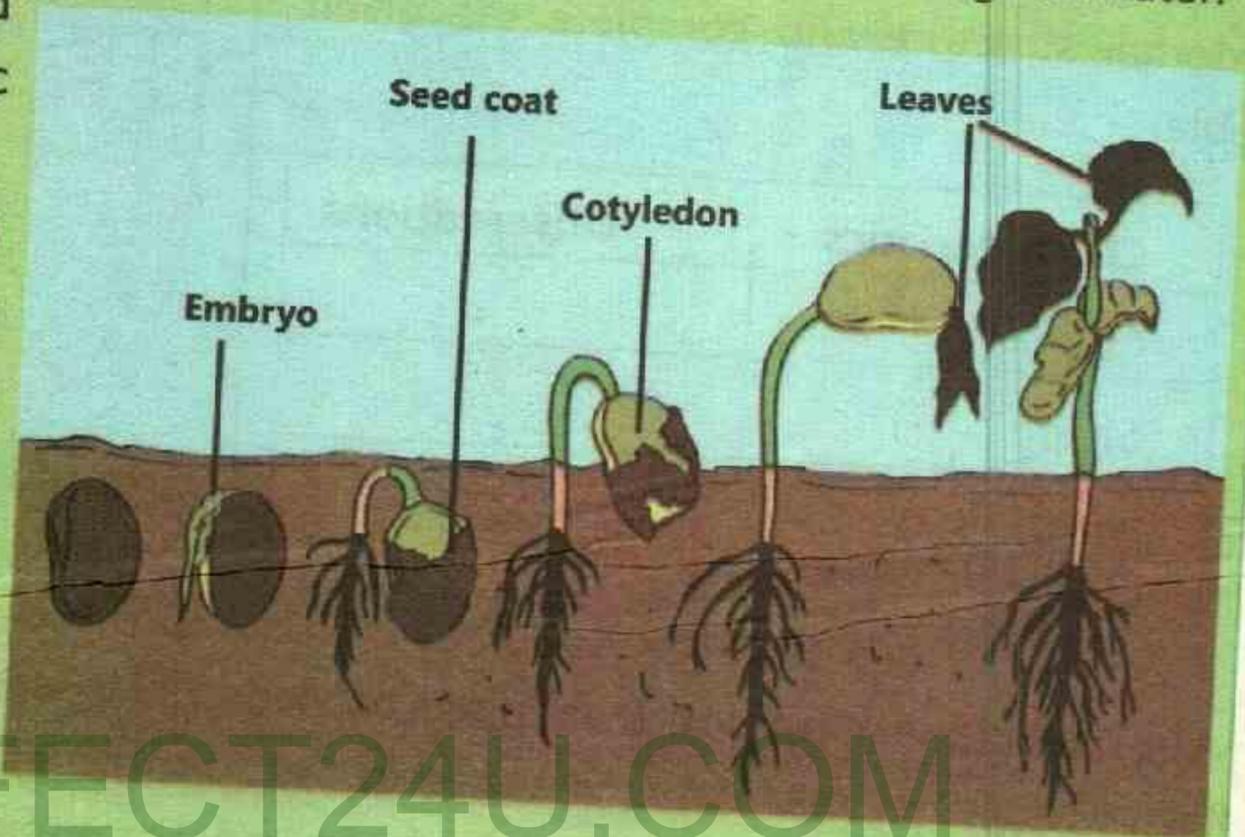
## Germination of Seed

The germination of seed is a process in which a seedling comes out of the embryo. During germination, seed absorbs water through its micropyle. On absorbing water, seed swells and the seed coat bursts. The cotyledons of seed provide food to radicle and plumule. The radicle grows towards the ground and gives rise to roots. Then the plumule grows upwards and gives rise to a tiny shoot. The cotyledons form the first leaflets of seed. These leaflets provide food to the growing roots and shoot till the new leaves appear on the stem.

**Activity 3.4**

Predict what will happen if we wrap bean seeds in a wet paper, tissue paper or cotton and put them in a plastic bag.

1. Before sowing bean seeds, keep them soaked in water for the whole night in water.
2. Put saw dust or sand in a transparent plastic cup.
3. Sow the bean seeds in saw dust or sand so that you can observe them easily.
4. After pouring some water, place the cup at a place where it can get sunshine.
5. Keep on pouring some water everyday.
6. Observe the seeds for two weeks and write your observations in the given table.



Days	Observation of Changes in the Seed
3 <sup>rd</sup> day	
6 <sup>th</sup> day	
9 <sup>th</sup> day	
12 <sup>th</sup> day	
15 <sup>th</sup> day	

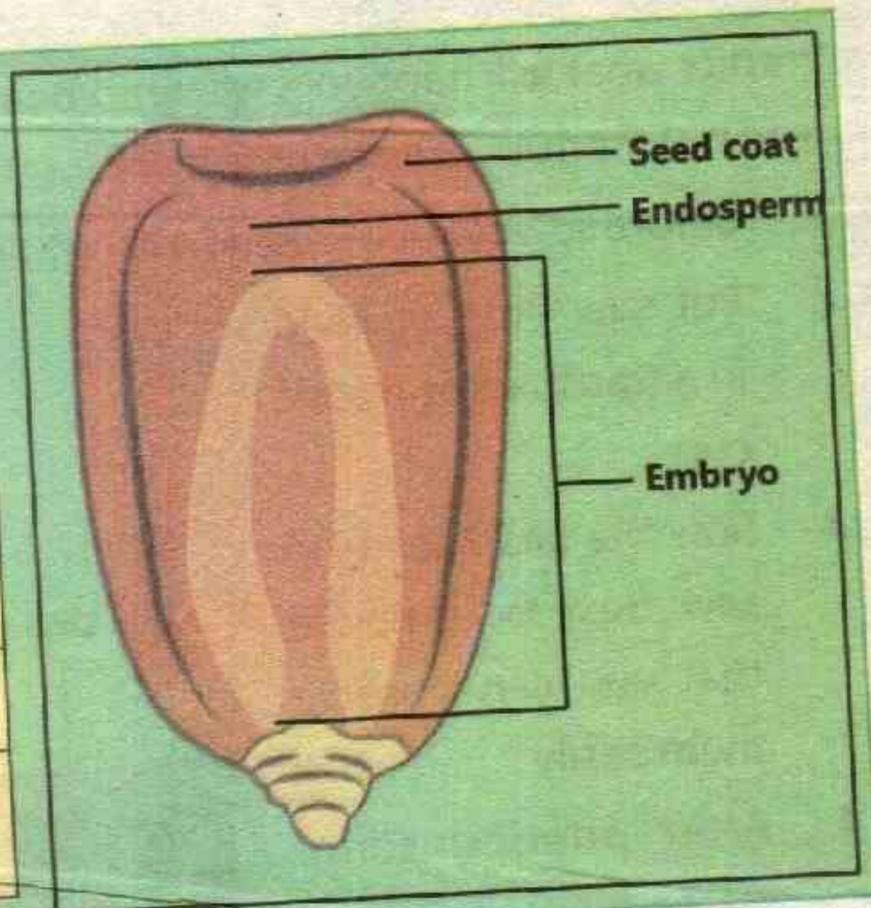
7. Draw the changes that occurred during the fifteen days. Write the changes observed, e.g. measure the length of the plant.

## Structure of Maize Seed

## Activity 3.5

Take grains of maize. Observe a maize seed and draw a sketch of its external structure. Study its external structure and complete the given table.

Characteristics	Observations
Colour	
Shape	
Structure of external surface	

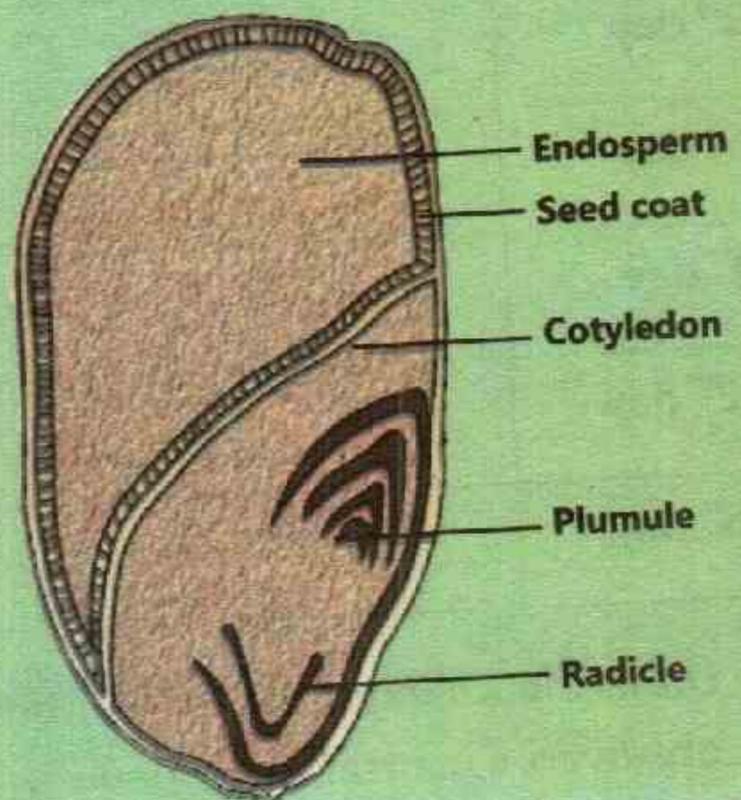


Maize is a monocot plant i.e. there is one cotyledon in its seed. The maize seed is oval and flat in shape. Its external covering is in the form of a thin seed coat. There is an endosperm inside the seed, where food is stored. The embryo of maize seed consists of one cotyledon, a radicle and a plumule.

## Activity 3.6

To observe the internal structure of maize seed:

1. Take the longitudinal section of a boiled maize seed.
2. Observe the internal structure of the seed.
3. Draw the sketch of the internal structure of the seed.



### Structure of Gram Seed

#### Activity 3.7

Take boiled and un-boiled grains of gram. Observe the gram seed and draw sketch of its external structure. Complete the given table.

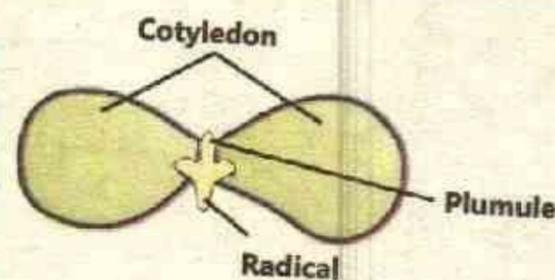
Characteristics	Observations
Colour	
Shape	
Structure of external surface	



There are two cotyledons in the gram seed. It is conical, pear-shaped and light brown in colour. The external covering consists of a thick seed coat. It has micropyle but no endosperm. There are two cotyledons beneath the seed coat. There is an axis between the two cotyledons. The lower end of the axis is radicle while the upper end is plumule.

#### Activity 3.8

1. Take the longitudinal section of the boiled gram seed.
2. Observe and draw the internal structure of the seed.



### Comparison of Gram and Maize Seeds

Gram Seed	Maize Seed
It has two cotyledons.	It has one cotyledon.
Endosperm is absent.	Endosperm is present.
Embryo is present at the centre of the seed.	Embryo is present at one side of the seed.

## Conditions Necessary for Seed Germination

All seeds need water, air (oxygen) and proper temperature to germinate.

### Activity 3.9

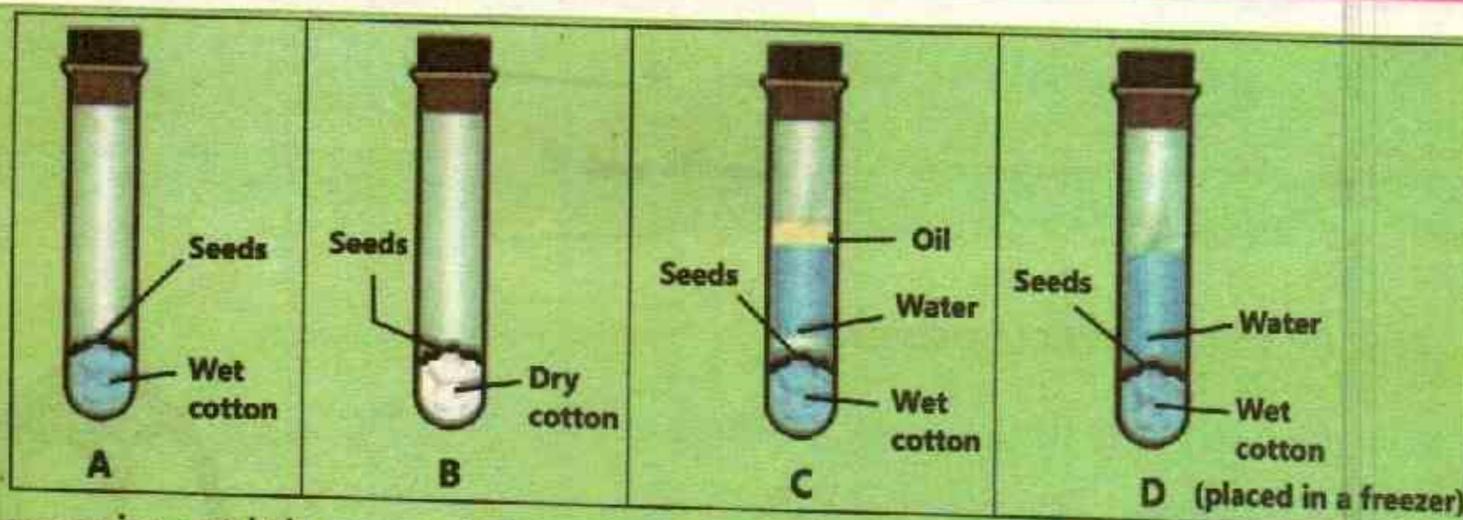
1. Take four test tubes and mark them as A, B, C, D.
2. Put wet cotton add four to five seeds in test tube A.
3. Put dry cotton add four to five seeds in test tube B.
4. Put cotton and add four to five seeds in test tube C. Pour water and then one or two drops of oil over it.
5. Put four to five seeds in test tube D and fill half of the test tube with water.
6. Close the mouth of the four test tubes by cork.
7. Put test tube A, B and C in the laboratory at room temperature.
8. Put test tube D in a freezer.
9. Pour water in test tube A daily, after removing the cork so that seeds may not dry up.
10. Observe the seeds for one week and enter your observation in the given table.

Test Tube	Number of Germinated Seed
A	
B	
C	
D	

(i) In which test tubes, the seeds germinated? Why did the seeds not germinate in some test tubes?

(ii) Why were the drops of oil put on the water in test tube C.

In test tube A, all necessary conditions for germination i.e., water, air and suitable temperature are present. There is no water in test tube B and no air in tube C. Test tube D has no suitable temperature.



From this experiment it is proved that water, air (oxygen) and suitable temperature are necessary conditions for seed germination.

### Key Points

- The four parts of a flower are sepals, petals, stamens and carpel. The transfer of pollen grains from anther to the stigma is called pollination.
- The two types of pollination are self-pollination and cross pollination.
- Reproduction is the process by which organisms produce new organisms of their own kind for the continuation of their generation.
- In asexual reproduction, only one parent produces new organisms of its own kind. Sex cells are not involved in it.
- Layering, stem cutting, stem, tuber are the ways of asexual reproduction in plants.
- The fusion of male and female gametes results in the formation of zygote. Zygote divides repeatedly and forms embryo.
- Ovule forms seed. The ovary ripens to form fruit.
- Maize is monocot plant i.e., its seed has one cotyledon.
- The maize seed consists of seed coat, endosperm and embryo.
- The gram seed has two cotyledons.
- For seed germination the environmental conditions are water, air and suitable temperature.



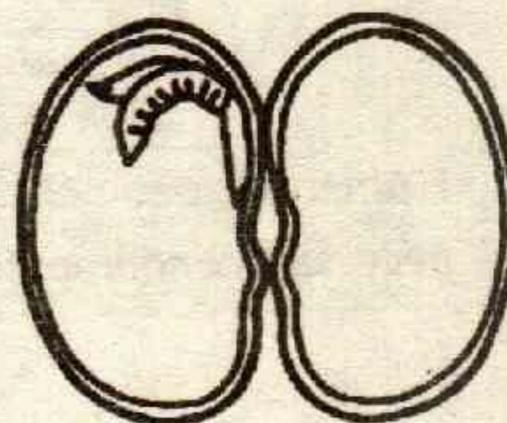
**Weblinks:** Use the following weblinks to enhance your knowledge about the topics in this chapter.

Video of Flower Blossoming	1. <a href="https://www.youtube.com/watch?v=LjCzPp-MK48">https://www.youtube.com/watch?v=LjCzPp-MK48</a>
Polinator	2. <a href="https://www.nationalgeographic.com/news/2015/05/150524-bees-pollinators-animals-science-gardens-plants/">https://www.nationalgeographic.com/news/2015/05/150524-bees-pollinators-animals-science-gardens-plants/</a>

## Exercise

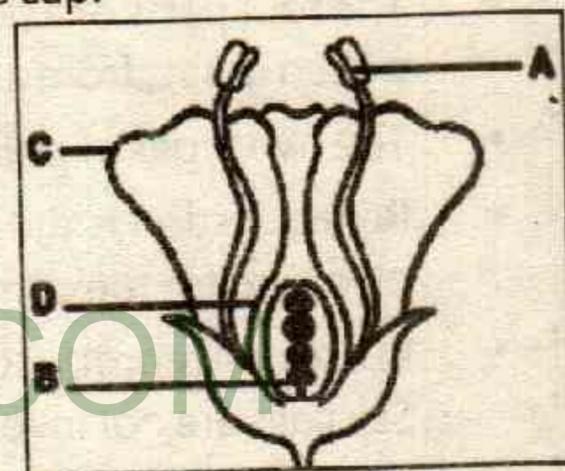
### 1. Tick (✓) the correct answer.

i. The given figure is of a dicot seed. Which statement is correct about it?



- a) Endosperm is present which stores food.  
 b) There is no role of cotyledon in storing food.  
 c) Cotyledon stores food for the embryo.  
 d) Cotyledon appears in the form of protective cap.

ii. In the given picture of a flower, which are the female reproductive parts of the flower?



- a) A, B and D                      b) B, C and D  
 c) A, B and C                      d) A, C and D

iii. The gram seed is covered by which structure?

- a) Cotyledon                                      b) Seed coat  
 c) Plumule                                        d) Endosperm

iv. Which conditions are necessary for seed germination?

- a) Water, soil and air, darkness              b) Air, water, light  
 c) Water, temperature, air                      d) Temperature, soil, light

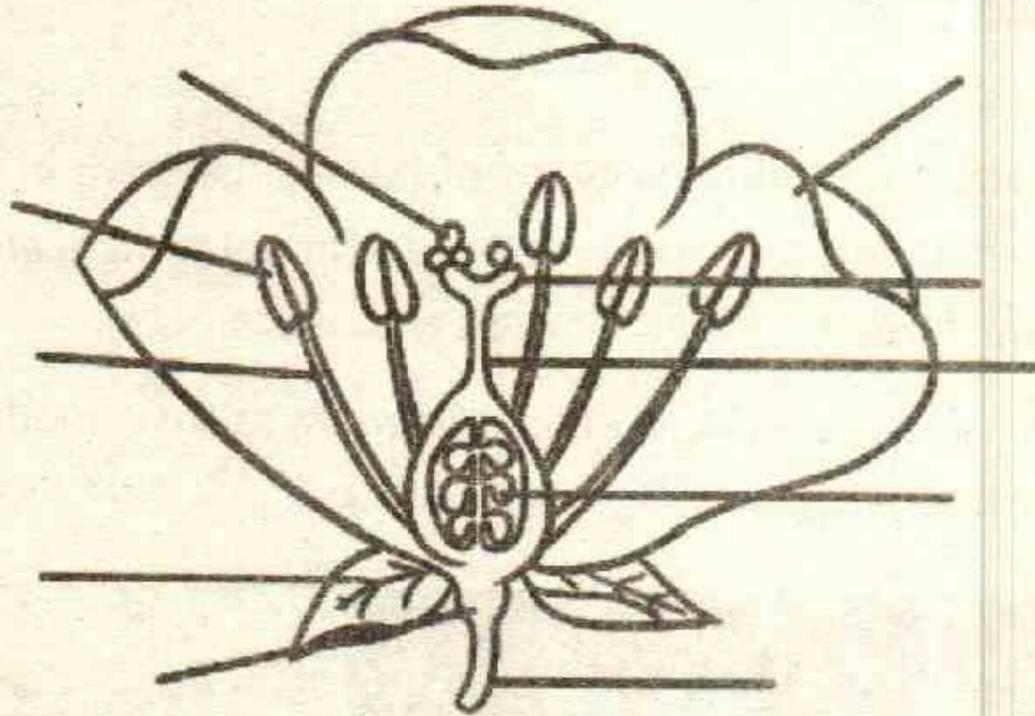
v. Which type of pollination is must for papaya?

- a) Self-pollination                                      b) Cross pollination  
 c) Both type of pollination                      d) None of these

### 2. Write short answers.

- i. Can you tell the names and functions of the four parts of a flower?  
 ii. How will you compare self pollination and cross pollination?  
 iii. Compare gram and maize seed?

- iv. Define reproduction.
- v. Label the given picture.

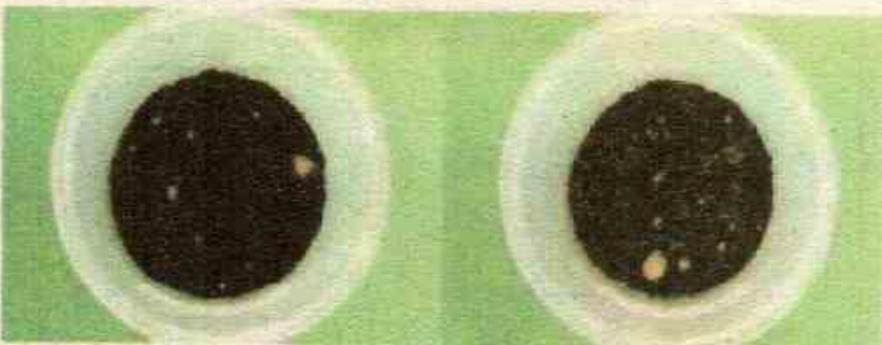


3. Constructed Response Questions:



Plain water

Water with salts



Water with sugar

Water with vinegar



i. Observe the given picture. What is the role of water in seed germination?

ii. Observe the given pictures. For which type of pollination, the shapes and structures of flowers are suitable?

4. Investigate:

If all the insects become extinct, what will be its effect on flowering plants?

**5. Project:**

- i. Collect five different types of flowers. Observe in which flowers sepals, petals, stamen, and carpel are present and in which these are not present. Compare these structures in different flowers.
- ii. Using low-cost or no-cost materials, make a model of flower. Pictures of four models are given, for your guidance.



## Chapter

# 4

## Environmental Pollution

*What will happen if there is a pile of garbage around us?*

*How is the smoke harmful for us?*

*How are the use of polythene bags harmful for the environment?*

### Students' Learning Outcomes

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

- Define pollution and its types.
- Explain the main causes of water, air and land pollution.
- Explain the effects of water, air and land pollution (unclean or toxic water, smoke, smog, excess carbon dioxide or other gases, open garbage dumps, industrial water etc.) on the environment and life.
- Explain the effects of burning fossil fuels and releasing greenhouse gases in the air.
- Differentiate between biodegradable and non-biodegradable materials.
- Explain the impact of non-biodegradable materials on the environment.
- Investigate possibilities and suggest way to reduce non-biodegradable materials.

The particular place where an organism lives is called its environment. The environment means the plants, animals, humans, sunlight, water and air which are present around us. The plants and animals are the living components of environment. Sunlight, soil, water and air are the non-living components of environment.

## Environmental Pollution and its Types

### Activity 4.1

1. Light a small candle. Predict, what type of pollution is being added by the burning candle?
2. Hold a glass over the flames of the candle for a while. Have you seen any change at the surface of the glass?
3. You have seen the soot over the glass surface. You can also touch it. The soot is an example of pollution in the environment.



Any change in the environment which is harmful for living things is called environmental pollution. The substances that cause pollution are called pollutants. We will study the types and causes of environmental pollution.

### Activity 4.2

Perform this activity in twenty minutes by forming four or five groups.

1. In first ten minutes discuss pollution.
2. In the next ten minutes make a list of pollution and its causes in Pakistan.

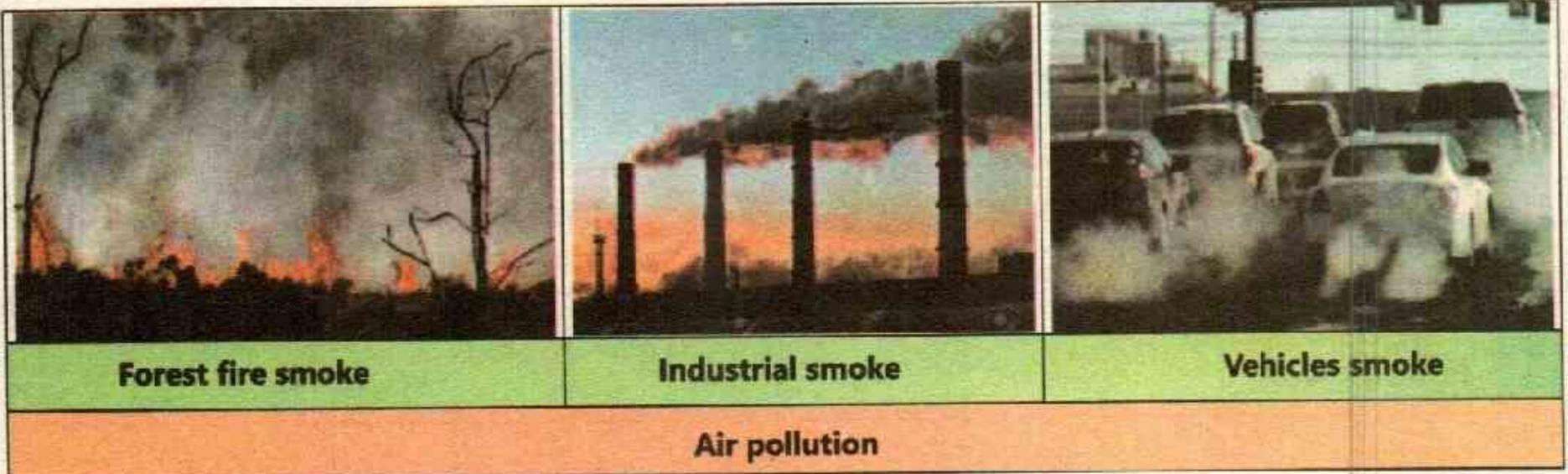
### Point to Ponder!

Presently, which is the most dangerous environmental pollution in Pakistan?

There are three types of environmental pollution i.e. air pollution, water pollution and land pollution.

### 1. Air Pollution

You would have seen smokes emitting from vehicles and factories. The poisonous substances present in the smoke pollutes the air. The burning of fuels in the kilns and homes is producing carbon dioxide gas which is polluting air. The fire in the forests also causes air pollution. Can you tell any other reason?



### 2. Water Pollution

We discuss about water pollution in our everyday life. Have we ever thought how the water is being polluted? The sewage, wastes of factories, insecticides and fertilizer etc., are polluting water. The oil leakages from oil tankers and petroleum refineries are also polluting water.



Polluted sewerage water
Water pollution

### 3. Land Pollution

The garbage of houses and cities remains scattered on land. There is no proper arrangements for disposal of the garbage. Sometime people do not take care while throwing garbage on land. Some people throw wastes outside from their vehicles while travelling. Thus, the cities and the villages do not remain neat and clean.

Other than these insecticides and fertilizers have chemical substances. These remain in the soil for a longer period of time and cause land pollution. Agricultural and poisonous substances of factories are also the cause of land pollution.



Garbage
Land pollution

## Activity 4.3

Write "Yes" or "No" in the given table

Reason of pollution	Air pollution	Water pollution	Land pollution
Cutting of trees	Yes	No	Yes
Polluted water			
Garbage			
Industrial wastes			
Use of chemical fertilizers or Insecticides			
Plastic			
Smoke from factories			
Burning plastic and garbage			

## Effects of Pollution on Life

## Activity 4.4

Can you fill the given table?

Types of Pollution	Effects of Pollution
Air pollution	
Water pollution	
Land pollution	

In activity 4.4, some of your answers may be correct or incorrect. It does not matter. Now we will study the effects of environmental pollution. You may correct your answers, if incorrect.

- (i) Germs present in polluted water are cause of the diseases.
- (ii) The poisonous substances present in the factory wastes pollute water and land environment.

- (iii) Bacteria present in sewerage use most of the dissolved oxygen present in water and the aquatic animals e.g., fish die due to lack of oxygen.
- (iv) The presence of pollutants such as chemicals, carbon dioxide and large quantity of other gases in polluted air cause throat, skin and eye diseases.
- (v) Pollutant gases present in smog cause lung diseases and allergy.
- (vi) The poisonous substances emitting from the chimneys of factories and smoke after dissolving in rain water produces acid rain. It is not only harming buildings and trees but also to the aquatic life of streams, canals and lakes.
- (vii) The poisonous substances and gases are produced by open garbage dumps which cause air and water pollution.



Disposing of garbage



Effects of pollution on aquatic life

Effects of acid rain

Polluted rain water

**Do you know?**

Pollutant gases in air combine together in presence of sunlight and produce smog. It reduces visibility during winter.

**Greenhouse Effects**

Greenhouse is a house made of transparent material. People grow vegetables and flowers in it. The greenhouse remains hot inside even in the winter season. The Sun rays enter in the greenhouse passing through its glasses and produce heat. This heat cannot go out of the glass of greenhouse and the inner atmosphere remains hot.



Greenhouse

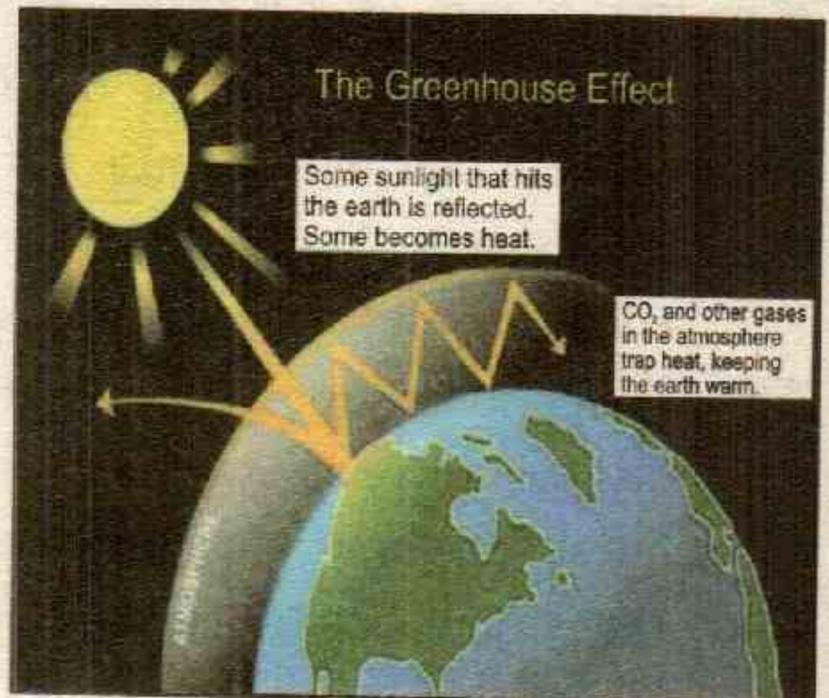
**For Your Information**

Our atmosphere mostly consists of nitrogen and oxygen. Carbon dioxide, methane, nitrogen oxide, ozone and water vapours are also present. These are called greenhouse gases.

Carbon dioxide and other gases present in our environment work like the gases of greenhouse. In other words this allows the sunlight to reach the Earth, but does not allow to leave the heat of the Earth. This process is called greenhouse effect. Due to this our Earth remains hot.

**Do you know?**

Coal, crude oil and natural gas are all considered fossil fuel. They were formed from the buried remains of plants and animals that lived millions of years ago on the Earth.

