

OXFORD  
SCHOOL EDUCATION

Aligned to  
Bloom's  
Taxonomy and  
NCERT  
Learning  
Outcomes

REVISED

# NEW SCIENCE IN EVERYDAY LIFE

VAISHALI GUPTA | SHALINI BAJAJ | SUPRIYA D SESHADRI

6



# Contents

## UNIT 1 Food

- 1. Food: Where Does it Come From? 11
- 2. Components of Food 23
- Worksheet 1* 37
- STE(A)M activity* 38

## UNIT 2 Materials

- 3. Separation of Substances 39
- 4. Fibre to Fabric 52
- 5. Sorting Materials into Groups 62
- 6. Changes Around Us 72
- Worksheet 2* 82

## UNIT 3 The World of the Living

- 7. Things Around Us 83
- 8. Getting to Know Plants 96
- 9. Form and Movement in Animals 111
- 10. Habitat of the Living 124
- Worksheet 3* 139

## UNIT 4 Moving Things, People, and Ideas

- 11. Measurements and Motion 140

*Worksheet 4* 157

## UNIT 5 How Things Work

- 12. Fun with Magnets 158
- Worksheet 5* 170

## UNIT 6 Natural Phenomena

- 13. Light, Shadows, and Reflection 171
- 14. Electricity and Circuits 182
- Worksheet 6* 195
- STE(A)M activity* 196

## UNIT 7 Natural Phenomena

- 15. Water and its Importance 197
- 16. Air Around Us 211
- 17. Garbage In, Garbage Out 222
- Worksheet 7* 233
- STE(A)M activity* 234
- Science Fair* 235
- Semester Test Papers* 236-239
- Timeline* 240

Oxford  
Areal

**Oxford Areal** is a magical app that makes your textbook come alive! The digital content of this book can be accessed by scanning this page (page 6).

Setting up and using the free Oxford Areal app is easy. Simply follow the steps given below.

1

Search and install the free Oxford Areal app from the App Store (iOS)/Play Store (Android).

2

Run the app and locate your book using the SEARCH box.

3

Tap the book cover to select it.

4

Tap GET THIS BOOK.

5

Tap SCAN and scan this page (page 6). Tap DOWNLOAD to save the complete Oxford Areal content for this book to your device.

6

Once you have scanned and downloaded the assets, you will be able to view the full digital content offline. To do so, simply tap the cover of the book and then the scanned page.



## 1

## UNIT 1: Food

## Food: Where Does it Come From?

Bankim's mother is making fish curry and rice. He likes to eat his fish curry and rice with vegetable salad. Identify the food group each of them belong to, from the list given below.

## You will learn about

- Food from plants
- Food from animals
- What do animals eat?

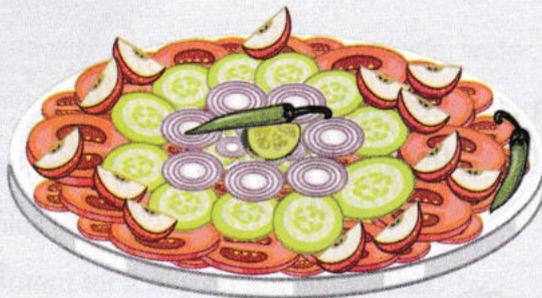
Fruits, Vegetables, Cereals, Meat, Milk products



1. Rice: \_\_\_\_\_



2. Fish curry: \_\_\_\_\_



3. Salad: \_\_\_\_\_

We get our food from both plants and animals. Thus, plant parts and animal products are our main sources of food.

Answers: 1. Cereals; 2. Meat; 3. Fruits, vegetables

## FOOD FROM PLANTS

LL

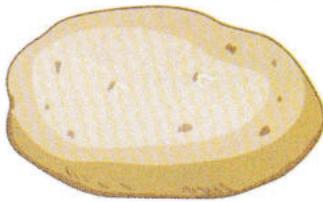
Green plants are known as producers because they prepare their own food. They use light, air (carbon dioxide), water, and chlorophyll (the green pigment present in leaves) to prepare their food by the process of photosynthesis.

Different plant parts serve as sources of food for us. Fruits, vegetables, cereals, and pulses that we eat are obtained from different parts of a plant.

### Word help

**Pigment** A substance giving a characteristic colour

**Roots** Roots of plants, such as carrot, radish, turnip, sweet potato, and beetroot, are eaten by us (Fig. 1.1).



(a) Potato

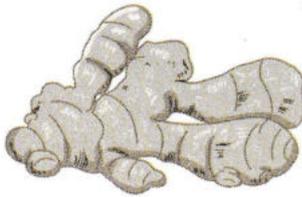


(a) Radish



(b) Beetroot

Fig. 1.1 Roots we eat



(b) Ginger

**Stems** Stems of certain plants are eaten by us. For example, the stem of sugar cane plant is eaten and is also used to make sugar. The stem and flower of banana plant is cooked and eaten in different parts of India. Certain plants have underground stems that we eat. Examples are potato and ginger (Fig. 1.2).

Fig. 1.2 Underground stems we eat

**Leaves** Leaves of plants, such as lettuce, spinach, cabbage, and fenugreek (*methi*), are eaten by us (Fig. 1.3).



(a) Spinach



(b) Cabbage

Fig. 1.3 Leaves we eat



(a) Cauliflower



(b) Broccoli

Fig. 1.4 Flowers we eat

**Flowers** Flowers of plants, such as cauliflower, broccoli, and banana, are also eaten by us (Fig. 1.4).

**Seeds** Pulses, such as *mung* bean, kidney bean, chickpea, as well as cereals, such as wheat, maize, and rice, which we eat are seeds of plants (Fig. 1.5). Wheat grains are ground to make flour (*atta*) that is used to make chapattis. We also use the seeds of certain plants, such as cumin, coriander, pepper, and cardamom, as spices, to add flavour to our food.

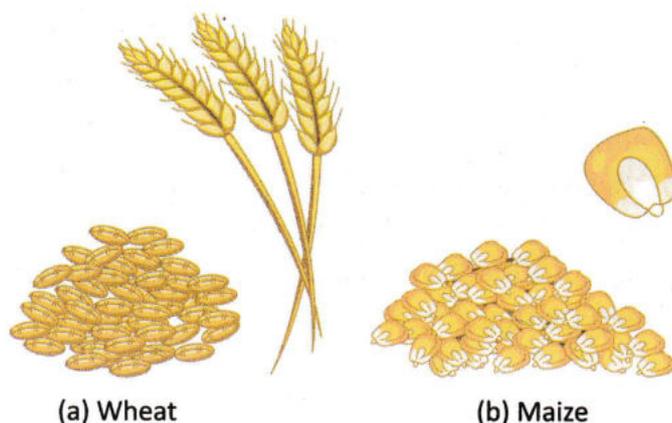


Fig. 1.5 Seeds

Sprouted seeds (or sprouts) of *mung* bean and chickpea (Bengal gram) are very nutritious. Sprouting involves soaking seeds, draining the water, and then leaving them till they germinate. Sprouts can be eaten raw as salad or cooked.

**Fruits and vegetables** Plants also provide us fruits and vegetables (Fig. 1.6). Apple, banana, and mango are common fruits. There are other fruits, such as brinjal and tomato, which are eaten either cooked or raw and are termed as vegetables.

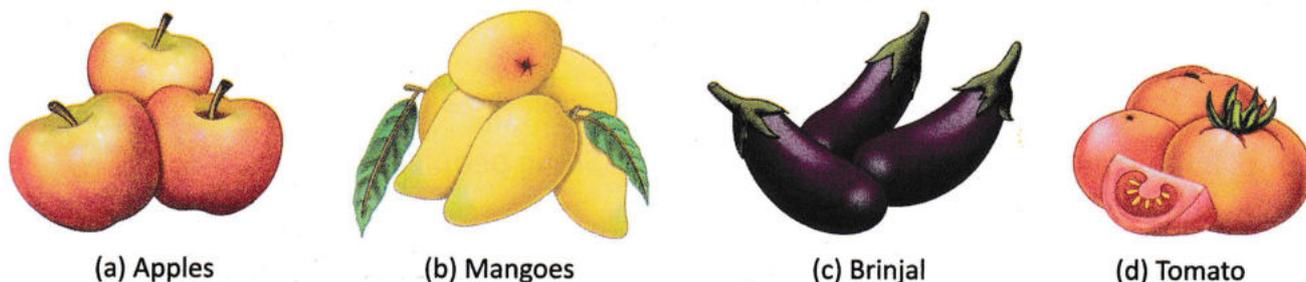


Fig. 1.6 Fruits and vegetables

### Activity

**Aim:** To observe sprouting in seeds

**Materials needed:** A petri dish, a handful of *mung* seeds, water, and blotting paper

**Method:**

1. Soak *mung* seeds in water inside the petri dish.
2. Leave the arrangement overnight on a window sill.
3. Next morning, drain the water and place the soaked seeds on a blotting paper inside the petri dish.
4. Leave the arrangement for a day on the window sill.
5. In case it is very hot, sprinkle a bit of water on the blotting paper. Observe what happens to the seeds after two days.

**Observation:** Thin, tiny, white thread-like structures come out from the seeds. (Sprouting is much faster in rainy and summer seasons than in winters.)

**Conclusion:** The seeds start sprouting when they get the right amount of air, water, and warmth.

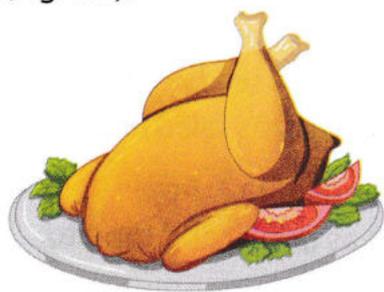
Like different plant parts, animals too serve as sources of food. Let us learn about the main food products obtained from animals.

## FOOD FROM ANIMALS

LL

Animal products such as meat, egg, honey, milk, cheese, butter, and curd are eaten by human beings.

**Meat** People commonly eat meat of animals such as goat, chicken, fish, and prawns (Fig. 1.7).



Chicken



Fish

Fig. 1.7 Animals give us meat.

**Egg** Hen's egg is the most common bird egg eaten in the world. It is a rich source of proteins and vitamins. Some people also eat eggs of goose and duck.

**Honey** Honey is a sweet liquid made by bees from the nectar of flowers (Fig. 1.8). Honey is collected from beehives. It is used in cooking and also has medicinal value.

**Milk** Milk is obtained from animals such as cow, buffalo, camel, and goat. It is a very nutritious food item and is a rich source of protein. Milk also contains calcium that is required for proper growth of teeth and bones, and for nerve functioning (Fig. 1.9).



Fig. 1.8 Honey



Ghee



Butter



Curd

Fig. 1.9 Milk products

### Green corner

Take only as much food on your plate that you know you will really be able to eat. You must not waste food.

### Fact File

People living in deserts also drink camel's milk. In ice-cold places, people mostly have yak's milk.

Products made from milk are known as *dairy products*. Some common dairy products are discussed below.

**Paneer (cottage cheese)** Paneer can be made by adding lemon juice or vinegar to hot milk. This process is called *curdling*. This results in the separation of milk into solid and liquid parts. Then, the liquid portion of milk is drained off and the solid part forms paneer.

**Cheese** Cheese is made from the curdled milk of cow, goat, sheep, or buffalo.

**Cream** Cream is made by collecting the top fatty layer of the milk.

**Butter** Butter is made by **churning** fresh cream.

**Ghee** Ghee is made by gently heating butter and removing the solid matter.

**Curd** Common methods of making curd include adding a small sample of curd in warm milk. The **microorganisms** (bacteria) present in the curd sample turn the milk into curd.

### Let's Discuss

Human beings eat a large variety of animal products. Discuss some such products that have not been mentioned in the chapter.

### Word help

**Microorganisms** Tiny organisms that can be seen only with the help of a microscope

**Churning** Stirring vigorously

### Know your Scientist

**Dr. Verghese Kurien** was a social entrepreneur, who started the largest agricultural development project in the world known as the **Operation Flood**. This development project was aimed at increasing the milk production in India, making India the world's largest producer of milk.

He is thus also known as the **Milkman of India** or the **Father of White Revolution**. He founded the dairy cooperative movement, which later came to be known as Amul.



### Let's Remember

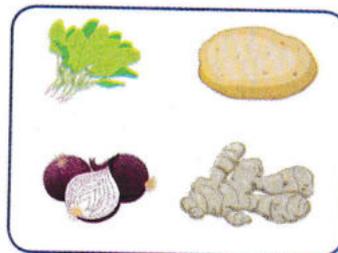


Circle the odd one out in each of the following. Give one reason for your choice.

1.



2.



3.



Unlike green plants, animals cannot make their own food. They depend on plants and other animals for food.

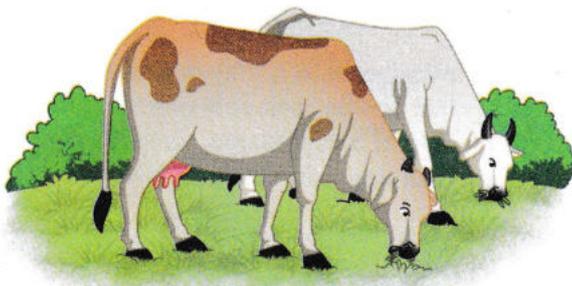
## WHAT DO ANIMALS EAT?

LL

Different animals have different feeding habits. Based on their feeding habits, animals can be divided into three groups: herbivores, carnivores, and omnivores.

### Herbivores

*Herbivorous animals* or *herbivores* (*herbi*, plant; *vore*, eater) eat only plants and plant products. Cows, deer, horses, giraffes, squirrels, and butterflies are examples of herbivores (Fig. 1.10).



(a) Cow



(b) Squirrel

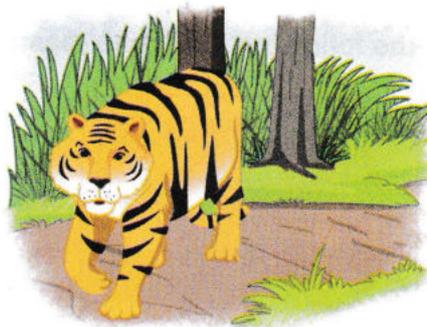
Fig. 1.10 Herbivores

### Special Characteristics of Herbivores

- Herbivores such as cow, horse, and goat have wide, blunt teeth. Such teeth are suitable for pulling plants off the ground and grinding them.
- Herbivores such as cow and goat have the ability to bring back previously swallowed food to the mouth for chewing it the second time. This helps them to absorb most of the nutrients from hard-to-digest food, such as grass.
- Squirrels have a pair of broad, sharp edged front teeth (incisors) in each jaw. They use these teeth to gnaw food items such as nuts.
- Insects such as butterflies do not need to worry about chewing their food. They have mouth-parts shaped like a straw to suck nectar from flowers.

### Carnivores

*Carnivorous animals* or *carnivores* (*carni*, meat; *vore*, eater) eat only the flesh of other animals. Lion, tiger, jackal, owl, eagle, snake, and spider are examples of carnivores (Fig. 1.11).



(a) Tiger



(b) Eagle

Fig. 1.11 Carnivores

### Special Characteristics of Carnivores

- Carnivores such as lion and tiger have sharp and pointed front teeth (canines). They also have sharp claws and powerful jaws, which help them to tear flesh.
- Carnivorous birds such as eagle and hawk have curved, pointed beaks that allow them to tear flesh.
- Carnivores such as chameleon and frog have a long, sticky tongue that they use to catch insects.
- Carnivorous fish such as shark have several small, sharp teeth that help them bite off chunks of flesh.
- Carnivores such as snakes swallow their **prey** whole.

### Omnivores

*Omnivorous animals or omnivores (omni, all; vore, eater)* are those that eat both plants and the flesh of other animals. Bear, raccoon, crow, and human beings are examples of omnivores (Fig. 1.12).

### Special Characteristics of Omnivores

- Omnivores such as bear and human beings have different types of teeth that help them to eat both plants and the flesh of other animals.
- Omnivorous birds such as crow have sharp and pointed beak that helps them to eat a variety of food.

### Scavengers and Decomposers

Instead of hunting live animals, some birds and animals eat the flesh of other animals that are already dead. Vulture is one such bird. These animals or birds are called *scavengers*.



Fig. 1.13 Fungi

### Word help

**Prey** An animal that is hunted or killed for food



Fig. 1.12 Bear

Some organisms feed on and degrade (or decompose) dead plants and animals. Fungi (Fig. 1.13) and bacteria are examples of such organisms. These organisms are called *decomposers*.

Together with scavengers, decomposers play a very important role in nature. Without these organisms, our planet would be covered with dead plants and animals.

## Let's Remember



Give one reason for the following.

1. Cows and horses have wide, blunt teeth.
2. Squirrels have broad, sharp edged front teeth in each jaw.
3. Eagles and hawks have curved pointed beaks.
4. Tigers and lions have sharp claws and powerful jaws.

## Key Words

- Herbivore** An animal that eats only plants and plant products is called a herbivore.
- Carnivore** An animal that eats only the flesh of other animals is called a carnivore.
- Omnivore** An animal that eats both plants and flesh of other animals is called an omnivore.
- Scavenger** An animal that eats only the flesh of animals that are already dead is called a scavenger.
- Decomposer** An organism that feeds on and decomposes dead plants and animals is called a decomposer.

## Summary

- Different plant parts such as root, stem, leaf, flower, and fruit serve as sources of food.
- Animal products such as meat, egg, honey, milk, curd, cheese, butter, and ghee are eaten by human beings.
- Herbivores have wide blunt teeth that help them to grind and chew plants.
- Carnivores have sharp teeth and claws, which help them to tear flesh.
- Omnivores have different types of teeth that help them to eat both plants and animals.

# Exercises

## LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with the correct words.

1. Green plants are known as \_\_\_\_\_ (producers/consumers) because they prepare their own food.
2. The stems of \_\_\_\_\_ (sugar cane/bamboo) plant is used to make sugar.
3. \_\_\_\_\_ (Honey/Milk) is collected from beehives and has medicinal value.

4. \_\_\_\_\_ (Cheese/Butter) is made by churning fresh cream.
5. A \_\_\_\_\_ (scavenger/decomposer) feeds on the flesh of dead animals.

**B. Choose the correct option.**

1. The flowers of which of these plants are eaten as vegetables?
  - a. Broccoli and cauliflower
  - b. Banana
  - c. Cabbage and Ginger
  - d. Both (a) and (b)
2. The seeds of this plant are used as spices.
  - a. Wheat
  - b. Cumin
  - c. Maize
  - d. Chickpea
3. Which of these is made if you put a few drops of lemon juice in hot milk?
  - a. Curd
  - b. Butter
  - c. Ghee
  - d. Paneer
4. This food product is obtained from beehives.
  - a. Honey
  - b. Eggs
  - c. Nectar
  - d. Milk
5. Which of these do herbivores depend on for their food?
  - a. Plants
  - b. Flesh of other animals
  - c. Dead plants and animals
  - d. All of these
6. Which of the following animals is a carnivore?
  - a. Butterfly
  - b. Spider
  - c. Honey bee
  - d. Squirrel
7. Which of these animals have sharp-edged front teeth?
  - a. Snakes
  - b. Squirrels
  - c. Tigers
  - d. Cows
8. Which of these animals swallow their prey whole?
  - a. Snakes
  - b. Butterflies
  - c. Eagle
  - d. Elephants
9. Which of these animals decompose dead plants and animals?
  - a. Crows and raccoons
  - b. Fungi and bacteria
  - c. Vultures and hawks
  - d. Raccoons and Chameleons
10. Which of the following birds has a sharp and pointed beak?
  - a. Eagle
  - b. Hawk
  - c. Crow
  - d. None of them

**II. Very short answer type questions.**

**A. Give one word for the following.**

1. The green pigment present in leaves of green plants \_\_\_\_\_
2. The process by which plants prepare their own food \_\_\_\_\_
3. Products obtained from milk \_\_\_\_\_
4. The process by which milk gets separated into solid and liquid parts \_\_\_\_\_
5. Organisms that decompose dead plants and animals \_\_\_\_\_

**B. Give two examples for the following.**

1. Roots that we eat as vegetables \_\_\_\_\_, \_\_\_\_\_
2. Stems that we eat as vegetables \_\_\_\_\_, \_\_\_\_\_
3. Leaves that we eat as vegetables \_\_\_\_\_, \_\_\_\_\_

4. Seeds that are eaten after sprouting \_\_\_\_\_, \_\_\_\_\_

5. Animals that give us eggs \_\_\_\_\_, \_\_\_\_\_

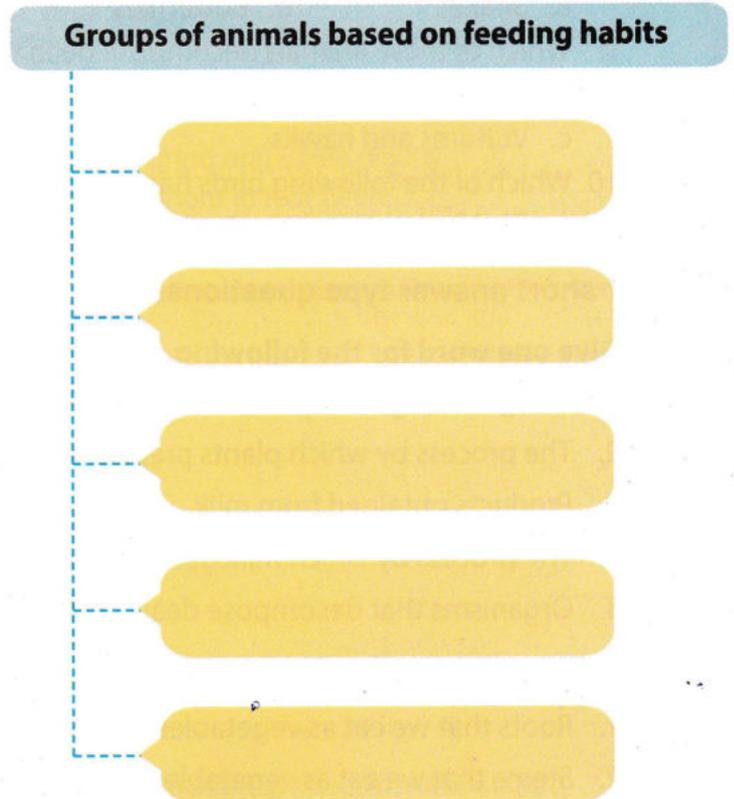
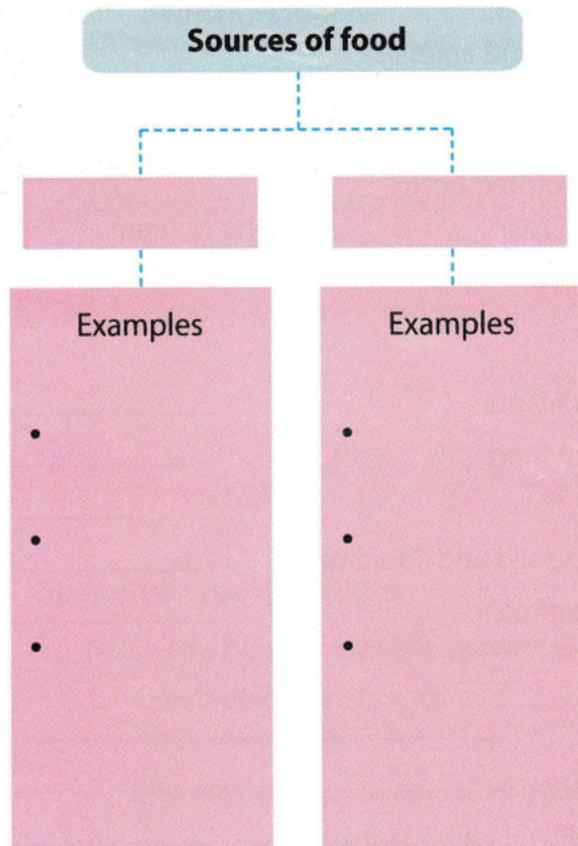
### III. Short answer type questions.

1. What are the main sources of food?
2. What is sprouting?
3. Why do we need to have calcium rich foods?
4. How do we commonly make curd at home?
5. Define the following terms.
  - a. Herbivores
  - b. Carnivores
  - c. Omnivores

### IV. Long answer type questions.

1. Describe, with examples, how plants are an important source of food.
2. What are milk products? With the help of paneer and curd, explain how we get them.
3. Classify animals based on the type of food they eat. Explain each group in detail.
4. Write a note on the type of teeth found in the following groups of animals.
  - a. Herbivores
  - b. Carnivores
  - c. Omnivores
5. Differentiate between scavengers and decomposers with examples.

## LET'S RECALL







1. Interview your family members and make a list of their favourite Indian foods. Then find out the region that those foods belong to, and make a colourful chart to show the diversity in the food culture of India. You could even paste a map of India and mark the regions from where each foodstuff originates. 
2. In groups of five, create a presentation on any one dairy product. Explain the various processes involved in making that product from milk. You could research on the internet and collect pictures. You could also create a pictorial report showing the process.   
3. Select any five animals to make a report, describing the kind of food they eat. Find out any special feature that they may have to catch and eat their food. Then classify them into categories based on their feeding type. You could also create a scrapbook with pictures of the animal and a list of its features.   

### Web Research

- Browse the internet and do a brief research on the food culture of different regions of India and prepare a report or a chart. Suggested websites:  
<http://www.nhcgroupp.com/indian-food-culture/> (accessed and checked on 12-08-2019)  
<https://theculturetrip.com/asia/india/articles/10-traditional-indian-dishes-you-need-to-try/>  
(accessed and checked on 12-08-2019)
- Browse the internet and find out the role microorganisms play in formation of cheese. Find out the names of microbes, and the stages when they are added during cheese production. Suggested websites:  
[https://microbewiki.kenyon.edu/index.php/Microbial\\_processes\\_of\\_cheese\\_production](https://microbewiki.kenyon.edu/index.php/Microbial_processes_of_cheese_production)  
(accessed and checked on 12-08-2019)  
<http://www.milkfacts.info/Milk%20Processing/Cheese%20Production.htm>  
(accessed and checked on 12-08-2019)



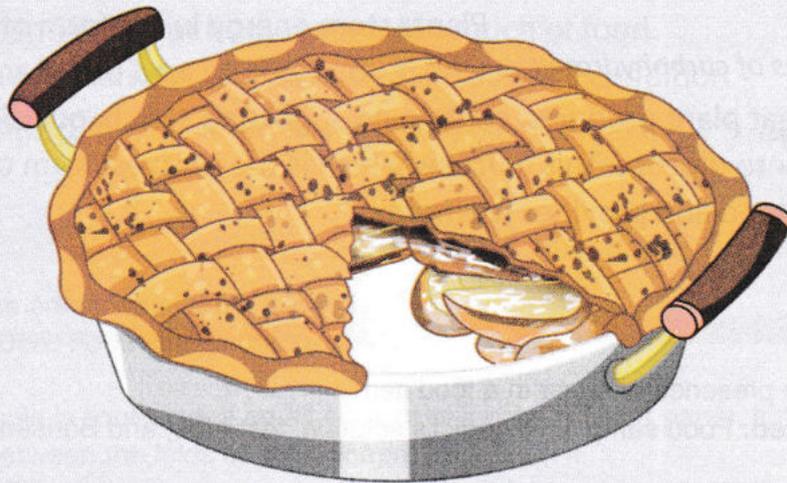
# 2

## Components of Food

Ruby has baked an apple pie for her sister.

### You will learn about

- Components of food
- Balanced diet
- Deficiency diseases



Identify the main nutrients present in each ingredient added to the apple pie.

- (i) Eggs: \_\_\_\_\_
- (ii) Flour: \_\_\_\_\_
- (iii) Butter: \_\_\_\_\_
- (iv) Sugar: \_\_\_\_\_
- (v) Apples: \_\_\_\_\_

Do you think any nutrient is missing in this dish? (Yes/No) \_\_\_\_\_

Food is essential for all animals, including human beings. The food that we eat contains different components. Let us learn more about the various components of food and their importance.

Answers: (i) Eggs: protein; (ii) Flour: Carbohydrates; (iii) Butter: Fat; (iv) Sugar: Carbohydrates; (v) Apples: Vitamins and minerals.

## COMPONENTS OF FOOD

The food that we eat consists of different components or nutrients. **Nutrients** are substances that are needed by our body for proper growth and healthy body function. There are six main components present in food: *carbohydrates, fats, proteins, vitamins, minerals, and roughage or dietary fibres*. These nutrients fulfill different needs of the body.



**Fig. 2.1** Sources of carbohydrates

### Carbohydrates

Carbohydrates provide energy to your body, which keeps it going throughout the day. There are two major types of carbohydrates in food: sugar and starch.

**Sugar** Sugar is also called simple carbohydrate. Fruits, honey, and table sugar are sources of sugar.

**Starch** Starch is also called complex carbohydrate. Plants store energy in the form of starch. Rice, wheat, corn, potato, and bread are sources of starch

(Fig. 2.1). When we eat plant products, containing sugar and starch, our digestive system breaks them down into glucose. This glucose, which is the simplest form of sugar, is then absorbed into the blood and provides us energy.

### Activity

**Aim:** To test the presence of sugar in a food item

**Materials needed:** Food sample, Benedict's solution, test tube, and Bunsen burner

**Method:**

1. Crush a small amount of the food sample (if solid) and put it in the test tube.
2. Add some water to the test tube and shake it.
3. Add a few drops of Benedict's solution to the test tube. Heat it for about 1 minute.

**Observation:** Depending on the amount of sugar present, Benedict's solution (which is blue) turns green (low sugar content), yellow (medium sugar content), or brick-red (high sugar content).

**Conclusion:** Change in the colour of Benedict's solution confirms the presence of sugar.

### Activity

**Aim:** To test the presence of starch in a food item

**Materials needed:** Food sample, dilute iodine solution, test tube, and Bunsen burner

**Method:**

1. Crush a small amount of the food sample (if solid) and put it in the test tube.
2. Add some water to the test tube and shake it.

3. Next, heat the test tube for about 1 minute. After the test tube has cooled down, add a few drops of dilute iodine solution to it.

**Observation:** The food sample turns bluish-black.

**Conclusion:** Change in the colour of food sample to bluish-black confirms the presence of starch.

## Fats

Fats too provide us energy. They are of two types: saturated and unsaturated. *Saturated fats* are normally solid at room temperature (e.g., butter and ghee), whereas *unsaturated fats* are mostly liquid at room temperature (e.g., vegetable oil). Meat, oil, ghee, nuts, butter, and cheese are sources of fats. Milk, fish, and egg also contain fats (Fig. 2.2).

Though fats are essential for our body, eating too much of food items rich in fats can be harmful. Excess body fat leads to a condition called *obesity*. Obesity may also lead to heart diseases.



Fig. 2.2 Sources of fats

## Activity

**Aim:** To test the presence of fat in a food item

**Materials needed:** Food sample and a sheet of filter paper

**Method:**

If the food sample is liquid, rub a small amount of it onto the filter paper. If the food sample is solid, keep it between the folds of a filter paper and crush it.

**Observation:** Oily stain appears on the filter paper if fat is present in the food item.

**Conclusion:** The appearance of oil stain confirms the presence of fats.



Fig. 2.3 Sources of proteins

## Proteins

Proteins are needed by our body for muscle-building and repairing worn-out tissues. Our muscles, organs, and even blood are made up of mostly proteins. If we do not eat proteins, our body will not be able to repair damaged cells, or build new ones. Proteins in our diet come from both animal and plant sources. Meat, fish, egg, and milk are animal sources of proteins (Fig. 2.3). Pulses, soyabeans, grams, and nuts are plant sources of proteins.

## Activity

**Aim:** To test the presence of proteins in a food item

**Materials needed:** Food sample (egg white), copper sulphate solution, sodium hydroxide, test tube, and Bunsen burner

**Method:**

1. Take a small amount of the food sample (egg white) and put in the test tube.
2. Add some water to the test tube and shake it.
3. Next, heat the test tube for about 1 minute.
4. After the test tube has cooled down, add two drops each of copper sulphate solution and sodium hydroxide to it.

**Observation:** The food sample turns purple or violet.

**Conclusion:** Change in colour of the food sample to purple or violet confirms the presence of proteins.

## Vitamins

Vitamins are needed for the proper functioning of our body. They help in keeping our eyes, bones, teeth, and gums healthy. There are 13 vitamins, each of which has a specific function. Vitamins are of two types: fat-soluble and water-soluble.

**Fat-soluble vitamins** Vitamins A, D, E, and K are fat-soluble vitamins. These are stored in the fat tissues of our body and are used only when the body needs them. Our body prepares vitamin D in the presence of sunlight.

**Water-soluble vitamins** Vitamins B1, B2, B3, B6, B12, and folic acid (together known as vitamin B complex) and vitamin C are water-soluble vitamins. Since water-soluble vitamins are not stored in the body, these need to be regularly supplied through food items, such as citrus fruits, spinach, and other green leafy vegetables. Lack of vitamins in the body can cause deficiency diseases.

## Minerals

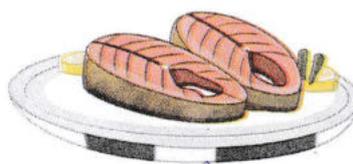
Just like vitamins, minerals also help our body to stay healthy. Minerals perform important functions such as formation of



Dairy products such as milk and cheese are rich in calcium.



Green leafy vegetables such as spinach are rich in iron.



Fish is rich in iodine and magnesium. Iodized salt contains iodine.



Citrus fruits such as oranges are rich in potassium.

Fig. 2.4 Sources of minerals

bones, teeth, and blood cells and helps in maintaining a normal heartbeat. Minerals are of two types: macrominerals and trace minerals.

**Macrominerals** (*macro: large*) These are needed by the body in larger amounts as compared to trace minerals. Calcium, magnesium, sodium, and potassium are examples of macrominerals.

**Trace minerals** These are needed by the body in very small amounts. Iron, zinc, copper, and iodine are examples of trace minerals.

### Roughage or Dietary Fibres

The portion of the plant food that remain undigested and do not provide any nutrients to our body, but provides bulk to our food, is called *roughage* or *dietary fibres* (Fig. 2.5). However, roughage helps in maintaining a healthy digestive system.

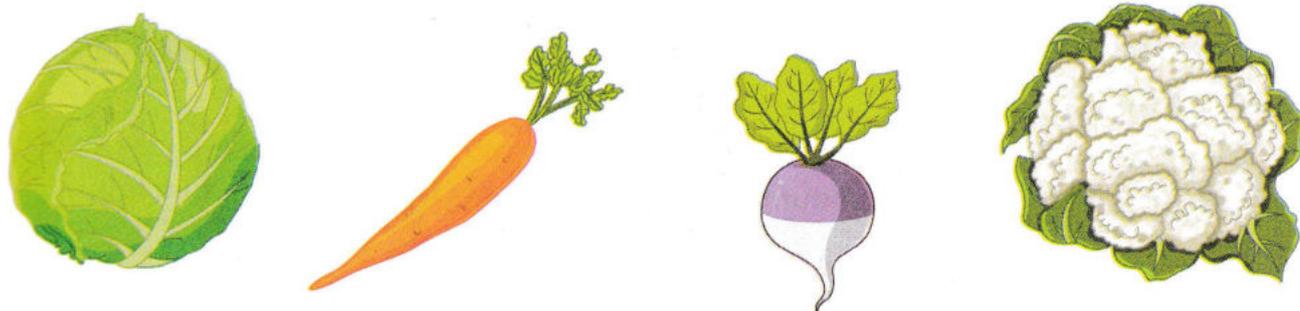


Fig. 2.5 Vegetables that contain roughage

Dietary fibres or roughage is of two types: soluble and insoluble. Soluble fibres are soluble in water, whereas insoluble fibres are not. Apple, strawberry, peach, and rice are examples of food items rich in soluble fibres. Whole grain, carrot, cabbage, turnip, and cauliflower are examples of food items rich in insoluble fibres. Lack of insoluble fibres in the diet causes the stool to become hard and difficult to pass. This condition is called *constipation*.

### Water

Almost 70% of our body weight is water. Water is needed by our body for good health.

- It helps to transport substances inside our body.
- It helps our body to absorb nutrients from food.
- It helps to regulate our body temperature.
- It is needed for various chemical reactions, such as digestion and excretion, which take place inside our body.

We get water not only from the liquids we drink but also from the food we eat. Milk, fruits, vegetables, and juices are good sources of water. We need to drink at least two to three litres of water per day to keep healthy.

#### Let's Discuss

It is important to have at least two to three litres of water every day. Discuss.

## Let's Remember



Unjumble names of foodstuffs given below. Also write the main nutrient in each of them.

- |                     |                 |
|---------------------|-----------------|
| 1. TEAM: _____;     | Nutrient: _____ |
| 2. TORI: _____;     | Nutrient: _____ |
| 3. TURBET: _____;   | Nutrient: _____ |
| 4. RANGEORS: _____; | Nutrient: _____ |
| 5. RACTOR: _____;   | Nutrient: _____ |
| 6. LAD: _____;      | Nutrient: _____ |
| 7. NOHEY: _____;    | Nutrient: _____ |

Out of these, which ones contain simple carbohydrates? \_\_\_\_\_

Which one contains complex carbohydrates? \_\_\_\_\_

Which of them will turn copper sulphate solution and sodium hydroxide purple? \_\_\_\_\_

## BALANCED DIET



Our diet must contain adequate amount of different nutrients for our body to function properly.

*A diet that contains adequate amount of different nutrients in the right proportions along with roughage and water required for the healthy functioning of our body is called a **balanced diet**.*

A balanced diet must include food items from the following four food groups.

- Milk group: includes milk and milk products
- Meat group: includes meat (chicken, fish, lamb, etc.) and meat substitutes (beans, peas, nuts, and seeds)
- Fruit and vegetable group: includes fruits and vegetables
- Grain group: includes breads and cereals

## DEFICIENCY DISEASES



Lack of carbohydrates, proteins, vitamins, or minerals in the diet can cause diseases.

*Diseases that are caused due to the lack of nutrients in the diet over a long period of time are called **deficiency diseases**.*

Deficiency diseases cannot be transmitted from one person to another.

### Deficiency of Carbohydrates

Carbohydrates are the main energy sources. Lack of carbohydrates in the diet results in the lack of energy and stamina. A labourer who does hard manual work needs more carbohydrates in his diet than a person who does his work sitting in his office.

## Deficiency of Proteins

Growing children need more proteins in their diet. Lack of proteins in the diet weakens muscles.

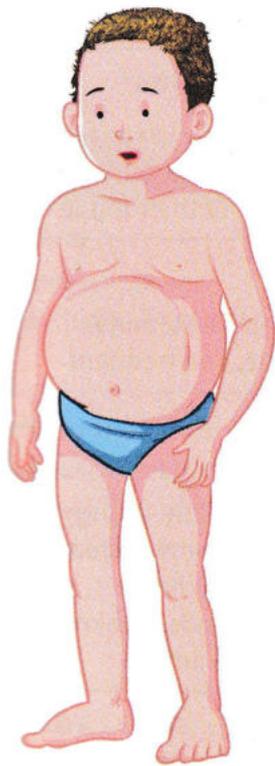


Fig. 2.6 A child suffering from Kwashiorkor

Deficiency of proteins leads to a disease called *kwashiorkor* (Fig. 2.6). Deficiency of proteins along with carbohydrate deficiency is called Protein Energy Malnutrition (PEM). It leads to *marasmus*.

A child suffering from kwashiorkor has some or all of the following symptoms:

- large, pot-like belly,
- stunted growth,
- swelling of face and limbs (especially the feet),
- skin diseases,
- mental diseases, and diarrhoea

If the treatment is started in time, improving protein intake may correct this disease.

Marasmus is more common among infants and children under 5 years of age. A child suffering from marasmus becomes very thin, shows slow body growth, lack of energy, loss of appetite, weak

legs, mental retardation, and poor muscle development.

To prevent these diseases, the Government of India had started programmes such as the Integrated Child Development Scheme (ICDS) and the Mid-day Meal Scheme in schools.

## Deficiency of Vitamins

Table 2.1 lists some important vitamins and their sources, functions, deficiency diseases, and symptoms.

Table 2.1 Vitamins—Functions, deficiency diseases, symptoms, and sources

Vitamin and sources	Function	Deficiency disease	Symptoms
A Sources: Green leafy vegetables, fruits, butter, egg yolk, carrots, and fish	Keeps eyes, hair, and skin healthy	Night blindness	Dryness of eyes, improper vision

### Fact File

Malnutrition in India has reached a very alarming state. According to global nutrition records, India accounts for almost one-third of world's malnourished children. More than half of all deaths in children under the age of five is estimated to be caused by poor nutrition. Malnutrition causes recurring infections, stunted growth, as well as poor thinking ability. It may even lead to death in severe conditions.

B1 <b>Sources:</b> Eggs, whole grains, and sprouts	Aids in digestion, maintains nervous system	Beriberi	Inflammation of nerves, digestive problems, and heart abnormalities
B2 <b>Sources:</b> Eggs, milk, and green leafy vegetables	Keeps skin and mouth healthy	Skin disorders	Irritation of eyes, skin and intestinal disorders, and inflammation of the tongue
B12 <b>Sources:</b> Meat	Formation of red blood cells	Anaemia	Pale skin, lack of stamina and appetite, and frequent headaches
C <b>Sources:</b> Citrus fruits such as lime, orange, and lemon; tomatoes, and sprouts	Helps to resist infections, and keeps teeth, gums, and joints healthy	Scurvy	Loosening of teeth, spongy and bleeding gums, increased susceptibility to diseases, slow healing of wounds, weakness, and pain in the limbs
D <b>Sources:</b> Milk, fish, eggs, and sunlight	Aids in the normal growth of bones in children	Rickets	Weak bones, joint and bone deformities such as bow legs and pigeon chest, softening of ribs, and protruding abdomen
K <b>Sources:</b> Spinach, cabbage, or any other green leafy vegetable	Helps in blood clotting (to stop bleeding)	Haemorrhage (excessive bleeding)	Affects clotting of blood

Some vitamins are very sensitive to heat and light. For example, vitamin C is easily destroyed during cooking. Therefore, vitamin C-rich food items should be eaten raw.

Scurvy was common among sailors in ancient times. Due to the lack of cure, several sailors died of this disease during long voyages.

### Know your Scientist

James Lind (1716-1794) was a Scottish surgeon and physician. He carried out an experiment on the HMS Salisbury, in 1746, and discovered that eating citrus fruits reduced the occurrence of scurvy in sailors.



## Deficiency of Minerals

Table 2.2 lists some important minerals and their sources, functions, deficiency diseases, and symptoms. Minerals also assist in certain chemical reactions in the body. Cooking does not destroy them.

**Table 2.2** Minerals—Functions, deficiency diseases, symptoms, and sources

Mineral and sources	Function	Deficiency disease	Symptoms
Calcium <b>Sources:</b> Milk and green leafy vegetables	Strengthens bones and teeth, and helps in clotting of blood	Osteoporosis in adults Rickets in children	Brittle bones, excessive bleeding, stunted growth, and weak teeth and bones
Phosphorus <b>Sources:</b> Cereals, pulses (dal), and milk	Strengthens bones and teeth	Rickets in children	Weakening of bones, poor development of bones and nervous system, mental retardation, retarded growth, and loss of weight
Iron <b>Sources:</b> Cereals, pulses, meat, and green leafy vegetables	Helps in the formation of haemoglobin and red blood cells	Anaemia	Pale body colour, body fatigue, white nails, loss of weight, and swelling in hands and feet
Iodine <b>Sources:</b> Fish and salt	Required for proper working of the thyroid gland	Goitre	Enlargement of the thyroid gland, mental retardation, and retarded growth
Sodium and potassium <b>Sources:</b> Salt and most food items	Help in maintaining body's water balance	Body and muscle weakness Paralysis	General weakness and dehydration
Magnesium <b>Sources:</b> Green leafy vegetables, cereals, chicken, and fish	Regulates the functioning of muscles and nerves	Weak muscles and nerves	Loss of appetite, upset stomach, and sleeplessness

## Deficiency of Water in the Body

Water is very essential for the proper functioning of our body. Excess loss of water from the body leads to a condition called dehydration.

Dehydration causes loss of salts and leads to weakness in the body. Oral Rehydrating Solution (ORS) can be given to the patient to recover from dehydration. It is available free of cost at primary health centres. It can also be made at home by mixing 6 teaspoons of sugar and half a teaspoon of salt in 1 litre of clean, drinking water.

## Key Words

<b>Saturated fats</b>	Fats that are normally solid at room temperature are called saturated fats.
<b>Unsaturated fats</b>	Fats that are normally liquid at room temperature are called unsaturated fats.
<b>Fat-soluble vitamins</b>	Vitamins that are stored in the fat tissue and used only when the body needs them are called fat-soluble vitamins.
<b>Water-soluble vitamins</b>	Vitamins that are not stored in the body and need to be regularly supplied through food are called water-soluble vitamins.
<b>Macrominerals</b>	Minerals that are needed by the body in larger amounts are called macrominerals.
<b>Trace minerals</b>	Minerals that are needed by the body in very small amounts are called trace minerals.
<b>Dietary fibre</b>	The portion of plant food that does not provide any nutrients to our body but helps in maintaining a healthy digestive system is called dietary fibre.
<b>Balanced diet</b>	A diet that contains adequate amount of different components of food required for healthy functioning of the body is called a balanced diet.
<b>Deficiency diseases</b>	Diseases that are caused due to the lack of nutrients in the diet are called deficiency diseases.