**Greenhouse effect**

When fossil fuel is burnt, carbon dioxide and other greenhouse gases are increased. This results in the increase of temperature of Earth. It is called global warming. The climate of the world is changing due to such reasons. The melting of ice from North and South poles is increasing the level of sea water. It is causing the occurrence of more rains and flood. If this process continues then the coastal areas and islands may disappear in the sea.

**Flood****Melting of Ice****Effects of greenhouse gases**

## Preventive Measures to Reduce Pollution

We should shift the factories away from the cities to reduce the effects of pollution. The smoke of factories should be made ineffective before releasing in the air. Polluted water should not be poured into rivers, canals and lakes. The garbage and solid wastes of house to be disposed of in a proper way. The number of vehicles should be reduced and smoke emitting vehicles should be banned. Cutting of trees and forest should be reduced. There should be more tree plantation.

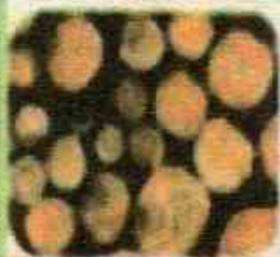
### Interesting Information

The Government of Pakistan is launching awareness campaign for tree plantation. From 2018 the Government has taken an initiative of "Billion Tree Plantation" across the country. It will be achieved in five years.

## Biodegradable and Non-biodegradable Materials

### Activity 4.5

Put the things given below in separate bags and leave it as it is for a week. Observe it after a week. Have any changes taken place?



Wood



Bread



Water



Leather



Stone



Fruit

Why is it appropriate to bury dead bodies and peel of vegetables? In fact the decomposed things are converted into their simple components by bacteria and fungi. If you throw bread, rice, meat, fruits, vegetables on the ground then you will see they have disappeared after decomposition. Such matters which become part of the soil after broken down by natural process into simple substances are called biodegradable materials. The matters that could not break down into simple substances by natural process are called non-biodegradable materials.

		
Vegetables and fruits	Meat	Paper
<b>Biodegradable Materials</b>		
		
Polythene bags	Plastic bottle	Computer components
<b>Non-biodegradable Materials</b>		

### Ways to Reduce Non-biodegradable Things

To reduce pollution of non-biodegradable things, the principle of "4R" is applied. "4R" means to recycle, reuse, reduce and refuse.

**REFUSE**



**REDUCE**



**REUSE**



**RECYCLE**



### Key Points

- Any change in the environment which is harmful for living things is called pollution.
- The three types of pollution are air, water and land pollution.
- The main causes of air pollution are the poisonous substances present in the smoke, which is emitted by vehicles on the roads and factories.
- The polluted water of sewerage, waste substances of factories, insecticides, fertilizers and leaking oil are the main causes of water pollution.
- Garbage from home, fertilizers, wastes, spray of chemical substances etc., are the main source of land pollution.
- The aquatic animals die owing to water pollution. Smog causes diseases of lungs, throat, skin and eyes.
- The temperature of Earth is increasing owing to increase in the amount of carbon dioxide gas and greenhouse gases which have been produced by burning of the fossil fuel. It is called global warming. Due to this the climate of the world is changing.
- Such matters which become part of the soil after broken down by natural processes into simple substances are called biodegradable materials.
- The matters that do not breakdown into simple substances by natural processes are called non-biodegradable materials.
- To reduce pollution caused by non-biodegradable materials 4R principle is used.



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

Greenhouse effect	1. <a href="https://www.nationalgeographic.org/article/greenhouse-effect-our-planet/">https://www.nationalgeographic.org/article/greenhouse-effect-our-planet/</a>
Pollution due to plastic	2. <a href="https://kids.nationalgeographic.com/explore/nature/kids-vs-plastic/pollution/">https://kids.nationalgeographic.com/explore/nature/kids-vs-plastic/pollution/</a>



## Exercise

### 1. Tick (✓) the correct option.

- i. Which disease is caused due to air pollution?
 

(a) Diarrhea	(b) Typhoid
(c) Lungs cancer	(d) Cholera
- ii. The germs present in it cause typhoid.
 

a) Sewerage water	b) Fertilizers
c) Factory waste	d) Insecticides
- iii. Which one of these is non-biodegradable?
 

(a) Feathers	(b) Paper
(c) Leaves of plants	(d) Polythene bag
- iv. Which of the following is NOT a greenhouse gas?
 

(a) Oxygen	(b) Methane
(c) Ozone	(d) Carbon dioxide
- v. Which one of the following acts causes most of the air pollution?
 

(a) Collecting rubber	(b) Burning rubber
(c) Reusing rubber	(d) Recycling rubber

### 2. Short short answers.

- i. Write three causes of air pollution.
- ii. What are the four effects of pollution on life?
- iii. What is greenhouse effect?
- iv. What will be the effects of Global warming?
- v. Write three ways of preventive measures to reduce pollution.



### 4. Investigate:

- i. What is the relationship between diseases and pollution?
- ii. Identify biodegradable and non-biodegradable materials present in your environment.

**4. Constructed Response Questions:**

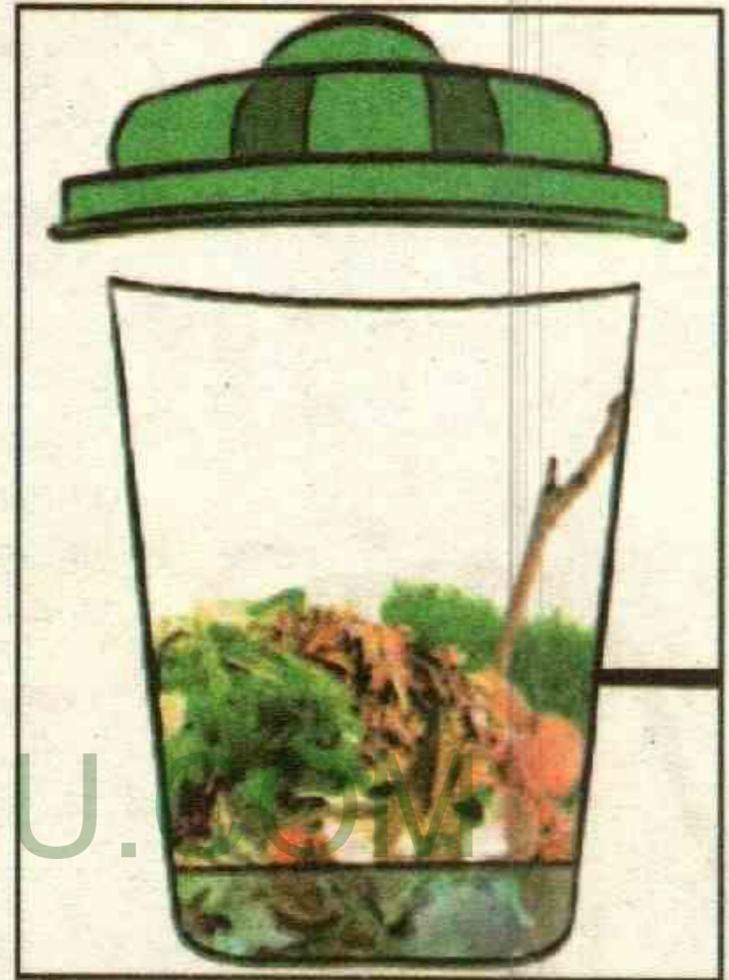
- i. What is the main cause of pollution?
- ii. Why Government of Pakistan has banned the use of polythene bags?
- iii. If it is written D2W on the polythene bags then why there is no ban on the use of such bags?

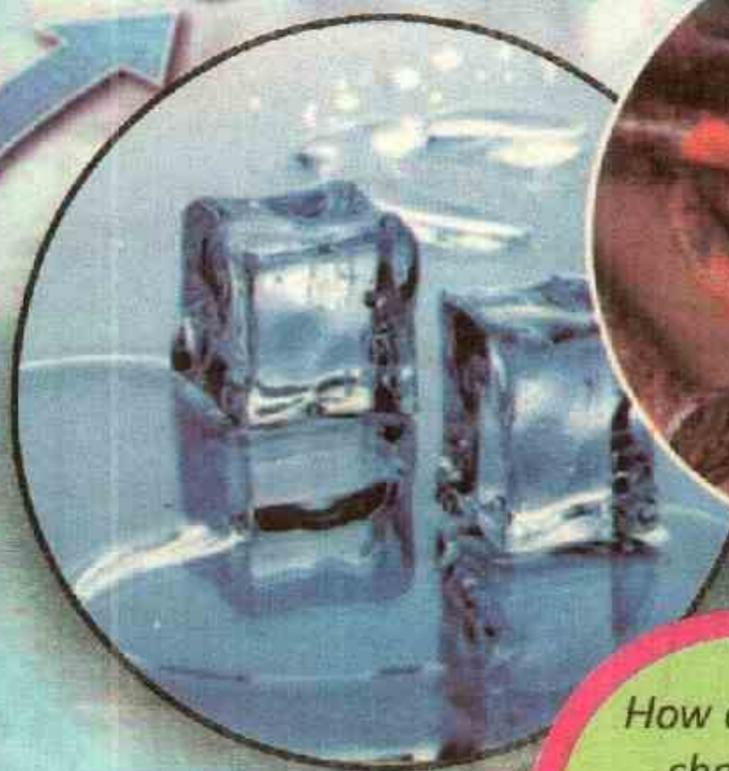
**5. Project:****Preparing Organic Fertilizer****Requirements:**

- i. Plastic bucket
- ii. Peels of vegetables, fruits and egg shell
- iii. Grass
- iv. Dry leaves
- v. Water
- vi. Wooden rod

**Procedure:**

- i. In a small plastic bucket put peels of vegetables, fruits, egg shells, dry leaves and some grass.
- ii. Pour water so that all of these become wet.
- iii. Stir with the help of a wooden rod, so that these can get oxygen.
- iv. When these things become brown it means the fertilizer has been made. It is called organic fertilizer. Now you can use it for the plants.





*How can the changes occurred in matter be identified?*

*What is the difference between sweet and sweetest juice?*

*What can we do to dissolve sugar in water?*

## Chapter

# 5

## Physical and Chemical Changes of Matter

### Students' Learning Outcomes

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

- Identify observable changes in materials that do not result in new materials with different properties (e.g., dissolving, crushing aluminum can)
- Recognize that matter can be changed from one state to another by heating or cooling (e.g., candle wax).
- Describe and demonstrate the process of melting, freezing, boiling, evaporation and condensation.
- Identify ways of accelerating the process of dissolving materials in given amount of water and provide reasoning (i.e., increasing the temperature, stirring and breaking the solid into smaller pieces increases the process of dissolving).
- Identify different mixtures and solutions in their surrounding.
- Enlist uses of mixture and solutions in daily life.
- Distinguish between strong and weak concentrations of simple solutions.
- Identify observable changes in materials that make new materials with different properties (e.g., decaying, burning, rusting).
- Differentiate between physical and chemical changes with examples.

## Physical Changes Observed in Everyday life

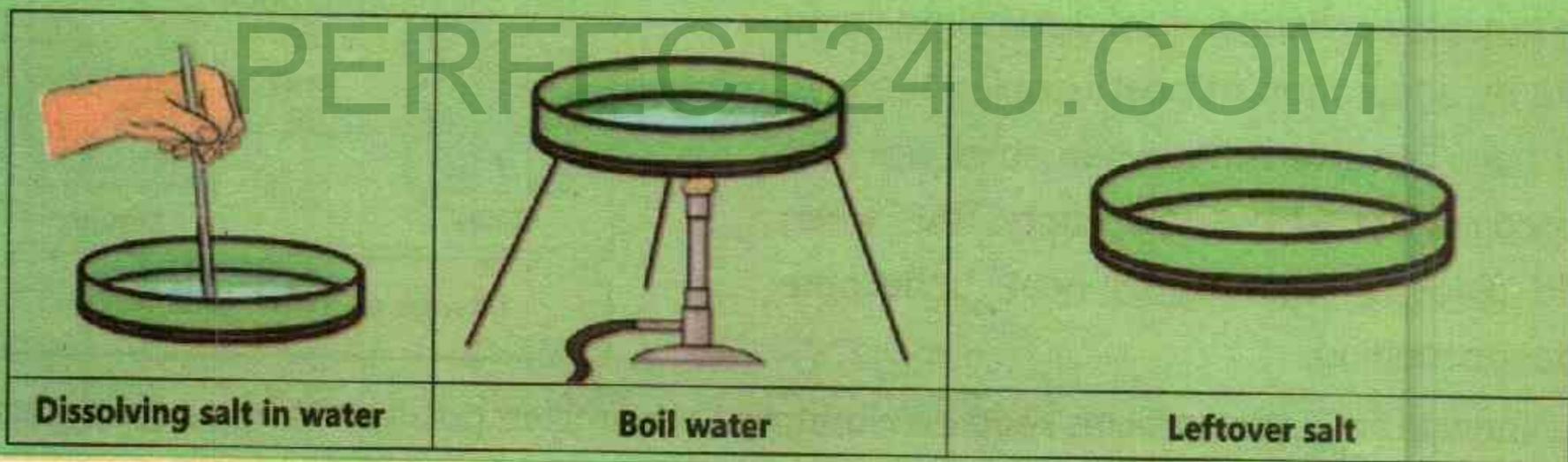
In the previous grade we have already read that all the substances are made of matter. Matter has mass and occupies space. The three physical states of matter are solid, liquid and gas, in which the arrangement of particles is different. Here we will study the physical changes in matter.

### Physical Changes in Matter

In physical change, only appearance of a matter changes but chemical composition remains the same.

#### Activity 5.1

1. Take two to three spoons of salt in a clean beaker or any dish.
2. Pour half cup of warm water into the dish and keep it stirring till all the salt dissolved. Can you see the salt?
3. Heat the beaker or dish till all the water evaporates as vapours.
4. You will observe that salt is present in the dish.



The dissolving of salt in water is a physical change. It only changes state of matter. But matter having new properties has not been formed. Physical state can be reversed. After evaporation of water as vapours salt remained there.

#### Activity 5.2

Take an aluminum can. Crush it with a hammer. Have you observed any change?

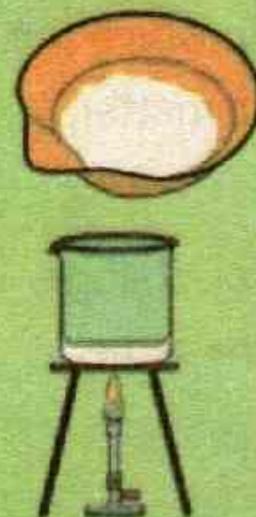
It has squeezed. Its shape has changed. In your opinion what type of change is this? Has the aluminum changed into a new matter?



## Changes in States of Matter

### Activity 5.3

Heat solid wax in a beaker or dish. What do you observe? The wax melted and became liquid. Pour the melted wax in a dish and let it cool. What change do you see? The wax freezes on cooling and changes to solid again. The changes that occurred in wax are related to the physical state of matter.

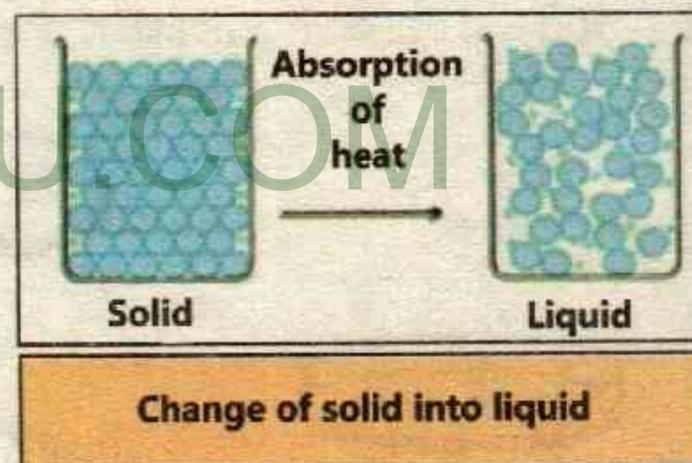


### Processes Involved in Changes in States of Matter

You have seen in activity 5.3 that the physical states of matter change on heating or cooling. During the changes in the states of matter following processes take place.

#### Melting

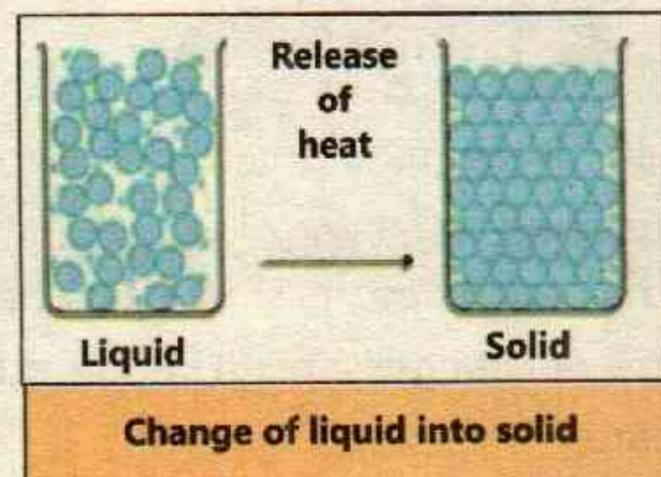
The process of change of solid state into liquid state by absorption of heat is called melting. You have observed that when solid wax was heated it changed into liquid state. Thus, when solid piece of ice absorbs heat, it becomes water on melting.



You know in solid the particles keep on vibrating at their fixed position. When a solid gets heat its particles start vibrating faster and do not remain at their position. The forces of attraction between them become weaker and they move away from each other. Thus, a solid thing is changed into its liquid state.

#### Freezing

When water is kept in a freezer then what happens? During this process heat is lost from water as a result the movement of its particles becomes slower and they come closer to each other. The force of attraction between particles becomes stronger. Thus the liquid is changed into solid. This process is called freezing.

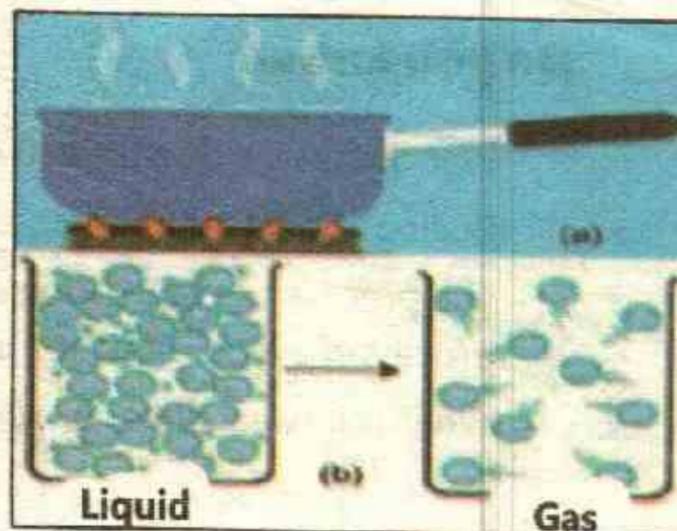


## Boiling

When a liquid is heated continuously the movement of its particles becomes faster. The space between the particles increases. Due to this the liquid is changed to vapours or gas and this process is called boiling.

## Evaporation

You must have observed if water falls on the floor, then after some time the floor becomes dry. Why does it happen? Water is released into surrounding air continuously as water vapours from all wet surfaces. This process takes place continuously from the surfaces of canals, lakes, rivers and oceans etc. The change of water into water vapours is called evaporation. This process also takes place from the snow surface and from the leaves of plants.



(a) Boiling of water

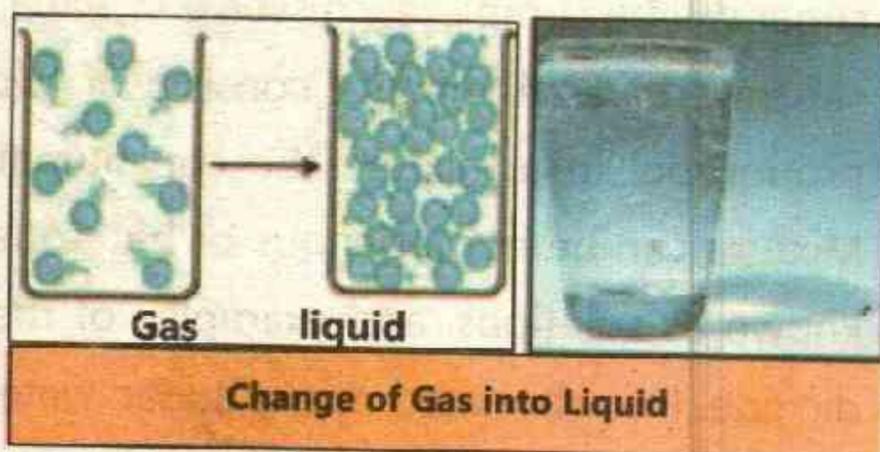
(b) Change of liquid into gas



Evaporation

## Condensation

While you are drinking cold water or drink in a glass, you see water drops at the external surface of the glass. From where do these drops of water come? When water vapours present in air collide with the external surface of glass, then because of cold, the heat of these particles is released. These water vapours after being changed into liquid stuck up at the external surface of the glass. This process is called condensation.



Change of Gas into Liquid

**Do you know?**

1. Wet clothes are dried due to evaporation.
2. Boiling a liquid requires high temperature.
3. The process of evaporation can take place at any temperature and at high temperature the process of evaporation becomes rapid.
4. When our sweat dries up, we feel cold owing to the process of evaporation.

**Mixture and Solution****Activity 5.4**

Take three glasses of water.

1. In glass A add pebbles of sand to the first glass. Stir the water. What will happen?
2. In glass B add a teaspoon of sugar. Stir the water and record your findings.
3. Add some vegetable oil to the third glass C. Stir and see what will happen?

In the above activity, you will see the sand will not dissolve in water in glass A. In glass B sugar will be completely dissolve in water. Oil will not mix with water and it will stay as a separate layer. A mixture consists of two or more substances mixed together in any proportion. In a mixture the constituents substances retain their original properties. Mixture can be homogenous or heterogeneous. Most homogeneous mixtures are also known as solutions, and examples of these include air which contains oxygen, carbon dioxide. In carbonated drinks sugar, water and  $\text{CO}_2$  are mixed together and even metal alloys are made up of different metals.

A heterogenous mixture can be separated by physical methods. At home the salad made of lettuce, cheese, seeds, tomatoes, broccoli and other vegetables is an examples of a heterogenous mixture. Soil is an example of a heterogeneous mixture. It combines many different components which are not uniform, such as stone, clay, decaying plant material and even living things.

## Dissolving Substances in Water

You have observed in activity 5.1 that salt dissolves in water. When a solid or liquid things put into water and its particles dissolve uniformly to form a mixture called solution. There are two important components of solution.

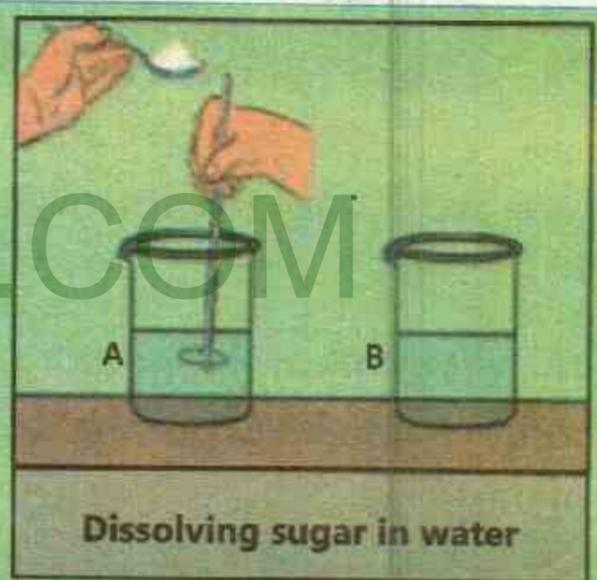
- Solute:** The substance that dissolves in liquid and is in less quantity is called a solute e.g., sugar, salt.
- Solvent:** The substance that dissolves a solute, resulting in a solution and is in more quantity is called a solvent, for example, water

Many things after dissolving in water form solution. The rate of dissolving of salt in water can be increased by the following processes:

### Stirring

#### Activity 5.5

- Take two beakers or glasses. Mark them as A and B.
- Add a spoon of sugar (solute) in both the beakers.
- Then pour a cup of water (solvent) in both beakers.
- Stir sugar in beaker A with a glass rod. Do not stir sugar in beaker B.
- What have you observed?

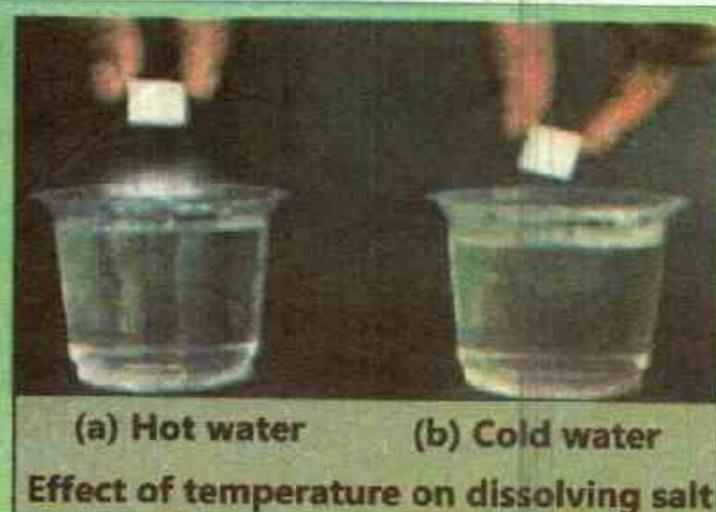


In the above activity the dissolving of sugar in such a manner is called stirring. When you stir sugar in beaker A it dissolved soon, whereas the sugar in beaker B did not dissolve. If the sugar is not stirred even then it will dissolve but it will take more time.

### Increasing Temperature

#### Activity 5.6

- Take two beakers or glasses.
- Mark them as A and B.
- Pour one cup of hot water (solvent) in beaker A and pour a cup of cold water (solvent) in beaker B.

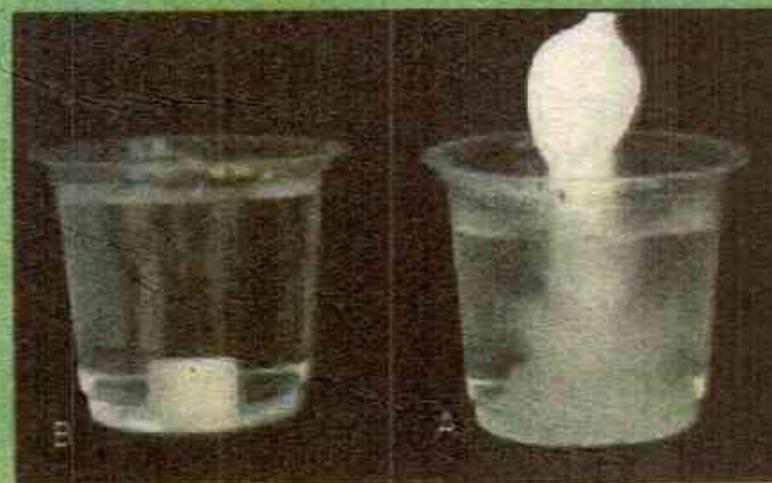


- Put a spoon of sugar or sugar cube in both the beakers simultaneously.
- Observe in which beaker the sugar dissolved quickly.

### Decreasing the Size of Particles

#### Activity 5.7

- Take two beakers or glasses.
- Mark them as A and B.
- Put a spoon of powdered sugar or grains of sugar in glass A.
- Put a sugar cube in glass B.
- Pour a cup of water in both the glasses.
- Observe in which glass the sugar will dissolve sooner. You will observe that the powdered or grains of sugar will be dissolved quickly whereas the cube of sugar will be dissolved slowly.



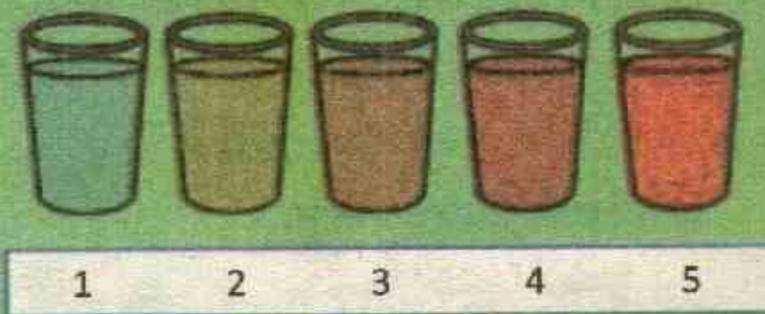
Dissolution of sugar grains and sugar cube

The dissolution of any solute depends on the size of particles. As much as the size of the solute (sugar) will be smaller, it will dissolve in solvent (water) faster with respect to the size of particles.

### Dilute and Concentrated Solution

#### Activity 5.8

- Pour equal quantity of water in five glasses.
- Do not pour anything in the first glass. Pour one spoon of coloured drink in second glass, two in the third, three in the fourth and four in the fifth glass.
- Observe and tell in which glass the colour of solution (drink) will be lightest and in which glass darkest?



Drinks such as milk, tea and soft drinks are all solutions. A solution having minor quantity of solute is called dilute solution. A solution having major quantity of solute is called concentrated solution. Identify in activity 5.7 which glass has the dilute solution and which one has concentrated.

## Chemical Changes in Everyday Life

If you look around you will see leaves of plants, branches, vegetables, fruits, papers and pieces of wood. These are being decomposed gradually. You must have seen rusted iron gates, doors, windows and other things. Have you ever thought why such things happens?

## Chemical Changes in Matter

In chemical change both appearance and composition of substance or matter changes.

### Decaying

The remains of dead organisms and waste matters disappear gradually through decomposition. How this happens? You have read about bacteria and fungi. They obtain their food by decomposing the dead bodies into simple components. This process is called decaying.



Decaying

### Burning

The fuel is burnt in the stove to cook food. When the fuel burns then you can see the flame. The flame develops during combustion reaction. This is called burning e.g., the burning of coal, wood, paper, match stick etc.

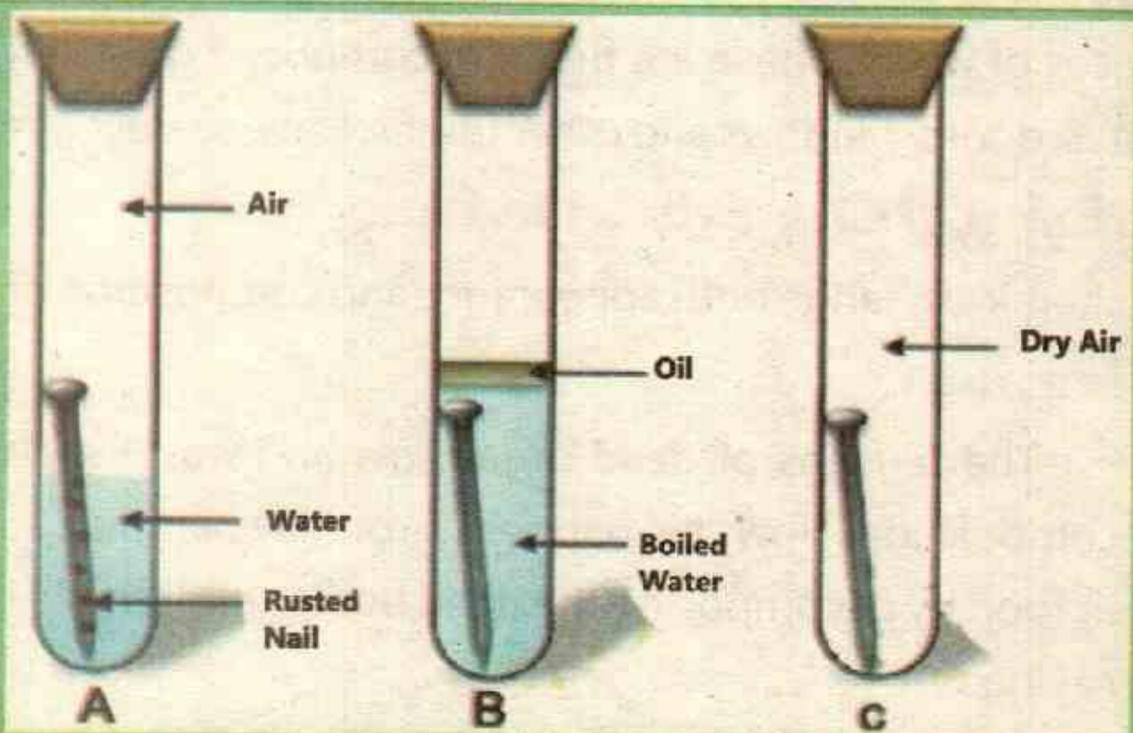


Burning

## Rusting

## Activity 5.9

1. Take three test tubes and mark them as A, B, C.
2. Take water in test tube A and put a nail in it.
3. Take boiled water in test tube B and put a nail in it. Put few drops of oil on it.
4. Dry test tube C properly and put a nail in it.
5. Seal the mouth of the three test tubes with cork and leave them for few days in similar conditions.
  - (i) In which test tube the iron nail became brown in colour?
  - (ii) Why in the test tube B boiled water was taken and oil drops were added?
  - (iii) In which test tube the change of colour of nail was not possible? Why?



In this activity you have observed that in one of the test tubes the colour of the nail changed. In this test tube oxygen was present which reacted with iron. Due to this reaction the colour of the iron changed.

The change that occurred on the iron due to the action of oxygen and water is called rusting.

Iron + Oxygen + Water = Rusting

**Do you know?**

To prevent iron from rusting, its surface is painted with oil or chromium.



**Rusted iron lock**

## Difference between Physical and Chemical Changes

We have already read that there are two types of changes: Physical changes and Chemical changes. A change in which no new material is formed with different properties then such change is called a physical change. Physical change can be reversed, such as on heating, the solid wax becomes liquid but remains wax. On cooling the liquid wax becomes solid but remains a wax.

Such a change which results into a totally new material is called chemical change. The burning of paper is a chemical change as ash is formed in the process. The chemical change cannot be reversed.

### Activity 5.10

To perform this activity, you will form four groups. Each group will write their observation on the worksheet.

Work in group	Observation
<b>Group 1:</b> Burn steel wool or dishwashing net over spirit lamp.	
<b>Group 2:</b> Dip blue litmus paper in vinegar. Take it out and let it dry. Dip litmus paper in limewater.	
<b>Group 3:</b> Burn paper	
<b>Group 4:</b> Take lukewarm milk and mix a spoon of yogurt + make yoghurt.	

### Key Points

- A material does not change into a new material having different properties due to physical change.
- The process during which solid becomes liquid on absorption of heat is called melting.
- The process during which heat is released from the liquid changing it into solid is called freezing.
- On heating the change of liquid into gas is called boiling.
- The change of water into vapours is called evaporation.
- The change of gas into liquid is called condensation.
- When a solid or liquid mixes with other liquid uniformly forming a mixture, it is called a solution.
- The minor component which is dissolved in a solution is called a solute, whereas the component which dissolves is called a solvent.
- A dilute solution is one that has a relatively small amount of dissolved solute. A concentrated solution is one that has a relatively large amount of dissolved solute.
- The change that occurs on the surface of iron due to action of oxygen and water is called rusting.
- When a material combines with another one to form new material having new properties, it is called a chemical change.



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

Dissolution factors	1. <a href="https://www.youtube.com/watch?v=qL5-lcc_TfY">https://www.youtube.com/watch?v=qL5-lcc_TfY</a>
Conservation of matter	2. <a href="https://www.nationalgeographic.org/article/conservation-matter-during-physical-and-chemical-changes/7th-grade/">https://www.nationalgeographic.org/article/conservation-matter-during-physical-and-chemical-changes/7th-grade/</a>

**Exercise****1. Tick (✓) the correct answer.**

i. The change of milk into yogurt is

- a) physical change                      b) climate change  
c) chemical change                      d) change of colour

ii. Why a person painted his iron gate?

- 1) To save from rusting                      2) To save from sunlight  
3) To make it beautiful                      4) To save from water

Out of these which answer is more suitable?

- a) 1 and 2                                      b) 1 and 3  
c) 2 and 3                                      d) 1 and 4

iii. Which factor will **NOT** affect the dissolving of sugar in water?

- a) To add salt in water.                      b) To make sugar powder by grinding.  
c) To heat water and sugar                      d) To stir water and sugar

iv. Which one is **NOT** a chemical change?

- a) Seed germination                      b) Making paper boat  
c) Burning of wood                      d) Cooking food

v. What type of change is it when metal expands on heating?

- a) Permanent                                      b) Chemical  
c) Physical                                      d) Irreversible

**2. Write short answers.**

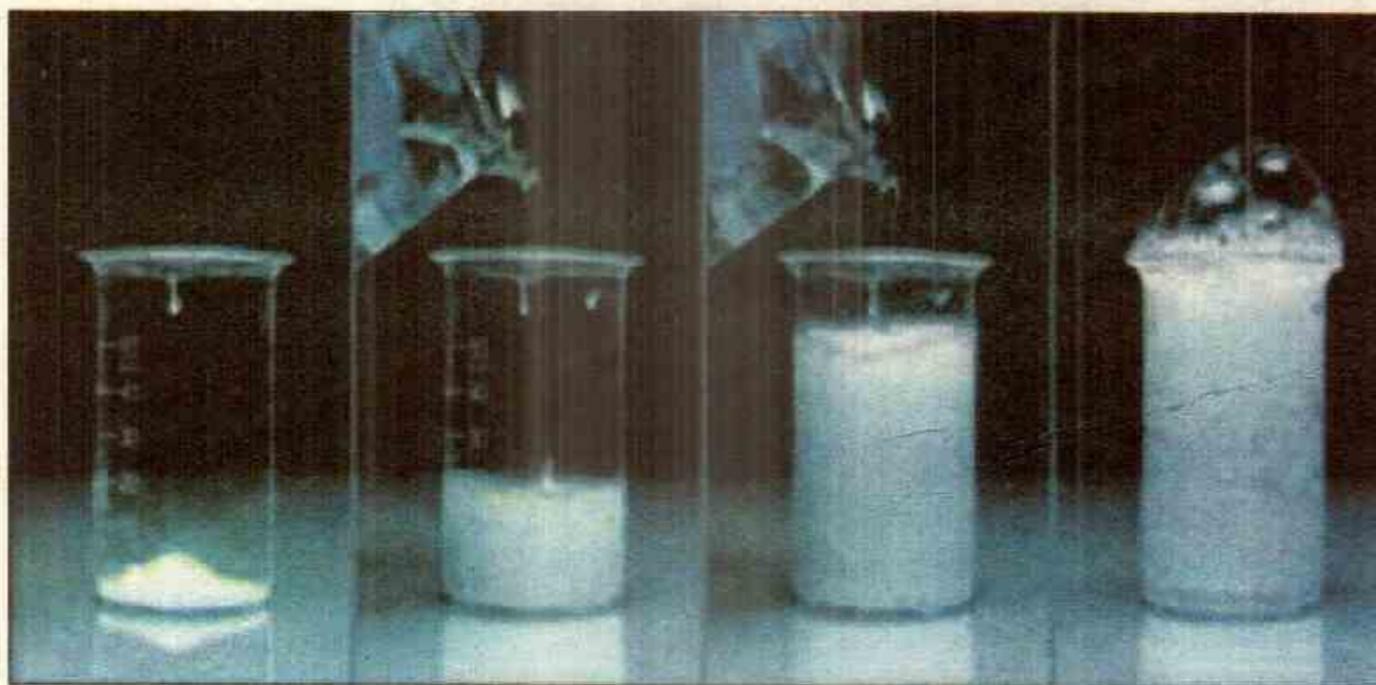
- i. Explain evaporation giving examples from everyday life.  
ii. Define condensation.  
iii. What is rusting and which type of change is this?  
iv. Give an example of chemical change in which carbon dioxide is produced?  
v. Explain the three states of matter and their interconversion.

**3. Investigate:**

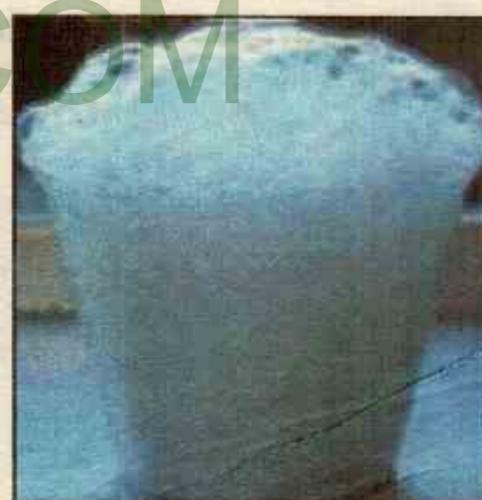
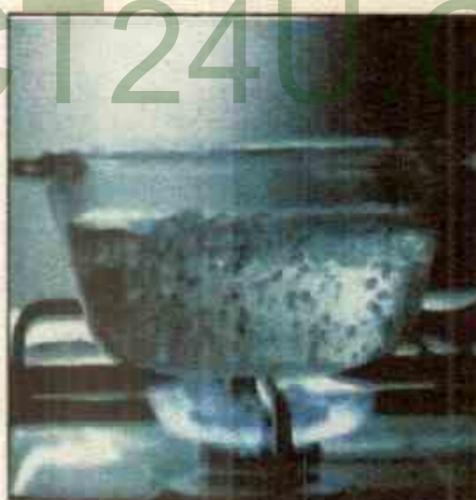
- i. Why the formation of fertilizer from leaves, is a chemical change?

**4. Constructed Response Questions:**

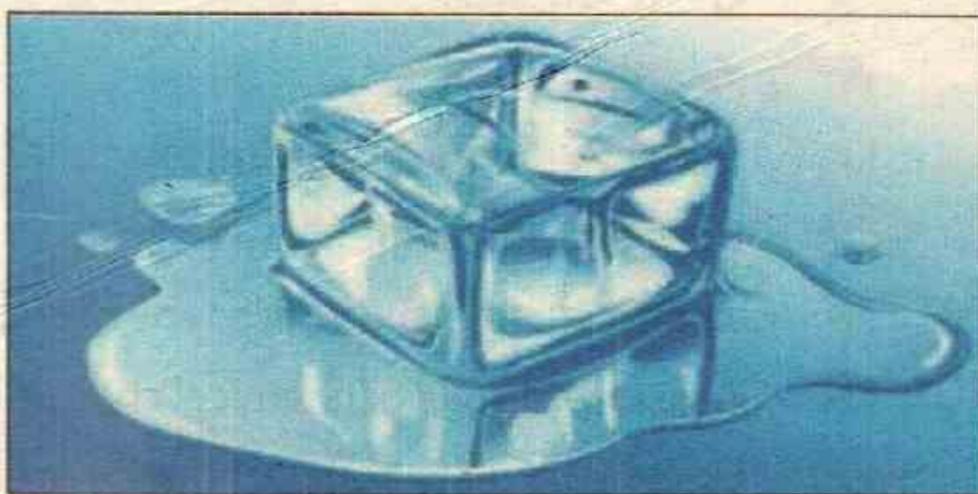
- i. Weigh one fourth of a glass of vinegar and tea spoon of baking soda. Then mix them together. As a result, bubbles will be formed. Weigh this compound again. Now its weight will become less than the previous one. How will you explain the loss of the weight?



- ii. On mixing vinegar and boiling water bubbles are produced. Out of the two one is chemical change and the other one is a physical change. Explain.



- iii. A student weighs a piece of ice and then allows it to melt. In your opinion what will be the weight of water and why?



## 5. Project:

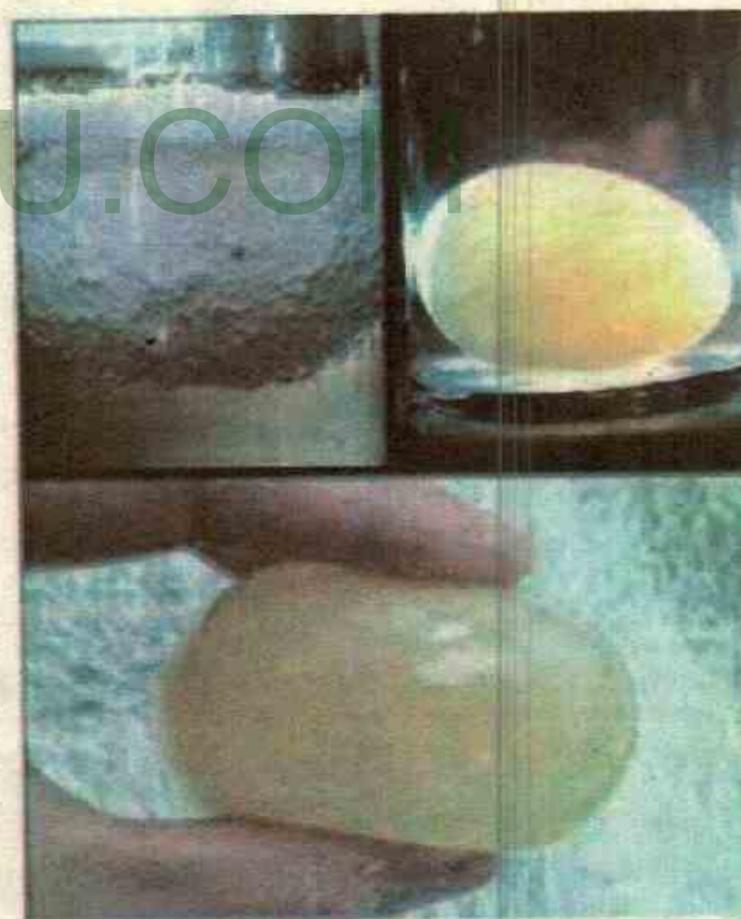
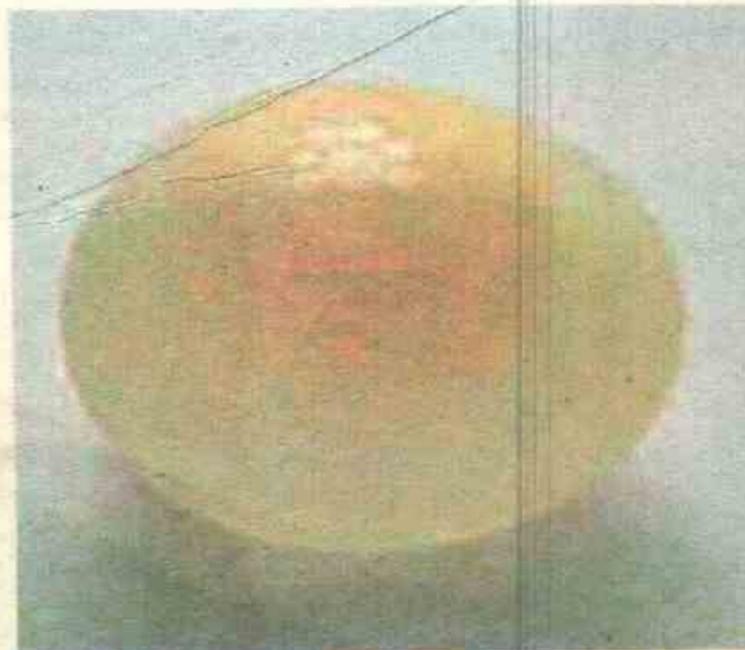
## Removal of Eggshell by Chemical Process

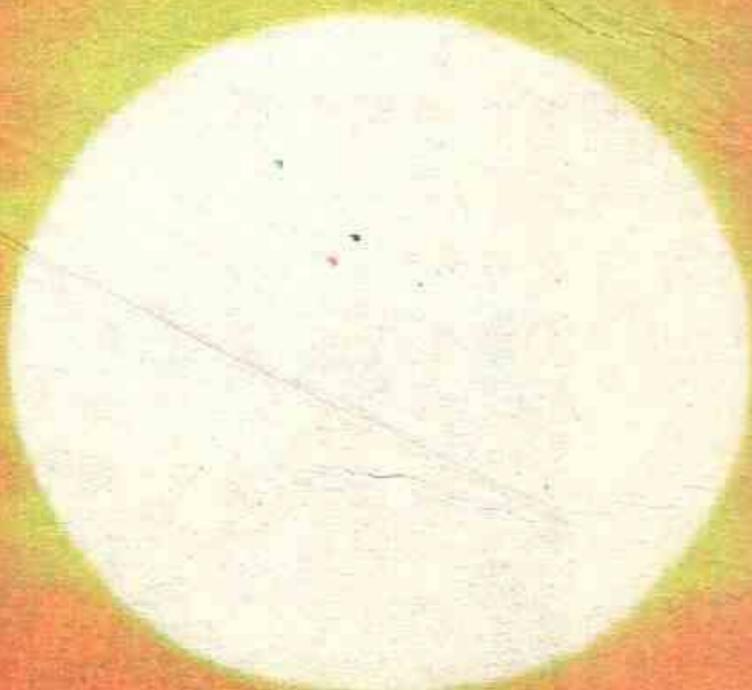
**Required Materials:**

- i. Egg
- ii. Vinegar
- iii. Vessel to keep egg

**Procedure:**

- i. Take an egg in a vessel or can. Pour vinegar on it, so that the egg is immersed into it—Bubbles will be formed on the egg surface.
- ii. Leave it for 12 hours. Carefully take out the egg out of the vessel. Then wash it gently and observe the egg.
- iii. You will observe that the shell of the egg has disappeared.
- iv. What did you conclude from this observation?





*Why is the moonlight not hot like the sunlight?*

*How can we recognise persons from their voices without seeing them?*

*What are pleasant and unpleasant sounds?*

## Chapter

# 6

# Light and Sound

### Students' Learning Outcomes

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

- Identify natural and artificial sources of light.
- Justify that light emerges from a source and travels in a straight line.
- Investigate luminous and non-luminous objects in daily life.
- Identify and differentiate between transparent, opaque and translucent objects in their surroundings.
- Investigate that light travels in a straight line.
- Explain the formation of shadows.
- Predict the location, size and shape of a shadow from a light source relative to the position of objects.
- Demonstrate that shiny surfaces reflect light better than dull surfaces.
- Describe and demonstrate how sound is produced by a vibrating body.
- Identify variety of materials through which sound can travel.
- Identify that speed of sound differs in solids, liquids and gaseous medium.
- Define and describe the intensity of sound with examples.
- Define noise and its harmful effects on human health.
- Appreciate the role of human beings in reducing noise pollution.

The beauty and fascination of our universe is because of sunlight. Our day starts with the rising of the Sun. We can see objects around us due to its light. Sun and stars are the natural sources of light. All forms of life on the Earth is due to light of the Sun. Have you ever thought what would have been the situation without the Sun? Nothing including human beings, birds, animals, vegetation, flowers and fruits would have been existed.

Sometime electricity supply is disrupted at night. The darkness spreads over all the things. We, then use artificial sources of light. Can you name some of such sources of light?

### Do you know?

Light is a form of energy. The plants prepare their food using sunlight.

### Interesting Information

Speed of light is fastest in this universe. Light travels 300,000 km in one second in air or vacuum.

### Point to Ponder!

The moon is not a natural source of light. Why it looks bright?

### Activity 6.1

Some light sources are given below. Tick (✓) the natural sources of lights.



### Luminous and Non luminous Objects

The objects which emit light are called luminous objects. Non luminous objects are seen when light striking them is reflected towards our eyes.

#### Interesting Information

Firefly and a few sea fish emit light due to some chemical reaction.



#### Activity 6.2

Tick (✓) the non luminous objects from the objects given below.



Chair



Moon



Human Body



Book page



Lighted energy saver



Oil lamp



Candle



Firefly



Stars



Sun

#### Interesting Information

The light from the Sun reaches on the Earth after 8 minutes, whereas the light reflected from the moon reaches us in 1.5 seconds.

## Transparent, Opaque and Translucent objects

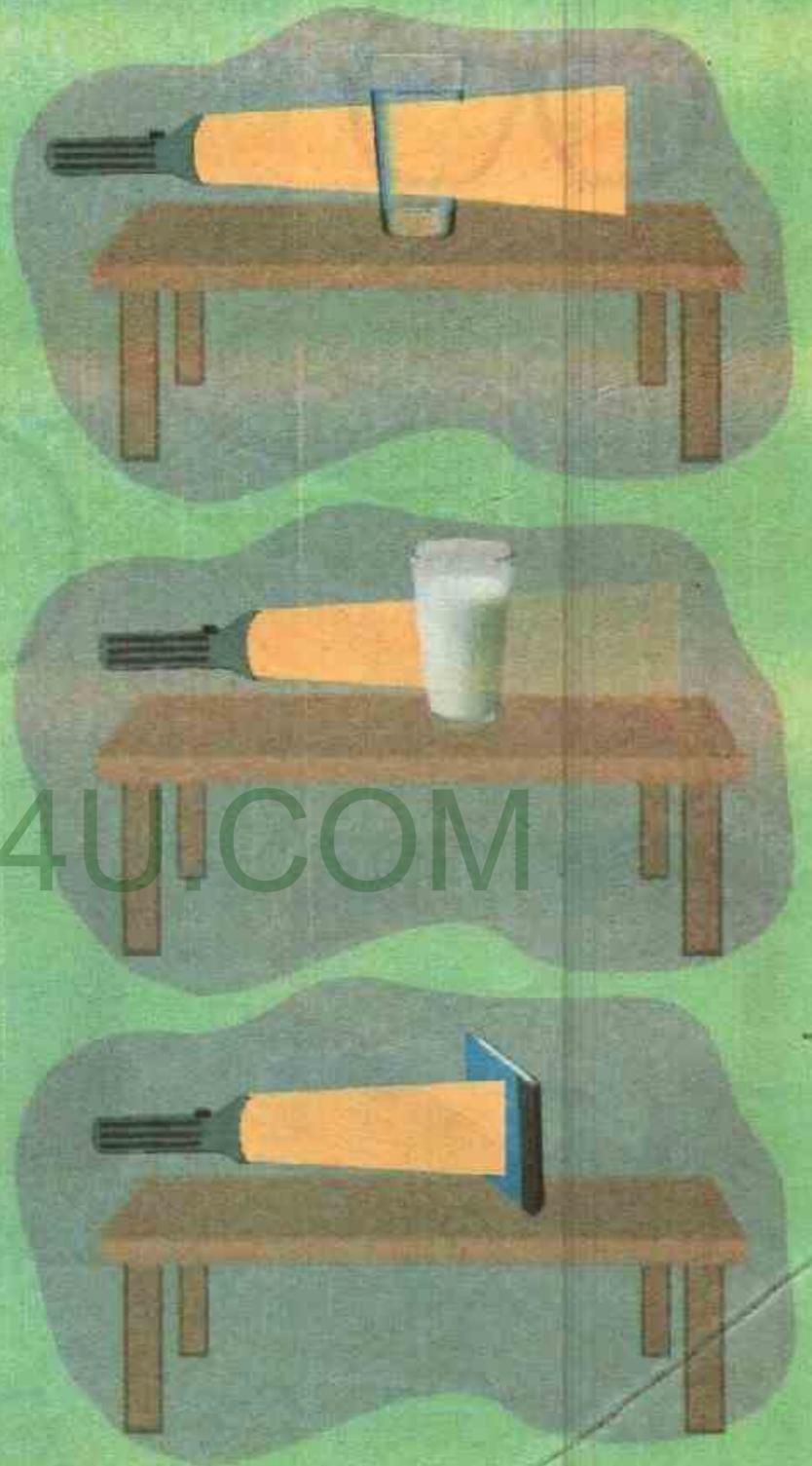
There are many types of non-luminous objects. Do all objects reflect light or some of them allow light to pass through them? Let us explore these objects by an activity.

### Activity 6.3

1. Place a glass full of water on the table in a dark room. Throw torch light on its one side as shown in the figure. Observe other side of the glass. Has all the light passed through the water? Can you see clearly across the glass containing water?
2. Now fill the glass with milk. Repeat the step one. What is your observation now? Has all the light passed through the glass containing milk?
3. Now throw torch light on one side of a cardboard or a book. Does it allow light to pass through?

Can you see across the cardboard?

- i. the objects through which light can pass completely are called transparent. We can see clearly across them.
- ii. The objects through which light can pass partially are called translucent objects. We cannot see clearly through them. We can see only a faint image of the object.
- iii. The objects which do not allow light to pass through them are opaque objects. We cannot see across them.

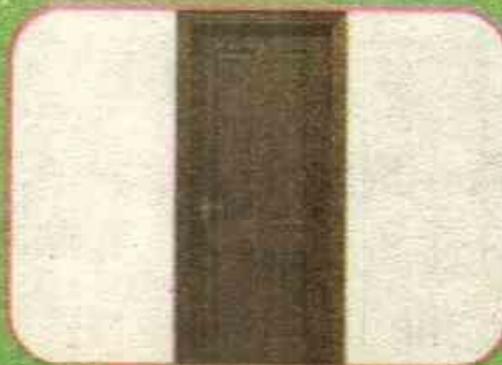


**Activity 6.4**

Identify the transparent, translucent and opaque objects from the given photographs.



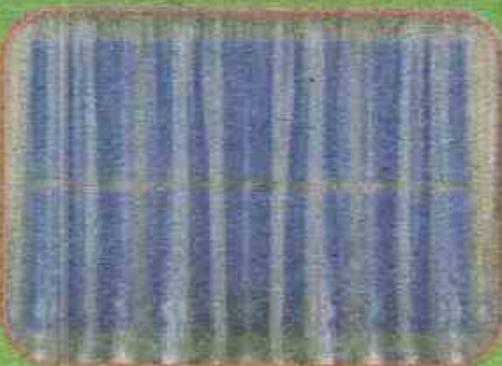
Glasses



Door



Window pane



Net curtain



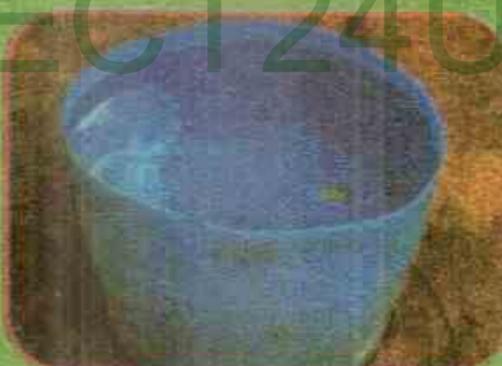
Magnifying glass



Brick wall



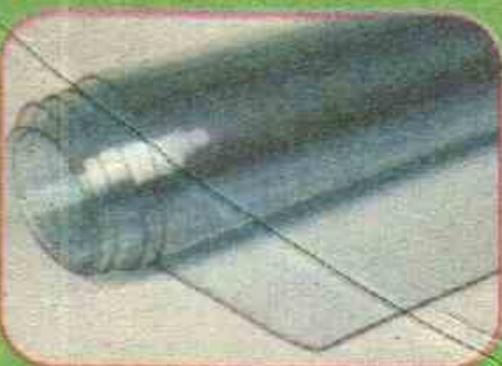
Tissue paper



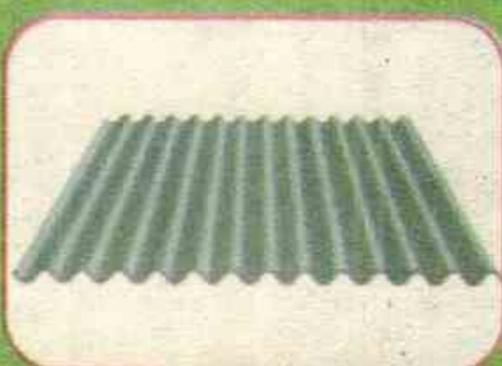
Soft drink



Packing tape



Plastic sheet



Ironsheet



Plastic bottle

**Interesting Information**

The sailors used light signals for communication before the invention of telephone or radio.

**Point to Ponder!**

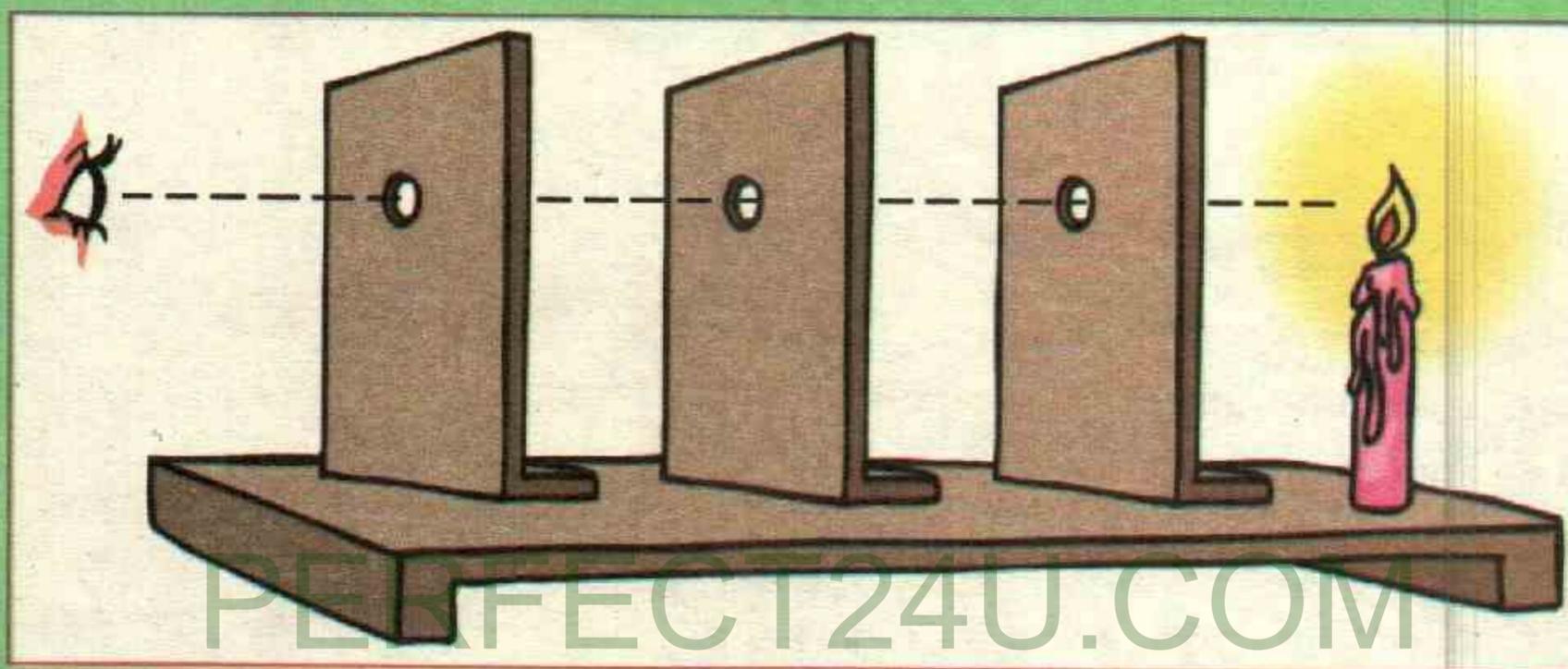
The light from the Sun reaches us after passing through air atmosphere. Is air transparent or translucent?

## Light Travels in a Straight Line

Light travels in a straight line. Let us investigate.

### Activity 6.5

1. Take three identical hard cardboard. Make holes in all of them at the same position. Place them vertically on the table as shown in figure.



2. Place a lighted candle on the outside of first cardboard. Adjust their positions. The candle will be visible only when all the holes and candle flame are in one straight line.
3. Can you see the candle flame from the hole of the last card?
4. Now displace one of the cardboards slightly. Try to see the candle again through the holes. Can you see the candle now?
5. What inference do you draw from your observations.

**Light travels in a straight line.**

### Formation of Shadows

You have observed that light travels in a straight line. Have you ever thought what happens when a non transparent object comes in the path of light. Let us investigate by an experiment.

## Activity 6.6

1. Place a torch or candle on a table near a wall in a room.
2. Place your hand in between the wall and the light coming out from the candle or torch as shown in figure.
3. What do you see on the wall?
4. Bring your hand near the candle. Is there any change in the size of shadow?
5. Place your hand away from candle and observe the shadow on the wall. Is it smaller or bigger than before?



What inference do you draw from the observations?

1. When a non transparent object blocks the path of light, a shadow of the object is formed.
2. Shadow is similar in shape of the object and is made in the opposite direction of the source of light.
3. When object is nearer to source of light, its shadow is bigger.
4. When an object is at greater distance from the source of light, its shadow becomes smaller.