## Summary

- Carbohydrates, proteins, fats, vitamins, minerals, and dietary fibres are the main components of food.
- Carbohydrates and fats provide energy to the body.
- Proteins are needed for muscle-building and for repairing worn-out tissues.
- Vitamins and minerals are needed for the normal functioning of our body.
- A balanced diet should include food items from all four basic food groups.
- Deficiency of carbohydrates causes lack of energy and stamina.
- Deficiency of proteins causes kwashiorkor, whereas combined deficiency of proteins and carbohydrates causes marasmus.
- Deficiency of vitamins can cause night blindness, beriberi, anaemia, scurvy, and rickets.
- Deficiency of minerals can cause osteoporosis, rickets, anaemia, and goitre.
- Deficiency of water can cause dehydration.

# Exercises

## LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with suitable words.

1. Plants store energy in the form of \_\_\_\_\_ (starch/sugar).
2. \_\_\_\_\_ (Saturated/Unsaturated) fats are normally solid at room temperature.
3. Our muscles, organs, and blood are made up of mostly \_\_\_\_\_ (fats/proteins).
4. Deficiency diseases \_\_\_\_\_ (can/ cannot) be transmitted from one person to another.
5. Deficiency of Vitamin C causes \_\_\_\_\_ (scurvy/beriberi).

#### B. Choose the correct option.

1. Which of these is the simplest form of sugar?  
a. Starch                      b. Glucose                      c. Sugar                      d. None of them
2. Which of these are fat-soluble vitamins?  
a. Vitamin A and D                      b. Vitamin E and K  
c. Vitamin C and B complex                      d. Both a. and b.
3. How does water help our body?  
a. It helps to transport substances inside the body.  
b. It helps to regulate the body temperature.  
c. It is needed for various chemical reactions inside the body.  
d. All of these
4. Which of these is caused by the deficiency of carbohydrates as well as proteins in the body?  
a. Kwashiorkor                      b. Scurvy                      c. Marasmus                      d. Both a and c
5. Which of these is needed for strengthening bones and teeth?  
a. Calcium                      b. Phosphorus                      c. Iodine                      d. Both a and b
6. Which of the following are sources of starch?  
a. Rice and fruits                      b. Honey  
c. Fruits and vegetables                      d. Rice and potatoes
7. Ghee is an example of this type of fat.  
a. Saturated fat                      b. Unsaturated fat  
c. Saturated only at room temperature                      d. None of the above

8. Deficiency of this vitamin causes anaemia?  
 a. Vitamin A            b. Vitamin D            c. Vitamin B2            d. Vitamin B12
9. The function of which vitamin is to help blood to clot and control bleeding?  
 a. Vitamin A            b. Vitamin B            c. Vitamin D            d. Vitamin K
10. Lack of which of the following minerals causes osteoporosis in adults?  
 a. Iron                    b. Calcium              c. Phosphorus            d. Magnesium

**II. Very short answer type questions.**

**A. Give two examples for the following.**

1. Sources of carbohydrates: \_\_\_\_\_;
2. Sources of proteins: \_\_\_\_\_;
3. Foods rich in dietary fibre: \_\_\_\_\_;
4. Rich sources of Vitamin A: \_\_\_\_\_;
5. Rich sources of Vitamin K: \_\_\_\_\_;
6. Deficiency diseases \_\_\_\_\_;

**B. Give one word for the following.**

1. Substances needed by our body for proper growth and healthy body functions \_\_\_\_\_
2. A condition caused due to excess body fat \_\_\_\_\_
3. Minerals that are needed by the body in larger amounts \_\_\_\_\_
4. Diseases caused due to lack of nutrients in the diet over a long period of time \_\_\_\_\_
5. A disease caused by lack of iron in the diet \_\_\_\_\_

**III. Short answer type questions.**

1. Define nutrients. List the nutrients present in food.
2. Why do we need carbohydrates? Name three sources of carbohydrates in our food.
3. Differentiate between saturated and unsaturated fats.
4. What is a balanced diet? Why is it important to have a balanced diet?
5. What are deficiency diseases? Name any two deficiency diseases and their causes.

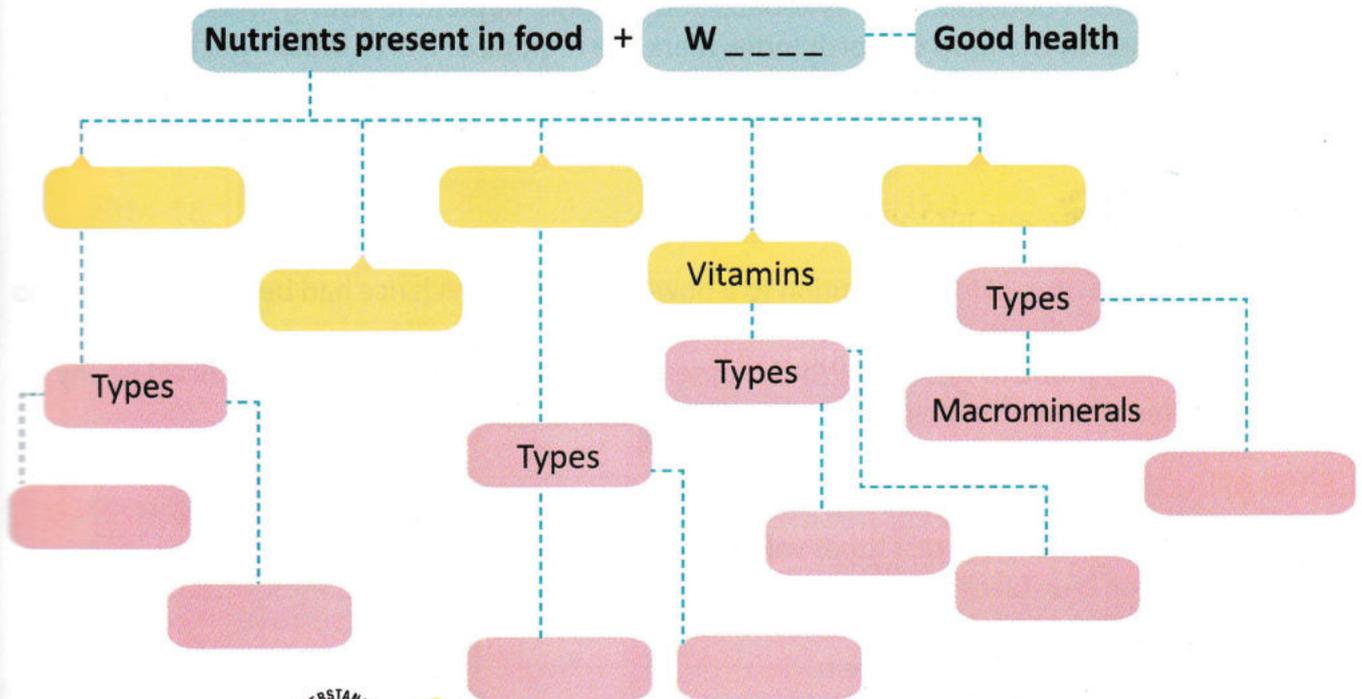
**IV. Long answer type questions.**

1. What is a balanced diet? Discuss the different food groups that should be included in a balanced diet.
2. Why are minerals important for the body? Describe the two groups of minerals.
3. Write a short note on roughage.
4. What is PEM? List the common symptoms of PEM in children.
5. Explain the causes and symptoms of each of the following deficiency diseases:  
 a. Rickets                    b. Beriberi                    c. Anaemia                    d. Goitre

## LET'S RECALL



Recall and complete the concept map given below.



## LET'S OBSERVE



LO 10

Observe the picture and answer the questions that follow.

1.
  - a. Which vitamin is found in this fruit?
  - b. Is it water-soluble or fat-soluble?
  - c. Name the disease caused by the deficiency of this vitamin.
  - d. A part of this orange is undigested and does not provide any nutrient. What is that part called?



2. Imagine you are a dietician. Draw and name two food items that you would recommend for the daily diet of a growing child.

## LET'S CONNECT HISTORY

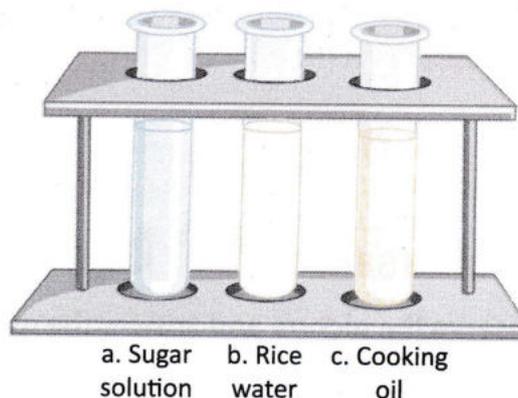
Food habits and foods preparations in North India were greatly influenced by the culture and customs of the Mughals; e.g., the use of spices, nuts, and butter (or oil and ghee) in various dishes. Foodstuff, such as kebabs and Biryani, depict the strong influence of Mughal culture on the food of North India. Mark the regions of North India, which were heavily under Mughal rule and the kind of foods eaten there. Analyse any five Mughal foods for their nutritive content and the food component each preparation contains.

## LET'S APPLY

1. Prateek added a drop of iodine solution to a bowl of water in which rice had been boiled. What do you think will happen to the iodine solution? Why?
2. Samarjit is very prone to fractures. Which nutrients do you think are lacking in his diet? List any five food items he should include in his diet. 

## LET'S ANALYSE AND EVALUATE

1. Analyse which of the three test tubes will turn iodine solution blue black? 
  - (i) Test tube a
  - (ii) Test tube b
  - (iii) Test tube c
  - (iv) None of these
2. Evaluate which of the above foodstuff when taken in excess is most likely to cause a heart disease? Justify your answer with a reason.  



## LET'S CREATE

 TD

1. In groups of five, make a chart on the symptoms and causes of deficiency disease and the foodstuffs that should be consumed to overcome each disease.  
2. Note down your breakfast, lunch, and dinner (and any meal in between) for one week. Arrange this data in a tabular form. Then analyse each food item for the nutrients they provide. Based on your findings, decide whether you have been eating a balanced diet or not.  
3. Take a few foodstuffs, such as honey, egg white, and raw potato, and test them for the presence of starch, protein, and fats. Then write a report based on your analysis.  

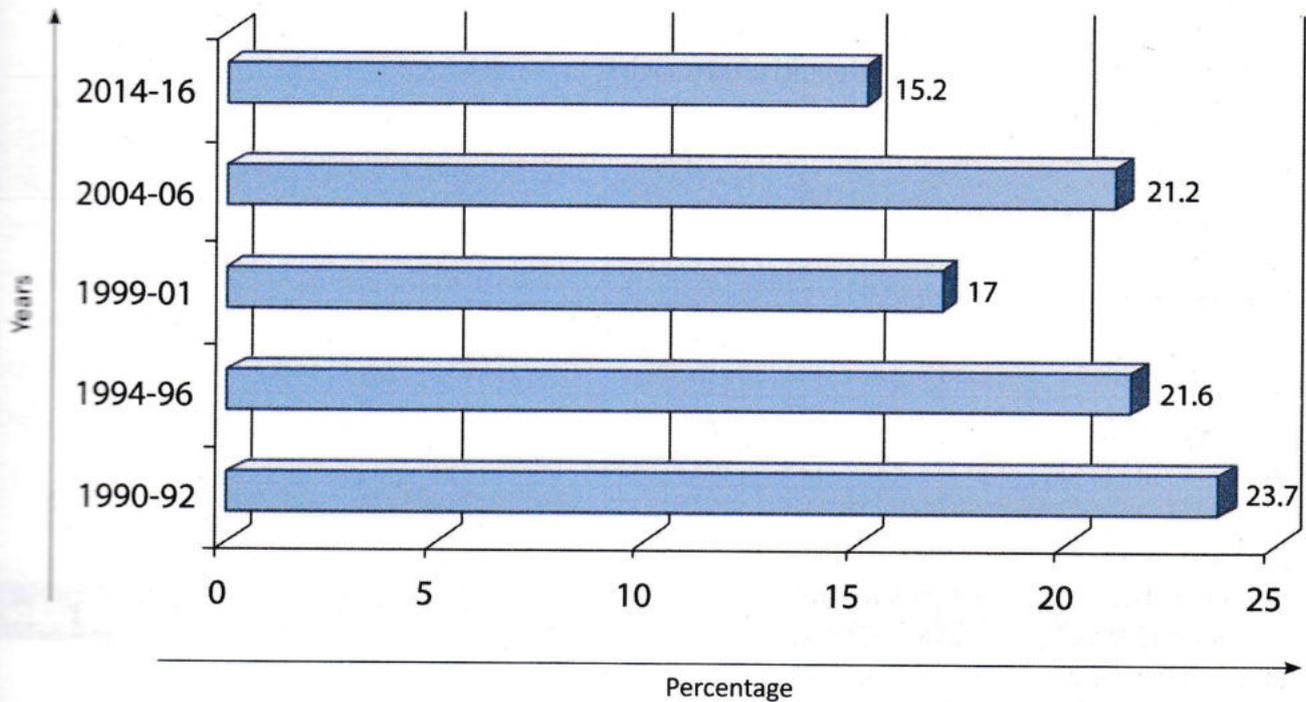
### Web Research

- Browse the internet and find out the salient features and efficacy of the Mid Day Meal scheme in India. Find out when it was started and why. Some suggested websites are:  
<http://mdm.nic.in/> (accessed and checked on 12-08-2019)  
<https://www.akshayapatra.org/indias-mid-day-meal-scheme> (accessed and checked on 12-08-2019)
- Find out the reasons for regional differences in the type of food eaten in Northern, Southern, Eastern and Western parts of India. These could be historical or geographical reasons. Some suggested websites are:  
<https://www.mapsofindia.com/maps/india/indian-cuisine-map.html> (accessed and checked on 12-08-2019)  
<https://www.nationalgeographic.org/encyclopedia/food/> (accessed and checked on 12-08-2019)

# Worksheet 1

## Skills assessed:

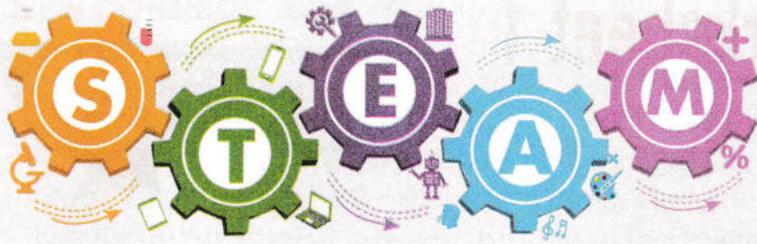
Problem solving, Quantitative analysis, and Qualitative analysis



The graph above shows the percentage of undernourished population in India.

- Which year showed most malnutrition in India?
  - 1990-92
  - 1994-96
  - 2004-2006
  - 2014-16
- Which of these are caused due to malnutrition?
  - Kwashiorkor
  - Marasmus
  - PEM
  - All of these
- Which of these does malnutrition lead to over a period of time?
  - Stunted growth
  - Mental retardation
  - Lack of energy and diseases
  - All of these
- Name the main food groups that should be included in a complete meal to overcome malnutrition.

5. What is a balanced diet?



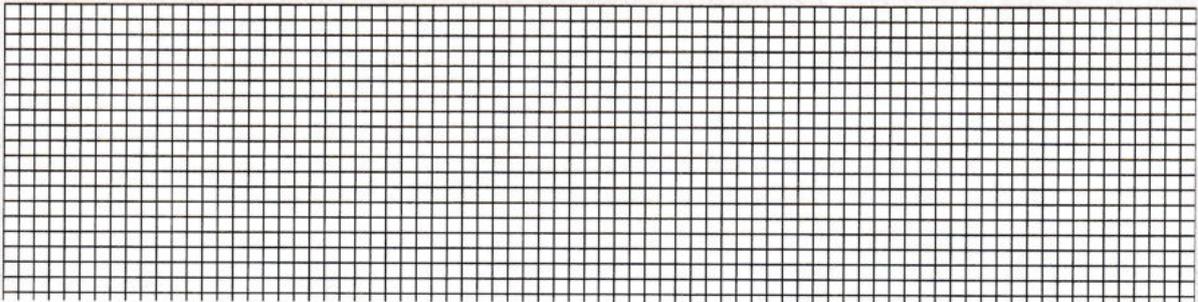
# Activity

## Skills Learnt:

Collaborating, communicating, creating, and critical thinking

**Aim:** To design an effective sprout machine in groups of five

1. Do the seeds look the same before and after soaking in water? \_\_\_\_\_
2. Trace one soaked and one unsoaked seed in the graph area. Observe whether the soaked and unsoaked seeds cover the same number of squares. What does this indicate?



### Observation table

	Seeds inside the refrigerator	Seeds in the warm place
What did the seeds look like when you tied them inside the cloth?		
What happened to the seeds after three days?		
How many seeds sprouted?		
Length of the roots that came out		
Did you need to water the seeds again?		
Can you see the seed leaves?		
What happened to the seed coat?		

3. Which ones sprouted more?
  - (i) Seeds inside the refrigerator or Why? \_\_\_\_\_
  - (ii) Seeds kept in the warm place
4. What were the conditions necessary for sprouting? \_\_\_\_\_
5. How were these conditions met? \_\_\_\_\_
6. Draw a rough sketch of the machine for sprouting seeds faster, after discussing with your group. Also mention whether it would be an electric or manual machine.

\*For the Teacher: Please refer to the teacher's manual for more details

# 3

## UNIT 2: Materials

# Separation of Substances

Separation is necessary when we need to remove unwanted things. For example, you can remove unwanted chillies from food by picking them with your hand. There are many other instances where we need to separate one substance from another. Look at the picture given below and write what is being separated.

### You will learn about

- Methods of separation
- Solution and solubility



There are different methods of separation about which we will learn in this chapter.

Answers: 1. Tea being strained; 2. Egg yolk being separated from egg white; 3. Wastes being separated; 4. Peas being removed from pods

## METHODS OF SEPARATION



Different methods are used for separating different substances that are mixed together. Let us learn about some common methods that are used.

### Threshing

Grains or seeds of plants such as rice and wheat serve as sources of food. The flour (*atta*) that is used for making chapattis is made from wheat grains. After these crops have been harvested or cut, the grains need to be separated from the stalks (the dried stems). This is done by *threshing*.

The process of beating harvested crops to separate the grains from the stalks is called **threshing**. It is done manually (by hand) or with the help of machines. Manual threshing is done by holding a pile of crop and beating it on a rock or a hard surface (Fig. 3.1). This loosens and separates the grain from the stalk. Sometimes, threshing is also done by crushing the harvested stalks using bullocks.

Threshing is also done with the help of machines such as combine harvesters (Fig. 3.2). A combine harvester reaps, threshes, and also cleans the crop in one operation. Threshed grains may still contain seed coverings and tiny pieces of leaves or stem (collectively called chaff). These are separated by winnowing.



Fig. 3.1 Manual threshing

Fig. 3.2 A combine harvester



## Winnowing

The method used to separate chaff from the grain by wind or blowing air is called **winnowing**.

The mixture of chaff and grain is taken in a winnowing basket (Fig. 3.3). The farmer stands at a higher level and lets the mixture fall to the ground. The grain, being heavier, falls almost vertically whereas the lighter chaff is carried away by the wind and forms a separate heap away from the grain. The separated chaff is used as fodder for cattle. The direction of the wind plays an important role in the process of winnowing.



Fig. 3.3 Winnowing

## Activity

**Aim:** To understand the process of winnowing

**Materials needed:** Plate, rice, tiny bits of paper, a chair, and old newspapers

**Method:**

1. Go to an open ground or garden and spread sheets of newspaper on the ground.
2. Take some rice mixed with bits of paper in a plate. Stand on the chair and let the mixture fall slowly by shaking the plate.

**Observation:** The rice grains form a separate heap from the paper bits.

**Conclusion:** The blowing air or wind can be used to separate lighter particles (paper bits) from heavier particles (rice grains).

## Hand-picking

Rice, wheat, pulses, etc., that we buy from the market may contain impurities (unwanted or harmful particles) in the form of small stones, unwanted grains, etc. Often, these impurities look very different from the food item and can be spotted easily. The method of separation used in such a case is *hand-picking* (Fig. 3.4).



Fig. 3.4 Hand-picking

This method is preferred when

- the quantity of the mixture is small,
- the unwanted substance is present in smaller quantities, and
- the size, shape, or colour of the unwanted substance is different from that of the useful one.

## Sieving

If the components of a mixture are of different sizes, they can be separated by *sieving* (Fig. 3.5). The smaller component passes through the pores of the sieve, whereas the larger component (stones or husk) is left behind in it. This method is used in some homes to separate wheat bran (the bigger particles) from flour.

### Word help

**Husk** Seed coverings or small pieces of stems or leaves

However, sieving wheat flour is not advisable as wheat bran, which is removed during



Fig. 3.5 Sieving

sieving, is very rich in nutrients and is also a rich source of fibre. It is better to remove visible impurities by hand picking.

The process of sieving is also used to separate pebbles and stones from sand at construction sites. The stones and pebbles present in the mixture remain in the sieve and the fine sand particles pass through the holes of the sieve.

## Activity

**Aim:** To understand sieving

**Materials needed:** Flour, powdered chalk, old newspaper, and a sieve

**Method:**

1. Sieve the flour on the newspaper to separate husk or any impurities.
2. Take a small amount of flour and mix it with fine chalk powder.
3. Sieve the mixture. Can chalk powder be separated from flour?

**Observation:** Husk and other impurities could be separated from the flour, but chalk powder could not be separated.

**Conclusion:** Husk particles are bigger than flour particles; so they are retained in the sieve. Particles of chalk powder and flour do not differ much in size; so chalk powder could not be retained in the sieve. Thus, sieving can be used to separate particles of different sizes.

## Let's Remember



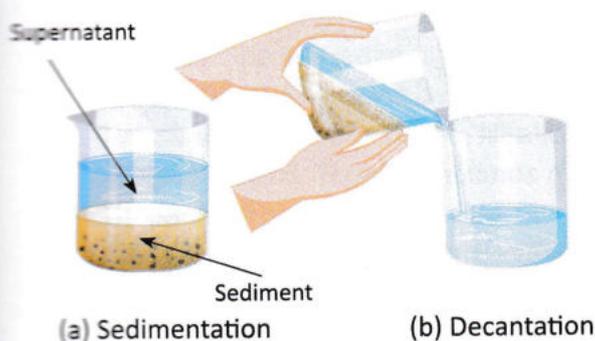
Name the process used for the separation of the following.

1. Wheat grains from stalks
2. Unwanted wheat grains from chickpeas
3. Wheat bran from flour
4. Chaff from corn grain

## Sedimentation and Decantation

Have you seen pulses being washed in your home? When pulses are kept in a bowl of water, they settle down as they are heavy. However, dirt, insects, tiny pieces of straw, and other lighter impurities float at the top. The water, which contains these impurities, is then poured out and discarded. This process involves two methods: *sedimentation* and *decantation*.

The process of separating insoluble solids, suspended in a liquid, by allowing them to settle down is called **sedimentation**.



The solid particles that settle down during sedimentation are called *sediments*. The process of pouring out the clear upper liquid without disturbing the sediments is called **decantation**.

The liquid above the sediments is called a *supernatant*.

A mixture of sand and water can be separated by sedimentation and decantation (Fig. 3.6).

The mixture is left undisturbed for some time. Sand, being heavier, settles down and water is poured out into a separate container.

**Fig. 3.6** Separating a mixture of sand and water using sedimentation and decantation

### Activity

**Aim:** To observe cleaning of rice by sedimentation and decantation

**Materials needed:** A cup of rice and a bowl of water

**Method:**

1. Observe the rice and record your observations. Does the rice look dirty? \_\_\_\_\_
2. Now, mix the rice with water in a bowl and allow it to stand for sometime.
3. Without disturbing the layer of rice, decant the water.

**Observation:** When the mixture is allowed to stand, most impurities come up and float near the surface, whereas the rice settle down. On decanting the water, we get cleaner rice.

**Conclusion:** Rice can be cleaned by sedimentation and decantation.

## Filtration

The process by which two substances (an insoluble solid and a liquid) are separated by passing the mixture through a filtering device is called **filtration**.

Filtration is commonly used in our homes. For example, after preparing tea, we filter out the tea leaves using a strainer. Filtration is also done to remove pulp from fresh fruit juice. Water may also contain solid impurities that can be removed by filtration.

During filtration, the insoluble solid is retained in the filtering device, whereas the liquid passes through it. It is important that the particles of the insoluble solid are bigger than the holes in the filtering device for them to be retained in the device. A filter paper is a filtering device that has very fine pores in it.

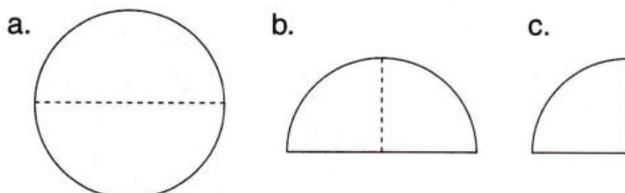
### Activity

**Aim:** To separate a mixture of sand and water by filtration

**Materials needed:** Mixture of sand and water, funnel, beaker, flask, and filter paper

**Method:**

1. Fold the filter paper along the dotted lines to make a paper cone.



2. Keep this filter paper cone inside the funnel. Place the funnel into the flask.
3. Pour the mixture of sand and water into the flask through the funnel.

**Observation:** It is observed that sand is retained in the filter paper but water passes through.

**Conclusion:** Sand and water can be separated by filtration.



### Evaporation

The process in which a liquid changes into a gas is called **evaporation**. In this method, the mixture is heated. The liquid part of the mixture evaporates leaving the solid part behind. For example, a mixture of common salt and water can be separated by evaporation. In fact, evaporating sea water is one of the oldest ways of obtaining salt (Fig. 3.7).



Sea water has salt dissolved in it. To obtain salt, sea water is collected in shallow pits and allowed to stand. Sun's heat evaporates the water. Salt, which is left behind, is collected and purified for consumption.

Fig. 3.7 Obtaining salt from sea water

## Activity

**Aim:** To separate a mixture of salt and sand

**Materials needed:** Mixture of salt and sand, filter paper, burner, two test tubes, test tube holder, and water

**Method:**

1. Take the mixture of salt and sand in a test tube. Add water to it and shake it well.
2. Salt dissolves in water, whereas sand does not. Sand can be separated using a filter paper, funnel, and another test tube.
3. Now, only salt solution remains in the first test tube.
4. Heat the salt water till all the water changes to vapour, leaving the salt behind.

**Observation:** Salt is left behind in the test tube.

**Conclusion:** Two processes, filtration and evaporation, were used to separate a mixture of salt and sand. Thus, sometimes more than one method can be used to separate the components of a mixture.

## Condensation

The process in which a gas changes into a liquid is called **condensation**. Condensation is the opposite of evaporation. In nature, water vapour in the air condenses to form its liquid form, the dew. Condensation takes place only when water vapour hits a cold surface.

## Activity

**Aim:** To separate both water and salt from saltwater

**Materials needed:** Saltwater, kettle, metal plate, a pair of tongs, container, and burner

**Method:**

1. Take saltwater in the kettle and heat it over the burner.
2. After sometime, steam comes out of the spout of the kettle.
3. Hold the metal plate (using tongs) above the spout. The steam condenses and changes into water droplets on touching the plate (cold surface).
4. Collect the falling water drops in the container.
5. Heat until all the water has boiled off.



**Observation:** Salt is left behind in the kettle and water is collected in the container.

**Conclusion:** Water and salt could be separated from saltwater by the process of evaporation and condensation.

## SOLUTION AND SOLUBILITY

When some salt is added to water and stirred, the salt disappears. This is because the salt has dissolved in the water (Fig 3.8).

**Dissolving** is a change where substances mix completely with the liquid they have been added to.

Not all substances dissolve in water. Only some substances, such as salt and sugar, dissolve in water and are known as soluble substances. Substances such as chalk and sand do not dissolve in water and are known as insoluble substances.



Fig. 3.8 Salt dissolves in water.

The substance that dissolves is called the *solute*, and the substance in which the solute dissolves is called the *solvent*. The resulting mixture is called the *solution*.

Thus, solute + solvent = solution.

For example, sugar + water = sugar solution (Fig 3.9)



Fig. 3.9 Sugar solution

If we keep adding spoonfuls of sugar to water and stir the solution each time, what will happen after some time? We will notice some grains of sugar at the bottom of the solution. This shows that no more sugar can be dissolved. We say that the solution has become saturated.

**A saturated solution** is the solution in which no more of the solute can be dissolved.

But what if we heat the solution? Can we then dissolve that 'extra' sugar present in the saturated solution? Yes, we can increase the solubility of a solute by heating the solution.

**Solubility** is the ability of a substance to get dissolved in a given liquid. The quantity of a substance that can dissolve in hot water is much more as compared to that in cold water... There are some other factors that affect the rate of solubility of a solute.

**Stirring** We can observe this by taking two glasses of water and adding a spoonful of sugar to each glass. Then we keep one glass undisturbed and stir the other. Sugar dissolves faster when the solution is stirred.

**Solute in powdered form** We can observe this by taking two glasses of water and adding a whole sugar cube in one glass and powdered or crushed sugar cube in the other. Sugar in the powdered form dissolves first.

Different substances dissolve in different amounts of water while making a saturated solution.

## Let's Remember



Write T for the true statement and F for the false one. Correct the false statement(s).

1. The insoluble solid is retained in filtering device during filtration.
2. A mixture of common salt and water can be separated by filtration.
3. The liquid above the sediments is called supernatant.
4. Condensation takes place when water hits a hot surface.
5. The substance in which the solute dissolves is called solubility.
6. The sugar in powdered form dissolves faster as compared to whole sugar cube.

## Key Words

<b>Threshing</b>	The process of beating harvested crops to separate seeds from the stalks is called threshing.
<b>Winnowing</b>	The method used to separate chaff from the grain by wind or blowing air is called winnowing.
<b>Sedimentation</b>	The process of separating insoluble solids suspended in a liquid by allowing them to settle down is called sedimentation.
<b>Decantation</b>	The process of pouring out the clear upper liquid without disturbing the sediments is called decantation.
<b>Filtration</b>	The process by which an insoluble solid is separated from a liquid by passing the mixture through a filtering device is called filtration.
<b>Saturated solution</b>	A solution that can dissolve no more of the solute is called a saturated solution.

## Summary

- Threshing is done either manually or by using machines to separate seeds or grains from the stalks.
- Winnowing involves separating the chaff from the grain by letting the mixture fall to the ground from a height when the wind is blowing.
- Hand-picking involves manually removing small stones, insects, etc., from the grains.
- Sedimentation and decantation are used to separate an insoluble solid from a liquid.
- Insoluble solid impurities present in water can be removed by filtration.
- Common salt can be separated from sea water by evaporation.
- Solubility of a solute can be increased by heating the mixture.

# Exercises

## LET'S UNDERSTAND



### I. Objective type questions.

#### A. Fill in the blanks with the correct words.

- \_\_\_\_\_ (Threshing/Winning) involves beating the harvested crop to separate the grains.
- Sieving is used for separating two substances with \_\_\_\_\_ (different/same) sizes.
- Condensation is \_\_\_\_\_ (opposite/similar) to evaporation.
- For filtration, the particles of the insoluble solid should be \_\_\_\_\_ (smaller/bigger) than the holes in the filtering device.
- The solubility of a solute can be \_\_\_\_\_ (increased/decreased) by heating the solution.
- Sugar dissolves faster when the solution is \_\_\_\_\_ (stirred/left undisturbed).

#### B. Match the following.

- | <i>Column A</i> | <i>Column B</i>                        |
|-----------------|--|
| 1. Supernatant  | a. liquid changes into gas             |
| 2. Sediments    | b. gas changes into liquid             |
| 3. Evaporation  | c. separating grain from chaff by wind |
| 4. Solute       | d. liquid above sediments              |
| 5. Winnowing    | e. substance that dissolves            |
| 6. Condensation | f. solid particles that settle down    |

#### C. Choose the correct option.

- Threshing is used to separate
  - chaff from grain
  - stones from grain
  - sand from grain
  - grains from stalks
- Which of the following methods is used to separate stones from grain?
  - Threshing
  - Winnowing
  - Hand picking
  - Sieving
- Which of the following methods can be used to separate a mixture of sand and water?
  - Filtration
  - Hand picking
  - Condensation
  - Winnowing
- What are the solid particles that settle down during sedimentation called?
  - Decantation
  - Sediments
  - Supernatant
  - Filter
- Which of the following methods can be used to separate a mixture of salt and water?
  - Filtration
  - Condensation
  - Evaporation
  - Winnowing

6. The size of the holes of the filtering device should be \_\_\_\_\_ as compared to particles of the insoluble solid for filtration.
  - a. bigger
  - b. same
  - c. smaller
  - d. different
7. The process of separating insoluble solids, suspended in a liquid, by allowing them to settle down is called
  - a. sedimentation
  - b. filtration
  - c. decantation
  - d. sieving
8. A solution in which no more of the solute can be dissolved is called
  - a. sugar solution
  - b. dissolving
  - c. salt solution
  - d. saturated solution
9. Which of the following will dissolve highest amount of salt?
  - a. A glass of ice cold water.
  - b. A glass of water at room temperature.
  - c. A glass of hot water.
  - d. All of them will dissolve same quantity of salt
10. Which the following is soluble in water?
  - a. Sand
  - b. Tea leaves
  - c. Chalk
  - d. Sugar

**II. Very short answer type questions.**

**A. Give one word for the following.**

1. A machine that reaps, threshes, and cleans the crop \_\_\_\_\_
2. The method used to separate chaff from the grain by wind or blowing air \_\_\_\_\_
3. The process by which an insoluble solid is separated from a liquid by passing the mixture through a filtering device \_\_\_\_\_
4. The process of pouring out the clear upper liquid without disturbing the sediments \_\_\_\_\_
5. The process in which a liquid changes into a gas \_\_\_\_\_

**III. Short answer type questions.**

1. Differentiate between threshing and winnowing.
2. Give an example where hand picking is used for separation.
3. What is sieving? Give an example where this method is used.
4. Define sediment and supernatant with one example of each.
5. Define solute, solvent, and solution with one example of each.
6. How is salt prepared from the seawater?

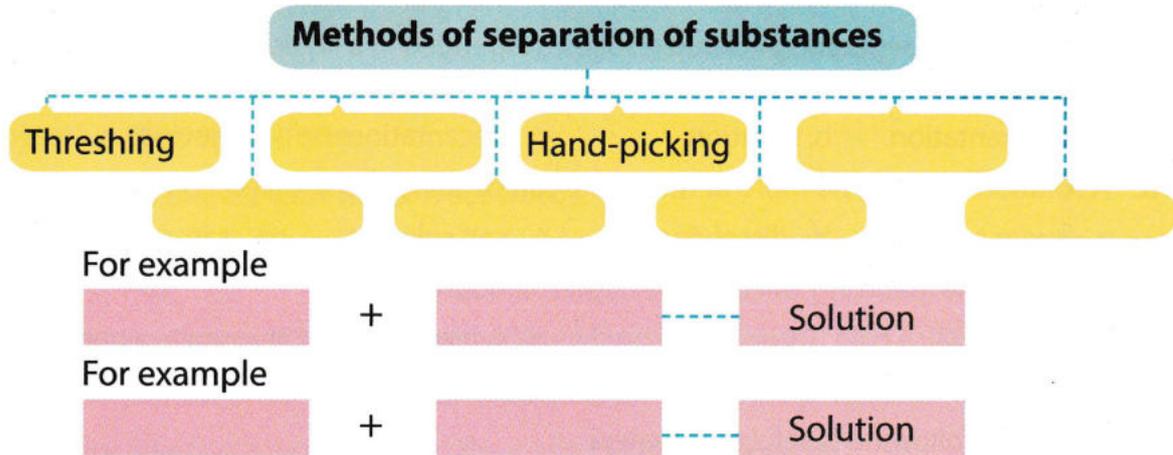
**IV. Long answer type questions.**

1. When is separation of substances necessary? Name four methods used to separate solid substances.
2. Describe two different methods which can be used to separate a mixture of sand and water. Also draw well-labelled diagrams for the two.
3. How can we dissolve extra sugar in the saturated solution of sugar? Discuss the factors that can speed up the solubility of a solute in a solvent.

## LET'S RECALL



Recall and complete the concept map given below.



## LET'S OBSERVE



Observe the following pictures and answer the questions that follow.

- a. Label the components marked in Fig. 1.
- b. Name the method of separation shown in Fig. 2.

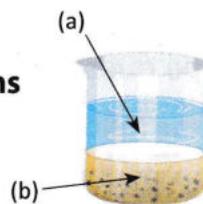


Fig. 1

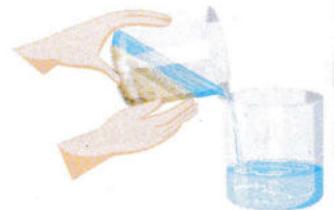


Fig. 2

## LET'S CONNECT



GEOGRAPHY AND MATHS

On the political map of India, plot the three largest producers of wheat, rice, maize, and pulses. Find out the annual average yield of each of these states. Also discuss various methods used by farmers from sowing of seeds to the market-ready products.

## LET'S APPLY



- You are stranded on an island and you prepare salt by collecting sea water in shallow pits. However, it is contaminated with sand and gravel. Suggest method(s) to purify it so that it can become fit for consumption. **LO 10**
- A sweet shop owner prepared a saturated solution of sugar in boiling water and after cooling he observed white deposition at the bottom of the container. Can you guess what could have happened?
- Your father went to the green grocer to buy vegetables for your home. Which method do you think he must have used for selecting fresh and healthy vegetables?

## LET'S ANALYSE AND EVALUATE

- Evaluate which of the following bowls of water will dissolve more sugar.
- |                               |                     |
|-------------------------------|---------------------|
| (a) Boiling water             | (b) Lukewarm water  |
| (c) Water at room temperature | (d) Ice cold water. |
- Rani was served a milk drink that was excessively sweet. Can you suggest a method to decrease the sweetness of the drink? Give a reason?



TD

1. Find out the solubility of some solids. Take any five solids and mix each one of them (1/2 teaspoon) with a glass full of water and observe what happens in each case in the following table. **LO 3 LO 10**

Name of the solids	Salt	Sugar	Coffee powder	Baking Powder	Wheat flour	Gram flour	Detergent	Talcum powder
Soluble/ Insoluble								

2. Find out the solubility of some liquids. Take five different liquids and mix each one of them (1 teaspoon) with a glass full of water and write your observations for each case in the following table. **LO 3 LO 10**

Name of the liquid	Coconut/ Mustard Oil	Honey	Milk	Vinegar	Lemon juice	Molten butter
Soluble/ Insoluble						

3. To compare the solubility of salt and sugar in water. **LO 4 LO 10**
- Take a cup and fill it with water and pour in a transparent container.
  - Add 1 level teaspoon of salt to the water at a time and stir the mixture with a separate spoon. Record the observation in the table given below.
  - Stop when you observe some insoluble substance, which does not dissolve even on stirring.
  - Repeat the procedure for sugar.
  - Put a tick mark in the box for every teaspoonful of the substance added.

Substance to be dissolve	Number of teaspoonfuls dissolved (Remember the substance must dissolve completely before another spoonful is added)	Total number of teaspoonfuls dissolved
Salt		
Sugar		

**Web Research**

- Browse the internet and do a brief research and prepare a report on at least two methods of separation other than the ones discussed in the chapter. Suggested websites:  
[https://www.ducksters.com/science/chemistry/separating\\_mixtures.php](https://www.ducksters.com/science/chemistry/separating_mixtures.php) (accessed and checked on 12-08-2019)  
<https://sciencing.com/fun-experiments-separating-mixtures-13769.html> (accessed and checked on 12-08-2019)  
<https://www.bbc.com/bitesize/guides/zgvc4wx/revision/1> (accessed and checked on 12-08-2019)
- Browse the internet and find out about the different techniques used to produce salt used in our homes, e.g. common salt, rock salt, vacuum salt, etc. Try collecting samples for each and prepare a project report on their occurrence in nature, difference, and preparation method. Suggested websites:  
<https://www.thespruceeats.com/how-is-salt-made-1328618> (accessed and checked on 12-08-2019)  
<https://www.mortonsalt.com/salt-production-and-processing/> (accessed and checked on 12-08-2019)  
<https://eusalt.com/salt-production> (accessed and checked on 12-08-2019)

# 4

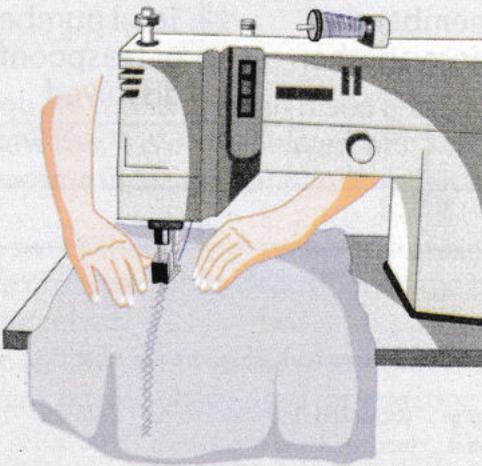
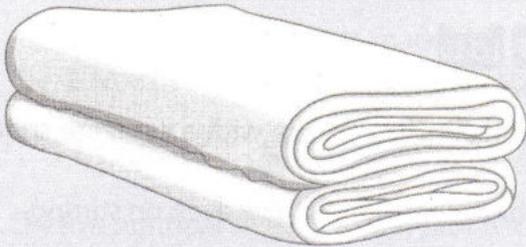
## Fibre to Fabric

Clothes are made from fibres obtained from plant and animal sources.

Look at the pictures given below and number them from 1 to 4 from the raw material to the finished cloth.

### You will learn about

- History of clothing
- Fibre and fabric
- Natural and synthetic fibres
- Plant fibres



Let us read the story of how clothing started, the different materials used to make clothes, and how they are made.

Answers: Cloth - 3; Spinning cotton into yarn - 2; sewing cloth - 4; Cotton boll - 1

## HISTORY OF CLOTHING

About 30,000 years ago, people started using animal skins for clothing. It is believed that wool was used as early as 6000 years ago. The domestication of silkworms to produce silk occurred around 3000 BC in China. In India, cotton came into widespread use around 3000 BC. These fabrics were not stitched. They were just wrapped around the body. Even today, sari, dhoti, and turban are unstitched pieces of cloth.

## FIBRE AND FABRIC



Clothes are made mostly from *fibres*. Fibres are thin strands of thread that are twisted together to make *yarns*. Yarns are woven or knitted to form fabric. For example, cotton fabric and silk fabric. The fabric is stitched to make clothes. For example, cotton fabric can be stitched into a cotton frock or a cotton kurta. There are two main processes of making fabric from yarn: weaving and knitting.

**Weaving** Weaving involves making fabric by arranging two sets of yarn (Fig. 4.1). It is done using a machine called loom that can be hand-operated or power-operated. The pattern in which two sets of threads are arranged in a piece of woven cloth is called a weave.



Fig. 4.1 Weaving



Fig. 4.2 Knitting

**Knitting** Knitting involves making fabric by forming a series of connected loops of yarn by using knitting needles or machines (Fig. 4.2). Sweaters are made from woollen yarns by knitting.

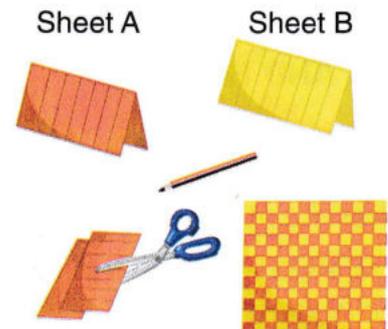
## Activity

**Aim:** To understand weaving

**Materials needed:** Chart papers of two different colours (say, red and yellow), ruler, pencil, and scissors

**Method:**

1. Cut square pieces, of length and width equal to 30 cm from each sheet.
2. Fold the sheets into half. Draw lines on them as shown.
3. Cut both the sheets along the lines and then unfold.
4. Weave the strips of sheet A one at a time through the slits in sheet B.
5. This is exactly how two sets of threads are woven to make fabric. Try this with different colours. Cover them with transparent sheets to make colourful table mats.



## NATURAL AND SYNTHETIC FIBRES

Fibres used to make fabric may be natural or synthetic. Fibres that are obtained from plants or animals are called *natural fibres*. Examples are cotton, jute, wool, and silk. Fibres that are made by man from chemical substances are called *synthetic fibres*. Examples are nylon, rayon, polyester, and acrylic. Let us learn more about plant fibres.

### Plant Fibres

LL

Cotton, jute, coir, silk cotton, hemp, and flax are examples of plant fibres. Denim, used to make jeans, is also made from cotton (Fig. 4.3).



Fig. 4.4 Cotton plant



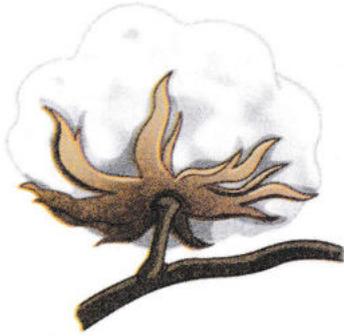
Fig. 4.3 Denim is made from cotton

### Cotton

The cotton plant is a shrub (Fig. 4.4). It grows well in black soil and warm climate. It needs moderate rainfall. Cotton is a soft fibre attached around the seeds of the cotton plant. A variety of textile products are made from cotton. In India, 'khadi', a coarse hand-woven cloth, is made from cotton.