## Home Activity

Using both hands, make shadow looking like various shapes of the birds.

## Point to Ponder!

1. What is the shape of shadow of a rotating object?
2. How is the shadow of a transparent object?
3. How is the shadow of a translucent object?

## Reflection of Light

The bouncing back of light from a non transparent surface is called reflection. Let us investigate which surface reflects more and which type of surface reflects less?

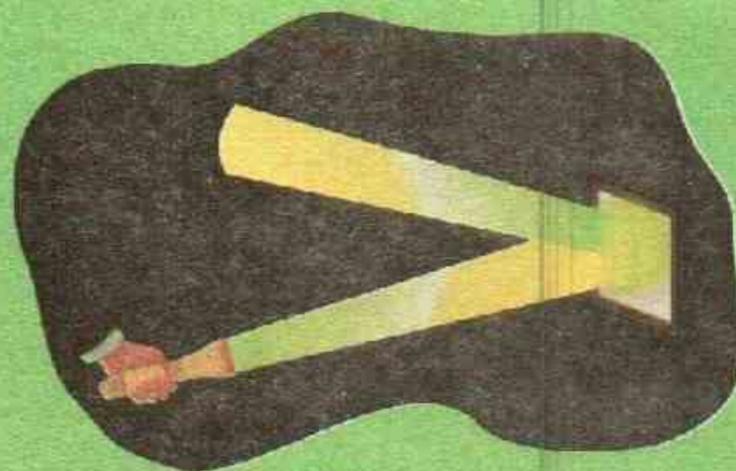
### Point to Ponder!

When you see the Sun setting, is it really present on the horizon?



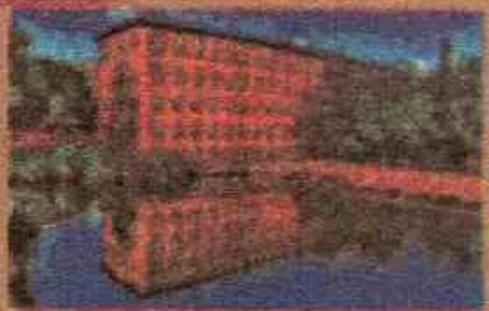
### Activity 6.7

1. Throw torch light on a mirror or shining steel plate in a dark room as shown in figure.
2. Observe the light falling on the nearby wall after bouncing off from the mirror.
3. Now repeat the same procedure by throwing the light on dull cardboard. What do you observe?
4. Is the light falling on wall same in both cases?
5. You must have seen that more light is reflected from a smooth shining surface than dull surface.



### Point to Ponder!

Why do we see the image of a nearby tree or building in a lake?



### Point to Ponder!

The light is not reflected by a dark surface. How can we read the dark print on a book?

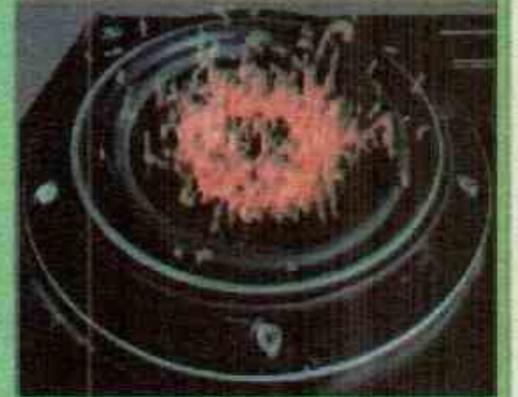
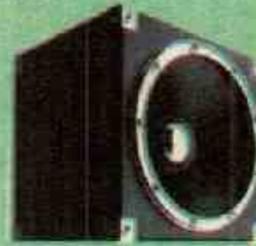
## Sound

We feel an active and busy life around us due to various sounds. Early in the morning the chirping of birds seems pleasant.

Many of us enjoy music. we become alert after listening some sounds. We talk to each other using sounds. But some sounds are very unpleasant such as pressure horns and noise of machine. How is sound produced? Let us perform an experiment.

**Activity 6.8**

1. Place a sound speaker horizontally as shown in the figure.
2. Sprinkle some grains around its cone.
3. Switch on the speaker and play some sound.
4. Observe the movement of the grains.
5. Are they jumping up and down i.e. vibrating very fast.
6. What inference do you get from the activity?



You have observed in the above activity that sound is produced by vibrations.

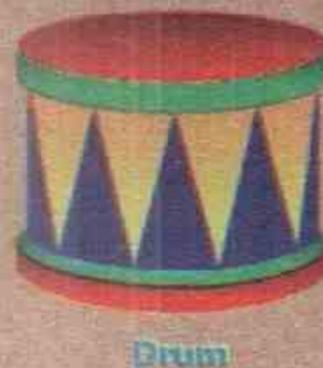
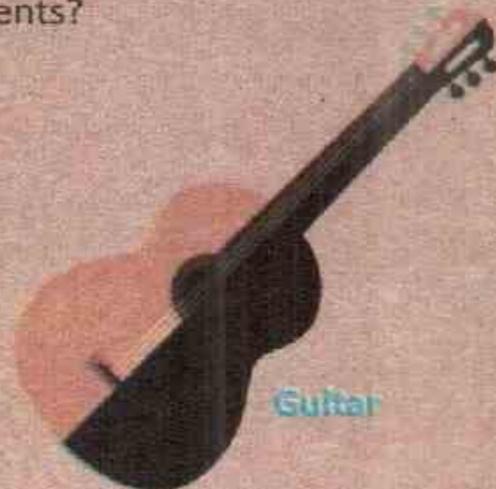
**A vibrating object produces sound.**

**Point to Ponder!**

When we speak which thing does vibrate in our throat?

**Point to Ponder!**

What vibrates in the given musical instruments?

**Propagation of Sound**

We hear sounds when they enter our ears after passing through air. Whenever an object vibrates, it forces the air particles around it to vibrate. These vibrating particles cause sound to travel from one place to another.

**Do you know?**

Buzzing of flies and mosquitoes is due to vibrations of their wings.

**Point to Ponder!**

Explosions are occurring in the Sun? Why do we not hear their sounds on the Earth?

Can sound pass through water (liquid) and solid bodies? Let us observe by doing some experiments.

**Activity 6.9**

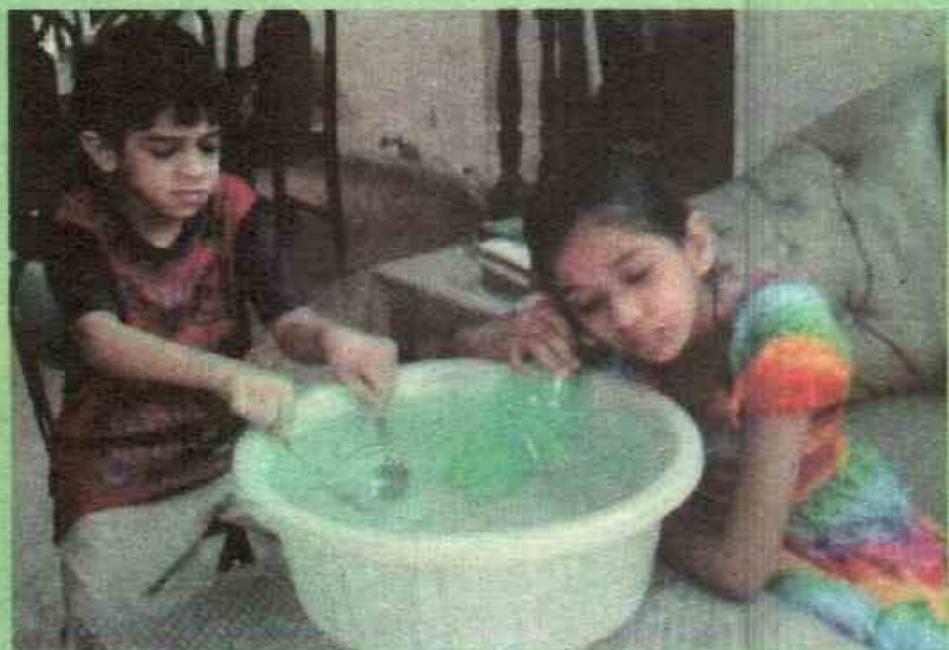
1. Place your ear on the table surface.
2. Ask a classfellow to tap slowly on the table surface with his fingers at the far end.
3. Did you hear the sound?
4. What inference do you draw from this observation.



**Sound passes through solid objects.**

**Activity 6.10**

1. Cut a plastic bottle from its bottom.
2. Bring your ear in contact with the neck of the bottle and ask your friend to strike two metallic spoons inside the water.
4. Do you hear the sound of striking spoons.
5. What inference do you draw from this observation.



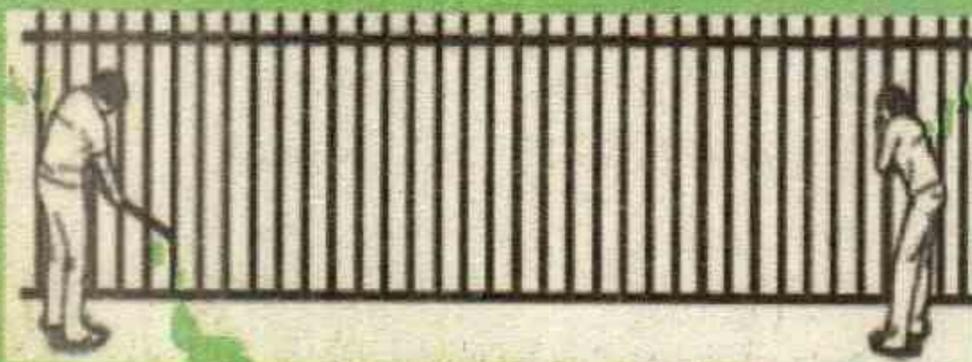
**Sound can also travel through water.**

## Speed of Sound in Different Materials

In old times, buggies or chariots pulled by horses were much used in the war. The men from defending side would listen the vibrations through the Earth surface by putting their ears to it for detecting the arrival of the on coming army. Whereas their sound would reach later through the air. Let us experience a similar observation in the next activity.

### Activity 6.11

1. Select a long iron fence near your school.
2. Put your ear at one point of the fence.
3. Ask a classfellow to tap slowly the fence with a spoon at some distance away.
4. Did you hear the sound instantly and clearly?
5. If fence is sufficiently long, you may hear two sounds. One through the iron fence and after a while another through the air.



### Sounds travel faster through solid objects than the air.

In solid objects, the particles are nearer than in water, hence the speed through solids is greater. The speed of sound in water is almost 5 times greater than in air and about 15 times in solid objects than air.

The following table shows the approximate speed of sound through different mediums.

Air	340 meter per second
Water	1500 meter per second
Iron	5000 meter per second

### Do you know?

There are no particles in the space. Therefore, sound cannot pass through space. A material medium is necessary for propagation of sound.

**Quick Quiz**

You can produce sound by plucking a stretched metal string or blowing air through a pipe. What is common and what is the difference between the two actions?

**Do you know?**

Sound is a form of energy which produce vibrations in matter particles.

**Intensity of Sound****Activity 6.12**

We hear a variety of sounds in our surroundings. Some are faint or low sounds and some are loud. Identify the low and loud sounds from the following sounds.



Intensity of sound depends on its loudness. The louder the sound, the greater is its intensity. Does intensity of sound depend on its distance from the listener as well? Let us find out by performing an activity.

## Activity 6.13

You may have seen a little bell on the neck of a cattle.

1. Take one such bell and shake it. Observe its sound. Is it low or loud sound?
2. Now ask a classfellow to take the bell at some distance outside of the classroom and shake it. Do you hear the sound with same loudness or less?
3. Tell the classfellow to take it further away and shake it again.



How the sound is heard now? Is it very low than before? What inference do you draw from your observations?

**The intensity of sound decreases with the increase of distance form its source.**

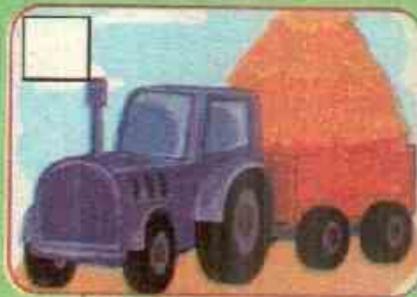
## Noise

We like some of the sounds we hear in our surrounding. They are called pleasant sounds. There are some other sounds which are harsh and irritant. We do not like to hear such sounds. They are called unpleasant sounds. Such sounds are called noise. The examples of these sounds are the dragging a chair on the floor, the pressure horns of wagons and buses, etc. They produce noise pollution.

## Pleasant and Unpleasant Sounds

## Activity 6.14

Mark (✓) for the pleasant sounds and (×) for unpleasant sounds in the small box of each picture given below:



## Harmful Effects of Noise on Human Health

### Activity 6.15

Discuss in groups what do you feel in a noisy environment. Recorded video of noisy environment can also be played. After ten minutes discussion, write the important points on the board. For example:

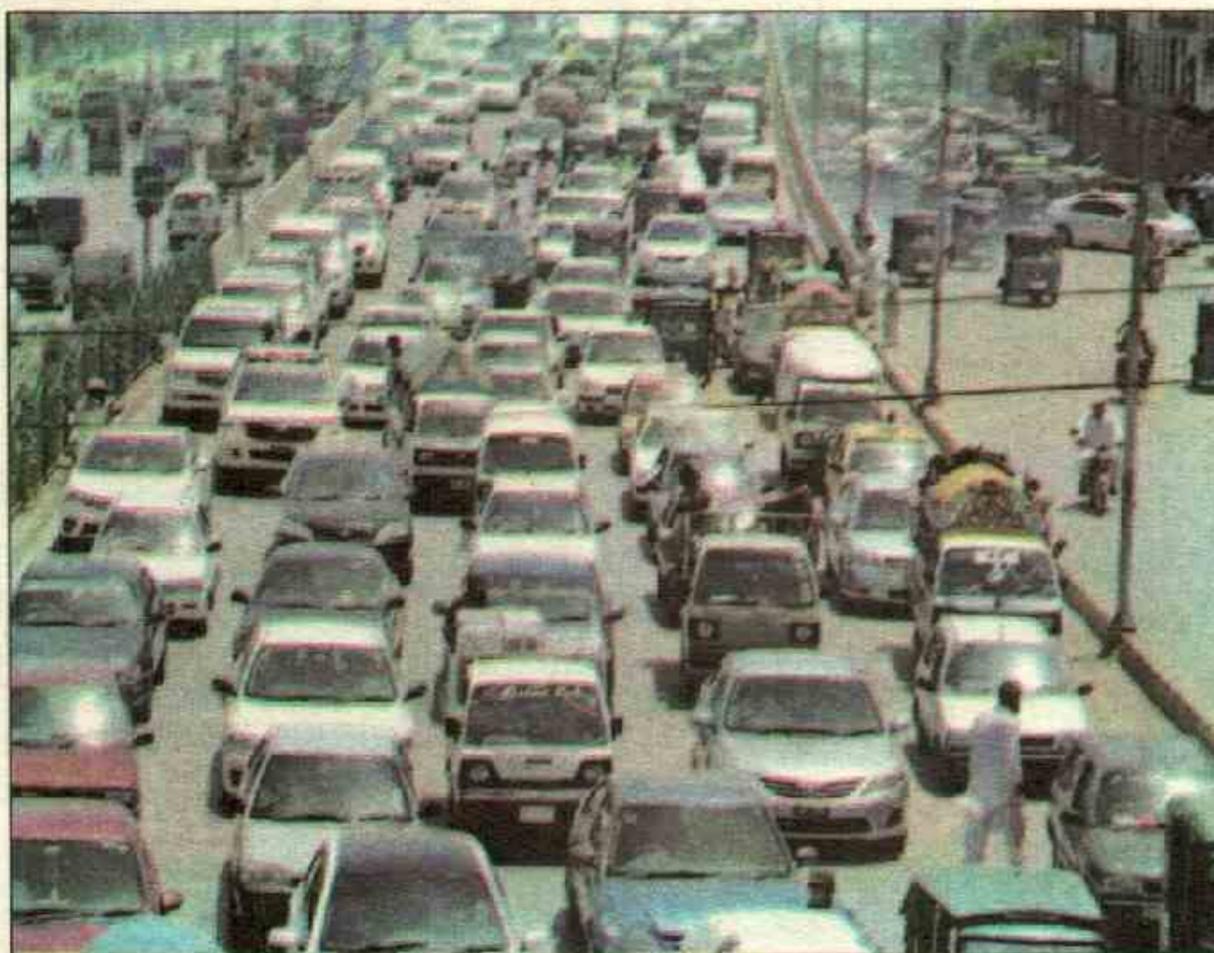
1. We cannot hear and understand the conversation of one another
2. Our thinking process is disturbed.
3. We cannot concentrate our attention on any task.
4. Noise not only affects our hearing ability but also disturbs other body functions. For example, digestive system, nervous system, headaches, and blood pressure etc.
5. We cannot study properly.
6. We cannot relax or sleep well.
7. Noise causes fatigue and anxiety.

### Do you know?

The animals are also affected badly by noisy environment. The growth of sheep and hen is disrupted whereas cow gives less milk.

### Controlling Noise Pollution

The noise levels of our cities and industrial zones are much higher than the safe limits notified by the United Nations. Therefore, it is very essential to take instant measures to overcome this problem.



**Activity 6.16**

Discuss various actions to control noise pollution. Write important points on the board. For example:



1. Use of horns be restricted. Their unwanted use near schools, hospitals, libraries and residential areas should be strictly banned.
2. The unnecessary use of loudspeakers should be specially restricted.
3. Broken roads and weared out tyres are also a big source of noise.
4. The use of good quality silencers and other noise absorbing devices in the motor vehicles and industries be ensured.
5. Bus stands, airports and factories should be planned away from residential areas.
6. Huge plantation be ensured around roads, railway lines, airports and factories. The trees not only absorb noise but also clean the polluted air.
7. Awareness in public should be promoted through media and other means regarding control of noise.

**Quick Quiz**

- Why do we like to live at calm and quiet places?
- What benefit we may get form the awareness campaign regarding harmful effects of noise pollution?

**Do you know?**

The astronauts who landed on the moon could not talk to each other like us. It is because of no air on the moon. They use wireless radio system attached to their dresses.

## Key Points

- Light is a form of energy which enables us to see object around us.
- We can see across transparent objects.
- Faint image is seen across a translucent object.
- Shadow is made behind opaque objects as light cannot pass through them.
- Light travels in a straight line.
- More light is reflected from a shining surface.
- Sound is produced by a vibrating body.
- Sound can pass through air, water and solid objects.
- The speed of sound in air is less than in liquids and solids.
- The intensity of sound decreases with increase of distance from its source.
- Harsh and irritant sounds are unpleasant sounds. Such sounds are called noise.
- Noise is very harmful for human health. Therefore reducing noise is necessary.

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

History of Light	<a href="https://video.nationalgeographic.com/video/short-film-showcase/00000157-70ff-d277-afdf-feff45fd0000">https://video.nationalgeographic.com/video/short-film-showcase/00000157-70ff-d277-afdf-feff45fd0000</a>
Why sky is blue?	<a href="https://spaceplace.nasa.gov/blue-sky/en/">https://spaceplace.nasa.gov/blue-sky/en/</a>

## Exercise

1. Tick (✓) the correct answer.

i. How does light travel in air?

- |                          |                      |
|--------------------------|----------------------|
| a. In a circle           | b. Along curved path |
| c. Along a straight line | d. In dispersed path |

ii. Which object does reflect maximum light?

- |                |                   |
|----------------|-------------------|
| a. White paper | b. Coloured paper |
| c. Mirror      | d. Brick wall     |

iii. Speed of sound is maximum in:

- |                 |           |
|-----------------|-----------|
| a. a metal wire | b. air    |
| c. water        | d. vacuum |

iv. Which of the following sounds is called noise?

- |                     |                       |
|---------------------|-----------------------|
| a. Sound of a flute | b. Rustling of leaves |
| c. Pressure horn    | d. Chirping of birds  |

v. When water comes in the way of sound travelling through air:

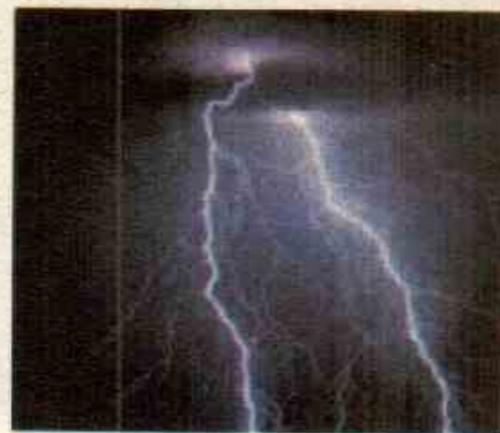
- |                           |                                    |
|---------------------------|------------------------------------|
| a. sound will stop        | b. sound will slow down            |
| c. sound will become fast | d. no effect on the speed of sound |

## 2. Write short answers.

- i. What is a transparent object? Write the name of three transparent objects.
- ii. When is your shadow the shortest and the longest in the sunlight.
- iii. The Moon is non-luminous like our Earth. How does it look luminous to us?
- iv. Can you be the winner while running with your shadow? Give the reason also.
- v. When a train is moving away from you, will the intensity of its sound increase or decrease?

## 3. Constructed Response Questions:

- i. "Ears are raised" is a phrase in Urdu. The ears of some animals such as hare and rat are actually raised up? when and why?
- ii. The wood and charcoal are naturally non-luminous objects. Can they be made luminous? How?
- iii. How can you compare the speed of light and speed of sound coming from the lightning?



iv. Mark (✓) for pleasant sounds and mark (×) for unpleasant sounds in the given pictures.



**4. Investigate:**

- i. Have you seen the ears of a frog, locust and fish? How do these animals hear sounds?
- ii. By using torch, find out how much light passes from the objects given below?

Objects	Completely	Partially	Do not pass at all
1. Window pane			
2. Wax paper			
3. White thin cloth (dupatta)			
4. Geometry box			
5. Kite paper			
6. Tissue paper			
7. Wooden door			
8. Clean water			
9. Cardboard			

**5. Project:**

- i. Make a pinhole camera by using cardboard box, wax paper or tissue paper. Observe the image formed by it. On which principle of light it works? What are the characteristics of its image?
- ii. Make a simple musical instrument using a wooden board, iron nails, thin steel wires of different lengths and a hammer. On which principle does this instrument work? Observe also the intensity of sound produced by it.



*How and why does lightning occur?*

*Why do we use fuse in most of the electric appliances?*

*How does the crane separate iron from the scrap?*

**Chapter**

**7**

# Electricity and Magnetism

## Students' Learning Outcomes

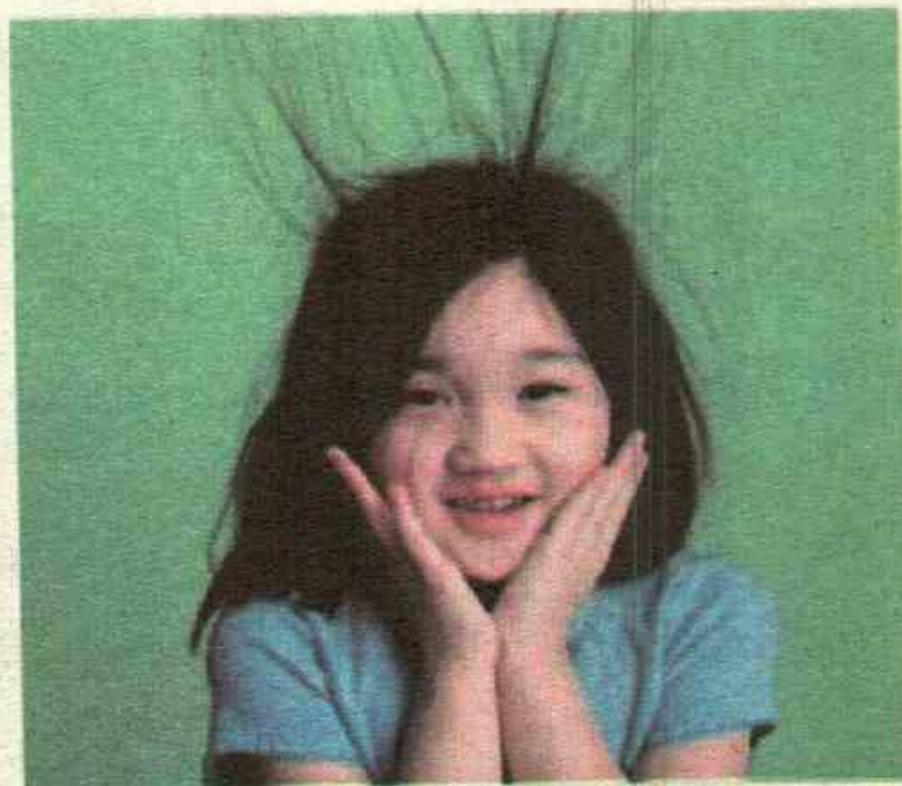
After studying this chapter, the students will be able to:

- Explain the phenomenon of static electricity in everyday life.
- Describe charges and their properties.
- Differentiate between conductors and insulators from daily life.
- Describe flow of electric current in an electric circuit.
- Describe and design an electric circuit and explain its components.
- Recognize that magnets can be used to attract some metallic objects
- Describe and demonstrate that magnets have two poles and that like poles repel and opposite poles attract.
- Identify earth as huge magnet and demonstrate it with an experiment.
- Describe the working of a magnetic compass.
- Explain different types of magnets (permanent, temporary magnet and electro-magnet).

Every one of us is familiar with the use of electricity. We use electricity to light up a bulb or run an electric fan for air. In addition to that, television, fridge, washing machine, electric iron and many other devices also work with electricity. You have already studied that electricity is a form of energy.

### Static Electricity

Electricity is commonly known as electric current. Current flows through metal cables but there is a kind of electricity which does not flow. Have you ever thought, why your hair are pushed apart and also raised up on combing your dry hair? This happens because of static electricity. Let us perform an experiment to understand it.



### Charge

#### Activity 7.1

1. Place a few paper bits on the table.
2. Pull a plastic comb through your dry hair twice or thrice in the same direction.
3. Bring the comb near the paper bits. Do the bits stick to it? Why does the comb attract these paper bits?

The reason of this phenomenon is that comb has acquired charge.



**Charge is a basic property of matter.**

## Types of Charge

Let us observe the types of charge by an experiment.

### Activity 7.2

1. Suspend an inflated balloon with the stands using a thread.
2. Bring a piece of woolen cloth near. Does the cloth attract the balloon towards it?
3. Rub the balloon vigorously with the woolen cloth and then remove it away.
4. Bring the cloth again nearer to the balloon slowly.
5. Does the cloth attract the balloon this time? You will observe that the cloth attracts balloon this time.



The reason is that there was no charge on both of them before rubbing. After rubbing they have acquired opposite charges due to which they attract each other. The balloon has acquired negative charge and the cloth positive charge.

**There are two types of charge: Positive charge and negative charge.**

### Do you know?

The clouds are charged due to rubbing with air. One end of the cloud becomes positive and the other negative. A spark is produced when clouds having opposite charges come near each other. We call it lightning. This is a kind of static electricity.



### Point to Ponder!

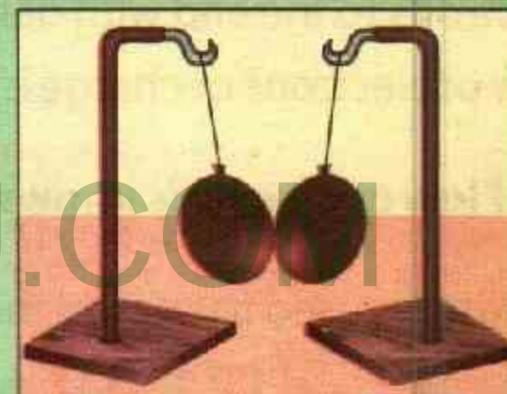
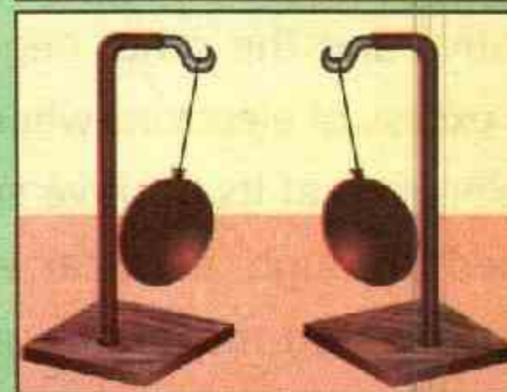
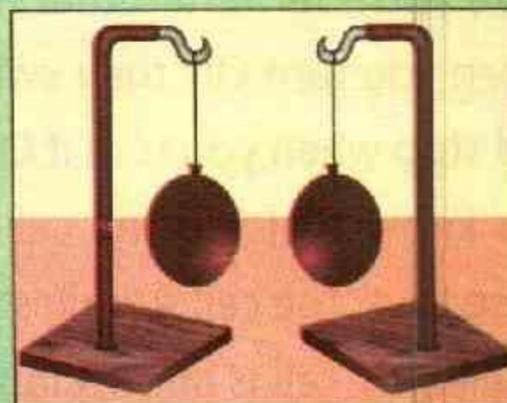
When a plastic comb is pulled through dry hair, it is negatively charged. What is the charge on the hair? What is the cause of hair to push apart?



## Properties of Charge

### Activity 7.3

1. Suspend two inflated balloons with the stands using thread.
2. Place them at a small distance from each other as shown in the figure.
3. Bring the balloons closer by moving the stands. Do the balloons attract or repel each other?
4. Rub each balloon with a woolen cloth. Bring them close, again. Do they attract or repel each other?
5. Now rub one balloon with woolen cloth and the other with a plastic comb or ruler. Bring the balloons closer. Do they attract or repel each other? What inference do you draw from your observations.



When balloons were rubbed with woolen cloth, both of them acquired negative charge. Due to which they repelled each other. When one balloon was rubbed with woolen cloth and the other with plastic object they acquired opposite charges. Hence, they attracted each other.

**Similar charges repel each other and opposite charges attract each other.**

### Do you know?

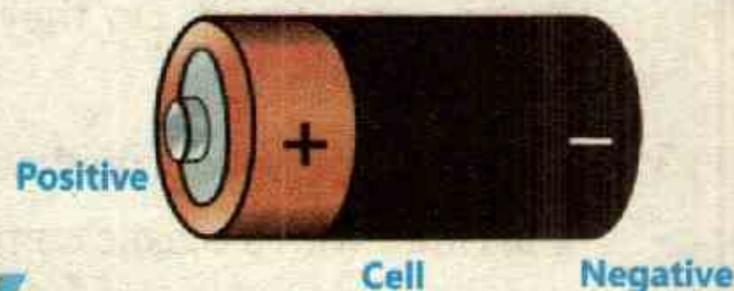
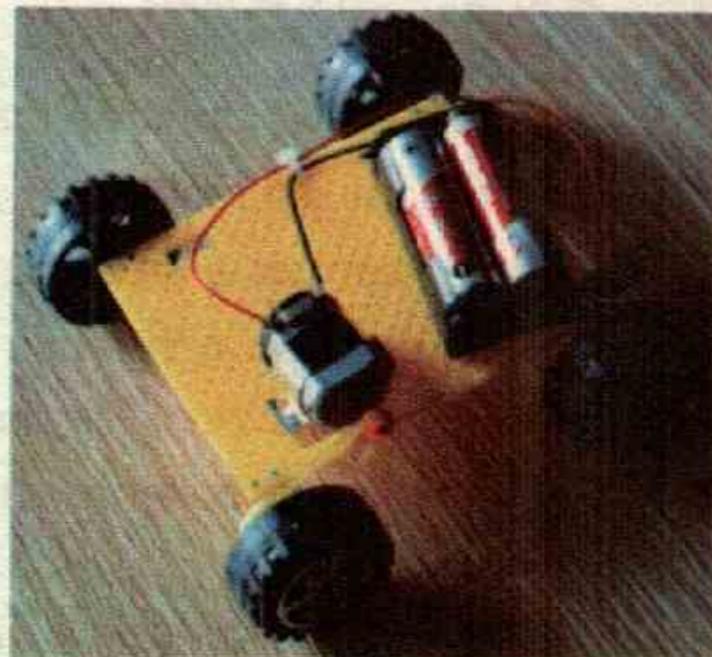
The smallest particle of a material is called atom. The atom contains further smallest particles electron and protons. Proton has a positive charge and electron has the same amount of negative charge. Protons and electrons are equal in number in an atom. As a whole atom is neutral. It has no charge.