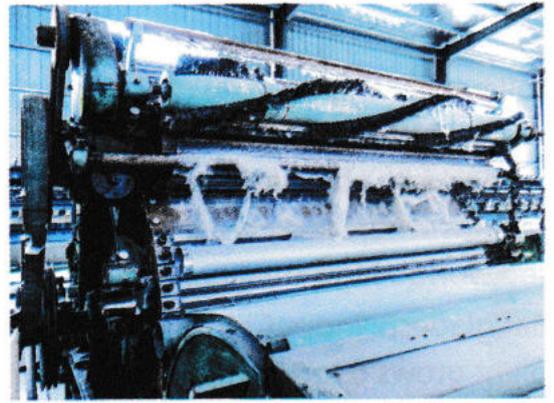
The steps involved in the production of cotton are given below.

1.



The cotton plant has a small, green fruit called the cotton boll. The boll has seeds inside, which are surrounded by cotton fibres. When the cotton boll matures, it splits open, exposing the raw cotton fibres. The heat of the sun dries these fibres. After the fibres have dried, the crop is harvested.

2.



Once the cotton is harvested, it is sent for ginning, where the fibres (called lint) are separated from the seeds. This separation is brought about with the help of strong air currents.

3.



The fibres are cleaned and made into long thread-like strands. The fibres are spun using spinning machines to form cotton yarn. The process of making yarn from fibres is called spinning. Yarn is then made into cotton fabrics by weaving or knitting.

#### Fact File

Mahatma Gandhi promoted the use of spinning 'charkha' throughout India. The 'charkha' came to be recognized as the Indian symbol of self-sufficiency and independence all over the world.

Fig. 4.5 Production of cotton

#### Know your Scientist

Eli Whitney was an American inventor who is famous for the invention of the cotton gin. Eli was born into an agricultural family. While growing up, he had seen how difficult and time-consuming the process of cleaning cotton was. He thus invented a special machine that cleaned cotton quickly and easily, separating the fibres from the seeds.



## Jute

Jute is a fibre obtained from the bark of the jute plant. It can be grown in different soil types, ranging from clayey to sandy soil. It grows best in loamy soil (mixture of sand, silt, and clay). It grows well in regions where it rains a lot. Almost 80% of the world's high-quality jute comes from

Bangladesh. India, China, Nepal, and Thailand are the other main producers of jute. The jute plant grows 6 to 10 feet in height and has no branches. The stem of the jute plant has a thick bark that has fibres inside it. These fibres are naturally glued together by a sticky substance.

Bundles of jute plants are dipped in water. The water rots away the stem and dissolves the sticky substance, separating the fibres. This process of rotting the stems to remove the sticky substance and separate the fibres is called retting [Fig. 4.6(a)].

Jute fibres are used to make jute bags, slippers, hats, *kurtis*, ropes, mats, and sacks for packing and storing grains [Fig. 4.6(b)].



(a) Retting of jute fibres



(b) Jute bag

Fig. 4.6 Jute

## OTHER USEFUL PLANT FIBRES

LL

There are other important plant fibres as well.

**Coir** Coir is the fibre obtained from the outer covering or the husk of the coconut. Usually coconuts are left in water for a few months. The husk is then separated from the nut and beaten with wooden mallets to get the fibre. The fibre thus obtained is spun and dyed and is ready for weaving.

Coir is used to make several household products such as ropes (Fig. 4.7) and floor coverings, and also as a stuffing in mattresses and pillows.



Fig. 4.7 Man making coir rope



Fig. 4.8 Silk cotton is obtained from kapok tree.

**Silk cotton** Silk cotton is another plant fibre that is commonly used as a stuffing in pillows, sleeping bags, and life jackets. This fibre is obtained from the silk cotton tree, also called *kapok* (Fig. 4.8).

The fruits of the kapok tree contain fibres that are light and fluffy (like cotton).

When the fruit ripens, it bursts open, releasing the fibres.

### Let's Discuss

Discuss why silk cotton would be better suited to make clothes than coir.

**Hemp** Hemp fibres are obtained from the stem of the hemp plant. Hemp fibres are used in the production of ropes, carpets, nets, clothes, and paper.

**Flax** Fibres obtained from the stem of the flax plant are woven to make a fabric called **linen**. Flax fibres are also used in the production of ropes and high-quality paper.

## Let's Remember



### I. Match the following.

Column A	Column B
1. Weaving	a. Kapok
2. Yarn	b. Two sets of yarns
3. Knitting	c. Sweaters
4. Jute	d. Thin strands of threads
5. Silk cotton	e. Retting

### II. Write T for the true statement and F for the False one. Correct the false statements.

1. Yarns can only be woven to make cloth.
2. Forming a series of connected loops of yarn is done on looms, forming a weave.
3. Cotton and silk cotton are plant fibres.
4. We get coir from animals such as sheep and camel.
5. Hemp fibres are obtained from the flax plant.

## Key Words

<b>Fabric</b>	The material made by weaving or knitting of yarn is called fabric.
<b>Weaving</b>	Weaving involves the making of fabric from yarn.
<b>Ginning</b>	The process of separating cotton fibres from its seeds is called ginning.
<b>Spinning</b>	The process of making yarn from fibres is called spinning.
<b>Retting</b>	The process of rotting the stems of the plants in water to remove the sticky substance and separate fibres is called retting.

## Summary

- Clothing materials are obtained from both plants and animals.
- Fibres are woven to make fabrics and fabrics are stitched to make clothes.
- Fibres may be natural or synthetic.
- Cotton, jute, coir, silk cotton, hemp, and flax are plant fibres.

# Exercises

## LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with the correct words.

1. \_\_\_\_\_ (Fibres/Yarns) are thin strands of thread that are twisted together to make \_\_\_\_\_ (fibres/yarns).
2. \_\_\_\_\_ (Weaving/Knitting) involves arranging two sets of yarns to make fabrics.
3. Cotton, wool, and silk are \_\_\_\_\_ (natural/synthetic) fibres.
4. \_\_\_\_\_ (Jute/Coir) is obtained from the outer covering or husk of the coconut.
5. Fibres obtained from the flax plant are used to make \_\_\_\_\_ (linen/hemp).

#### B. Choose the correct option.

1. Which of these involves making fabric by forming a series of connected loops of yarn?  
a. Spinning      b. Ginning      c. Weaving      d. Knitting
2. Which of these is not true about jute production?  
a. We get jute from the bark of the flax plant.  
b. It grows best in loamy soil.  
c. Jute fibres are separated by rotting the stem in a process called retting.  
d. None of these
3. Which of these fibres would you use to make a pair of denim jeans?  
a. Cotton      b. Coir      c. Hemp      d. Jute
4. Which of these involves a loom?  
a. Retting      b. Spinning      c. Weaving      d. Knitting
5. Which of these are obtained from the fruit of the kapok tree?  
a. Jute      b. Hemp      c. Flax      d. Silk cotton

### II. Very short answer type questions.

#### A. Give one word for the following.

1. The material made by weaving or knitting of yarn \_\_\_\_\_
2. The pattern in which two sets of threads are arranged in a cloth \_\_\_\_\_
3. Fibres that are made by man from chemical substances \_\_\_\_\_
4. The small green fruit of the cotton plant \_\_\_\_\_
5. The process of making yarn from fibres \_\_\_\_\_

**B. Give two examples for each of the following**

1. Natural Fibres
2. Products made from jute fibres
3. Products made from silk cotton
4. Products made from flax fibres

_____	_____
_____	_____
_____	_____
_____	_____

**III. Short answer type questions.**

1. What are clothes made of?
2. What are synthetic fibres? Give two examples.
3. What is ginning?
4. Describe the process of retting.
5. Name any three products made from jute fibres.

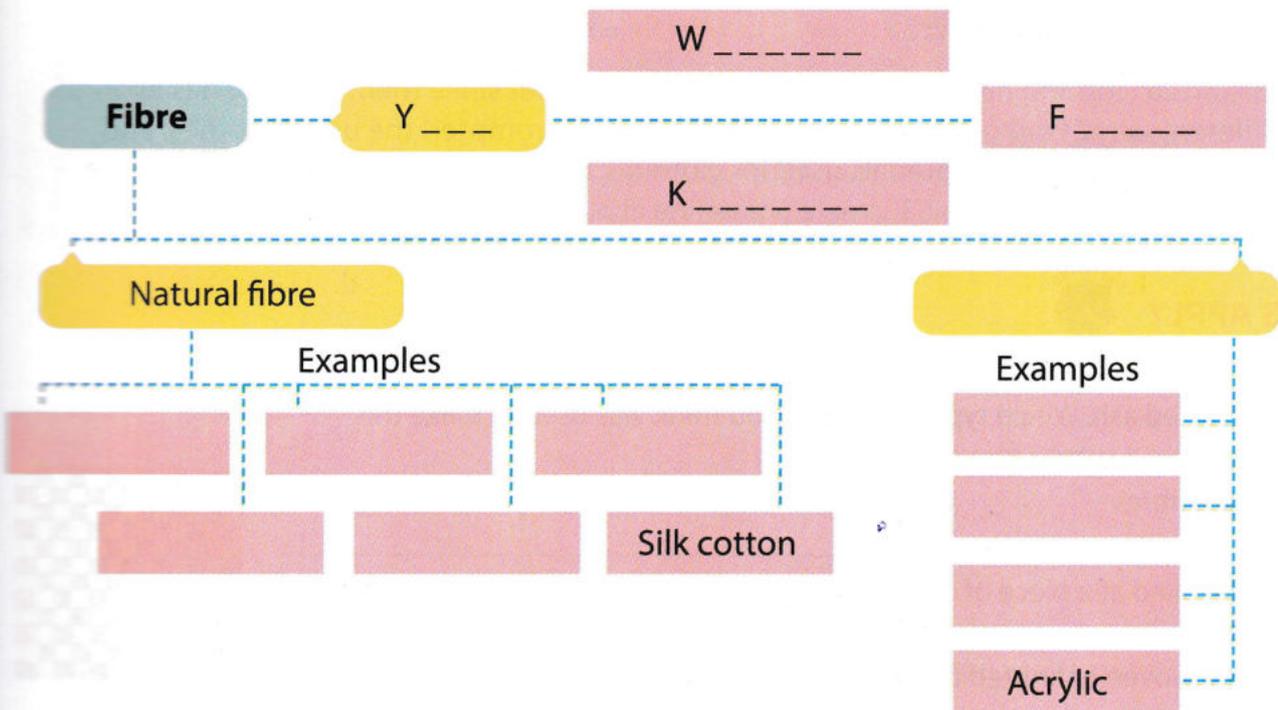
**IV. Long answer type questions.**

1. What are fibres? How do we get clothes from fibres?
2. Describe two processes of making fabric from yarn.
3. Describe the steps involved in the production of cotton.
4. Describe how jute fibre is obtained from the plant.
5. Write short notes on the following:

- a. Coir                      b. Silk cotton              c. Hemp                      d. Flax

**LET'S RECALL** 

Recall and complete the concept map given below.



## LET'S OBSERVE

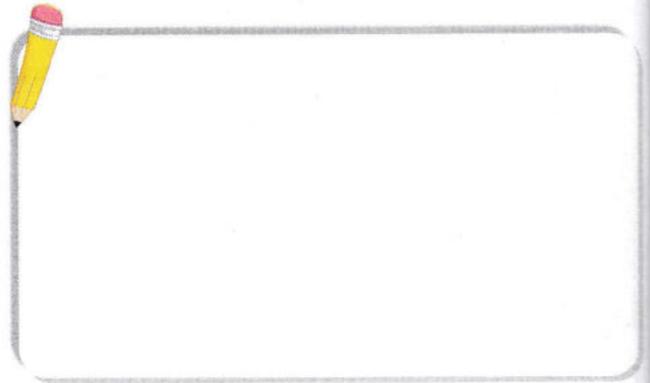
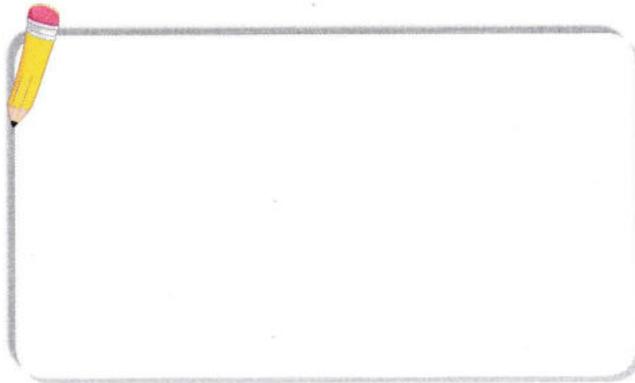


Observe the following pictures and answer the questions that follow.

- Name the cloth making machine that is being used here \_\_\_\_\_
  - Which of the following processes is it used for?
    - Knitting
    - Weaving
    - Ginning
    - Spinning
  - What would you call the pattern on this cloth?  
\_\_\_\_\_
  - How many yarns are used? (1/2)



- Draw any two articles made of jute that you have seen. Name them.



## LET'S CONNECT



HISTORY

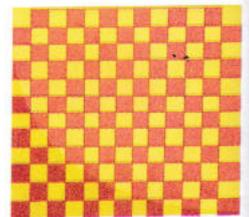
Man started clothing himself about 30,000 years ago. Ever since then, clothing has evolved in different ways. Find out how clothing started, what prompted the use of clothes, and what were the different materials used for clothing. Using this information, as well as the information given on page 53, create a timeline illustrating the history of clothing.

## LET'S APPLY



- A piece of fabric was brought near the flame of a candle. It burned like paper and formed ash. Which type of fibre do you think was used to make this fabric? Give a reason for your answer.
  - Plant fibres
  - Animal fibres
  - Synthetic fibres

---
- Payal looked at a piece of cloth with a hand lens, and saw the pattern given alongside.  
Is this a woven or knitted fabric? What makes you say so?



## LET'S ANALYSE AND EVALUATE



1. Analyse which of the following fibres is obtained from outer covering of its fruit?

- (i) Cotton                      (ii) Jute                      (iii) Coir                      (iv) Linen

Name the fruit \_\_\_\_\_

2. Evaluate which of the above would be best suited for making sacks and bags. Give one reason for your answer.



LO 10

## LET'S CREATE



TD

1. In groups of five, collect at least 10 pieces of cloth (of different fabrics) and paste them on a chart paper with the following information against each piece of cloth.

LO 2

LO 12

- The texture of the cloth
- Whether it is woven or knitted
- The kind of weave it may have
- The source of the fibre (plant, animal, or man made)

2. Create a flowchart to show the process of production of cotton yarns from the cotton plant. Create a similar flowchart for the extraction of jute fibres and manufacture of jute products. Present these flowcharts to the class and discuss them in your mother tongue.

LO 6

LO 8

3. On a map of Asia, mark the major jute- and cotton-producing countries. Create a presentation, highlighting the climate, soil, and rainfall conditions required for growing each of these plants.

LO 10

### Web Research

- Find out the problems associated with hand looms in India. Trace the history of weaving in India, and create a report on the different traditional weaves of India.  
<https://www.naturallighsafari.com/blog/hand-loom-weaving-in-india> (accessed and checked on 12-08-2019)  
<https://www.craftsvilla.com/blog/indian-handlooms-from-different-states-of-india/> (accessed and checked on 12-08-2019)
- Browse the internet and make a list of more plant fibres and the various uses of each of those plant fibres.  
[http://www.wildfibres.co.uk/html/plant\\_fibres.html](http://www.wildfibres.co.uk/html/plant_fibres.html) (accessed and checked on 12-08-2019)

# 5

## Sorting Materials into Groups

Placing or sorting similar things together is called **grouping**. Grouping makes it easier for us to find things when we need them.

Various types of things are given below. Sort them into meaningful groups.

### You will learn about

- ◆ Grouping on the basis of common properties
  - Roughness
  - Hardness
  - State
  - Flotation
  - Attraction towards magnet
  - Conduction of heat
  - Conduction of electricity
  - Lustre
  - Transparency
  - Solubility



1. Ant

2. Cows

3. Rose plant

4. Cockroach

and  are \_\_\_\_\_

and  are \_\_\_\_\_



5. Grape vine

6. Deer

and  are \_\_\_\_\_

Answers: 1 and 4 are insects; 2 and 6 are animals; 3 and 5 are plants.

## GROUPING ON THE BASIS OF COMMON PROPERTIES

AN

Objects are made of different materials. One material can be used to make different objects. This is possible because different types of materials have different properties. We have to choose materials with the right properties based on what we want to use it for. For example, a chalk made of wood or plastic would be of no use because it cannot be used to write on the blackboard.

Materials have different properties such as roughness, lustre, hardness, transparency, solubility, flotation, attraction towards a magnet, conduction of heat, and conduction of electricity. Let us study these properties one by one.

### Roughness

Materials can be rough or smooth. Rough materials have bumps or ridges on their surface, which can be felt by touching them. Smooth materials lack these bumps. Rocks, sandpaper, and bark of a tree are examples of rough surfaces. A glass sheet, flower petals, and surface of an apple are examples of smooth surfaces (Fig. 5.1).



A stone is rough to touch.



Flower petals are smooth to touch.

**Fig. 5.1** *Materials can be rough or smooth.*



Gold jewellery

**Fig. 5.2** *Metals have lustre.*

### Lustre

Lustre is the shine of a material. All metals in pure state are shiny and said to possess lustre. This property of metals is widely used for making jewellery and other decorative articles. Materials such as gold, silver, and bronze have lustre (Fig. 5.2).

### Hardness

Materials can be hard or soft. Hard materials are difficult to compress. Soft materials can be compressed easily. Rocks, wood, iron, and diamond are examples of hard materials. Rubber, sponge, cotton, and wool are examples of soft materials.

### Transparency

Different materials allow different amounts of light to pass through them depending on a property called transparency. Based on transparency, materials can be of three types: transparent, translucent, and opaque.

Materials that allow all the light to pass through them are called **transparent** materials (Fig. 5.3). Glass, water, acrylic sheet, and cellophane paper are transparent materials. Shopkeepers generally prefer to keep items such as toffee, biscuit, and sweet in transparent jars so that we can see them easily. Windows are also usually made of glass so that light can pass through and light our rooms.

Materials that allow some light to pass through them are called **translucent** materials. Oiled paper and coloured glass are translucent materials.

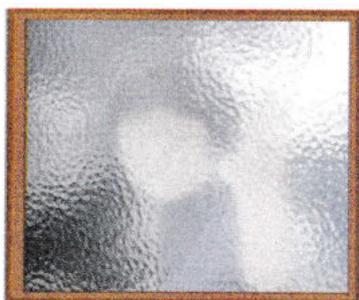
Materials that do not allow light to pass through them are called **opaque** materials. Wood, metal, leaf, stone, and cardboard are opaque materials.

### Let's Discuss

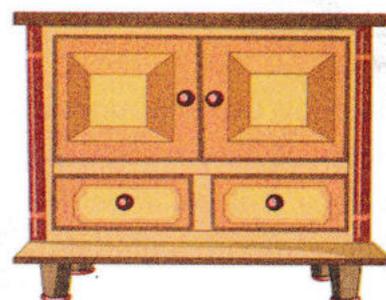
Discuss why it is important to have windows with transparent glasses.



(a) Glass window



(b) Frosted glass



(c) Wooden cabinet

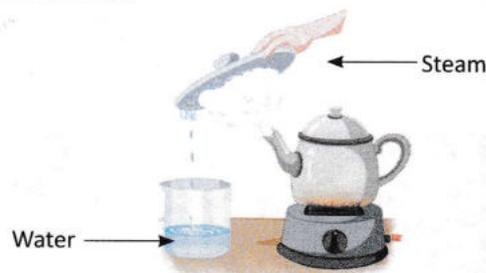
**Fig. 5.3** Transparency of different materials

### State

All substances are made up of matter. Matter is made up of particles. Matter exists in three states—solid, liquid, and gas (Fig. 5.4).



(a) Solid (ice)



(b) Liquid (water) and gas (steam)

**Fig. 5.4** States of matter

**Table 5.1** Grouping based on the states of matter

Solid	Liquid	Gas
Definite shape and volume	Definite volume but no definite shape. They take the shape of the container they are poured into.	No definite shape and volume
Cannot be compressed	Can be compressed to a small extent	Highly compressible
Particles are closely packed.	Particles are not as closely packed as in solids.	Particles are loosely packed.

## Let's Remember



Write T for the True and F for the False statement. Correct the false statements.

1. Smooth material lacks bumps or ridges on its surface.
2. Sandpaper is shiny and is used to make jewellery.
3. Windows are usually made of glass so that light can pass through.
4. Solids have a definite volume but no definite shape.
5. The property of a material to float on water is called solubility.

### Solubility

Different materials have different solubility in water. Based on their solubility, materials can be soluble, insoluble, miscible, or immiscible.

Solid materials that dissolve in water are said to be soluble in water. For example, common salt and sugar. Solid materials that do not dissolve in water are said to be insoluble in water. For example, sand, wood, stone, chalk powder, and wax. Liquids that dissolve in water are said to be miscible in water. For example, alcohol, vinegar, lemon juice, honey, and glycerine. Liquids that do not dissolve in water are said to be immiscible in water. For example, kerosene, coconut oil, and diesel (Fig. 5.5).



Fig. 5.5 Immiscible liquid

Some gases dissolve in water (e.g., carbon dioxide and oxygen). Oxygen dissolved in water is essential for the survival of aquatic organisms. Soft drinks have carbon dioxide dissolved in them. Gases such as nitrogen, hydrogen, and helium are insoluble in water.

### Flotation

Certain materials float on water whereas others sink. This property of a material to float on water is called *flotation*. Materials such as wood, leaf, cork, and feather float on water, whereas rock and metal sink (Fig. 5.6).



Fig. 5.6 Metal sinks while cork floats.

## Activity

**Aim:** To classify the given materials as magnetic or non-magnetic

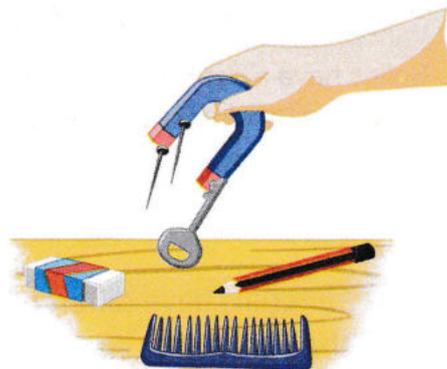
**Materials needed:** Pins (made of metal), clips (made of plastic), pencil, eraser, water, glass, cardboard, comb, nails, iron key, rock, sewing needle, paper, and a magnet

**Method:**

1. Bring the magnet near the objects one by one.
2. Observe which objects are attracted towards the magnet and which are not.

**Observation:** Pins, nails, key, and sewing needle are attracted to the magnet. Eraser, clips, pencil, water, comb, rock, glass, cardboard, and paper are not attracted to the magnet.

**Conclusion:** Some materials are magnetic, whereas some are non-magnetic.



## Attraction towards magnet

Materials that are attracted to a magnet are called **magnetic materials**. This property is called **magnetism**. Objects made of iron are attracted to a magnet. In addition to iron, nickel and cobalt are also attracted to a magnet.

## Conduction of heat

If you observe the utensils in your kitchen, you will notice that though most of them are made of metals, their handles are made of wood or hard plastic.

Why aren't the handles made of metal as well? This is because metals get heated, whereas materials such as plastic and wood do not (Fig. 5.7). It would be difficult to hold the handles made of metal while cooking.

Materials that allow heat to flow through them are called **conductors** of heat, whereas materials that do not allow heat to flow through them are called **insulators** of heat.

Generally, metals are conductors of heat, whereas non-metals such as wood, plastic, glass, bamboo, air, and paper are insulators of heat.



**Fig. 5.7** Handles of most kitchen utensils are made of wood or plastic.

## Conduction of electricity

We get electricity in our homes through cables and wires. An electric cable consists of a number of metal wires with or without a plastic covering (Fig. 5.8).

The metal wires conduct or transmit electricity, whereas the plastic covering provides insulation and do not conduct electricity.

Materials that conduct electricity are called **conductors**. Materials that do not conduct electricity are called **insulators**. For example, metals are conductors of electricity; wood, air, and plastic are insulators.

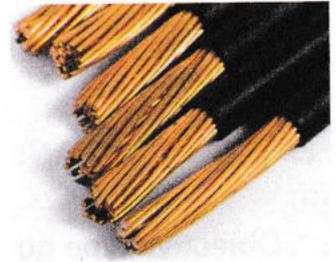


Fig. 5.8 Copper wires

### Let's Remember



Match the following.

Column A

1. Vinegar
2. Gold
3. Iron
4. Coconut oil
5. Rock
6. Glass

Column B

- conductor
- immiscible in water
- sinks in water
- attracted to magnet
- insulator
- miscible in water



### Key Words

<b>Transparent</b>	Materials that allow light to pass through them are called transparent materials.
<b>Translucent</b>	Materials that allow some light to pass through them are called translucent materials.
<b>Opaque</b>	Materials that do not allow light to pass through them are called opaque materials.
<b>Miscible</b>	Liquids that are soluble in water are said to be miscible in water.
<b>Immiscible</b>	Liquids that are insoluble in water are said to be immiscible in water.
<b>Magnetic materials</b>	Materials that are attracted by a magnet are called magnetic materials.
<b>Conductors</b>	Materials that conduct heat or electricity are called conductors.
<b>Insulators</b>	Materials that do not conduct heat or electricity are called insulators.

### Summary

- Materials have different properties that make them useful for making different objects.
- An object can be made from different materials.
- Different objects can be made from the same material.
- Materials can be rough or smooth, transparent or opaque, soluble in water or insoluble, can float on water or sink, can be a conductor or insulators of heat or electricity.

# Exercises

## LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with the correct words.

1. Glass sheets and flower petals are examples of \_\_\_\_\_ (smooth/rough) surfaces.
2. \_\_\_\_\_ (Hard/Soft) materials can be compressed easily.
3. Materials that allow some light to pass through them are called \_\_\_\_\_ (transparent/translucent) materials.
4. \_\_\_\_\_ (Solids/Gases) are highly compressible.
5. Liquids that do not dissolve in water are called \_\_\_\_\_ (immiscible/soluble) in water.

#### B. Choose the correct option.

1. Which of the following has a rough surface?  
(a) A sandpaper (b) Petals of a flower  
(c) Surface of an apple (d) Glass sheet
2. Which of the following can be compressed to a small extent?  
(a) Gases (b) Liquids (c) Solids (d) None of these
3. Which of the following is translucent?  
(a) Cellophane paper (b) Oiled paper  
(c) Water (d) Wood
4. Which of the following is a characteristic feature of a solid?  
(a) It has no definite shape. (b) It is highly compressible.  
(c) It has no definite volume. (d) Its particles are closely packed.
5. Which of the following is insoluble in water?  
(a) Common salt (b) Sugar (c) Wax (d) Carbon dioxide
6. Which of the following is a conductor of heat?  
(a) Metals (b) Plastic (c) Bamboo (d) Glass
7. Which of the following states of matter has close packing of particles?  
a. Solid state b. Liquid state c. Gaseous state d. All of these
8. Which of the following materials will sink in water?  
a. Wood b. Feather c. Rock d. Leaf

9. Which of the following gases is soluble in water?
- a. Hydrogen      b. Nitrogen      c. Helium      d. Carbon dioxide
10. Which of the following is a conductor of electricity?
- a. Air      b. Copper wire      c. Plastic      d. Wood

**II. Very short answer type questions.**

**A. Give two examples for the following.**

- |                             |        |       |
|-----------------------------|--------|-------|
| 1. Soft materials           | _____; | _____ |
| 2. Transparent materials    | _____; | _____ |
| 3. Opaque materials         | _____; | _____ |
| 4. Gases insoluble in water | _____; | _____ |
| 5. Magnetic materials       | _____; | _____ |
| 6. Insulators of heat       | _____; | _____ |

**B. Give one word for the following.**

- |   |       |
|---|-------|
| 1. Materials that have uneven or bumpy surface            | _____ |
| 2. Materials that do not allow light to pass through them | _____ |
| 3. Liquids that are soluble in water                      | _____ |
| 4. Materials that are attracted to a magnet               | _____ |
| 5. Materials that do not have a definite shape and volume | _____ |

**III. Short answer type questions.**

- Which property of metals makes them suitable for making jewellery?
- Compare hard and soft materials with one example of each.
- What is floatation?
- Why are cooking utensils made of metals while their handles are made of wood or hard plastic?
- Why are electric cables made of metal wires?
- What are conductors and insulators of electricity? Give one example of each.

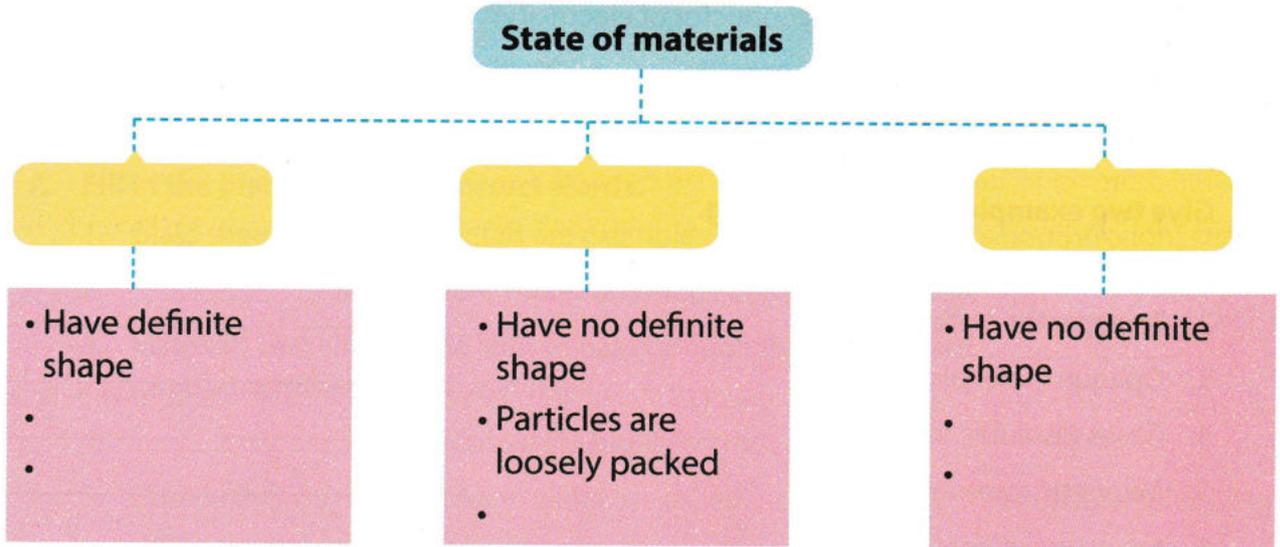
**IV. Long answer type questions.**

- Differentiate between transparent, translucent and opaque. Give two examples for each.
- What is magnetism? Describe an activity to differentiate between magnetic and non-magnetic substances.
- Describe grouping of materials depending upon their solubility in water.

## LET'S RECALL



Recall and complete the concept map given below.

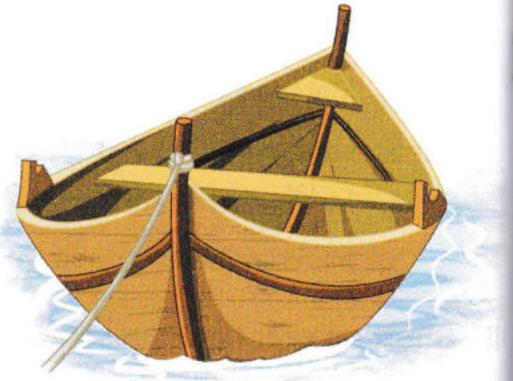


## LET'S OBSERVE



Observe the following pictures and answer the questions that follow.

- Which material is the boat made up of?
    - gold
    - mud
    - plastic
    - wood
  - What property of the material makes it suitable for this purpose?
  - Do you think the material would be a good conductor of heat?
  - Will it be able to transmit electricity? **LO 1** **LO 4** **LO 5**
- Look at the pictures given alongside. One is a wooden cabinet and the other is a metal utensil. Tick on the one you think will conduct electricity. Give reason.



## LET'S CONNECT



Ships are made of metals but still they do not sink. Make a project report on the design of objects that can make them float despite being made of dense material. Also include interesting facts about Titanic ship, which was considered to be unsinkable, but sank in the ocean in 1912.

## LET'S APPLY



1. Which would be the best materials for the following purposes, in terms of transparency? State your reasons.
  - a. Swimming goggles for protection of eyes while swimming.
  - b. Sunglasses for protection of eyes from damage from bright sunlight
  - c. A cabinet for display of jewellery at a jewellery shop
  - d. Trial room for trying clothes in a readymade garment shop.
2. A lady while buying a magnetic sticker for her fridge realized that her silver bangles were being attracted to it. Do you think that the bangles were made of silver? Give reasons.

## LET'S ANALYSE AND EVALUATE

1. Discuss why we should never touch naked live electric wires or electric cables that have fallen on roads. 
2. What precautions are necessary while handling electrical appliances (dry/wet hands, barefoot/ rubber slippers etc.)? Give one reason to justify each precaution. 

LO10

## LET'S CREATE



TD

1. Test the solubility of different materials, such as turmeric, common salt, sugar, coffee, spices, wheat flour, baking soda, washing powder, etc. in water. Mix a spoonful of each in a glass of water (separate glass of water for each item). Stir it well and let it stand for 5 minutes. Observe whether the item dissolves in water or not. Record your observations.  
2. A sewing needle, which is made of iron metal, sinks in water but we can be made to float on water surface by a special technique.  
  - a. Fill a wide bowl with water and keep it undisturbed.
  - b. Cut a small square out of a paper napkin and place a needle over it.
  - c. Place the napkin with the needle on the surface of the water gently without disturbing it.
  - d. The paper napkin will absorb water and sink whereas needle will remain afloat.
  - e. Find out why needle floats when placed on the surface of water by this method.

### Web Research

- Browse the internet and do a brief research and prepare a report on 'Glass' - include its preparation method and find out why glass is considered a pseudo solid. Suggested websites: <https://www.explainthatstuff.com/glass.html> (accessed and checked on 12-08-2019)
- Browse the internet and do a brief research and prepare a report on 'Interesting applications of magnets.' Suggested websites: <https://thesecretuniverse.wonderhowto.com/how-to/11-weird-wonderful-uses-for-magnets-0137723/> (accessed and checked on 12-08-2019)  
<https://gizmodo.com/6-ways-that-magnets-are-about-to-change-our-lives-1722803538> (accessed and checked on 12-08-2019)  
<https://www.goodhousekeeping.com/home/organizing/tips/a25969/new-uses-magnets/> (accessed and checked on 12-08-2019)  
<https://www.livescience.com/47383-cool-facts-about-magnets.html> (accessed and checked on 12-08-2019)  
<http://www.scienceclarified.com/everyday/Real-Life-Physics-Vol-3-Biology-Vol-1/Magnetism-Real-life-applications.html> (accessed and checked on 12-08-2019)

# 6

## Changes Around Us

Look at the following illustrations. Can you identify what has happened in each case?

### You will learn about

- Reversible and irreversible changes
- Physical and chemical changes
- Expansion and contraction of materials



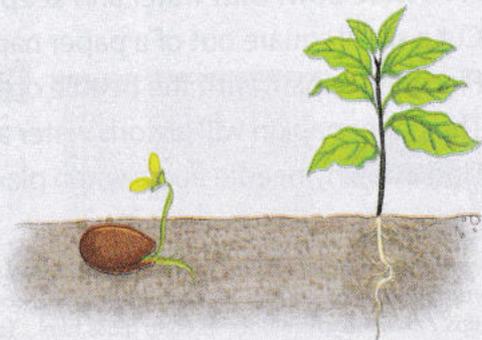
1. \_\_\_\_\_



2. \_\_\_\_\_



3. \_\_\_\_\_



4. \_\_\_\_\_

As you can see from the above pictures, changes take place all around us. Changes can be of different types about which we will learn in this chapter.

Answers: 1. A child growing into an adult. 2. Water heating up and becoming steam. 3. Fire burning the wood into ash. 4. Seedling growing into a plant.

## REVERSIBLE AND IRREVERSIBLE CHANGES

Changes that occur around us can be broadly categorized as reversible or irreversible depending on whether they can be reversed or not.

### Reversible Changes

Changes that can be reversed are called **reversible changes**.

What happens to an ice cream if you do not finish it quickly? It melts. Can you change the molten ice cream back into a solid? Yes! Just keep it in the freezer. Molten ice cream can be changed back to its solid form. Thus, melting is a reversible change. Melting of butter and chocolate are also reversible changes.

What about changes such as condensation, freezing, and evaporation of materials? If you take out some ice cubes from the freezer and keep them outside, the ice cubes will absorb heat from the surrounding and melt [Fig. 6.1 (a)]. When this water (molten ice) is heated for some time, it starts boiling (liquid starts to evaporate) and steam escapes from the container.



(a) Melting of ice

(b) Water evaporating and condensing

**Fig. 6.1** Reversible changes

Now, if you hold a lid over the container, the steam will again liquify or condense into small droplets of water on coming in contact with the cold lid [Fig. 6.1 (b)]. This water can be cooled down further and then kept in the freezer to form ice again. Thus, the three physical states of water are reversible and can be changed from one state to another by heating or cooling.

### Activity

**Aim:** To understand reversible changes

**Materials needed:** A balloon, dough, roller pin, and a sheet of paper

**Method:**

1. Blow the balloon. Now, release the air. Does it come back to its original shape and size? \_\_\_\_\_
2. Take some dough and make a ball. Roll it out. Can you change it back to the ball of dough? \_\_\_\_\_
3. Fold the sheet of paper to make a toy aeroplane. Can you get back the same paper by unfolding the aeroplane? \_\_\_\_\_

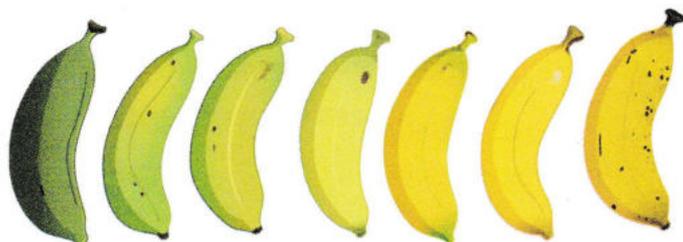
**Conclusion:** If the answer is 'yes' to all the questions above, then all the above changes are reversible.

## Irreversible Changes

Changes that cannot be reversed are called **irreversible changes**.

There are a large number of irreversible changes that take place around us. These result in a new material being produced, which may or may not be useful. Examples of irreversible changes are given below.

- Ripening of fruits is an irreversible change because it is not possible to get back the raw fruits from ripened or mature ones [Fig. 6.2(a)].



(a) Ripening of banana



(b) Baking of cake

**Fig. 6.2** Irreversible changes

- Blooming of flowers is an irreversible change because flowers cannot change back into buds.
- Milk gets spoiled when not refrigerated, particularly in summer. This is called curdling or souring of milk, which is an irreversible change. Curdling of milk is also done by adding lemon juice to milk for making cottage cheese or paneer.
- Burning of paper is an irreversible change. A new substance called ash is left or formed after a paper has been burnt. This new substance differs from the paper in its appearance and properties.
- Cooking of food is an irreversible change because we cannot get back the ingredients in their original form after cooking them. For example, after a cake is baked using flour, egg, milk, chocolate, etc., we cannot get back the ingredients [Fig. 6.2(b)].

### Let's Remember



#### I. Write T for the true statement and F for the false one. Correct the false statement(s).

1. Melting of ice cream cannot be reversed and is a physical change.
2. Curdling of milk is a reversible change.
3. Change of liquid water into ice is reversible but change of liquid water into steam is reversible.
4. Ripening of fruits is an irreversible change.

#### II. Identify the following changes as reversible/irreversible change.

1. Burning of paper
2. Tearing a piece of paper
3. Folding a piece of paper
4. Melting of ice cream
5. Boiling of an egg

## PHYSICAL AND CHEMICAL CHANGES

AN

What happens when you tear a piece of paper into two pieces? You get smaller pieces of paper! But they are still paper. This type of change is called a physical change (Fig. 6.3). *Changes in which no new substances are formed are called **physical changes**.* These changes do not result in the production of new substances. A physical change is generally observed during melting, freezing, condensing, breaking, crushing, cutting, and bending. Examples of physical changes are powdering of sugar, slicing, shredding, grating fruits and vegetables, and making ornaments/jewellery out of gold. All of these are physical changes as the original substance remains the same but in a new form.

All reversible changes and some irreversible changes are physical changes. For example, melting of butter is reversible and also a physical change as there is only change of state from solid to liquid form. Breaking of glass is irreversible and also a physical change as glass cannot be reconstituted to its original shape. Nevertheless, it remains glass in both forms.

What would happen when you burn leaves? The leaves will change into some invisible gases and ash. These new substances are not leaves (Fig. 6.4). This type of change is called a chemical change. *Changes in which new substances are formed are called **chemical changes**.* In a chemical change, the new substances formed are very different and they have entirely different properties. Examples of chemical changes are burning of LPG, natural gas, candle wax, wood and coal, cooking of food, rusting of iron, and respiration.

Chemical changes are always irreversible in nature and thus are permanent changes. For example, curdling of milk results in the formation of new substances.

Burning of candle is often cited as physical change because what we see immediately is melting of wax that solidifies on cooling. You must have observed that size of lit candle keeps on decreasing with time as molten wax vapourizes from candle flame on heating. The vapours of wax burn to produce new substances. Thus, melting of candle wax is an example of physical change, whereas burning of candle is a chemical change.



Fig. 6.3 Tearing of paper is a physical change.

### Let's Discuss

Physical changes may be either reversible or irreversible. However, chemical changes are always irreversible. Discuss.



Fig. 6.4 Chemical change

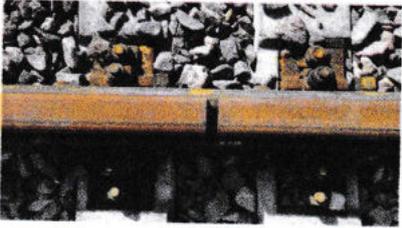
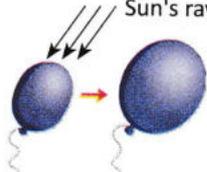
## EXPANSION AND CONTRACTION OF MATERIALS

AN

Some materials expand on heating and some contract on cooling. Heating makes the particles (that form the material) expand or become loose. Cooling makes the particles (that form the material) contract or become tight.

The amount of expansion differs in solids, liquids, and gases. Gases expand the most, whereas solids expand the least. Table 6.1 shows some examples of expansion.

**Table 6.1** Expansion in solids, liquids, and gases

Expansion in solids	Expansion in liquids	Expansion in gases
<p>Railway tracks consist of two parallel metal rails joined together. Small gaps, called expansion gaps, are deliberately left between the rails as there is an expansion of the rails in hot weather.</p> 	<p>Mercury expands on heating. Try this with the help of an adult. Take a glass of water in a container and heat it (do not boil). Now, dip the tip of the thermometer in the hot water. The mercury level rises up due to the expansion of mercury.</p> 	<p>If you keep an inflated balloon in the Sun for some time, what will happen? It will grow in size as the air inside it expands on taking heat from the surroundings.</p> 

Cooling does the opposite of heating. Cooling causes a material to contract. Solids contract the least, whereas gases contract the most. Table 6.2 lists some examples of contraction.

**Table 6.2** Contraction in solids, liquids, and gases

Contraction in solids	Contraction in liquids	Contraction in gases
<p>If we hold a very hot glass tumbler under cold water, it cracks. This is because the outer surface of the glass comes in direct contact with cold water and contracts more as compared to the inner surface.</p> 	<p>We observed that mercury expanded on heating. Can you say what will happen if the thermometer is allowed to cool down? The mercury level will go down. This is because of contraction.</p> 	<p>If an inflated balloon is tied at the mouth of a bottle and the bottle is placed in ice-cold water, what will happen? The balloon will shrink in size, as the air inside the balloon contracts on cooling.</p> 

## Applications of Expansion and Contraction

Expansion by heating can be used in several everyday activities.

- The jammed metal lid of a jam jar can be opened by heating. The jar is inverted and only the lid is dipped in hot water. After sometime, the lid can be opened easily as the lid gets slightly expanded.
- The fact that materials expand on heating is used in thermometers. In many thermometers, mercury is used. When the bulb of the thermometer comes in contact with a hot object, the mercury expands and its level rises in the glass tube, indicating the temperature.
- Why are electric lines never hung **tautly** between the poles? Wires in the outside environment are subjected to extreme weather conditions ranging from acute hot to cold temperatures. A taut wire on contraction in winters can snap.

### Get it Right

Water has a unique property. It contracts on cooling until it reaches the temperature of  $4^{\circ}\text{C}$ . However, when it is cooled further from  $4^{\circ}\text{C}$  to  $0^{\circ}\text{C}$ , it expands. So, ice floats on water.