### How and Why?

When two different materials are rubbed together, the electrons from one material are transferred to the other. The material which loses electron becomes positively charged and the other which has now excess of electrons becomes negatively charge.

## Electric Current

Have you ever noted that many toys have a switch. When you turn ON their switches, they start moving and stop when you turn it OFF. Why does it happen? You know that electric cell or a battery is used in these toys. The cell supplies energy for their working. An electric cell is shown in the figure. Its one end is positive and the other negative. The negative end has excess of electrons whereas there is a deficiency of electrons at its positive end. When both ends are joined through a metal wire and a switch, the electrons start moving from the end with excessive electrons to the end with deficiency of electrons. This flow of electrons or charge is called electric current.



**Flow of charge is known as an electric current.**

A switch is used to control the flow of charge.

## Electric Circuit and its Components

In our homes, we turn ON the switch to light a bulb or to run a fan. The same switch is also used to turn them OFF. Various electric circuits are made for this purpose.

### Simple Electric Circuit

Let us make a simple electric circuit.

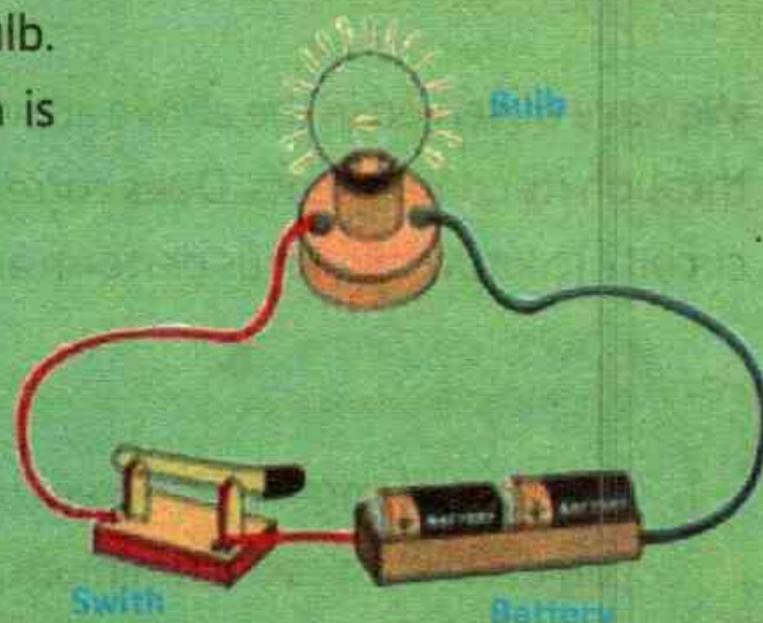
#### Activity 7.4

1. Insert a torch bulb in a holder.
2. Connect bulb to a cell or battery through a switch with the help of metal wires as shown in figure.
3. Turn the switch ON and observe the bulb  
Does it start glowing?

4. Now, turn the switch OFF and observe the bulb. Why did it stop glowing? When the switch is turned ON then why the bulb start glowing?

Bulb starts glowing because an electric current flows through it.

Electric current passes through the cell or battery, bulb, switch and wires as shown in figure. They together provide a path for current to flow through.



### Electric circuit is a path of flow of current.

As you see in the figure that battery, bulb and switch are connected through wires in an electric circuit.

Bulb, battery or cell and switch are called the components of electric circuit.

Battery is a source of electric current. The switch is used to control the flow of current and glowing bulb indicates that current is passing through it.

### Open and Closed Circuits

You have learnt that on turning the switch ON, the circuit becomes complete or CLOSED due to which current starts flowing through it. On turning the switch OFF, the circuit becomes incomplete or OPEN, so current stops flowing through the circuit. It is called open circuit.

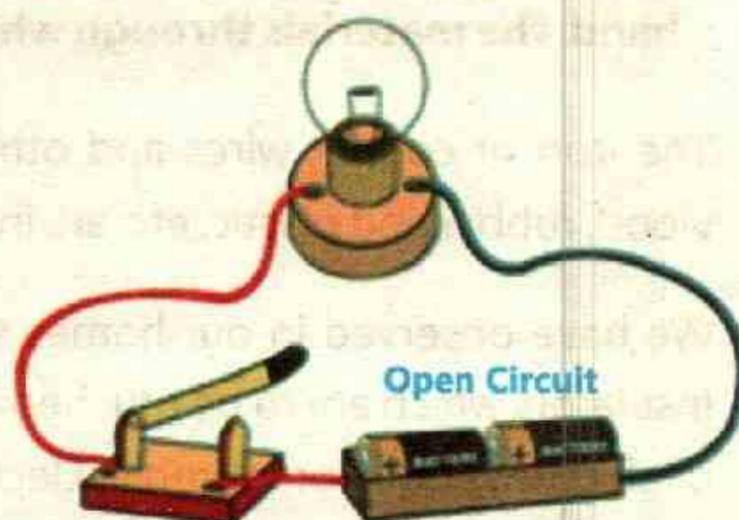
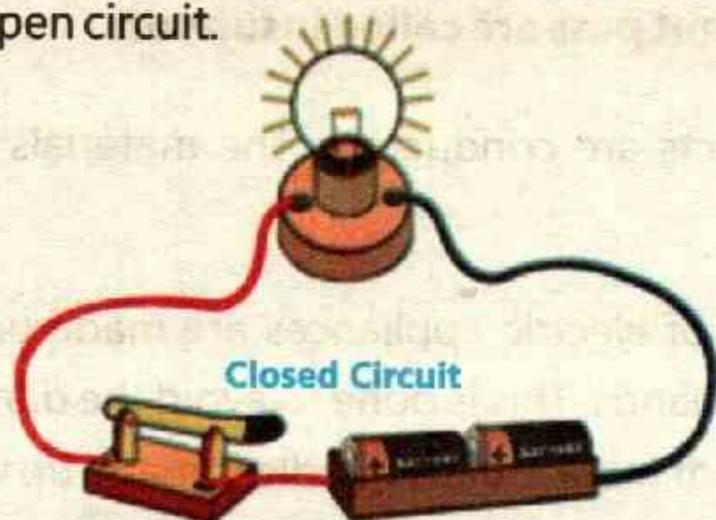
### Do you know?

A battery consists of more than one cell



### Point to Ponder!

If battery connections are reversed in a closed circuit, will the bulb glow?



## Conductors and Insulators

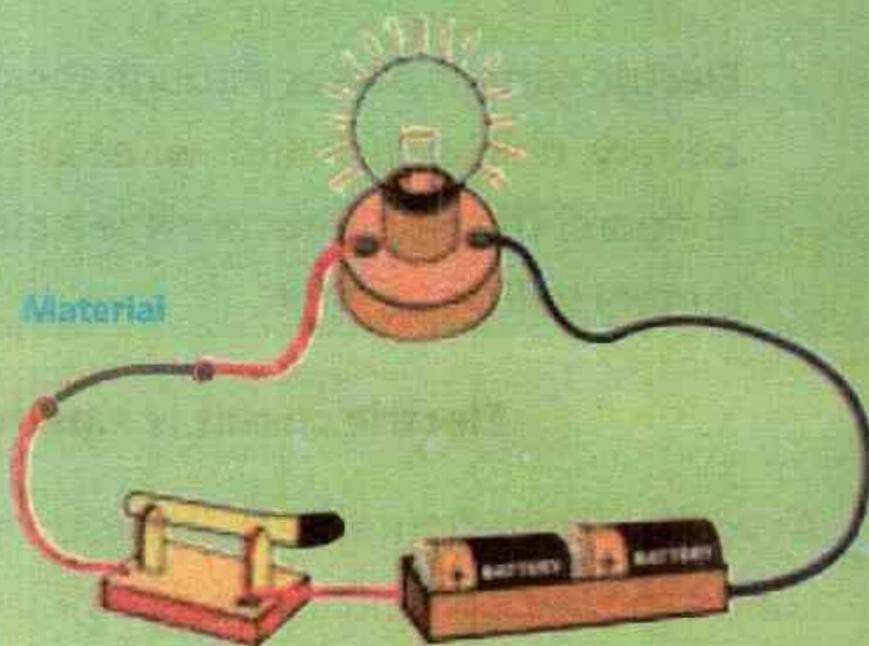
We have observed in the above activity that in case of closed circuit, electric current passes through its components. Does current pass through all kinds of materials in case of closed circuit? To know this, let us perform an other experiment.

### Activity 7.5

1. Collect a number of different material objects such as aluminium foil, a pencil, iron wires, copper wires, an eraser, glass strip, plastic ruler, etc.
2. Can you predict? which material will allow the current to pass through it?

Let us confirm it.

3. Make a circuit by connecting a bulb, a battery and a switch through wires.
4. Turn the switch ON. The bulb will glow, which indicates that current is flowing through the circuit.
5. Now connect collected objects turn by turn in the circuit according to the figure. Observe the bulb. Which materials allow the bulb to glow and which ones do not?



The material which does not let bulb glow, cannot conduct current. This shows that current can pass through some materials and cannot pass some other materials.

**The materials through which current can pass are called conductors. On the other hand, the materials through which current cannot pass are called insulators.**

The iron or copper wires and other metallic objects are conductors. The materials like wood, rubber and plastic, etc. are insulators.

We have observed in our homes that those parts of electric appliances are made up of insulators which are to be touched or held with our hands. This is done to avoid the danger of electric shock. For example, Electric iron is made of metal but its handle is made up with

plastic rod. The handles of electrical heaters and electric kettle are also made-up of insulators. Now-a-days, the bodies of the entire electric fans, washing machines and refrigerators are made up of plastic instead of metal.

### Quick Quiz

Name any three conductors and insulators other than those mentioned here.

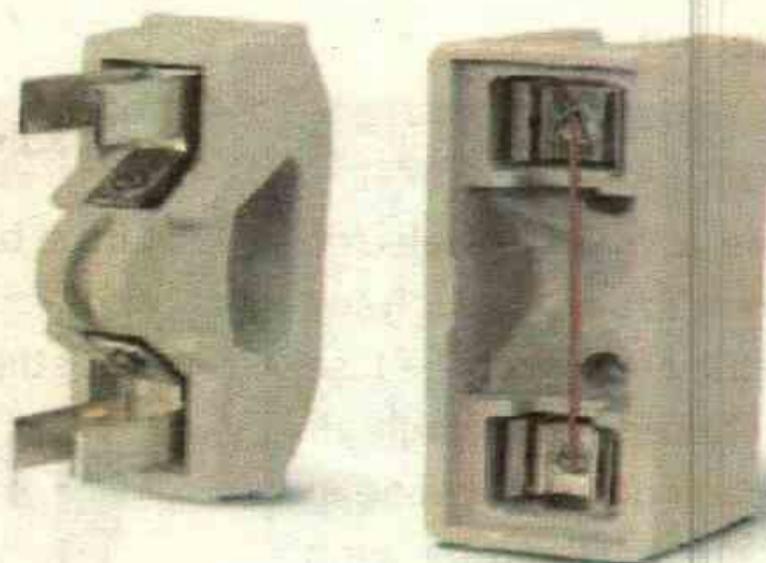


### Interesting Information

Usually the conductors of electricity are also the conductors of heat. However, diamond is insulator for electricity but conductor for heat. Hence, the jewelers can verify the real or fake diamond by touching it with their lips.

### Fuse and its Use

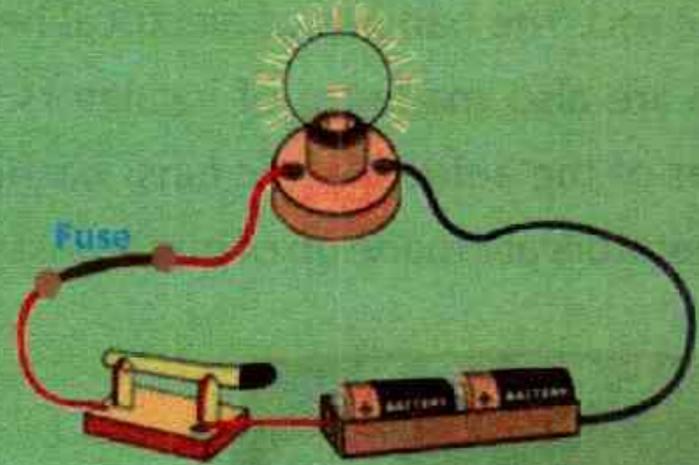
Electricity is commonly used in our homes to operate fans, television, refrigerator, iron and washing machine etc. A fuse is used in a circuit for the safe use of electricity. What is a fuse? Let us perform an experiment to understand it.



### Activity 7.6

1. Make a battery joining two cells. Connect thick copper wire to each end of battery with the help of sellotape.
2. Take a piece of very thin metallic wire.

3. Touch the ends of the thin wire with the thick copper wires as shown in the figure.
4. Does the thin wire melt and break? What is its reason?



When excessive current passes through the piece of thin wire, it becomes too hot and melts instantly. As a result the circuit breaks and current stops flowing. Such a piece of thin wire is called a fuse.

#### Caution!

Do not touch switch, wire and electric devices with wet hands and bare footed.

**Fuse is a piece of thin wire that is used in an electric circuit to protect electrical appliances.**

A fuse is used in an electric iron, washing machine, heater, oven, water pumps and other electric appliances. If due to some fault current starts flowing in any appliance, one may get an electric shock on touching it. If a fuse is used, it will blow immediately and current will stop flowing. In this way the electric appliances and the person touching it both will be protected.

#### Point to Ponder!

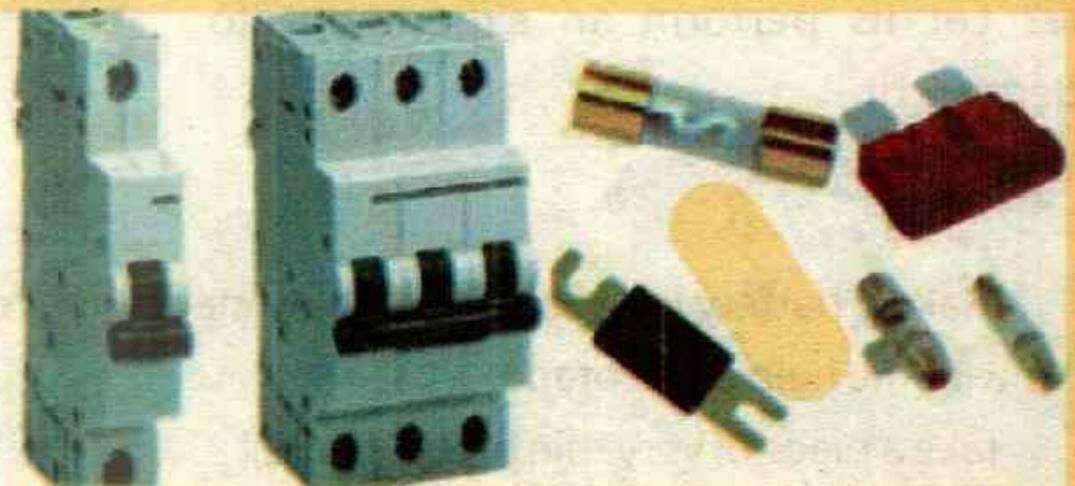
You must have heard building set on fire by short circuit. How it can be avoided?

#### Interesting Information

There is a limit of electric current to pass through any electric appliance. The fuse is inserted accordingly. If the amount of current in the circuit exceed this limit due to some fault, the fuse blows immediately. The flow of current in the circuit stops and the appliance is not damaged.

#### Do you know?

Circuit breakers are used these days instead of fuse. They also work like fuse. The instant tripping of circuit breaker stops the current flow.



## Magnet

Have you ever seen a piece of metal which has the ability to attract some materials? We call it a magnet. Which materials are attracted by a magnet, let us explore by an experiment.

### Magnetic and Non-Magnetic Materials

#### Activity 7.7

1. Place some objects of different materials such as pencil, rubber, steel pins, copper wire, iron nails, steel clips, stone etc. on the table.
2. Bring a strong magnet near these things turn by turn and observe if the magnet attracts them.
3. Write down the names of things which are attracted by the magnet. Write separately those which are not attracted by the magnet.



**Materials which are attracted by the magnet are called magnetic materials.**

These materials include things made up of iron, nickel and cobalt. For example steel pins, iron nails, coins made up of nickel and cobalt, etc.

**Materials which are not attracted by the magnet are called non-magnetic materials.**

The examples of non-magnetic materials are copper, wood, plastic, rubber, glass, etc.

#### Do you know?

Only magnetic materials can be magnetized to make magnets.

### Interesting Information



Over 2000 years ago, Greeks discovered a rock (lodestone) which could attract things containing iron. It is a natural magnet.

### Magnets of Different Shapes



U Magnet



Bar Magnet



Ring Magnet



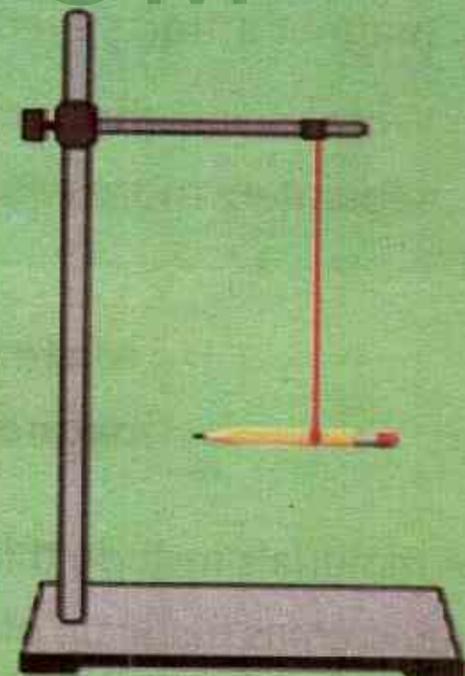
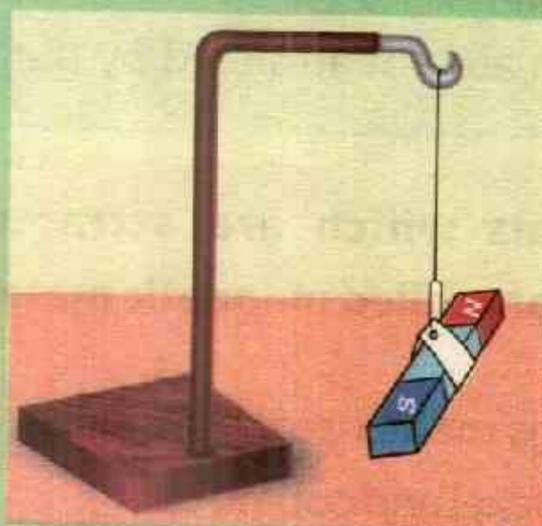
Disc Magnet

### Properties of a Magnet

Magnets have very interesting and useful properties. Let us perform the following activities to explore some of the properties of magnets:

#### Activity 7.8

1. Suspend a pencil with the help of a thread as shown in the Figure. Observe the direction along which it comes to rest.
2. Disturb its position and again observe its position after it comes to rest. Has its position changed? You will see that the pencil does not come to rest in any specific direction.
3. Now suspend a bar magnet. Observe its direction when it comes to rest. Disturb it and again observe in which direction it comes to rest. Repeat the process two or three times. Does it always come to rest in a specific direction? What is that direction?



**A freely suspended magnet always points in the north-south direction.**

The end of bar magnet that points towards north is called its north pole and the end pointing towards south is called its south pole. Thus a magnet has two poles.

**The ends of a magnet are called its magnetic poles.**

Usually, red colour is coated to show north pole that is labeled as (N). Blue colour is coated to show south pole (S).

**Investigate:** Find out which part of the magnet attracts strongly using a magnet and iron filling.

**Point to Ponder!**

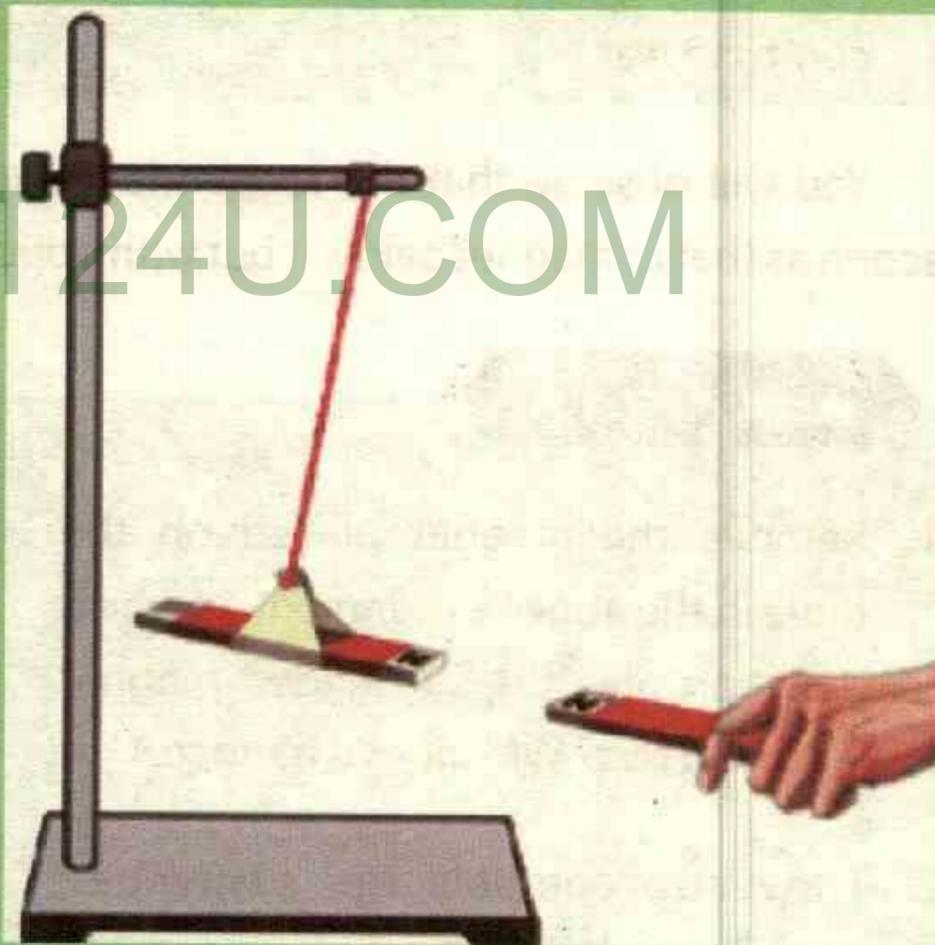
Can you make two magnets having one pole each by breaking a bar magnet?

**Do you know?**

The magnetic force of the magnet is the strongest at the magnetic poles.

### Activity 7.9

1. Suspend a bar magnet with the help of a thread such that it can rotate freely as shown in figure.
2. Take another bar magnet. Bring its north pole near the north pole of the suspended magnet. What do you observe?
3. Now bring the south pole of second magnet near the south pole of the suspended magnet. Observe what happens?
4. Repeat the process by bringing opposite poles near each other and observe them.
5. What do you conclude from these observations?



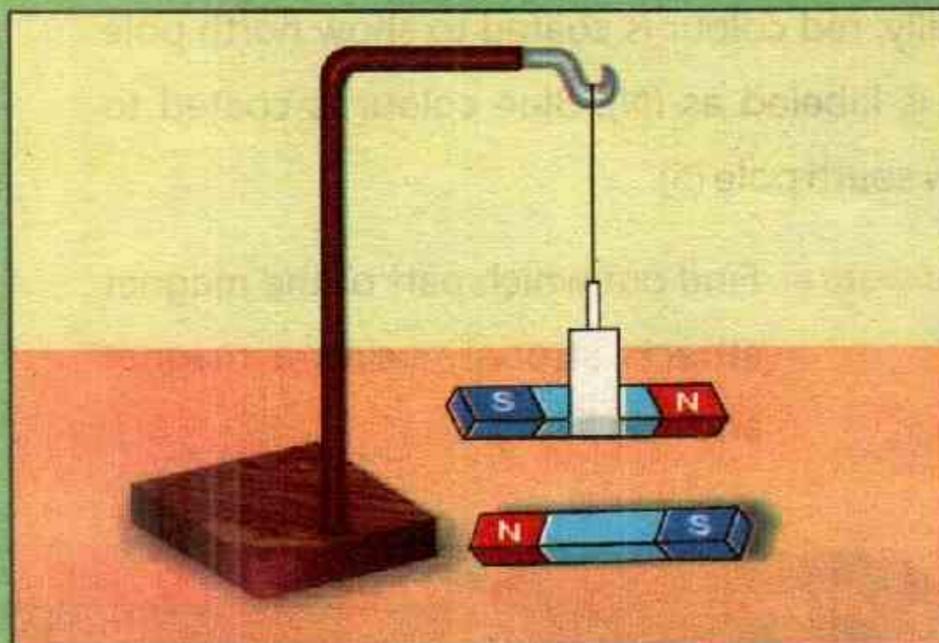
**Two like magnetic poles repel each other while opposite poles attract each other.**

## Earth - A Huge Magnet

Earth behaves like a huge bar magnet. Let us explore it by doing an experiment.

### Activity 7.10

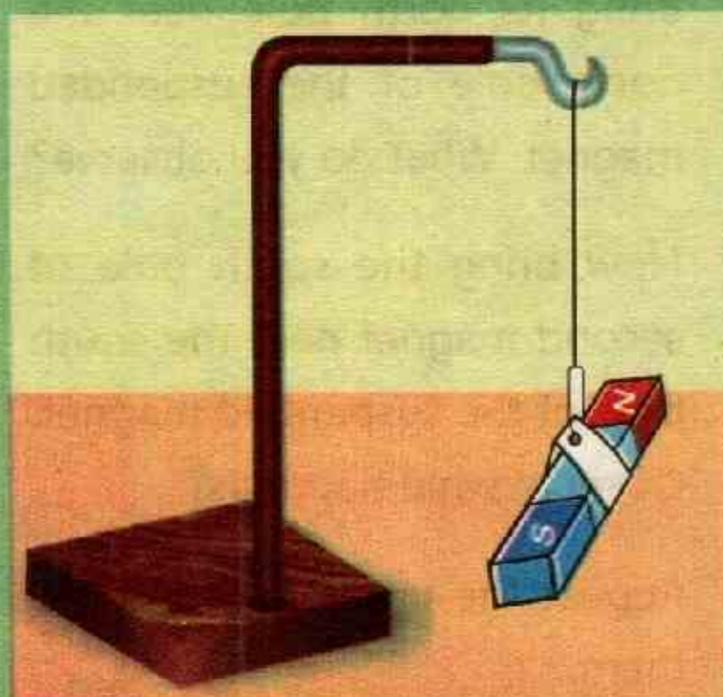
1. Place a bar magnet along east-west direction on a table.
2. Suspend another bar magnet from a stand using a thread over it so that it can rotate freely as shown in the figure.
3. Observe the direction of suspended magnet when it comes to rest.



You will observe that the suspended magnet also comes to rest along the same direction as that of magnet below it but with opposite poles near each other.

### Activity 7.11

1. Remove the magnet placed on the table in the above experiment. In which direction now the suspended magnet comes to rest? Why does it happen?
2. The Earth compels the suspended magnet to do so. This happens as if a very large magnet is present in North-South direction inside the Earth.

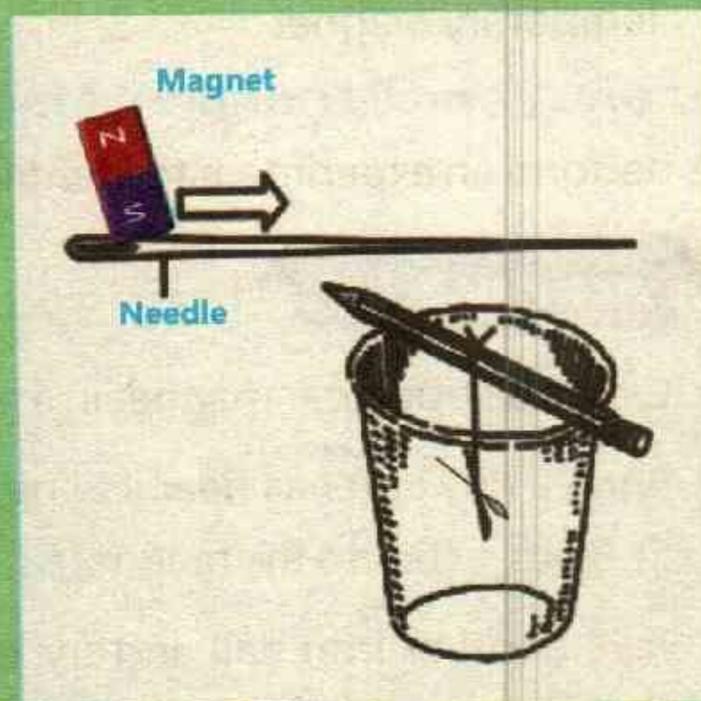


**The Earth behaves like a huge bar magnet.**

## Magnetic Compass

### Activity 7.12

1. Place a sewing needle on the table. Make it a magnet by rubbing it a few times in the same direction with north or south pole of a strong bar magnet.
2. Tie one end of a thread with the needle and other with the pencil. Suspend it in an empty glass as shown in the figure so that it can move freely.
3. Observe in which direction the needle comes to rest?
4. Disturb the needle. Does it come to rest again in the same direction?
5. Does it stay always in north-south direction?



Magnetic compass is also made on this principle. It is used to find the directions at any place.

### Working of Magnetic Compass

Let us perform an experiment to know the use of a magnetic compass.

### Activity 7.13

1. To know directions at any place put a magnetic compass on a table or ground. Its needle will stay along north-south direction.
2. Ensure there is no other magnet or an object made of iron near it.
3. Rotate the compass slowly until the north pole of the needle is aligned with the north direction (N) of the compass.

In this condition, the magnetic compass will indicate correctly the four directions marked on it.



### Do you know?



A magnetic chip is built in a credit card of a bank. The ATM machine is programmed to read the data of the user present in the chip.

## Types of Magnet

There are three types of magnet:

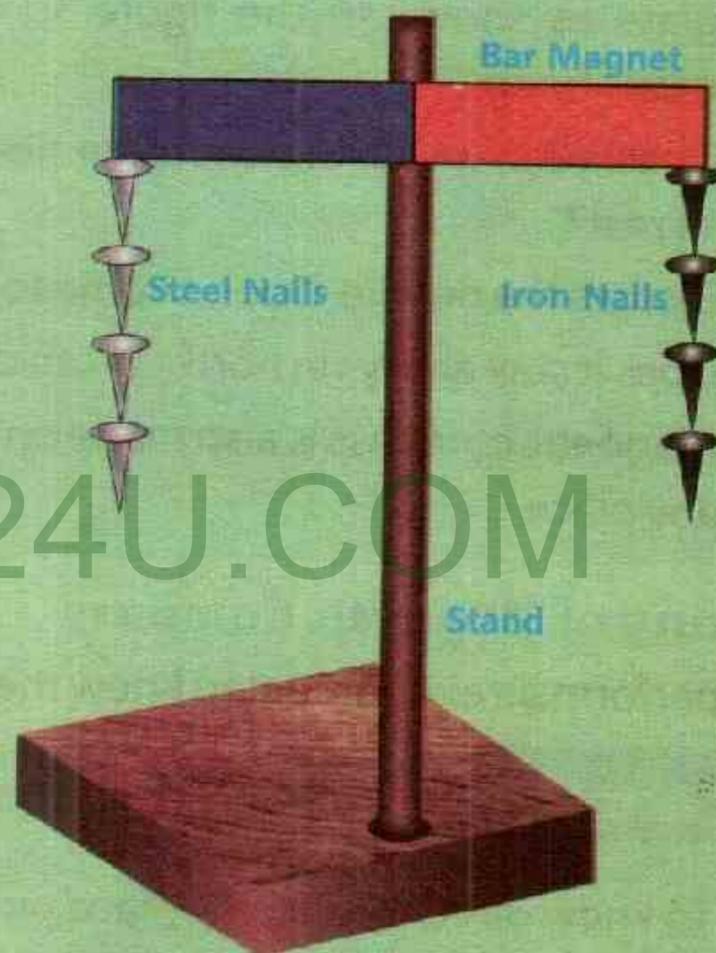
1. Temporary magnet
2. Permanent magnet
3. Electromagnet

### Temporary and Permanent Magnets

Let us perform an experiment to identify temporary and permanent magnets.