### Word help

**Tautly** Stretched or pulled tightly

## Key Words

<b>Reversible change</b>	A change that can be reversed is called a reversible change.
<b>Irreversible change</b>	A change that cannot be reversed is called an irreversible change.
<b>Physical change</b>	A change where no new substances are formed is called a physical change.
<b>Chemical change</b>	A change where new substances with different properties are formed is called a chemical change.

## Summary

- Changes happen around us and also within us.
- Some changes are reversible, whereas some are irreversible.
- Some changes are physical changes, whereas some are chemical changes.
- Heating causes expansion in a material.
- Cooling causes contraction in a material.
- Gases expand the most and solids expand the least.
- Gases contract the most and solids contract the least.



8. What will happen to the level of mercury in the thermometer when it is dipped in hot water?
  - a. Remains same
  - b. Rises up
  - c. Falls down
  - d. Cannot be predicted
9. Which of the following is an irreversible and physical change?
  - a. Melting of chocolate
  - b. Breaking of glass
  - c. Making jewellery out of gold
  - d. Respiration
10. Which of the following will result in expansion of air?
  - a. Keeping an inflated balloon in the sun
  - b. Keeping an inflated balloon in the refrigerator
  - c. Keeping an inflated balloon in ice-cold water
  - d. No change will be observed in the size of balloon.

**II. Very short answer type questions.**

**A. Give two examples for the following.**

1. Physical changes \_\_\_\_\_;
2. Chemical changes \_\_\_\_\_;
3. Reversible changes \_\_\_\_\_;
4. Irreversible changes \_\_\_\_\_;
5. Application of expansion \_\_\_\_\_;

**B. Identify the type of changes that occur when the following happens.**

1. Breaking of a glass jar \_\_\_\_\_
2. Making cottage cheese from milk \_\_\_\_\_
3. Powdering of sugar \_\_\_\_\_
4. Melting of ice \_\_\_\_\_
5. Burning of coal \_\_\_\_\_

**III. Short answer type questions.**

1. Compare reversible and irreversible changes by citing two examples of each.
2. Describe how baking a cake is an example of an irreversible reaction.
3. Compare physical and chemical changes by giving two examples of each.
4. Describe how breaking of glass is an irreversible and physical change.
5. What will happen if an inflated balloon is kept in the sun for some time?

**IV. Long answer type questions.**

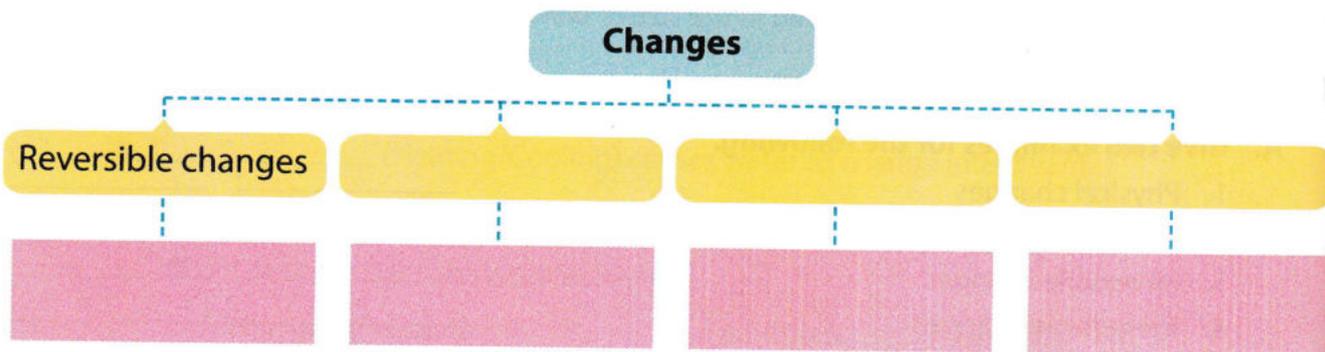
1. Describe how the three physical states of water can be changed from one state to another.
2. Which type of change, reversible or irreversible, takes place in each of the following cases? Give reasons for each.
  - a. Ripening of fruits
  - b. Melting of ice cream
  - c. Tearing of paper
  - d. Curdling of milk

3. Which type of change, physical or chemical, takes place in each of the following cases? Give reasons for each.
- a. Baking a cake
  - b. Burning of paper
  - c. Tearing of paper
  - d. Breaking of glass
4. Describe one example each of expansion in solids, liquids, and gases.
5. Describe one example each of contraction in solids, liquids, and gases.

### LET'S RECALL



Recall and complete the concept map given below.



### LET'S OBSERVE



Observe the following pictures and answer the questions that follow.

1. Name the type of changes shown in the following pictures.



2. a. Is the change shown in the first picture physical or chemical change?  
 b. Is the change shown in the second picture physical or chemical change?  
 c. Is the change shown in the third picture physical or chemical change?  
 d. In which of the above changes is burning desirable?



79

Changes Around Us

LO 4

78

Changes Around Us

Find out the maximum and minimum temperature observed for all the months in your city/town for last 5 years from internet. Record this data in a table and answer the following: Which year had the hottest summer and coldest winter? Which year had summer season with lowest temperature and winter with the highest? What according to you could be the reasons for variations in the temperature observed during summers and winters?



## LET'S APPLY

1. The Eiffel Tower is about six inches taller in the summer than in the winter. Why?
2. Why do deodorant sprays carry signs, such as store in cool place or do not leave in sunlight? 

## LET'S ANALYSE AND EVALUATE

1. 'We are living on this planet as if we have another one to go to.' Discuss this quote by Terri Swearingen with reference to uncontrolled tampering of Earth through undesirable changes. 
2. Compare the Earth of today with that of 100 years ago. Discuss the changes responsible for the present state of the Earth. Make a list of our actions and what we could have done instead.



## LET'S CREATE



1. Prepare a project report on any ten changes that occur in your surroundings. Take printouts of their pictures, paste them on a chart paper, and give suitable descriptions to each of them. Classify into physical/chemical and reversible/irreversible changes. Discuss if these changes are desirable or undesirable.  

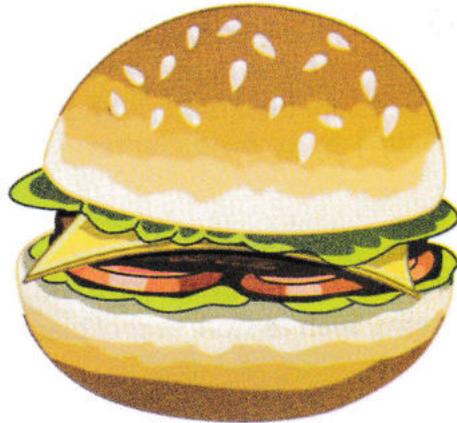
## Web Research

- Browse the internet and do a brief research and prepare a report on different types of changes and their causes and effects (other than the ones cited in the book) taking place in our environment Suggested websites:  
[https://chem.libretexts.org/Courses/Palomar\\_College/PC:\\_CHEM100\\_-\\_Fundamentals\\_of\\_Chemistry/01%3A\\_The\\_Chemical\\_World/1.7%3A\\_Physical\\_and\\_Chemical\\_Changes](https://chem.libretexts.org/Courses/Palomar_College/PC:_CHEM100_-_Fundamentals_of_Chemistry/01%3A_The_Chemical_World/1.7%3A_Physical_and_Chemical_Changes) (accessed and checked on 12-08-2019)  
[https://en.wikipedia.org/wiki/Physical\\_change](https://en.wikipedia.org/wiki/Physical_change) (accessed and checked on 12-08-2019)  
<https://www.bbc.com/bitesize/guides/zc9q7ty/revision/3> (accessed and checked on 12-08-2019)

# Worksheet 2

## Skills assessed:

Problem solving, and qualitative analysis



Shreya prepared vegetable burgers for breakfast using various processes. She sliced the bun and roasted the slices on a flat pan. While roasting the bun slices, she placed cheese slices on top of the bun, causing it to melt. She fried vegetable patties, drained excess oil, and placed it on the bun slice. She added a layer of tomato sauce and mayonnaise on top of the fried patty. She chopped various vegetables, such as onions, tomatoes, cucumber, and lettuce, and placed the slices on top of the fried patty.

1. Identify any two physical changes that took place while preparing the burgers.  
\_\_\_\_\_  
\_\_\_\_\_
2. Identify any two chemical changes that took place.  
\_\_\_\_\_  
\_\_\_\_\_
3. Which of the following is reversible change: melting of cheese slice or slicing the burger bun? Why?  
\_\_\_\_\_
4. Identify a change that is both reversible and physical.  
\_\_\_\_\_
5. Identify a change that is both irreversible and physical.  
\_\_\_\_\_
6. Which out of the two is a chemical change: baking of buns or slicing onions? Why?  
\_\_\_\_\_

# 7

## UNIT 3: The World of the Living Things Around Us

Things around us can be broadly divided into two groups: living and non-living. There are certain characteristics that make living beings very different from non-living things.

### You will learn about

- Characteristics of living things
- Environment

Look at the picture below. Make a list of any five living things and five non-living things that you can see here.



Living things : \_\_\_\_\_  
Non-living things : \_\_\_\_\_

Answers: Living things: 1. Man/boy, 2. Birds, 3. Plants/Mango tree, 4. Squirrel, 5. Dog  
Non-living things: 1. Newspaper, 2. Bench, 3. Bicycle, 4. Lamp post, 5. Spectacles/Helmet/Ball

Let us learn about the characteristic features of living and non-living things in our environment and how they interact with each other.

## CHARACTERISTICS OF LIVING THINGS

LL

Let us learn about the characteristics of living things.

### Structural Organization

Living things have a definite structural organization (Fig. 7.1). The bodies of living things are made up of cells, which are the building blocks of the body.

A *cell* is the smallest living structure that is able to function independently.

A group of similar cells that perform a particular function form a *tissue*.

A group of tissues performing a particular function in the body form an *organ*.

A group of organs interacting with one another to perform a particular *life process*, such as digestion and respiration, form an *organ system*.

There are organisms made of just one cell. An organism whose body consists of a single cell is called a *unicellular organism*, e.g., *Amoeba* and *Paramecium* (Fig. 7.2). In a unicellular organism, all life processes are carried out by the single cell.

An organism whose body consists of several cells is called a *multicellular organism*, e.g., human beings and a rose plant.

### Movement and Response to Stimuli

Most living things are capable of moving on their own. Animals move from place to place in search of food and water, to escape from danger, and many other reasons.

Plants do not move on their own. However, they exhibit movement of their certain parts, such as leaves and roots, in response to changes in their immediate environment.

A *change in the immediate environment of an organism, which produces a change in the activities of the organism, is called a stimulus* (plural: *stimuli*). An organism's reaction to a stimulus is called a *response*.

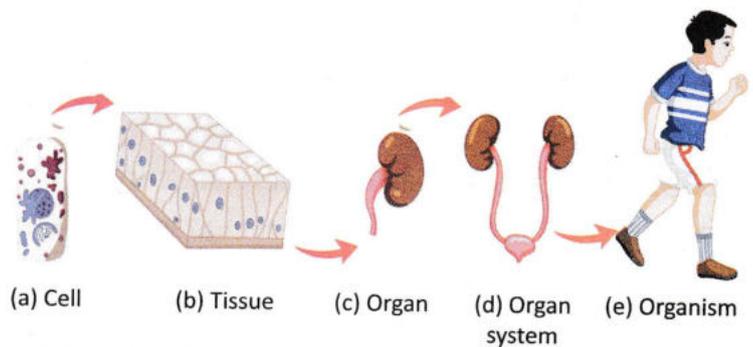


Fig. 7.1 Structural organization in human beings

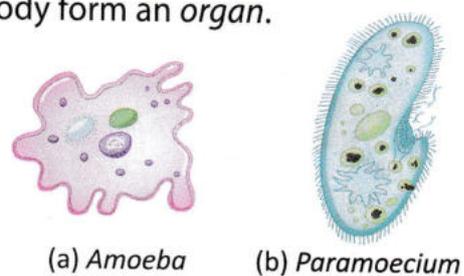


Fig. 7.2 Unicellular organisms



Fig. 7.3 Leaves of touch-me-not respond to touch.

Leaves of touch-me-not curl up when touched (Fig. 7.3). Here, touch is the stimulus and curling up of leaves is the response.

Shoot of a plant grows towards the light and the root grows towards gravity. Here, light and gravity are the stimuli and plant growth is the response.

### Growth and Development

Living things grow. For example, a child grows into an adult and a seedling grows into a plant (Fig. 7.4). Growth in living things is irreversible. For example, we cannot get the seedling back from the plant.

### Excretion

Living things remove wastes from their body by the process of excretion.

- Most animals excrete solid wastes in the form of faeces, liquid wastes in the form of urine, and gaseous wastes in the form of carbon dioxide.
- Gum, resins, and latex are wastes given out by plants.

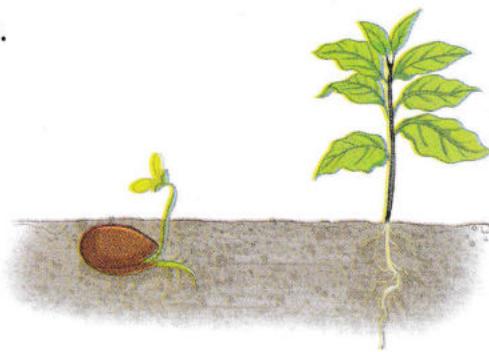


(a) Child growing into adult

### Respiration

The process by which living things utilize oxygen to release energy stored in the food they eat is called **respiration**. Plants and animals respire all the time.

Breathing is a part of respiration. By breathing, we inhale air that contains oxygen. It is through respiration that this oxygen is used by the body to obtain energy from food. Plants also respire to obtain energy from the food they make by photosynthesis. Thus, respiration is a vital process for all living organisms.



(b) Seed growing into plant

Fig. 7.4 Growth and development

### Reproduction

Living things have the ability to reproduce more of their kind through reproduction. Different organisms have different means of reproduction. Plants reproduce mostly through seeds. Animals reproduce by either laying eggs or giving birth to young ones.

### Nutrition

All living things need food. Green plants manufacture their own food by photosynthesis. Hence, they are called *autotrophs* (*auto*, self; *trophe*, food). Animals cannot manufacture their own food. Hence, they are called *heterotrophs* (*hetero*, different; *trophe*, food). They depend on plants and other animals for food.

### Life Span and Death

All living things follow a cycle of growth and development in which an organism takes birth, grows into an adult, grows old, and dies. This is known as the *life cycle* of the organism.

**Table 7.1** Differences between living and non-living things

Living things	Non-living things
1. Living things are made up of cells.	1. Non-living things are not made of cells.
2. They excrete and get rid of wastes.	2. They do not produce wastes.
3. They reproduce new offsprings.	3. They do not reproduce.
4. They need food and air to stay alive.	4. They do not need food or air to stay alive.
5. Living things follow a cycle of growth and they finally die.	5. Non-living things do not grow or die.

### Let's Remember



Identify the following pictures and label them correctly using the words given below.

Nutrition, Response to stimuli, Organ system, Amoeba, Growth

1.



\_\_\_\_\_

2.



\_\_\_\_\_

3.



\_\_\_\_\_

4.



\_\_\_\_\_

5.



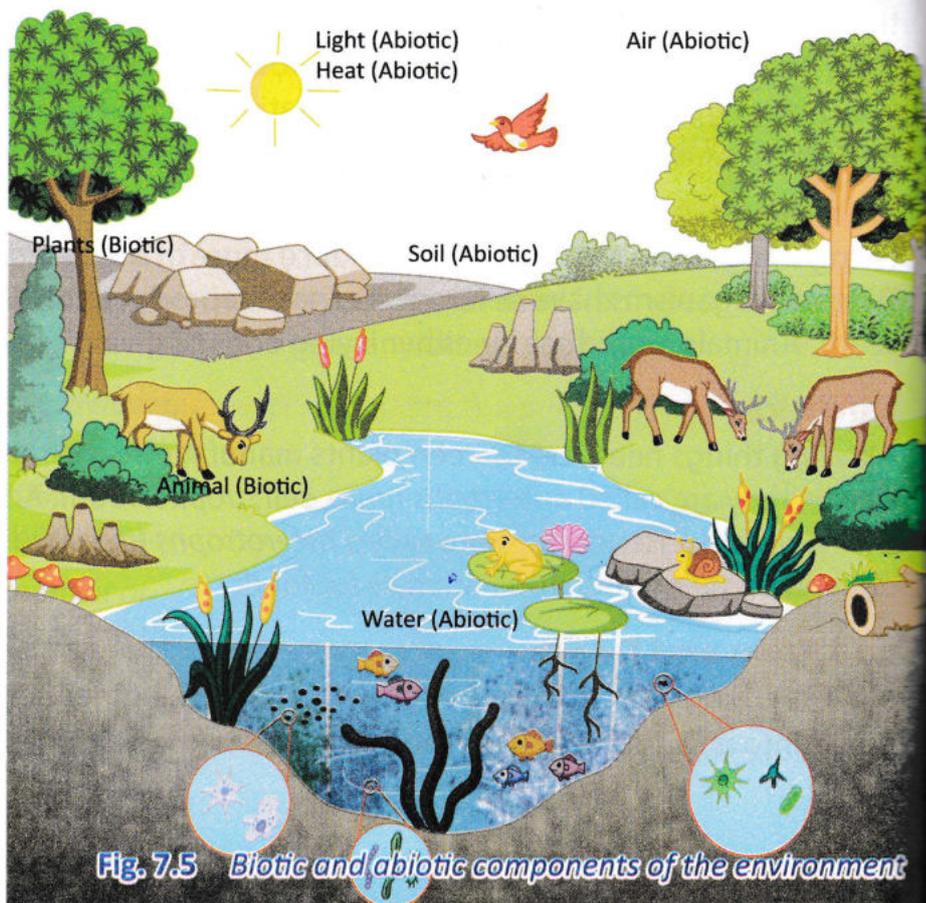
\_\_\_\_\_

### ENVIRONMENT

All living things depend on their surroundings for food, water, and shelter.

All that surrounds living things and affects their growth and development is called their **environment** (environ: to surround).

Both living and non-living things form the environment. Thus, we can say that the environment is made up of two parts or components—biotic and abiotic (Fig. 7.5). Living things such as plants and animals are called **biotic components**.



**Fig. 7.5** Biotic and abiotic components of the environment

Non-living things such as air, light, water, soil, and temperature are called **abiotic components**.

### Biotic Components

The word 'biotic' means 'living'. Biotic components are those that have life. Plants, animals, scavengers, and decomposers are biotic components.

### Plants

Most plants have green leaves. Leaves are green because they contain a green pigment called chlorophyll (*chloro*: green; *phyll*: leaf). Chlorophyll gives plants the special ability to make their own food using light, water, and carbon dioxide (Fig. 7.6).

The process by which green plants make their food using carbon dioxide and water in the presence of light and chlorophyll is called **photosynthesis** (*photo*: light; *synthesis*: production).

### Animals

Animals cannot make their own food, as green plants do. Thus they are called heterotrophs. Both animals and plants need substances, called nutrients, in order to grow. Plants absorb nutrients such as nitrogen, phosphorus, and calcium from the soil. These nutrients enter the bodies of animals when they eat plants or the flesh of other animals. After these plants and the animals die, their bodies decompose and the nutrients are returned to the soil.



Fig. 7.7 Vulture: a scavenger

### Scavengers and Decomposers

Some organisms feed on the bodies of dead plants and animals, and release the nutrients trapped inside them.

Animals that feed on the dead bodies of other animals are called **scavengers**. For example, hyena and vulture (Fig. 7.7). Tiny organisms that feed on the remains of dead plants and animals to break them down into simpler substances are called **decomposers**. Bacteria and fungi are common decomposers.

The nutrients released from the dead bodies by the action of scavengers and decomposers get mixed with the soil and are again absorbed by plants. This process is called *recycling* of nutrients.

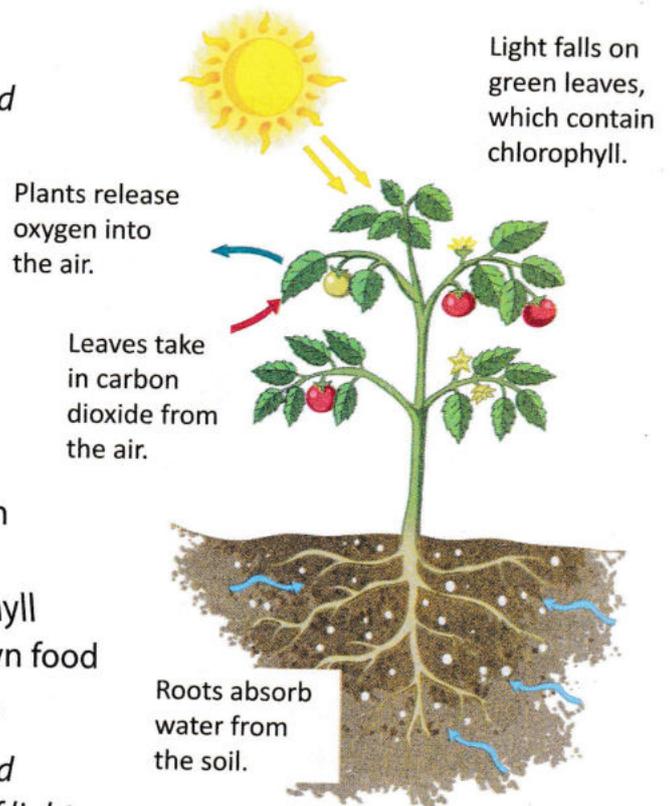


Fig. 7.6 Diagrammatic representation of photosynthesis

### Let's Discuss

Discuss the role of scavengers and decomposers in recycling of nutrients in nature.

Scavengers and decomposers play two important roles in the environment by:

- keeping the environment clean by removing the bodies of dead plants and animals, and
- helping in the recycling of nutrients in the environment.

### Interactions Among Biotic Components

Plants and animals depend on each other for various needs. Animals mainly depend on plants for food and shelter. Animals in turn help plants by pollinating flowers, dispersing seeds, etc.

In nature, the following relationships are observed among plants, animals, scavengers, and decomposers.

- Plants (called *producers*) utilize the sun's energy and manufacture their own food through photosynthesis.
- Herbivores (called *primary consumers*) such as rabbit and deer feed on plants.
- Carnivores (called *secondary consumers*) such as tiger and lion feed on herbivores.
- Omnivores (called *secondary consumers*) such as human beings and bear feed on both plants as well as the flesh of other animals.
- Scavengers and decomposers feed on dead plants and animals, and release the nutrients trapped inside their bodies into the soil. These nutrients are then absorbed by plants, which help them to grow and manufacture their food.



**Fig. 7.8** A bee pollinates flowers while collecting nectar.

### Let's Remember



Name any three biotic and three abiotic components in the picture below. Also colour the producers green and the consumers brown.