#### Activity 7.14

1. Clamp a strong bar magnet in a horizontal position with a stand.
2. Bring a tiny iron nail near its one pole (say S). Does it stick to the magnet?
3. Take another iron nail and try to hang it with the first nail. Why does it stick to the first nail? The reason is that the first nail has become a magnet under the effect of strong magnetic force of the bar magnet.
4. Continue hanging as many as nails one by one as could be held by the magnet. It forms a chain of nails.
5. Now hang some steel nails to the other pole of the magnet in the same manner. What do you observe?
6. Now remove the iron chain by pulling the top nail away from the magnet. What happened and why? The iron nails will no longer support each other and fall down. Now remove the steel chain from the top. What do you observe?



You will see that iron chain collapses whereas the steel chain did not. It means that iron nails become magnets temporarily. On the other hand, steel nails retain their magnetism and become permanent magnets.

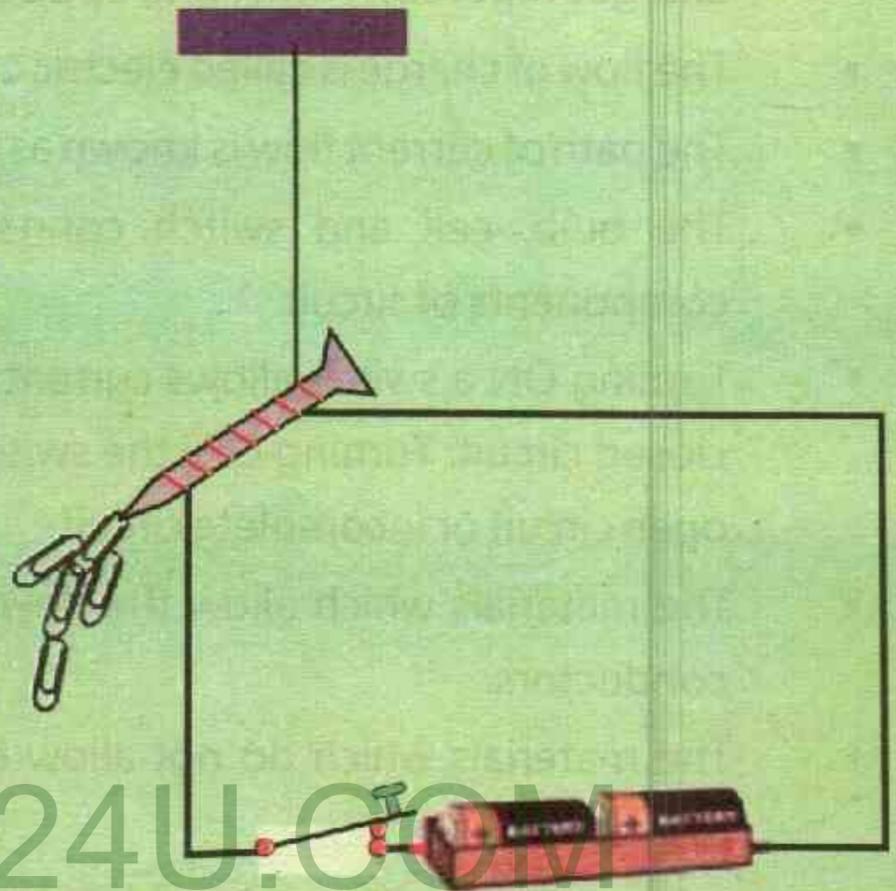
**Magnets made by iron are temporary magnets while the magnets made by steel are permanent magnets.**

## Electromagnet

Can a magnet be made with the help of an electric current. Let us perform an experiment.

### Activity 7.15

1. Wind an insulated copper wire very closely over an iron nail or a rod so that it becomes a long coil.
2. Attach the connecting wires to the two ends of the coil and connect them to battery through a switch as shown in the figure.
3. Keep the switch OFF and bring some steel pins near one end of the nail. Does the nail attract them?
4. Turn the switch ON and see if the nail attracts the pins now.
5. What inference do you draw from it?  
Predict what will happen if the current is switched OFF.
6. Turn the switch OFF to verify your prediction.
7. What do you conclude from this experiment?



**When an iron nail or a rod is placed in a current carrying coil, it becomes a magnet. This is known as electromagnet.**

Electromagnet is a temporary magnet. It does not remain magnet when current is stopped in the coil.

### Point to Ponder!

How will you identify the north and south poles of an electromagnet? If battery terminals are reversed do the poles also change?

### Quick Quiz

Electric crane can lift iron objects from the scrap easily. How are they dropped in a truck to carry to a factory?

## Key Points

- Charge is a basic property of matter.
- There are two kinds of charge: Positive charge and negative charge. Similar charges repel each other and opposite charges attract each other.
- The flow of charge is called electric current.
- The path of current flow is known as an electric circuit.
- The bulb, cell and switch connected in an electric circuit are known as components of circuit.
- Turning ON a switch allows current to flow in the circuit. It is called complete or closed circuit. Turning OFF the switch stops current flow in the circuit. It is called open circuit or incomplete circuit.
- The materials which allow the flow of electric current through them are called conductors.
- The materials which do not allow the flow of current through them are called insulators.
- A fuse is inserted in an electric circuit for safety purpose.
- Magnet is a piece of metal which attracts objects made of iron, nickel and cobalt.
- The materials which are attracted by a magnet are called magnetic materials.
- A freely suspended magnet always stays in north-south direction.
- The ends of a magnet are called magnetic poles.
- Similar magnetic poles repel each other and opposite poles attract each other.
- The Earth behaves as a huge bar magnet.
- The magnetic compass is used to find directions accurately.
- If current is passed through a coil wound around an iron rod, it behaves as a magnet. It is known as an electromagnet. This is a temporary magnet.



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

Static Electricity	<a href="https://kids.nationalgeographic.com/explore/science/all-charged-up-wiggly-water/">https://kids.nationalgeographic.com/explore/science/all-charged-up-wiggly-water/</a>
Magnetism	<a href="https://www.nationalgeographic.org/encyclopedia/magnetism/">https://www.nationalgeographic.org/encyclopedia/magnetism/</a>



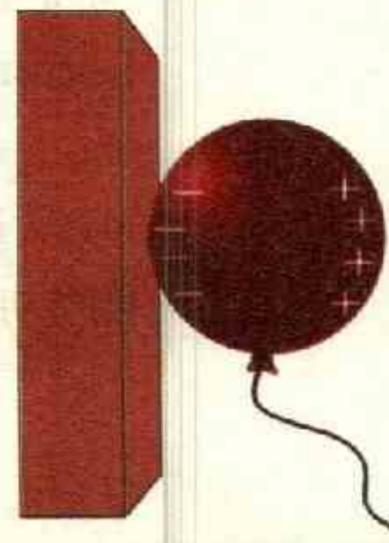
## Exercise

### 1. Tick (✓) the correct answer.

- i. The flow of current in an electric circuit is controlled by:
- |           |                |
|-----------|----------------|
| a. bulb   | b. copper wire |
| c. switch | d. rubber      |
- ii. Current can easily pass through:
- |                     |                 |
|---------------------|-----------------|
| a. steel paper clip | b. glass strip  |
| c. plastic comb     | d. wooden spoon |
- iii. How many poles are there of a ring shaped magnet?
- |      |      |
|------|------|
| a. 1 | b. 2 |
| c. 3 | d. 4 |
- iv. A freely suspended bar magnet always stays along
- |                        |                          |
|------------------------|--------------------------|
| a. east-west direction | b. north-south direction |
| c. any direction       | d. keeps oscillating     |
- v. Which one is the true statement?
- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| a. North pole attracts north pole | b. North pole repels north pole   |
| c. South pole repels north pole   | d. South pole attracts south pole |

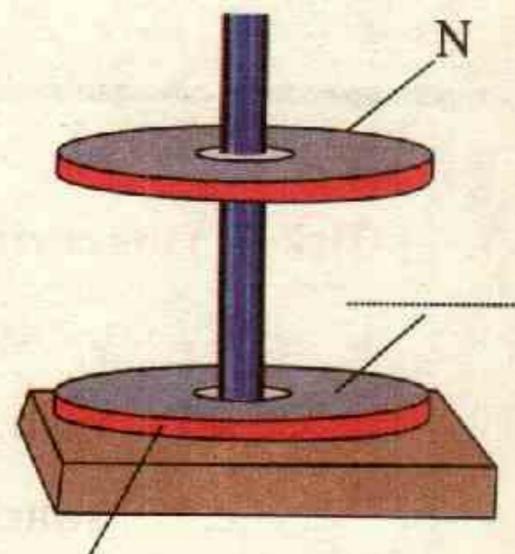
### 2. Write short answer.

- i. Why does a bulb light up in a closed circuit?
- ii. You are given a bulb. What other components are required to light it up?
- iii. Why an iron nail stuck to a magnet attracts another nail?
- iv. How are directions found using a magnetic compass?
- v. A balloon is charged by rubbing it with a woolen cloth. Why does it stick to a wall when brought near it?



### 3. Constructed Response Questions:

- i. Two ring magnets are shown on a wooden stand. The upper magnet rises up and is suspended in air as shown in the figure.
  - a. Why does the upper magnet float in the air?
  - b. Label the N and S-poles of the magnets.
- ii. There is a bar magnet without any indication. How will you identify its south pole?
- iii. There are three similar metal bars. One is a magnet, the second one is that of iron and third bar is of aluminium. How would you identify each bar?
- vi. A plastic comb charged with a woolen cloth is touched with an iron key. What do you observe? Give an example of similar phenomenon in daily life.

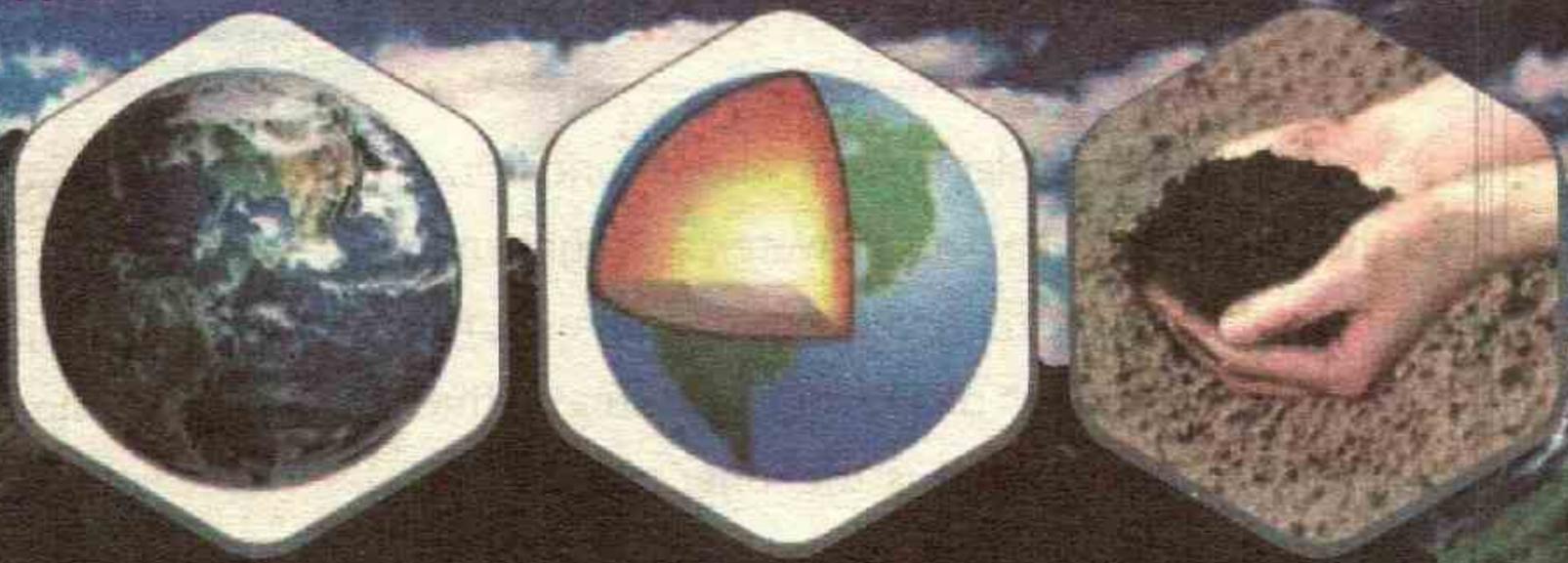


### 4. Investigate:

You are provided bar magnet, paper pins, glass, plastic, aluminium, steel plates and a wooden board. Investigate which material allows magnetic attraction to pass through it?

### 5. Project:

- i. You are provided with a water tub, cardboard, magnet, sellotape. Make a boat using the materials provided to you whose forward or backward motion can be controlled by another magnet.
- iii. You are given a cardboard, torch bulb, electric cell, screws, and connecting wires. Design and make a test board for 4 science quizzes so that the bulb light up on the correct answer only.



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

*From where does the water comes in your home?*

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

**Chapter**

**8**

## **Structure of the Earth**

### **Students' Learning Outcomes**

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

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

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

**Do you know?**

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

**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 resembles 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 surface in the form of lava during volcano eruption.

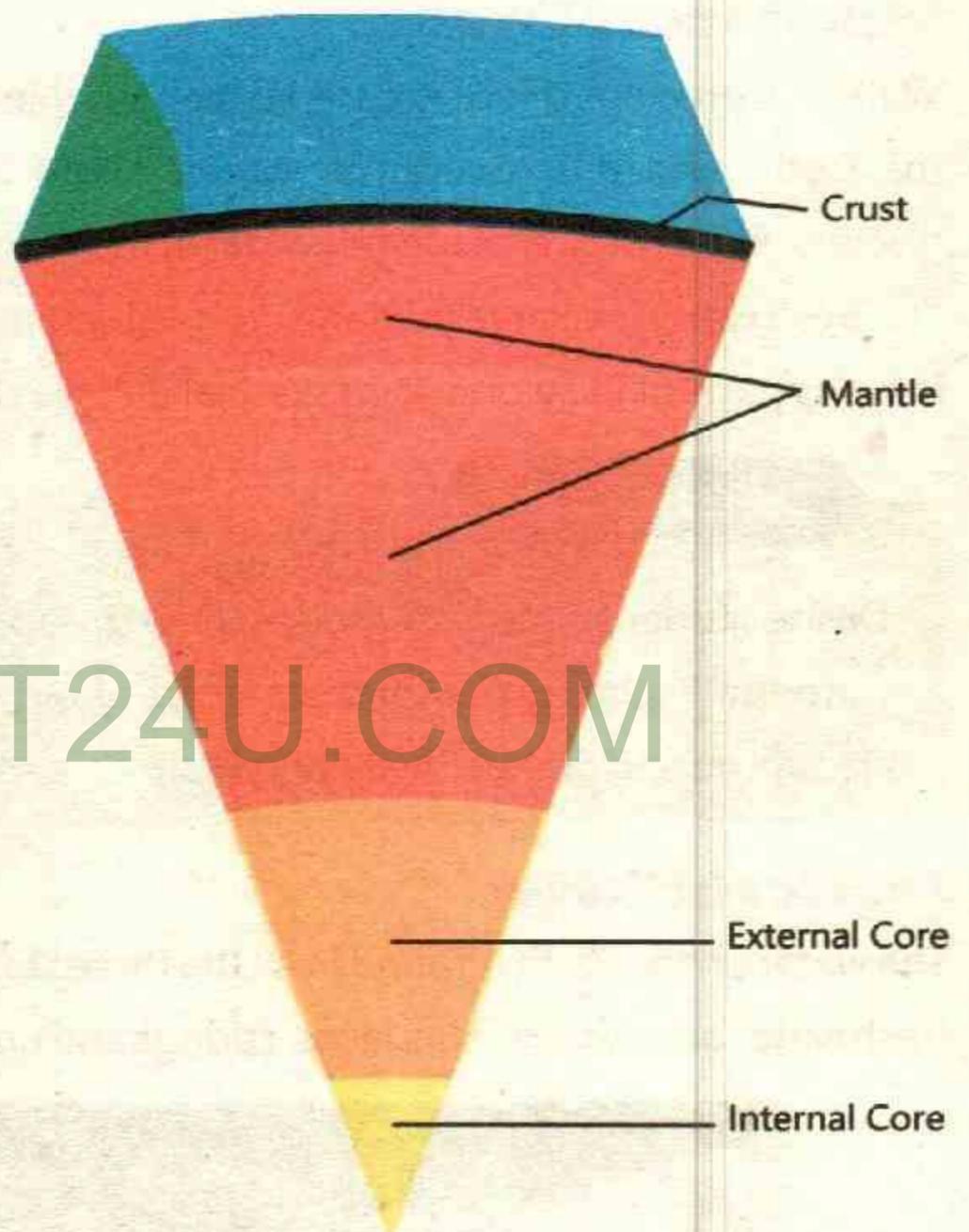
## Core

The central part of the Earth is called the core. It is the hottest part of the Earth. Its temperature is about  $5000^{\circ}\text{C}$ .

The core consists of two parts:

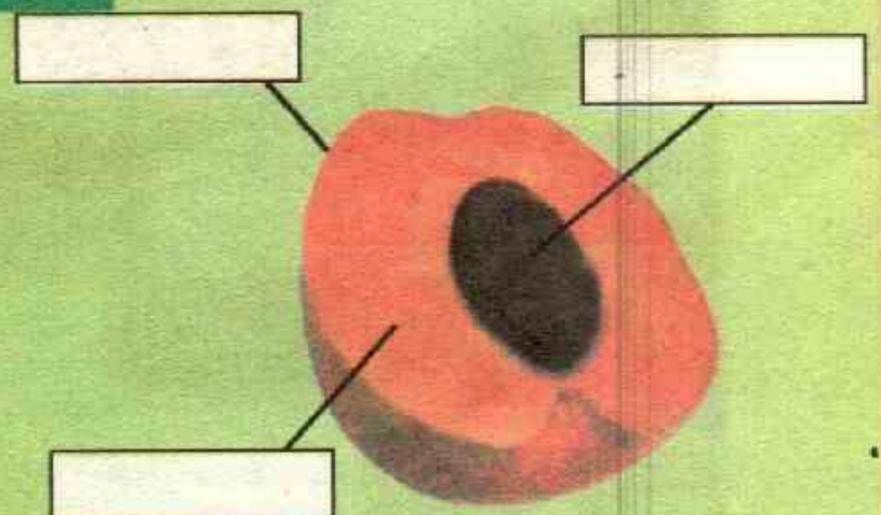
- a. Internal Core
- b. External Core

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 1000 years to make only a 5cm 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 the Earth without it. The 70% 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 one percent. There is acute shortage of water in many parts of the world. It is essential that we should 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 prepare 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.

**Quick Quiz**

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

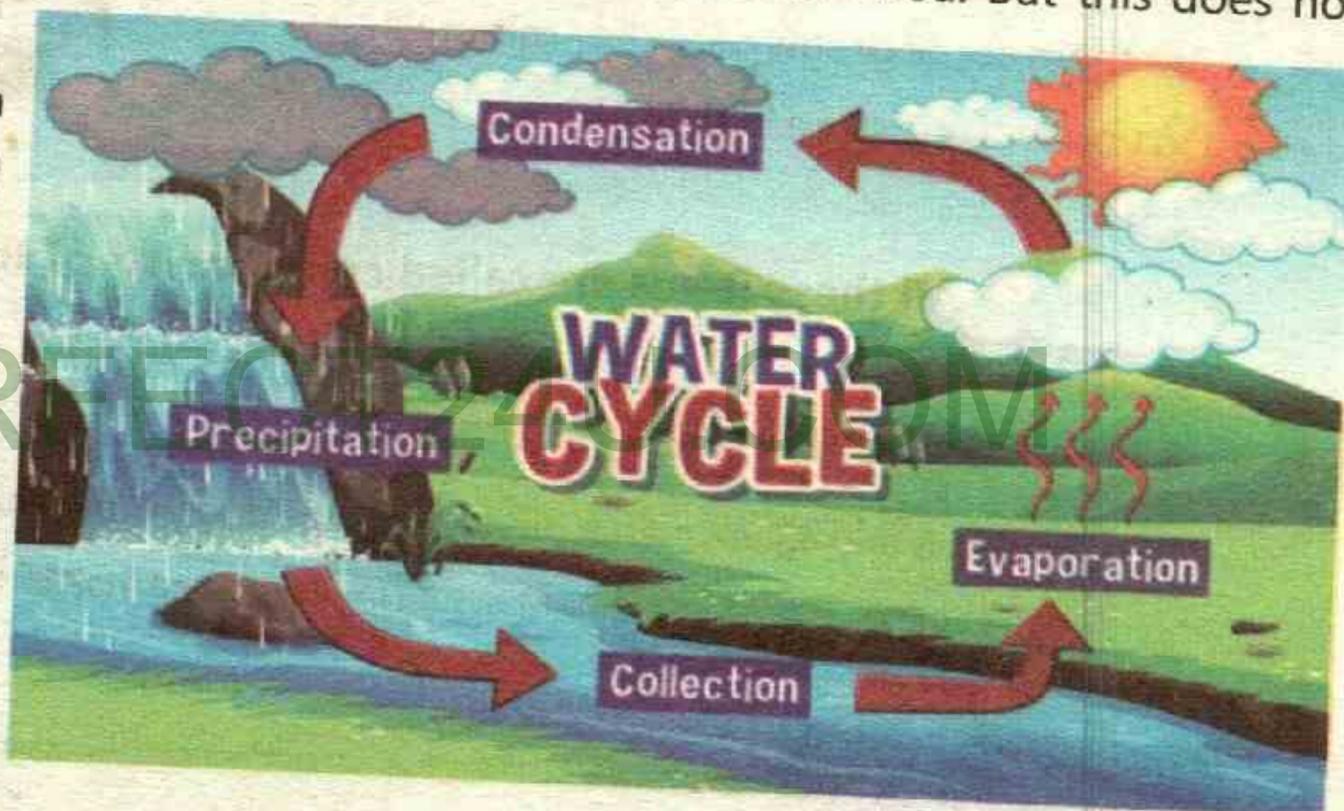
**Point to Ponder!**

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

**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 cyclic 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 surface.

Soil is composed of the small broken particles of rocks, minerals, water and air, etc. The

## Chapter 8

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 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 jar?
4. What do you see over it in the muddy water?
5. What is floating up 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 in it 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)			
iv. Weight (heavy, light, lightest)			
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:

- i. Clay      ii. Sand      iii. 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 feel 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 things 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 other one of 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?**

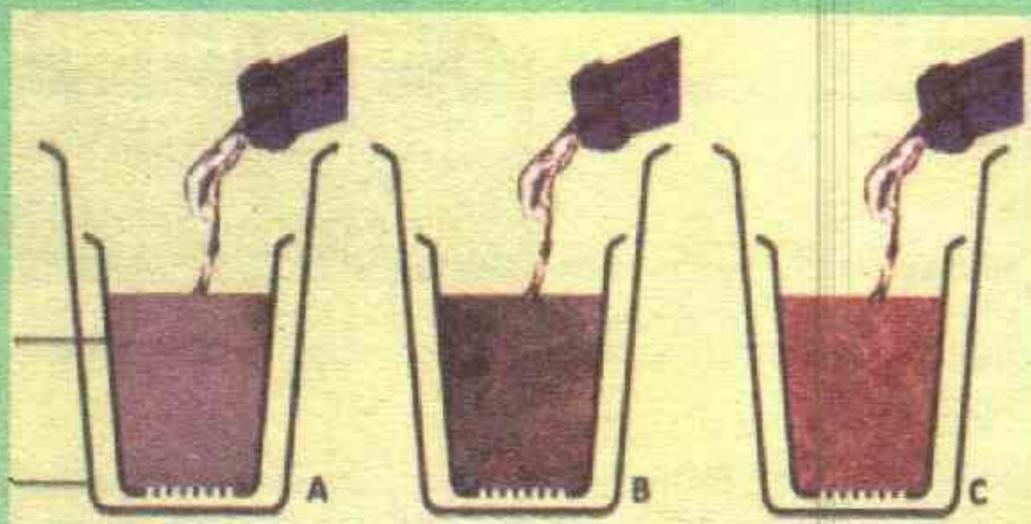
The bacteria and other microorganisms in the soil convert the wastes of living animals and dead plants into useful nutrients. They increase the fertility of the soil.

**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. Make a drainage hole at the bottom of each cup.
3. Fill three Styrofoam or plastic cups with each sample of the soils.
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 do you observe?

- You will see that water drainage rapidly through a sandy soil. The drainage of water through silty soil is less than 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

- There are three parts of the Earth on the basis of its structure.
- The outer layer is known as crust. It consists of sea and solid rocks.
- The middle layer is mantle. It consists of extremely hot thick fluid.
- The core is the central part of the Earth. It is the hottest and heaviest part of the Earth.
- Oceans, glaciers, rivers, lakes, springs and underground water are sources of water.
- There are three types of soil; sand, clay and silt.
- Clay is useful to make pottery, sand for glass and silt is good for cultivation. 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. <a href="https://www.natgeokids.com/uk/discover/geography/physical-geography/structure-of-the-earth/">https://www.natgeokids.com/uk/discover/geography/physical-geography/structure-of-the-earth/</a>
How soil reduces changes in weather?	2. <a href="https://video.nationalgeographic.com/video/0000015b-a120-d835-ad5b-b32aef720000">https://video.nationalgeographic.com/video/0000015b-a120-d835-ad5b-b32aef720000</a>

## 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, sand    |
| c) sand, silt and clay | d) silt, humus and clay |

iii. Which type of soil is good for growth of plants?

- |          |          |
|----------|----------|
| a) sandy | b) silty |
| 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) make 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?

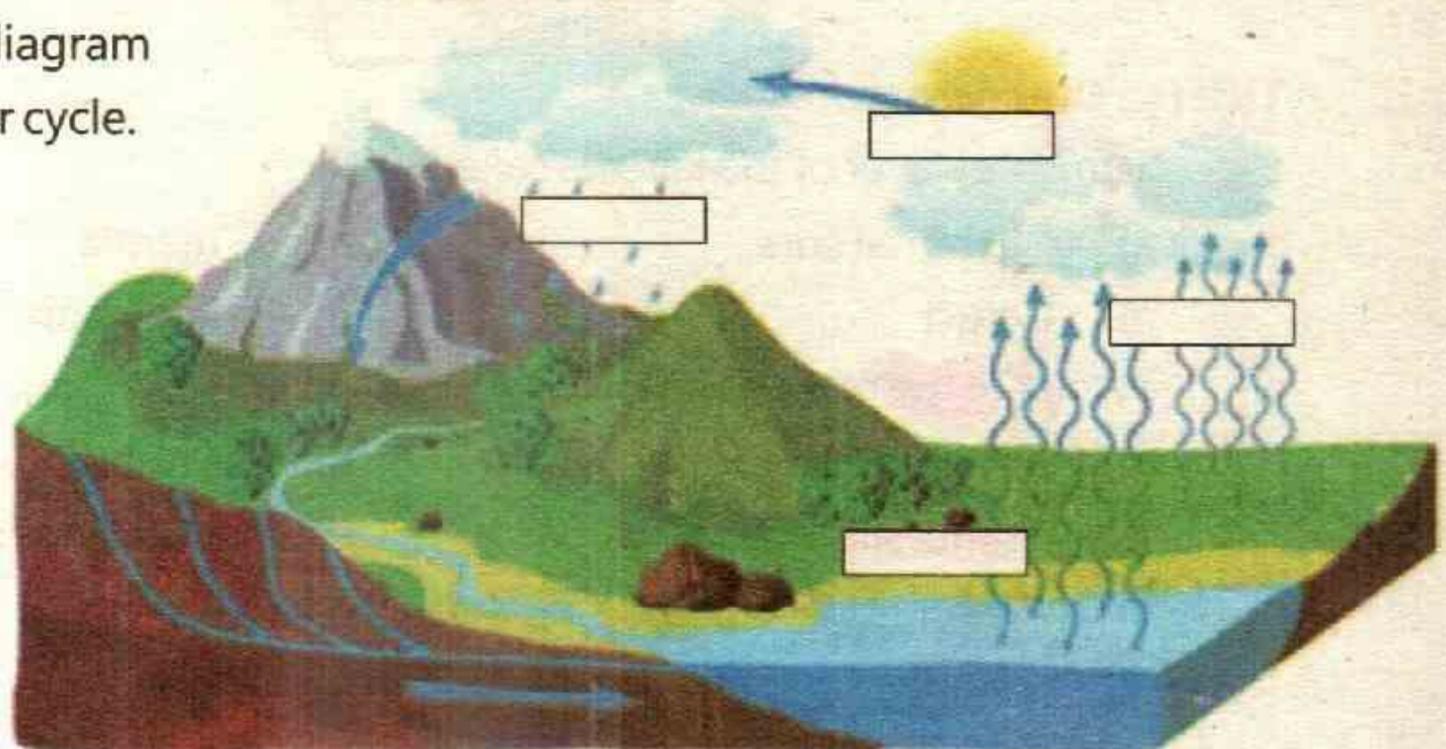
- |             |                       |
|-------------|-----------------------|
| a) minerals | b) the decayed matter |
| c) sand     | c) salts              |

## 2. Write short answers.

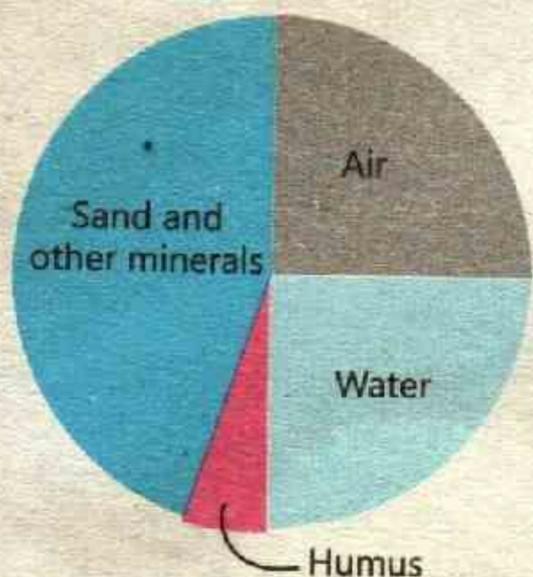
- i. Name the outer layer of the Earth? What is its importance in our life?
- ii. Which soil is useful to make pottery? What are its properties?
- iii. Which matter is obtained from the decayed plants and insects?
- iv. How much part of the Earth's surface consists of oceans? Why we cannot drink sea water?
- v. Where the water is 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 houses in village? Which property of the soil is useful to do so?
- iii. How do the plant roots and other creatures inside the Earth respire?
- iv. Estimate the components of silt (fertile soil) from the given figure.



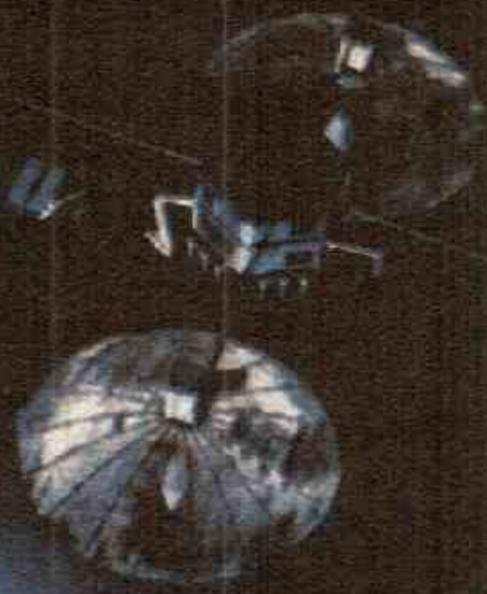
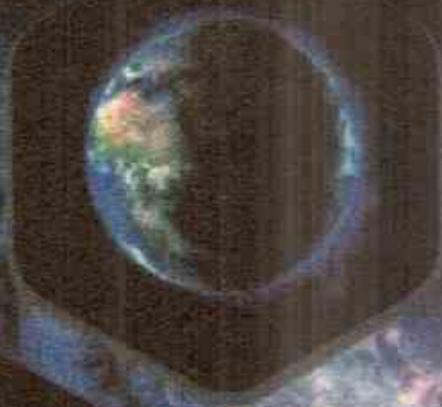
Components	Approximate Percentage
Air	
Water	
Humus	
Sand and other minerals	

#### 4. Investigate:

You have heard the devastation of floods. What is its reason? How the surplus water of floods can 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.



*What is the significance of space suit?*

*Why do the stars twinkle?*

*Why and how space walk is done?*

## Chapter

# 9

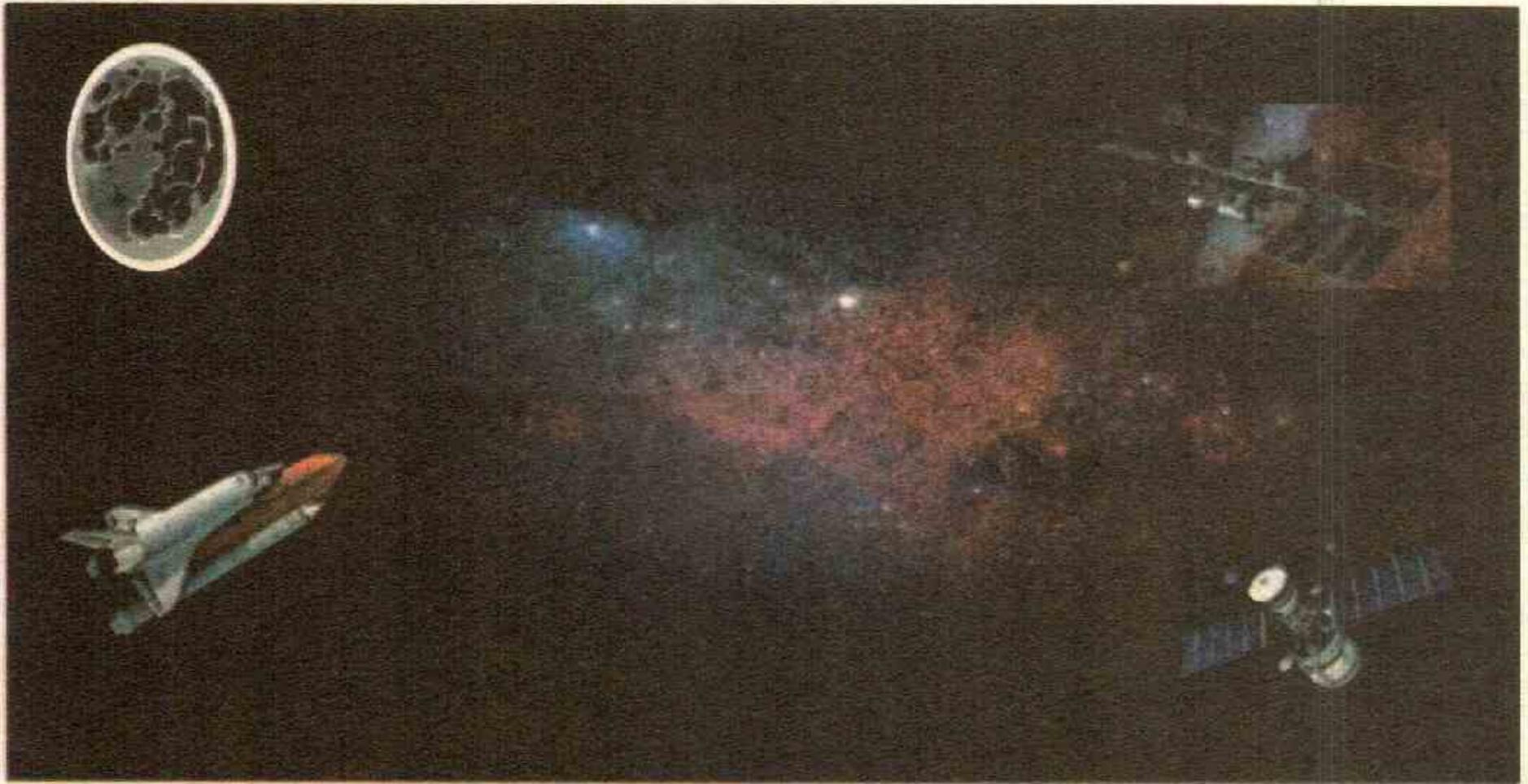
# Space and Satellites

### Students' Learning Outcomes

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

- Define the term 'space' and emphasize the need to explore it
- Recognize the role of NASA (National Aeronautics and Space Administration) in space exploration.
- Define the term 'satellite' and describe its importance.
- Describe the natural satellites of the planets of the solar system.
- Define artificial satellites and explain their importance in exploring the Earth and space.
- Recognize the key milestones in space technology.
- Describe the uses of various satellites in space i.e. geostationary, weather, communication and Global Positioning System (GPS).

A space scene is shown in the following photograph. Can you recognize the various objects in it? Make a list.



When we look up at the sky on a clear night we see countless tiny lights commonly known as stars. But scientifically, they are not all stars. Infact they include galaxies, stars, planets, Moon and some other objects. All these objects are called heavenly bodies. These heavenly bodies are a part of the vast space around us which collectively known as the universe.

### Space Exploration

After seeing the heavenly bodies one becomes curious to know the realities of the Earth and space. The invention of rocket made it possible to travel beyond our atmosphere into the vast space. We also could know how our Earth and solar system came into existence.

The space age began on October 4, 1957 when Soviet Union launched Sputnik-1 in the orbit of the Earth. This was followed by America and some other countries who launched many other spacecrafts. They are monitoring weather conditions, long range radio and television transmission, precise navigation and exploration of the Earth resources.



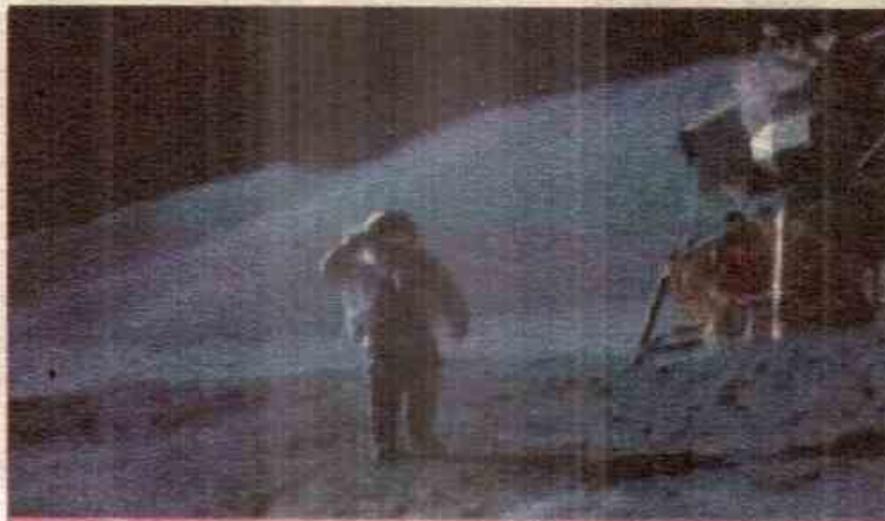
Sputnik-1

## The Role of NASA

National Aeronautics and Space Administration (NASA) is an American Agency. It is responsible for space exploration and aviation.

As a result of its space activities, the man stepped on to the Moon on 20th July, 1969. NASA has sent space crafts to the other planets of the solar system as well for investigation purpose. The instruments and devices installed on them are sending us valuable information regarding their environment.

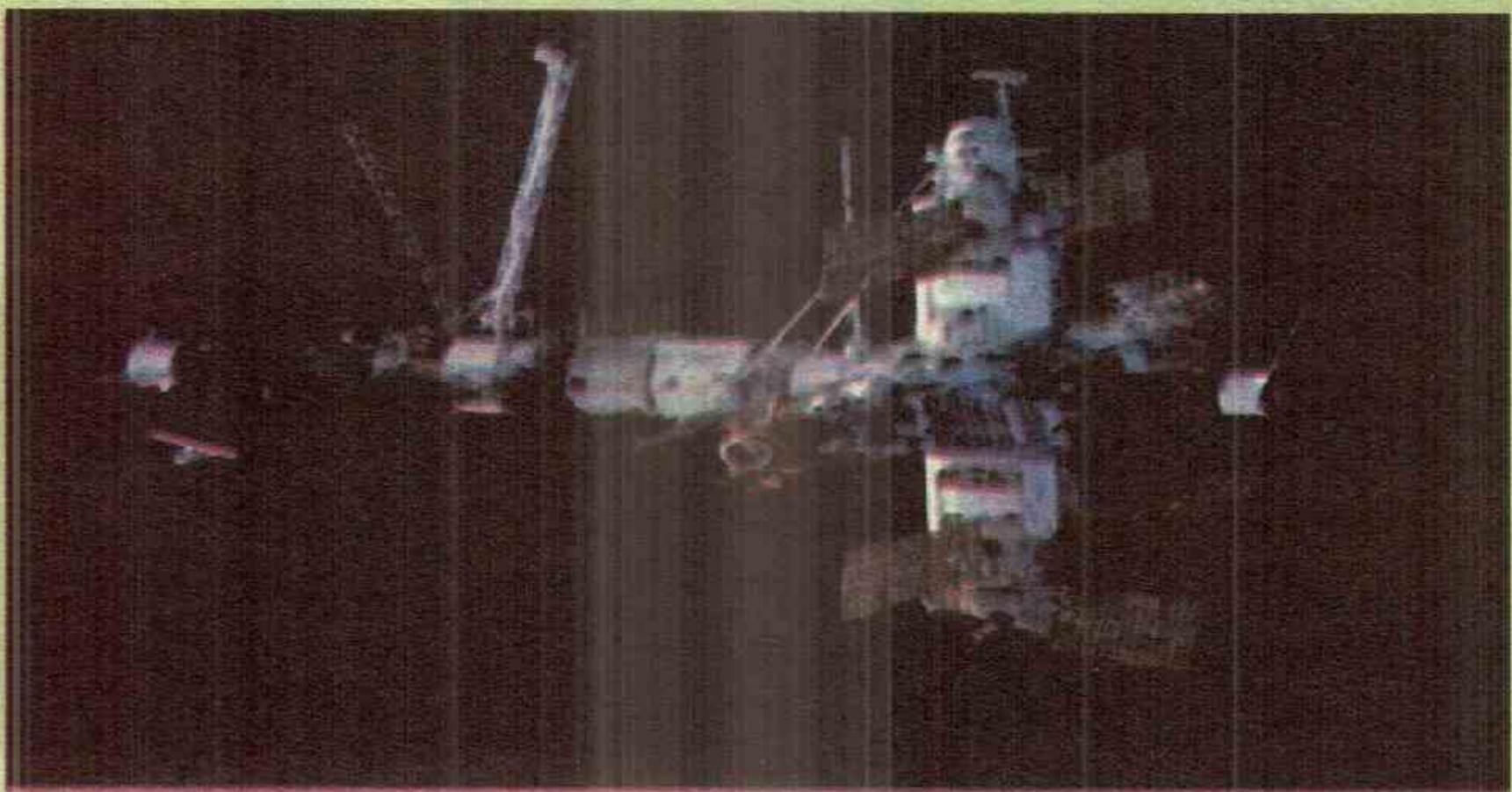
An other big achievement of NASA is the establishment of International space Station



Human first step on moon

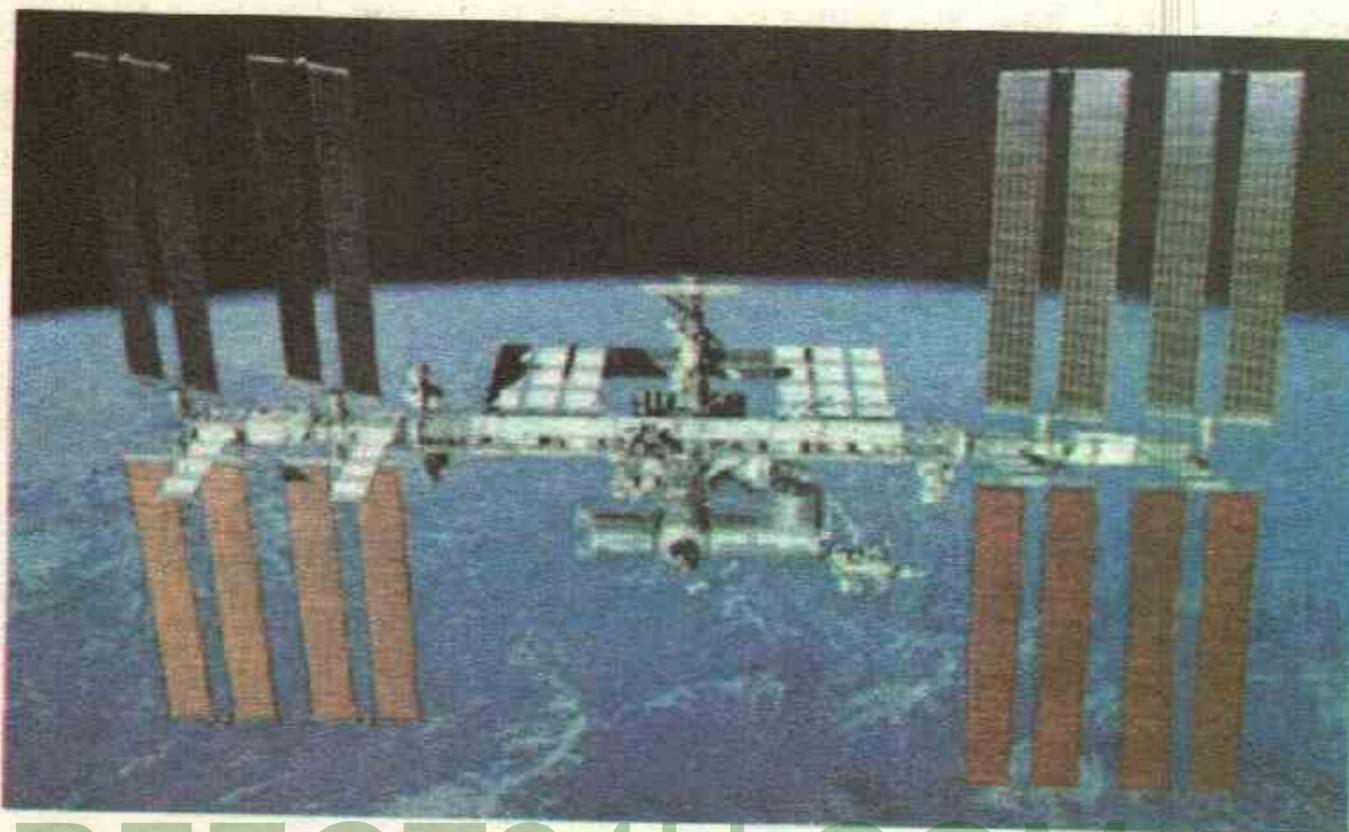
For your information!

MIR, the Russian Space Station orbited the Earth for 15 years at a height of 300 km. The scientists performed many fascinating experiments in it.



(ISS). This was a joint project with the collaboration of space centres of Russia, Japan, Canada and Europe. Its size is greater than a football ground. It has been orbiting the Earth at a height of approximately 400 km for the last 20 years. It completes its one revolution around the Earth in 90 minutes.

The scientists from all over the world visit this space station and many of them stay in it for several months. Space shuttles are used to go and come back from this station. More than 250 scientists have benefitted for their research work in its specific and gravity free environment.



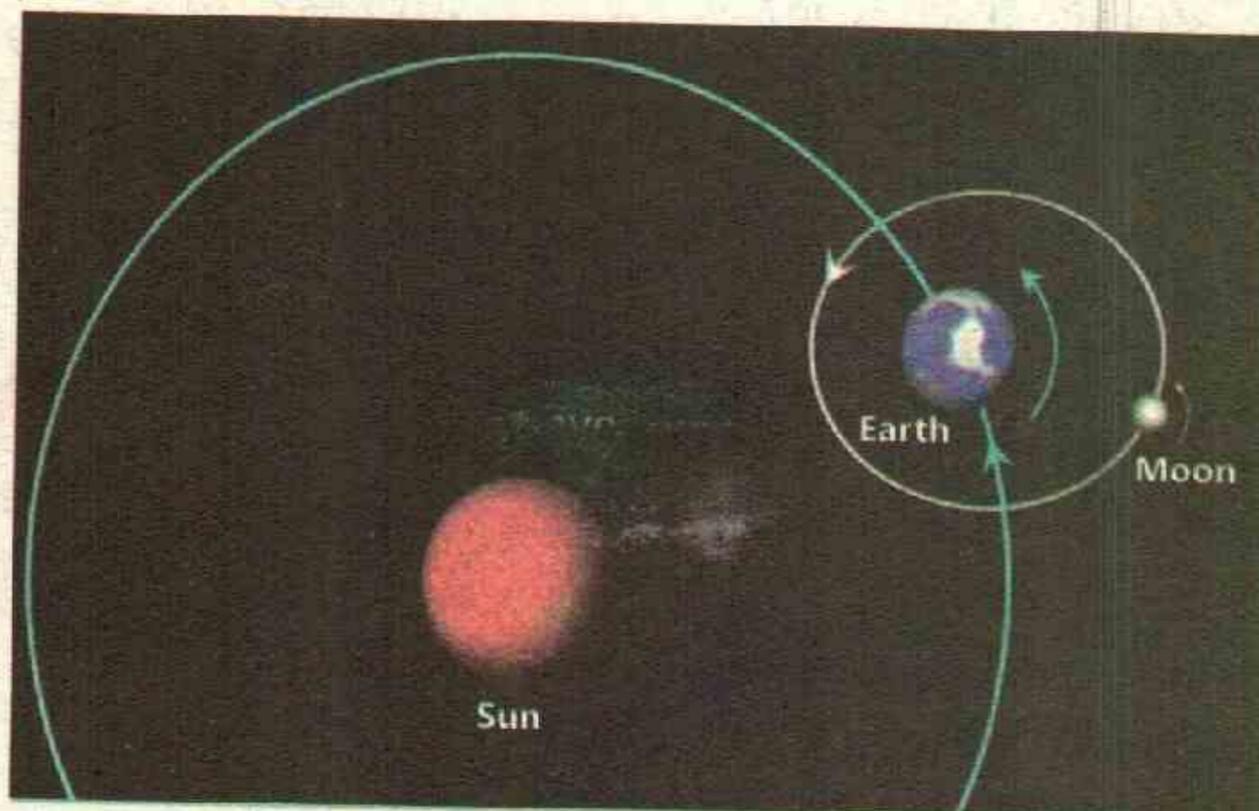
International space station

### Interesting information

Soviet Union sent Sputnik-2 in space on 3rd November 1957 that carried first living thing, a dog.

### Satellite

An object moving around a very big heavenly body due to its gravity is called a satellite. The Moon revolves around the Earth. It is a natural satellite of the Earth.



## The Moons of other Planets

The Moon is the only natural satellite of the Earth. Likewise some other planets have also their moons according to recent research.

Sr. No.	Planet	Moons
1	Mars	2
2	Jupiter	79
3	Saturn	82

Sr. No.	Planet	Moons
4	Uranus	27
5	Neptune	14

### Try it out

Very fascinating moons of Jupiter and Saturn can be seen by using even a moderate power handy telescope. Seek help from internet for location in the sky.

### Do you know?

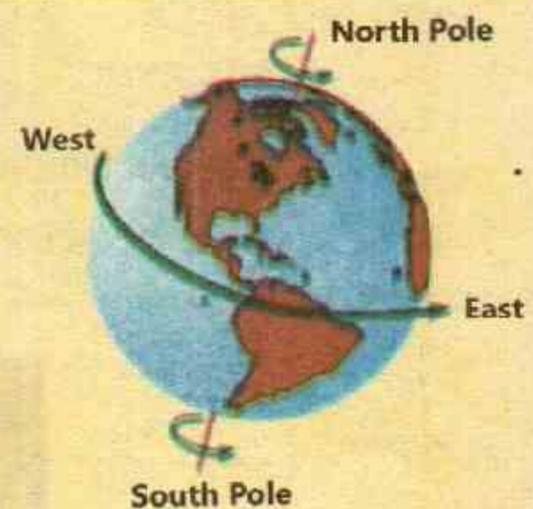
The bright object that we see on the horizon just before sunrise or after sunset is the planet Venus. It is also called morning star.

### Activity 9.1

Students should find the names of moons of some planets using Internet or library.

### Do you know?

The Earth rotates about its axis from west to east direction. Hence, the Sun, Moon and stars appear to move from east to west.



## Artificial Satellites

The space ships which are made by humans to revolve around the Earth are called artificial satellites. These are sent into space by a rocket and are given a right speeds for their height. The higher the satellite, the slower is its speed and longer is the time required to complete its one orbit.

### Do you know?

Hundreds of satellites have been sent into space. We can see some of them like moving stars on a clear night sky.

### Interesting Information

A satellite carrying Hubble space radio telescope uses radio signals for space exploration and send informations to us.



### Importance of Artificial Satellites

Can you tell, which benefits we get from artificial satellites? Radio, television transmission and information by internet reach in each part of the world because of artificial satellites. We can make contact at far off places by telephone. We can correctly locate our position at any where in the world. We can predict changes in weather much earlier. This helps us to deal with floods, storms, forest fires and other disasters effectively.

### Uses of Various Satellites

#### Geostationary Satellites

The satellites revolving in the orbits around the Earth with the same speed as that of the Earth are known as geostationary satellites. They orbit at a height of about 36000 km and are positioned directly above equator.

They appear stationary at one place all the time when viewed from the Earth. These are commonly used for communication purposes and transmit TV signals across the world.



Geostationary Satellite

### Interesting Information

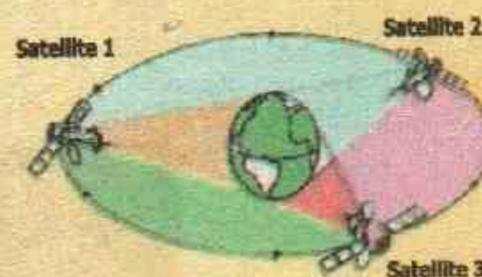
The Earth rotates about its axis with a speed of 1470 kilometer per hour over the equator.

**For your information!**

For a satellite to stay in a particular orbit, it must be traveling at the specific speed. The lower the height, the faster it must be moving.

**Do you know?**

The whole Earth can be covered by just three geo-stationary satellites for global transmission of radio and TV programs.

**Weather Information**

For weather information, Polar Orbiting Satellites are used. They pass the Earth from North Pole to south pole. They are used to survey the Earth. As the Earth spins under their orbits, the whole Earth can be seen through them. In addition to weather conditions these satellites are also used for the survey of the Earth, for navigation and observing other satellites.

**Communications Satellites**

These satellites help to transmit signals of Radio, T.V and mobile phones from one place to another. There are over 200 Earth based stations for transmitting and receiving information through these satellites. You can also pick up the signals directly from these satellites through dish antennas.



Communication Satellite

**Do you know?**

The study of the Earth from orbiting satellites is known as remote sensing.

**Point to Ponder!**

Moon is a natural satellite of the Earth. Why is it not used for telecommunication?

### Global Positioning System

Global positioning system is a process to know the location at a place. Commonly it is known as GPS. It is established by twenty four satellites at a height of 400 km orbiting the Earth in six sets of orbits.

Four signals are received at any moment by a receiver or cell phone from satellites located at different places. The cell phone receiver works out the exact position of its location. The motorists use this system not only to tell where they are, but also to select the best route to their destination.

#### Do you know?

An aeroplane pilot, sailor or a desert hiker can now use a pocket size instrument or cell phone to find his position on the Earth within 10 meter accuracy.

### KEY MILESTONES IN SPACE TECHNOLOGY

1.	October 4, 1957	Soviet union launches 1st ever Sputnik 1.
2.	January 31, 1958	United states launches Explorer 1 to explore Van Allen radiation belt.
3.	April 12, 1961	Soviet Cosmonaut Yuri Gagarin becomes the first human to enter space and return safely.
4.	July 20, 1969	Neil Armstrong became the first man to walk on the moon in Apollo-11 mission.
5.	March 1994	Completion of "Global Positioning System" (GPS).
6.	November 20, 1998	First piece of the International Space Station is launched.
7.	August 6, 2012	Unmanned spacecraft, a robotic rover "Curiosity" landed on Mars. It was launched on Nov. 26, 2011 to explore the environment of Mars.

### Key Points

- Space is the unlimited expanse in which all heavenly bodies such as Moon, Earth, Sun, stars and galaxies are located.
- NASA is an American agency responsible for space exploration and aviation.
- Satellite is an object which revolves around another big object due to its gravity.
- Artificial satellites are the objects put into orbits around the Earth by human beings.
- Geo-stationary satellites keep pace with the Earth and complete one orbit in one day.
- Satellites are used for very useful purposes such as Communication, Navigation, TV display the world over, Survey, Weather monitoring and spying, etc.
- International Space Station is a human made huge laboratory orbiting in space around the Earth.

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

Space	<a href="https://kids.nationalgeographic.com/explore/space/">https://kids.nationalgeographic.com/explore/space/</a>
GPS	<a href="https://www.nationalgeographic.org/encyclopedia/gps/">https://www.nationalgeographic.org/encyclopedia/gps/</a>

## Exercise

### 1. Tick (✓) the correct answer.

- i. Countless shining lights seen at night on the sky are:
 

a. stars	b. moons
c. planets	d. different heavenly bodies
- ii. How long does it take for a geo-stationary satellite to complete one orbit?
 

a. One day	b. One week
c. One month	d. One year
- iii. First man to step on the Moon?
 

a. Edwin Aldrin	b. Neil Armstrong
c. Yuri Gagarin	d. Alan Shapard
- iv. The system locates the position of an object on the Earth surface is:
 

a. GRS	b. GMS
c. GPS	d. PGS
- v. The first artificial satellite was sent into space in:
 

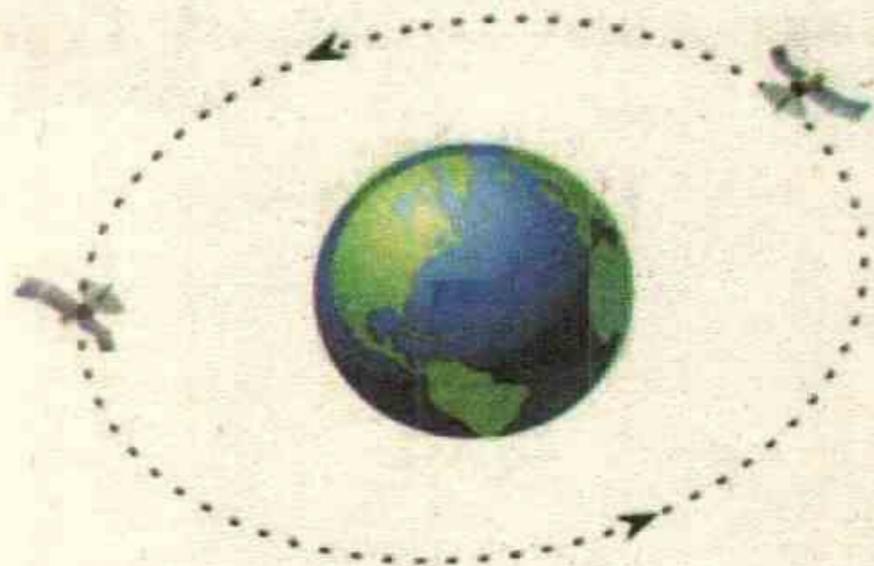
a. 1945	b. 1957
c. 1969	d. 1973

### 2. Write short answers.

- i. Write the names of 5 benefits which we get from artificial satellites?
- ii. Moon is satellite of the Earth. Is the Earth also satellite of some bigger object? What is that object?
- iii. Why does a geo-stationary satellite appear to be stationary?
- iv. Why do the astronauts wear space dress? What are its benefits?
- v. Why a telescope installed on a satellite can take more clear photographs than from the Earth surface?

**3. Constructed Response Questions:**

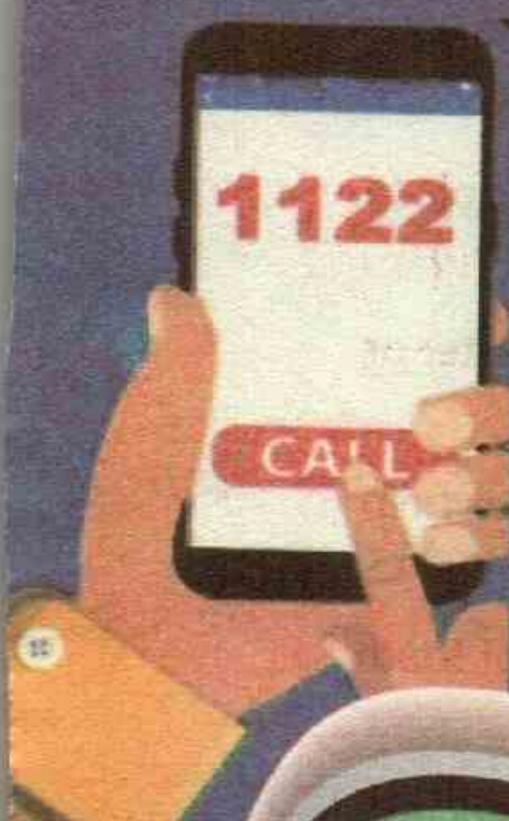
- i. What provides the force needed to keep artificial satellites moving around the Earth? Indicate its direction on the two satellites shown in the given figure.
- ii. Astronauts have to face a lot of problems in space. Can you name some of these problems?
- iii. How do the astronauts respire in your opinion?
- iv. Why cannot you pour water in a glass in space?

**4. Investigate:**

Investigate in library or through internet what types of experiments are performed in the space station that cannot be done while living on the Earth surface.

**5. Project:**

Find out from the library or internet, the first five astronauts who visited the space. From which country do they belong? What were dates of their missions and how long did they stay in space?



How will you check the level of the horizontal surface of a table?

What will you use to keep a wall straight up?

What is the significance of First Aid?

## Chapter

# 10

# Technology in everyday Life

### Students' Learning Outcomes

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

- Enlist and practice safety procedures while carrying out the activities.
- Make a model of foot bridge and bookshelf.
- Use spirit level/water level to level different objects (table, picture, frame etc.).
- Use a plumb line to install a flag pole vertically.
- Prepare LED light strings working with 12 volt battery.
- Make a musical instrument from easily available resources.
- Make moveable wagon, bus, trolley etc.
- Use first aid box to dress a wound.
- Practice Shifting a person to hospital.
- Practice earth quake, fire and flood drill.

## Safety Measures

1. Keep your area clean. Remove the unnecessary objects around you.
2. Workplace should not be wet to avoid slipping.
3. Be careful while using sharp tools. Put them at their proper place after use.
4. Be careful while working with fire. You should not wear polyester or nylon clothes as they catch fire instantly.
5. Avoid electricity operated tools and devices. If necessary, seek help of the teacher.
6. Do not use spit for folding or turning pages. Use a piece of foam soaked in clean water.
7. All activities should be performed under the supervision of teacher.

## A Few Principles while Working in a Laboratory

1. Wear apron before working in a laboratory.
2. Be aware of safety equipment for example fire tools, water storage and first aid box shelf.
3. The safety equipment should be near the entrance of the lab.
4. The chemical bottles are all labelled. If there is any without label, do not try to use it.
5. Inform the lab attendant in case of any mishap.

## Making Technical Models

Model making is very useful skill. It promotes working with hands. You may have seen a bridge made up of rope and wooden planks that is used by pedestrians to cross a river or a canal. Let us make a model of such a bridge.

### Making Models of Foot Bridge

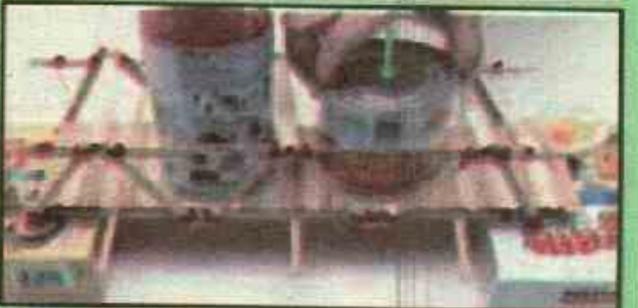
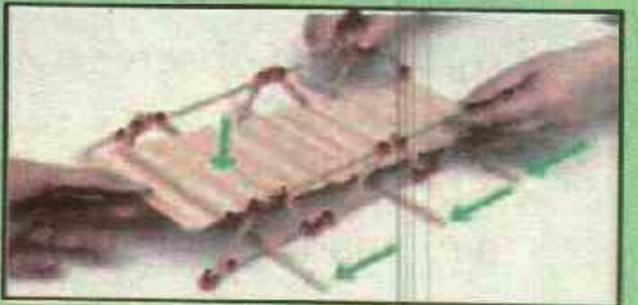
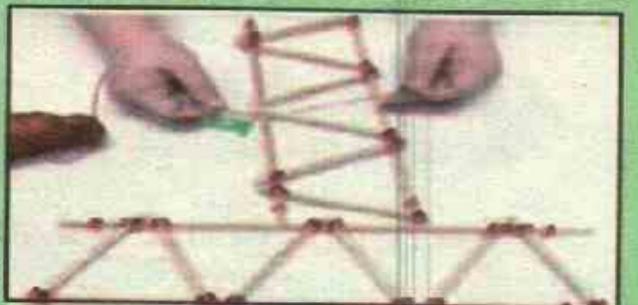
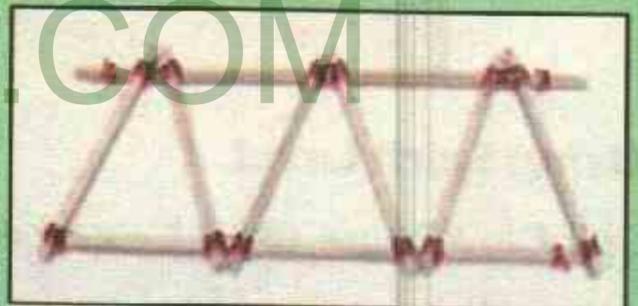
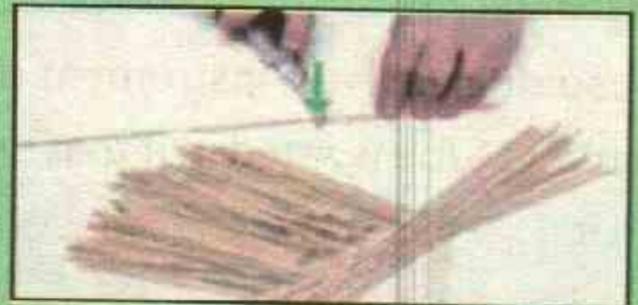
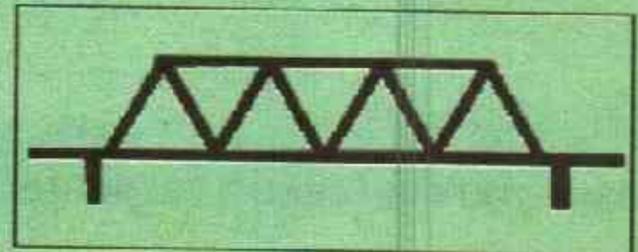
#### Activity 10.1

##### Material Required

Skewers, Ice cream sticks, paper, thread, glue. (A skewer is a long thin pointed piece of wood or metal.)

##### Procedure

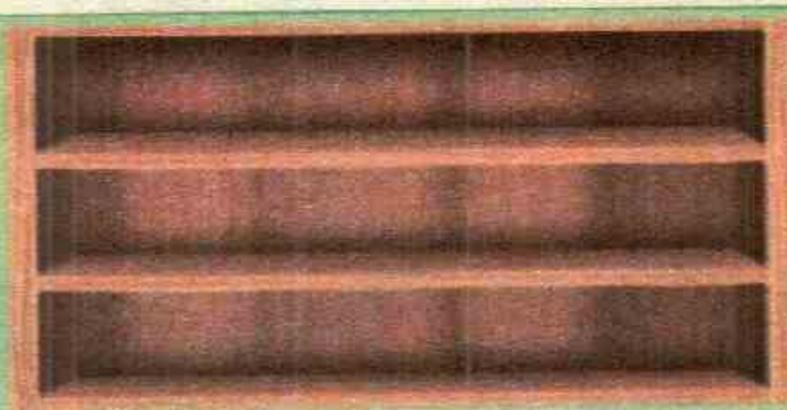
1. Sketch out your design on paper. It will help you to assess that how many skewers you will need.
2. Place your wooden skewers on your sketch and cut them to size.
3. Layout two skewers for upper and lower supports of a side wall. Putting small skewers on the two supports form triangles at alternating angles. Join them by using thread and glue. One side wall is ready. Make another side wall in the same way.
4. Construct the deck by pasting ice-cream sticks on a strip of paper by using glue.
5. Layout at least two horizontal skewers (beams) on which the two side walls can be placed vertically. Fix the walls with these skewers with the help of glue or thread.
6. Apply glue on the beams and fix the deck on it carefully. Let it dry for a few hours. Place the foot bridge on two books as shown in Figure. The model of foot bridge is ready.



## Making Model of Bookshelf

### Activity 10.2

Make a model of a bookshelf using glue and card board pieces as shown in figure.



### Spirit Level

Have you ever seen a carpenter who levels the surface of a table top using a spirit level and a planer.

A spirit level is an instrument designed to check whether a surface is horizontal or not. A bubble tube is fitted in it that is filled with a liquid, usually coloured spirit, leaving a bubble in it.

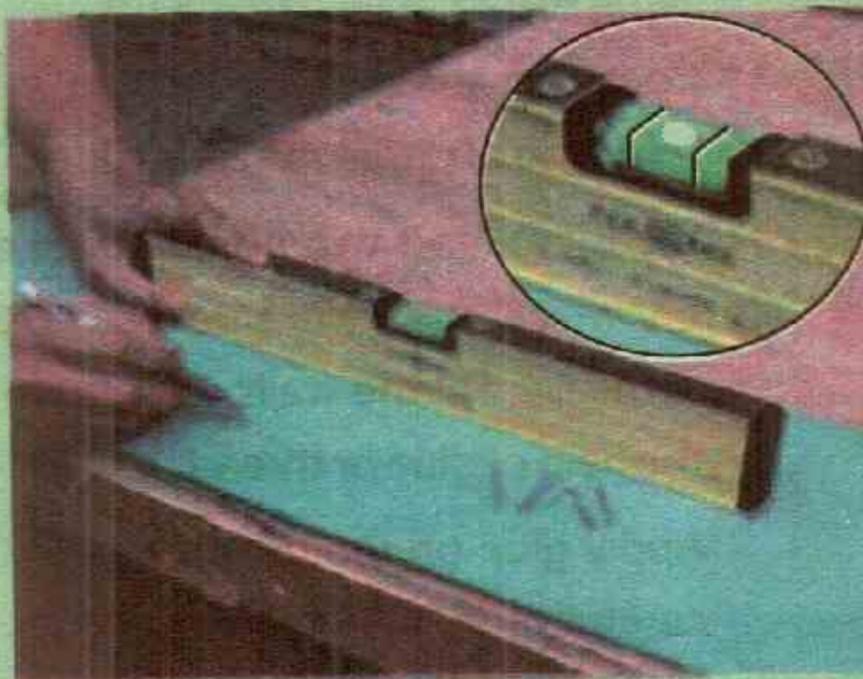


### Using Spirit Level

Spirit levels are used by carpenters, masons, frame makers, electricians, plumbers and some other professional workers.

### Activity 10.3

1. To check a horizontal surface of table top, place the spirit level on the surface and observe the bubble.
2. If the bubble is exactly in the middle of two marked lines on the tube, the surface is perfectly horizontal.
3. If the bubble is not at the centre and it is on any one side, the surface is not horizontal.



### Interesting Information

In some spirit levels, three bubble tubes are installed as shown in figure. One tube is meant for horizontal surface, while the other tubes are used to check a vertical surface and an inclined surface at an angle of  $45^\circ$ .



### Plumb Line

Have you ever seen a mason constructing a brick wall. How does he check whether the wall is vertical or not. He uses a plumb line for that purpose.

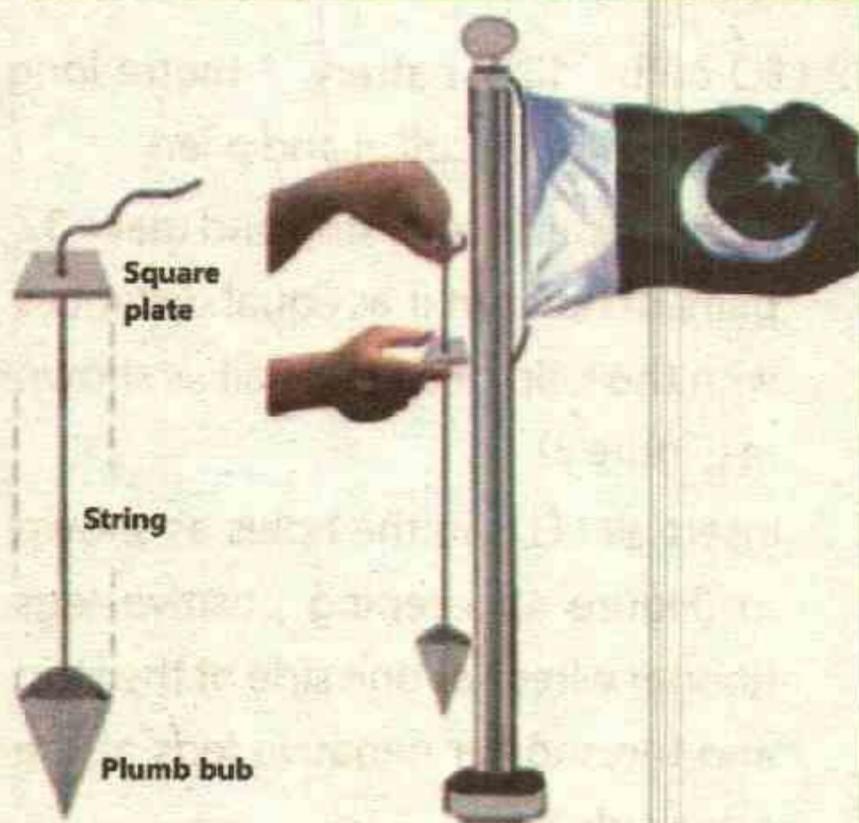
A plumb bob is a weight with a pointed tip at the bottom. One end of a string is tied to it as shown in figure. This is used as a vertical reference line usually called as plumb-line. The free end of the string passes through a hole in the centre of a square plate having its each side equal to the diameter of the bob as shown in Figure .

Let us demonstrate how a plumb line is used to install a flag pole vertically.

### Activity 10.4

1. Fix the pole in the ground vertically.
2. Hold the square plate horizontally in contact with any side of the pole.
3. Allow the bob to fall downward.

Observe the bob carefully whether the hanging bob touches the pole or stays away. The pole will be exactly vertical, when the bob just touches the pole as shown in Figure .



### Assembling Technical Devices

The technical devices and machines are now widely used in our homes. They have made our life easy and comfortable. We should be able as how to assemble and use them observing certain precautions.

## Preparing LED Light Strings

LEDs are the tiny light emitting bulbs. When a small voltage of 2 to 3 volts is applied across an LED, it starts glowing. Lights of different colours are emitted by different LEDs as shown in (Figure 1).

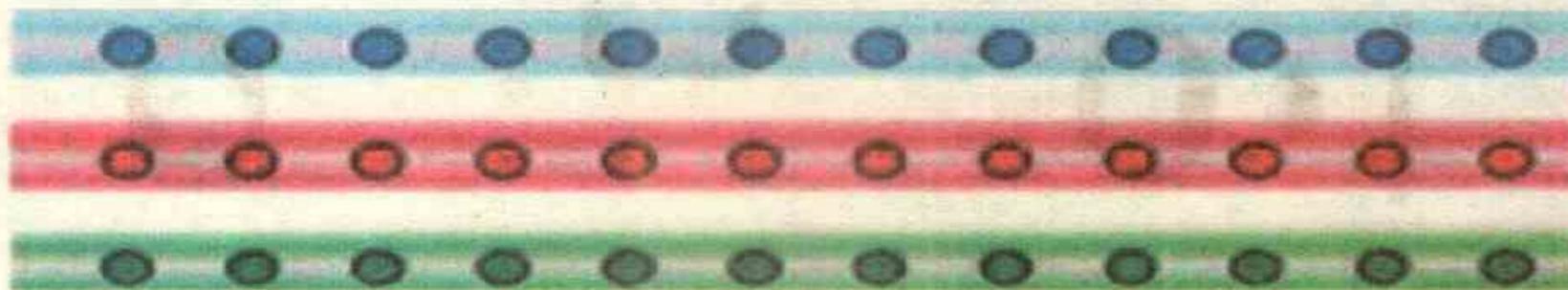


Figure 1

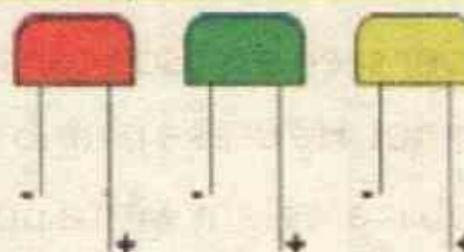


Figure 2

The longer leg (wire) of an LED is positive (+) and the shorter one is negative (-) as shown in Figure 2.

We can prepare decorating LED lights of one or more colours. Here we are going to prepare an LED light string of blue colour that could be lit by 12 V battery.

### Activity 10.5

#### Material Required

32 LED bulbs, 12 V battery, 1 metre long and 5cm wide cardboard strip, a steel nail, connecting wires, a cutter and pliers

1. Take the cardboard strip and make 32 pairs of holes in it at equal distances with the help of a steel nail as shown in (Figure 3).
2. Insert all LEDs in the holes as shown in (Figure 4), keeping positive legs (longer wires.) at one side of the strip and the shorter negative legs at the other side.
3. Join all the 8 positive legs of set 1 together. Similarly, join their negative legs together on the other side. Repeat the same process for set 2, set 3 and set 4.



Figure 3

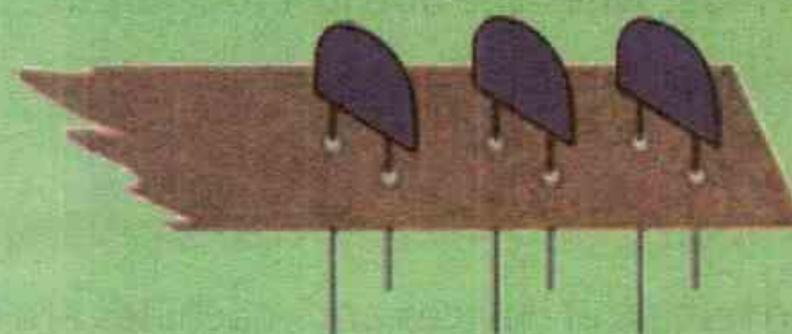


Figure 4

4. Now join negative side of set 1 to the positive side of set 2. In the same way, join negative side of set 2 to the positive side of set 3 and negative side of set 3 to positive side of set 4. Finally, connect positive side of set 1 to the positive terminal of the 12 V battery and negative side of set 4 to the negative terminal of the battery. Yes, your LED lights strip is ready.

#### Observations

- You will observe that when the battery is connected to the LEDs, these start glowing. When the battery is disconnected, LEDs stop glowing.

#### Precautions!

- Make sure that positive legs of all LEDs are at one side of the cardboard strip and the negative legs on the other side. If an LED is not glowing, change its leg sides and check it again. If still it does not glow, it is a faulty LED. Replace it by a new one.
- Never connect this LED lights string to 220 V A.C. The circuits of LED lights string to be operated with 220 V A.C supply are different.

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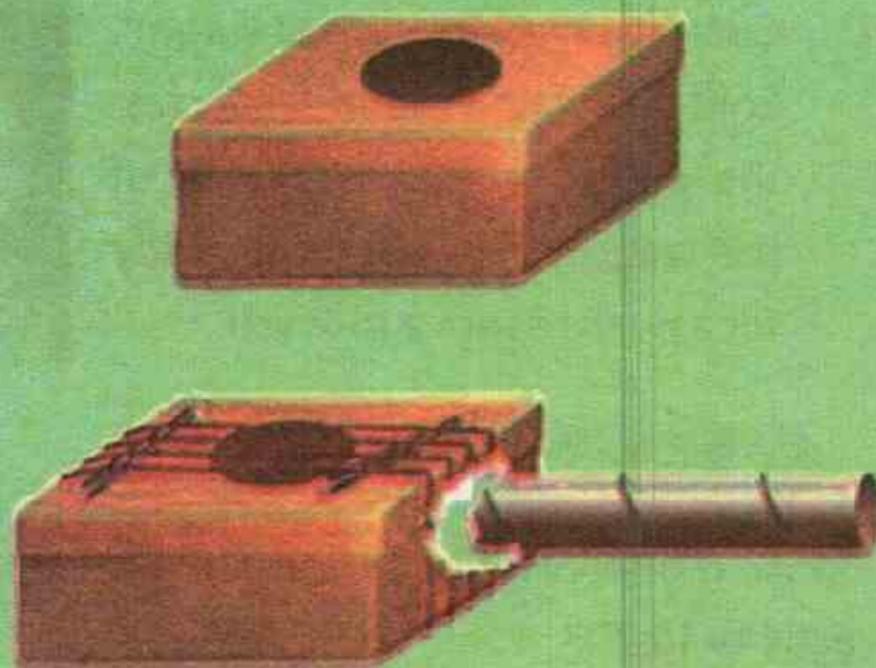
## Making a Musical Instrument

### Activity 10.6

#### What you need:

An empty shoe box, card board tube or pipe, scissors, rubber bands and glue.

- Cut a round hole of about 10 cm diameter on the top of empty shoe box and a small hole on its one side.
- Make small cuts on the tube and join it with the box as shown in the figure.
- Stretch two rubber bands on the box on one side and two more on the other side of the tube.
- Insert two pencils under the rubber bands on the box. Tilt one pencil



slightly to make the lengths of rubber bands effectively different.

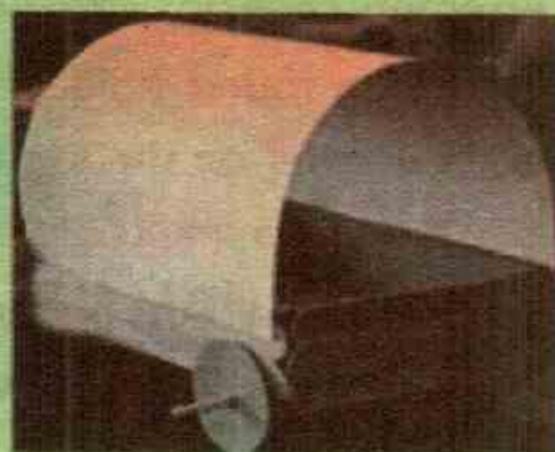
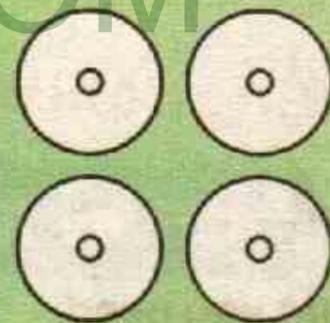
5. Pluck the rubber bands with your finger. Do they produce low and loud tones? This is a simple guitar.

### Making a Model of Movable Wagon

#### Activity 10.7

You will need a cardboard (any old carton), two thin wooden sticks or reeds, scissors, packing tape, coloured paper, white chart paper.

1. Make a sketch of the floor of wagon on a cardboard as shown in the figure.
2. Cut the cardboard along the blue line.
3. Fold the card along the red line. Stick packing tape around them. This is the main structure of the wagon.
4. Make round sketches on the cardboard to make wheels. Cut them with a scissors and drill hole in their centres.
5. Fix two thin wooden sticks or reeds under the wagon body using packing tape or glue.
6. Fix the four wheels on them.
7. Cut a paper of the size of wagon. Fold it as shown and fix it over the wagon to make the roof of the wagon. The wagon is ready for a push to move forward.



#### Activity 10.8

Make model of movable bus and trolley yourself as per similar instructions given in the activity 10.7.

## First Aid

First aid is a temporary care given to a person who has got sudden illness or injury.

## Disaster Management

Management of resources for dealing with emergency situation during the earthquake, fire, flood, etc. is called disaster management.



First Aid Box

### Activity 10.9

#### Dressing a Wound

If a person gets some injury or a wound on any part of the body, it must be dressed to prevent it from infection. Following steps can be taken for dressing a wound:

1. Take a pair of sterile gloves from the First Aid Box and put on your hands.
2. Clean the wound with saline water.
3. Take a sterile bandage from the First Aid Box and place it on the wound.
4. Press the bandage on the wound to stop bleeding.
5. If the bleeding seeps through the bandage, add another bandage on it and keep it pressing.
6. When bleeding stops, take a gauze swab from the First Aid Kit and place it on the wound.
7. Take another gauze swab. Add a few drops of pyodine on it and place it over the swab already placed on the wound.
8. Apply a bandage over the wound and dress it up properly.



## Shifting a Person to Hospital

Hospitals are the places where patients are treated properly. How can we shift a person who has been injured during an accident to the hospital?

Following steps can be taken:

### Step 1

- Support and shift the injured person to some safe place.



### Step 2

- Check if there is bleeding or fracture at any part of his/her body.
- If there is bleeding, apply a bandage using some piece of cloth at the injured part to stop/reduce bleeding.



Bandage to stop bleeding

### Step 3

- Call to emergency ambulance service for help to shift the injured person to hospital.
- Tell the location where the ambulance service needs to reach for picking up the injured person.
- Also tell them about the nearby hospital where the patient can be shifted for emergency treatment.



### Step 4

- On arrival of ambulance, shift the injured person in it.

### Step 5

- Inform the relatives of the injured person at his/her home and tell them about the hospital where he/she is being shifted.

### Activity 10.10

The teacher is requested to provide training to students and conduct a demonstration/rehearsal activity so that students can learn and practise for shifting a person to hospital.

## Earthquake/Flood/Fire Drill

During the earthquake, we need to follow as indicated:



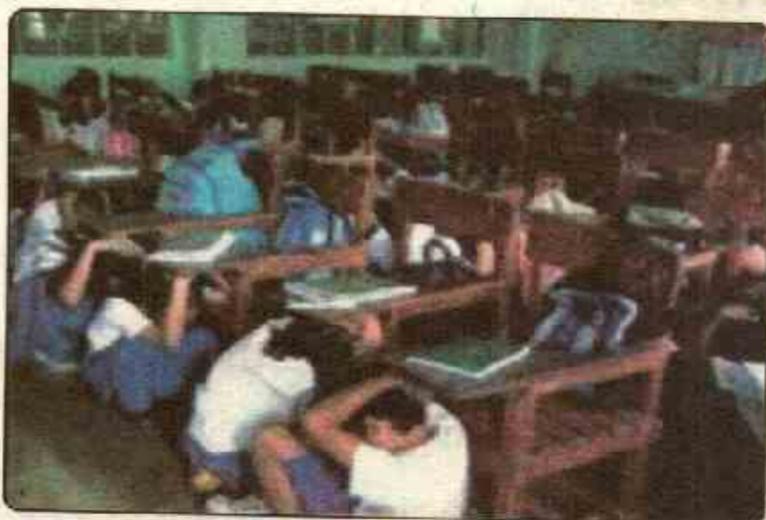
Drop



Cover



Hold on



If you are in classroom



If you are in the lawn

When you are out of danger:



Hold on



Stand up



Exit

### Activity 10.11

1. The teacher is requested to provide training to students and conduct a demonstration/rehearsal activity so that students can learn and practise an earthquake drill.
2. Coordinate with rescue 1122 unit to arrange a training session by them.

### Fire drill

During the fire, we need to follow the emergency procedures as under:

### Activity 10.12

1. On hearing the fire alarm, we should stop what we are doing.
2. Make line behind the teacher and exit the building.
3. Stand away outside the building/classroom.
4. Ask the staff if you need help.

**For Your Information****Fire Extinguisher**

If there is a fire extinguisher in your school then read the printed instructions on it. Use it carefully in case of emergency.

**Key Points**

- Making technical model is a useful skill.
- Spirit level is used to check the level of horizontal surface.
- Mason use a plumb line to keep a wall vertically straight.
- It is essential to know the correct operating method and various precautions for assembling and operating machines and technical tools.
- The knowledge of first aid and natural disasters management practices can save substantial, financial and life losses.



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

Show case	<a href="https://video.nationalgeographic.com/video/short-film-showcase/00000157-70ff-d277-afdf-feff45fd0000">https://video.nationalgeographic.com/video/short-film-showcase/00000157-70ff-d277-afdf-feff45fd0000</a>
LED decorating light	<a href="https://spaceplace.nasa.gov/blue-sky/en/">https://spaceplace.nasa.gov/blue-sky/en/</a>

**Exercise****1. Tick (✓) the correct answer.**

- We check the horizontal surface level:
  - plumb line
  - metre rule
  - spirit level
  - triangle
- What does a mason use to keep a wall vertical?
  - Metre rule
  - Spirit level
  - Triangle
  - Plumb line
- Saline water is used for:
  - cleaning wounds
  - drinking by patients
  - washing hands
  - taking a bath

- iv. Sterile gauze is used:
- |                                     |                           |
|-------------------------------------|---------------------------|
| a. for checking blood pressure      | b. as bandage on wound    |
| c. for finding the body temperature | d. for cleaning workplace |
- v. The emergency phone call number is:
- |         |         |
|---------|---------|
| a. 2211 | b. 1133 |
| c. 1122 | d. 0911 |

**2. Write short answers.**

- i. What do you need to make a model of foot bridge?
- ii. What is difference between the functions of spirit level and plumb line?
- iii. What is an LED?
- iv. You have to install a picture frame on the wall. How it can be kept straight horizontally as well as vertically?
- v. What is meant by first aid?

**3. Constructed Response Questions:**

- i. What sort of tools and equipments are required to make a wooden model?
- ii. How does a musical instrument produce sound?
- iii. Why is it necessary to join long wires of LEDs together and short wires together while preparing a light string?

**4. Investigate:**

You are provided 6 volt battery, one strip of cardboard and 12 blue colour LEDs. How will you make a decorating light?

**5. Project**

Make a model of stretcher with low cost material.

## Glossary

<b>Amphibians:</b>	The vertebrates that can live both on land and in water; their development takes place in water.
<b>Animalia:</b>	A kingdom that contains organisms that cannot make their own food.
<b>Atom:</b>	The smallest particle of a material.
<b>Bacteria:</b>	Are single celled organisms that live in all types of environments; these may be beneficial or harmful.
<b>Biodegradable:</b>	A substance or object capable of being decomposed.
<b>Biodiversity:</b>	The variety of living organisms at any particular place.
<b>Birds:</b>	Vertebrates having feathers and beak and their development takes place through eggs.
<b>Chemical change:</b>	A change that occurs in a matter resulting into a new substance.
<b>Classification:</b>	The arrangement of organisms into separate groups according to their similarities and dissimilarities.
<b>Close circuit:</b>	A complete path for the electric current to flow through it
<b>Condensation:</b>	The change of water vapours into liquid.
<b>Conductor:</b>	The material which allows the electric current or heat to pass through it.
<b>Core:</b>	The central part of the Earth.
<b>Crust:</b>	The outermost layer of the Earth..
<b>Dicot plants:</b>	Plants with two cotyledons in their seeds.
<b>Echinoderms:</b>	Spiny-skinned invertebrates which are found only in the sea.
<b>Electric circuit:</b>	The path of electric current.
<b>Electric current:</b>	Flow of electric charge.
<b>Electromagnet:</b>	A temporary magnet made when electric current passes through a coil around an iron rod
<b>Evaporation:</b>	The process of turning water (liquid) into vapours.
<b>First Aid:</b>	An instant treatment given to an injured person.
<b>Fish:</b>	Vertebrates that live in water and breathe through gills, have scales on their bodies.
<b>Freezing:</b>	When a liquid becomes solid on cooling.
<b>Fungi:</b>	A kingdom that contains many celled organisms that obtain food by absorbing nutrients from the place where they live.
<b>Fuse:</b>	A piece of thin wire inserted in an electric circuit or appliance for safety purpose.
<b>Humus:</b>	The matter in the soil made up from dead plants and animals.
<b>Insects:</b>	Invertebrate animals having jointed legs.
<b>Insulator:</b>	The material which does not allow to pass electric current or heat through it.

<b>Luminous objects:</b>	The objects which emit their own light.
<b>Magnetic Compass:</b>	A device to locate the directions.
<b>Magnetic objects:</b>	The objects which are attracted by a magnet.
<b>Mammals:</b>	Animals that give birth to young ones and feed them.
<b>Mantle:</b>	The part of the Earth in between the crust and core.
<b>Melting:</b>	When a solid becomes liquid on heating.
<b>Micro-organisms:</b>	Small organisms that can be seen only under a microscope.
<b>Microscope:</b>	An instrument used to see objects that are too small to be seen by the naked eyes.
<b>Molluscs:</b>	Soft-bodied invertebrates; in some of them the body is enclosed in a shell.
<b>Monera:</b>	A kingdom that contains single celled organisms such as bacteria.
<b>Monocot plants:</b>	Plants with one cotyledon in their seeds.
<b>Noise:</b>	An unpleasant sound.
<b>Non-biodegradable:</b>	A substance or object not capable of being decomposed.
<b>Opaque object:</b>	The object which does not allow light to pass through it.
<b>Open Circuit:</b>	It is an electric circuit with switch OFF and current does not flow through it.
<b>Pathogen:</b>	Microorganism that causes diseases.
<b>Physical change:</b>	A change that occurs in a matter resulting into no new substance.
<b>Planet:</b>	A heavenly objects which revolves round another bigger heavenly object due to its gravity.
<b>Plantae:</b>	A kingdom that contains organisms that are usually green in colour and make their own food.
<b>Plumbline:</b>	A device used to construct a wall vertically straight.
<b>Pollination:</b>	The transfer of pollen grain from anther to the stigma.
<b>Protista:</b>	A kingdom that contains organisms that have characteristics of both plants and animals such as bacteria.
<b>Reproduction:</b>	The biological process by which new offspring are produced by their parents.
<b>Reptiles:</b>	Vertebrates with thick, scaly and dry skin, whose development takes place through eggs.
<b>Satellite:</b>	A heavenly body which moves around the Earth or any other planet.
<b>Shadow:</b>	The dark shade formed behind an opaque object when light falls on it.
<b>Spirit level:</b>	A device to check the level of a horizontal surface.
<b>Sponge:</b>	Invertebrate aquatic animals that have bodies full of pores.
<b>Static electricity:</b>	The kind of electricity which does not flow in a circuit.
<b>Translucent objects:</b>	The objects which allow light partially to pass through them.
<b>Transparent object:</b>	The object which allows light to pass through it.
<b>Virus:</b>	Are small infectious particles having characteristics of both living and non-living organisms.
<b>Worms:</b>	Invertebrate animals that have thin, soft bodies.

### Authors Profile

- **Prof. Jawaid Mohsin Malick** did his post-graduation in Zoology with specialization in Entomology from Dhaka University. He taught various classes for more than forty five years in various capacities. He has also worked as Education Officer, in Nigeria for four years. He served as lecturer in Quaid-e-Azam College and Notre Dame College Dhaka. He is a former head of the department of Zoology, F.G. Postgraduate College, H-8, Islamabad, where he served for more than twenty five years. He is also a former Principal of Federal Government College and Director of Administration, Federal Directorate of Education, Islamabad. He published four research papers and many articles. He is co-author and managing author of more than forty five textbooks on General Science and Biology. He has also served as a National Consultant, Science Education.
- **Prof. Muhammad Ali Shahid** was conferred the Presidential Award "Izaz-e-Fazeelat" in 1999 for distinguished author and educationist and Governor Punjab Education Gold Medal in 2001 for developing Science Curricula 2000. He also received a letter of commendation from President of Pakistan for drafting the Physics Curriculum 2006. He served the Punjab Textbook Board as Director (Technical) from 2003 to 2007. Prior to that, he taught Physics for 30 years in various institutions of repute in Pakistan and abroad. He is co-author and editor of more than 40 books on physics, general science and environmental studies. He served as a resource person for various teachers' training workshops at Provincial and Federal level.