1. Biotic components:

---

---

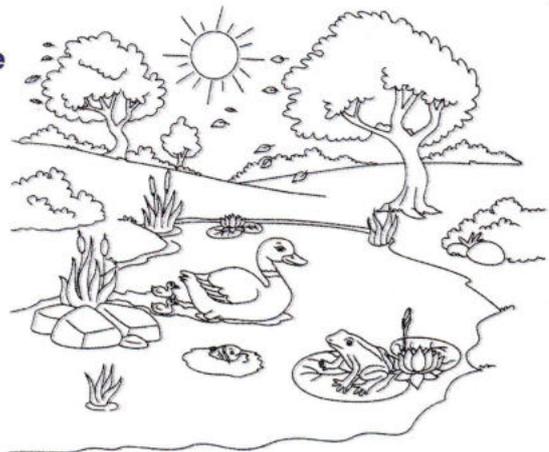
---

2. Abiotic components:

---

---

---



### Abiotic Components

The word 'abiotic' means 'non-living'. Light, air, water, soil, and temperature are examples of abiotic components of the environment. Even though these components are themselves non-living, they have an effect on the living organisms, i.e., the biotic components of the environment.

## Light

Plants use light to prepare their own food. The growth of plants and flowering are also dependent on the availability and duration of exposure to light. For example, kharif crops such as maize and cotton flourish in summer when day length or exposure to light is more.

## Temperature

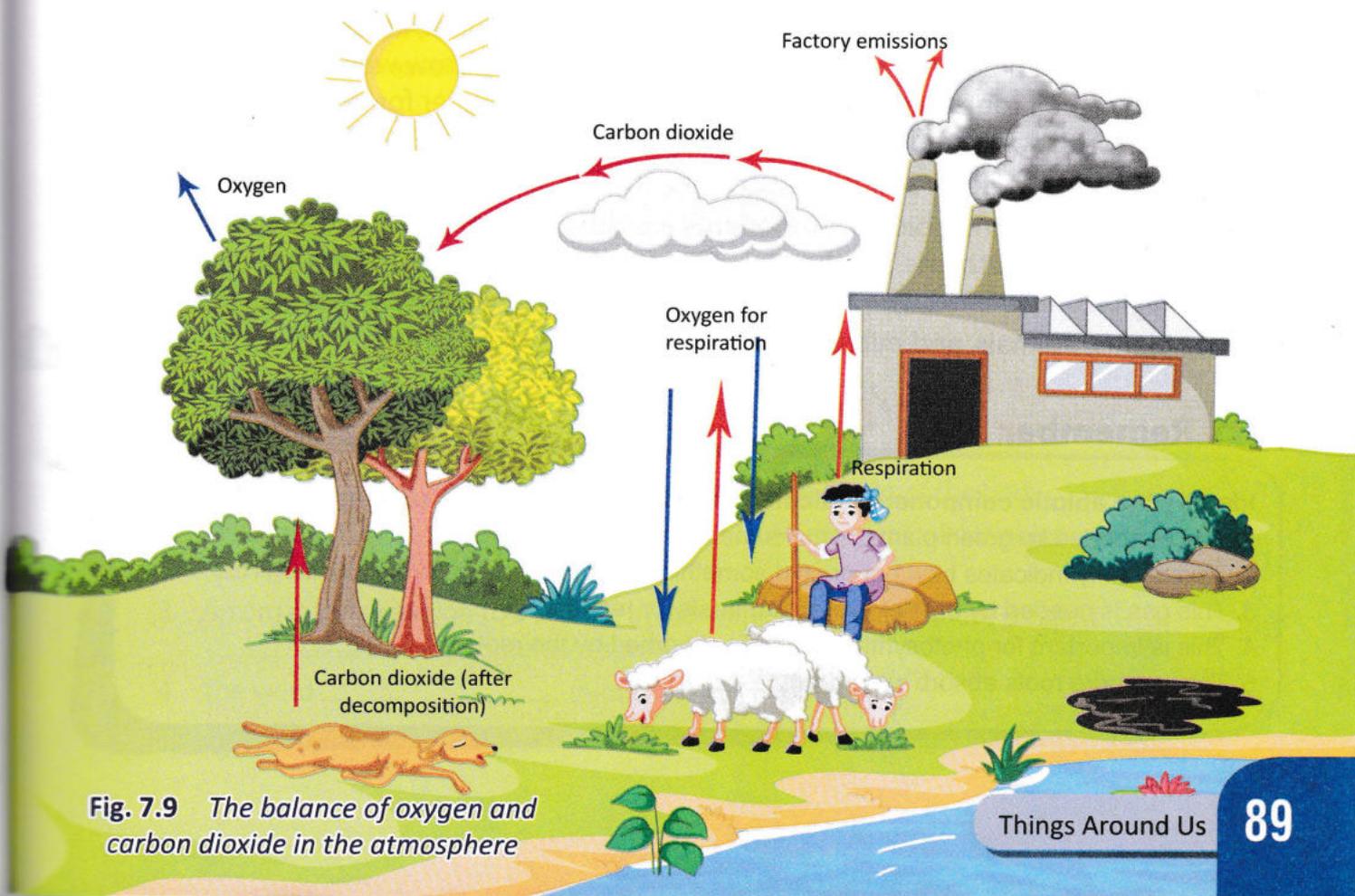
**Temperature** is a measure that tells us how hot or cold something is. The Earth is the only known planet that has a temperature suitable for life to exist. Even on the Earth, the temperature is not uniform all around. It is very hot near the equator, whereas places near the poles are very cold. Temperature affects the distribution of plants and animals around the planet.

Animals whose body temperature changes with the outside temperature are called **cold-blooded animals**. Most reptiles, insects, and amphibians are cold-blooded. Animals whose body temperature does not change with the outside temperature are called **warm-blooded animals**. Most mammals and birds are warm-blooded.

Warm-blooded animals can survive in areas, such as desert and the Arctic region, having extreme temperatures. Here, cold-blooded animals would have difficulty in surviving. Polar bear is adapted to survive in the harsh temperatures of the Arctic.

## Air

Oxygen and carbon dioxide present in air are very important for the survival of organisms. Both plants and animals need oxygen for respiration. Animals and human beings release carbon dioxide during respiration, which is used by green plants for photosynthesis (Fig. 7.9).



Carbon dioxide is also released by the burning of fuels in vehicles and factories. Plants, in turn, release oxygen into the environment. Thus, green plants play a very important role in maintaining the balance of oxygen and carbon dioxide in the environment. Moving air or wind also helps in the reproduction of plants through pollination and dispersal of certain fruits and seeds.

### Water

Water is very important for living organisms (Fig. 7.10). Plants absorb water through their roots, which is then transported to different plant parts. Water is essential for carrying out photosynthesis in plants.

It also plays an important role in the human body. Blood, which transports substances within the human body, is largely composed of water. In fact, 70% of the human body consists of water.

Water dissolves vital gases such as oxygen and carbon dioxide. This enables living beings to survive in water.



**Fig. 7.10** Water is essential for living organisms.

### Soil

Soil is the uppermost layer of the Earth's crust. It has four sub-layers—topsoil, subsoil, parent material, and the bedrock. It is in the topsoil that plants grow.

Soil is usually very rich in minerals such as magnesium, potassium, and phosphorus. Without soil, there would be no plants, and thus, no food for us. Plants grow well in loosely packed soil as it allows their roots to grow deeper and also makes it easier for them to absorb water and nutrients. This is why farmers plough their fields before sowing seeds.

Animals such as earthworm and snail also make the soil loose by turning it.

Thus in nature, biotic and abiotic components are closely interrelated. Biotic components (organisms) interact with one another too. *A group of interdependent organisms that live in the same region and interact with one another form a **biotic community**.* A biotic community includes plants, animals, and microorganisms.

### Let's Remember



**Identify the abiotic component indicated in each of the following sentences.**

1. This is needed by green plants to make their own food. \_\_\_\_\_ T
2. This quantity indicates how hot or cold something is. \_\_\_\_\_ P \_\_\_\_\_ U R \_\_\_\_\_
3. This gas is needed by both plants and animals for respiration. \_\_\_\_\_ Y \_\_\_\_\_
4. This is important for photosynthesis and is absorbed by the roots. \_\_\_\_\_ R
5. This is where roots absorb water from \_\_\_\_\_ L

## Key Words

<b>Cell</b>	A cell is the smallest living structure that is able to function independently.
<b>Stimulus</b>	A change in the immediate environment of an organism, which produces a change in the activities of the organism, is called a stimulus.
<b>Response</b>	An organism's reaction to a stimulus is called a response.
<b>Respiration</b>	The process by which living things utilize oxygen to release energy stored in the food they eat is called respiration.
<b>Environment</b>	All that surrounds living things and affects their growth and development is called their environment.
<b>Biotic components</b>	Living things like plants and animals are called biotic components.
<b>Abiotic components</b>	Non-living things like light and temperature are called abiotic components.
<b>Biotic community</b>	A group of interdependent organisms that live in the same region and interact with one another is called a biotic community.

## Summary

- Living things have certain characteristics: structural organization, movement and response to stimuli, growth, excretion, respiration, reproduction, feeding, and death.
- Plants, animals, scavengers, and decomposers are examples of biotic components.
- Light, temperature, air, water, and soil are examples of abiotic components.
- Green plants maintain the balance of oxygen and carbon dioxide in the environment.
- Plants and animals have developed various ways to survive in regions having extreme temperatures.
- Soil and water are essential for all living organisms.

## Exercises

### LET'S UNDERSTAND



QT

#### I. Objective type questions.

##### A. Fill in the blanks with suitable words.

1. \_\_\_\_\_ (Cells/Tissues) are the building blocks of the body.
2. In \_\_\_\_\_ (unicellular/multicellular) organisms, all life processes are carried out by a single cell.
3. An organism's reaction to a change in the immediate environment is called \_\_\_\_\_ (stimulus/response).
4. The word \_\_\_\_\_ (biotic/abiotic) means living.
5. Bacteria and fungi are common \_\_\_\_\_ (scavengers/decomposers).

**B. Choose the correct option.**

- Which of these refers to a group of similar cells that perform a particular function?  
a. Tissue                      b. Organ                      c. Organ system                      d. Organ system
- Which of these do living things get from their environment?  
a. Food                      b. Water                      c. Air                      d. All of these
- Which of these animals feed on dead bodies of other animals?  
a. Deer                      b. Tiger                      c. Hyena                      d. Bacteria
- Which of these are cold-blooded animals?  
a. Insects                      b. Reptiles                      c. Amphibians                      d. All of them
- Which of these form the biotic component of the environment?  
a. Plants                      b. Animals                      c. Microorganisms                      d. All of these
- Which of these are characteristics of living things?  
a. Grow                      b. Reproduce                      c. Excrete                      d. All of these
- Which of these form the abiotic component of the environment?  
a. Soil                      b. Plants                      c. Fungi                      d. Bacteria
- Which of these do plants need to prepare their food?  
a. Light                      b. Water                      c. Carbon dioxide                      d. All of these
- Which of the following are called primary consumers?  
a. Herbivores                      b. Carnivores                      c. Decomposers                      d. Omnivores
- Which of these are warm-blooded animals?  
a. Earthworm                      b. Snail                      c. Bear                      d. Snake

**II. Very short answer type questions.**

**A. Give two examples for the following.**

- Life processes in living things \_\_\_\_\_; \_\_\_\_\_
- Wastes given out by plants \_\_\_\_\_; \_\_\_\_\_
- Omnivores \_\_\_\_\_; \_\_\_\_\_
- Biotic components \_\_\_\_\_; \_\_\_\_\_
- Secondary consumers \_\_\_\_\_; \_\_\_\_\_

**B. Give one word for the following.**

- The smallest living structure that is able to function independently \_\_\_\_\_
- The process by which living thing use oxygen to release energy from food \_\_\_\_\_
- Components of the environment that are non-living \_\_\_\_\_
- A cycle of growth and development of an organism \_\_\_\_\_
- Animals that feed on dead plants and animals \_\_\_\_\_

**III. Short answer type questions.**

- State any four characteristics of living things.
- Define respiration. Why is it important?
- What are autotrophs? How are they different from heterotrophs?
- Define decomposers.
- What is a biotic community?

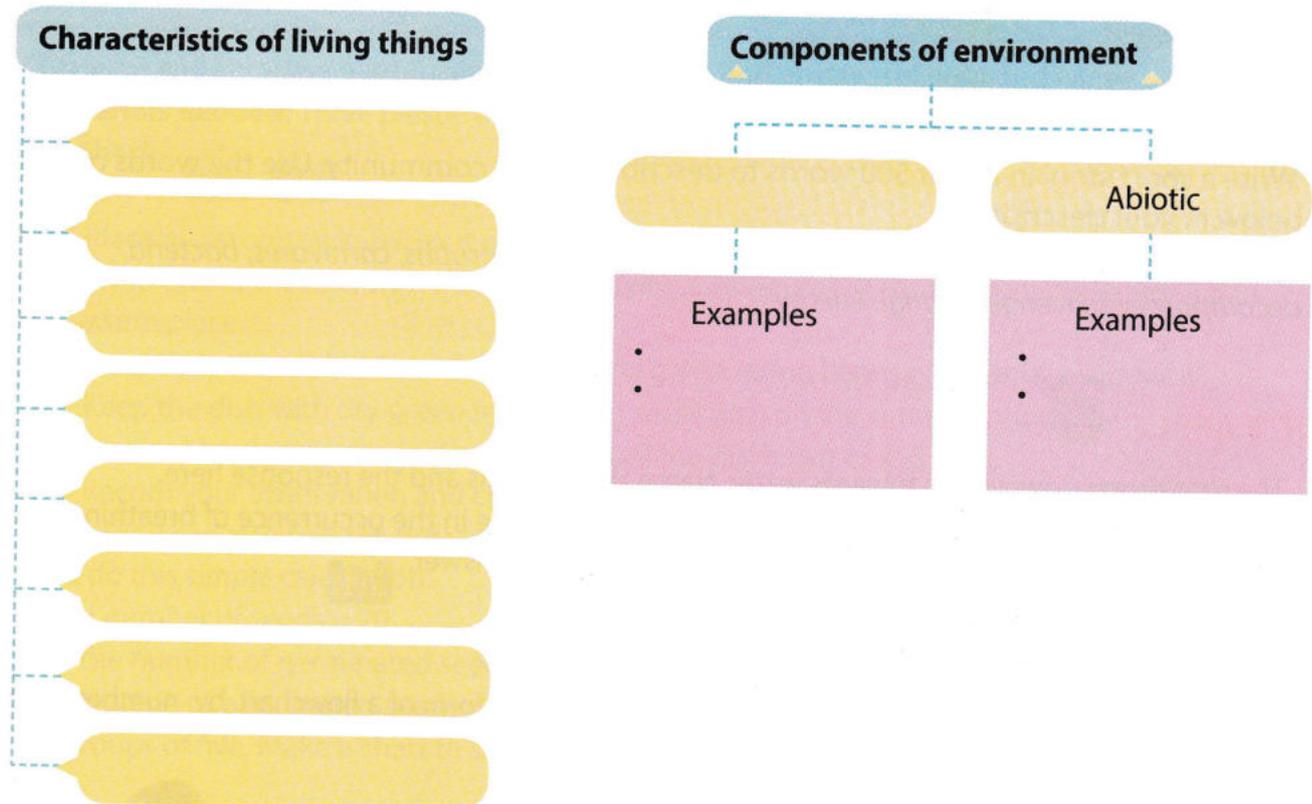
#### IV. Long answer type questions.

1. Describe the structural organization in living things.
2. With the help of an example explain stimulus and response in plants.
3. Differentiate between living things and non-living things.
4. Describe the different abiotic components of the environment.
5. Explain how oxygen and carbon dioxide of the air are balanced in nature.

#### LET'S RECALL



Recall and complete the concept map given below.



#### LET'S OBSERVE



1. Observe the following picture and answer the questions that follow.

LO 4

a. Is this organism an autotroph or a heterotroph?

\_\_\_\_\_

b. Name the process by which it get its food.

\_\_\_\_\_

c. What are the raw materials required for the process?

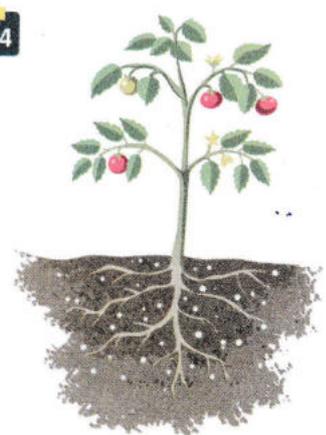
\_\_\_\_\_

d. Does it comprise the biotic or abiotic component?

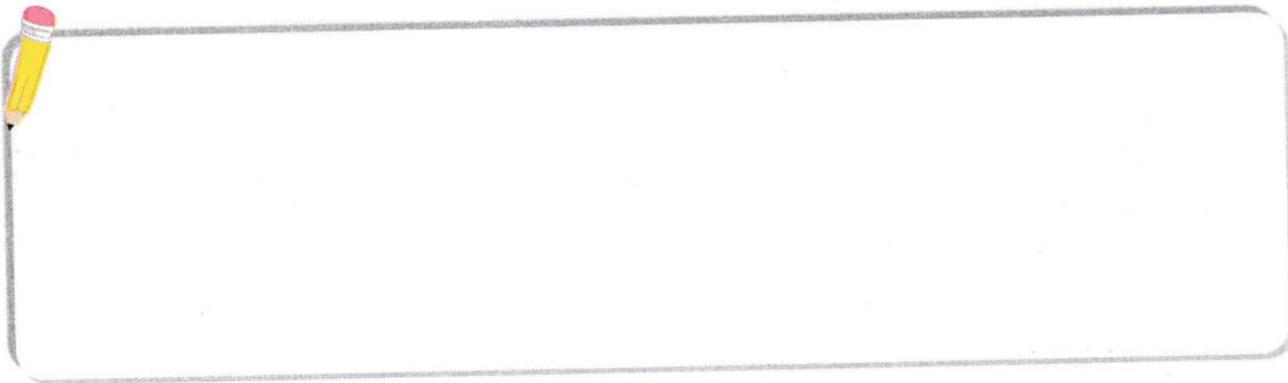
\_\_\_\_\_

e. Are the raw materials biotic or abiotic?

\_\_\_\_\_



2. Draw a well-labelled diagram to depict the structural organization in living things.



### LET'S CONNECT ENGLISH

Write a short story in about 500 words to describe a biotic community. Use the words given below in your description.

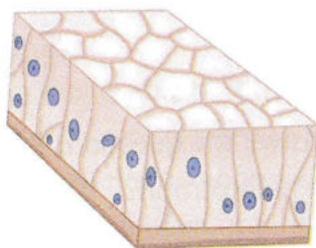
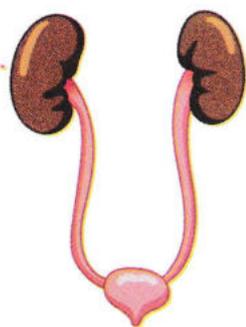
*Sun, air, water, photosynthesis, green plants, herbivores, autotrophs, carnivores, bacteria, decomposers, scavengers, fungi, energy*

### LET'S APPLY

- The root grows downwards towards water. Name the stimulus and the response here.
- Maya says that cutting down of trees is leading to an increase in the occurrence of breathing problems in the city. Do you think she is right? Justify your answer.  LO 11

### LET'S ANALYSE AND EVALUATE

- Illustrate the structural organization in living organisms in the form of a flowchart, by numbering the pictures in ascending order.   LO 8



- Evaluate which of these groups of organisms do not have complex organs and organ systems. Who is responsible for carrying out life processes for them?

(i) Cow and horse

(ii)

Man and a fish

(iii) Amoeba and Bacteria

(iv)

Man and a rose plant





1. Take a large plastic tub or bucket and burrow it under the ground such that only the rim is above the ground. Add a layer of soil in it. Add some water to moisten the soil. Now add a layer of fruit and vegetable wastes. Add another layer of soil over this and add water. Cover the bucket completely with soil. Leave the tub covered for a few months. After a few months, dig out the soil, and observe what happens to the vegetable waste. Do you think decomposers have acted upon them? What do you get at the end of decomposition? Discuss in your mother tongue.

LO 9 LO 11 LO 12

2. Observe and compare germination in the presence and absence of light and water.

**Materials needed:** Three plastic dishes, cotton, water, green mung beans, and aluminium foil.

**Method:**

LO 6 LO 10

- a. Place moist cotton in two out of three dishes. Keep 20 green mung bean seeds in each dish.
- b. Wrap one of the dish with moist cotton, with aluminium foil to stop light. Keep it in a dark, warm place.
- c. Keep the other dish with moist cotton and green mung beans on a sunny windowsill.
- d. Keep the dish with dry green mung bean seeds also on the sunny windowsill.
- e. Find out how many seeds germinated in all the dishes after 2–3 days.
- f. Record your observation and conclusion in your scrapbook.

**Note:** You can also find the percentage of germinated seeds in each dish! To find the percentage, just do this simple calculation:

Total number of seeds = 20.

Let the number of germinated seeds be  $x$ .

Percentage of germinated seeds =  $(x/20) \times 100$ .

3. In groups of five, make a chart to show the structural organization in a plant as well as an animal.

LO 8

4. In groups of five, make a plasticine model to show the life cycle of a hen or a frog.

LO 9

### Web Research

- Browse the internet and find out names of more (i) Unicellular organisms (ii) Cold blooded animals and (iii) Warm blooded animals. Then make the list as a table, under three categories.

Some suggested websites:

<https://www.worldatlas.com/articles/ectothermic-cold-blooded-animals.html>

(accessed and checked on 12-08-2019)

<https://sciencing.com/list-singlecell-organisms-8543654.html> (accessed and checked on 12-08-2019)

- Browse the internet and find out about the different parts of a cell, for a deeper dive. Some suggested websites:

<https://askabiologist.asu.edu/cell-parts> (accessed and checked on 12-08-2019)

<https://sciencing.com/do-parts-cell-do-8657384.html> (accessed and checked on 12-08-2019)



The parts that remain under the ground form the *root system* and the parts above the ground form the *shoot system*. Let us now study each part in detail.

## ROOT SYSTEMS

LL

There are two main types of root systems: taproot and fibrous root system.

### Taproot System

In the taproot system (Fig. 8.1), a single root (called the primary root) comes out from the seed after germination.

Later, smaller roots called lateral roots branch out from this primary root. Mango, neem, pine, sheesham, pea, carrot, radish, turnip, and beetroot are examples of plants with tap roots.

### Fibrous Root System

Fibrous roots (Fig. 8.2) that grow from the base of the stem, have a bushy appearance. These roots are thin and almost equal in size. Grass, maize, wheat, onion, sugar cane, and rice are examples of plants with fibrous roots.

### Functions of Roots

Some functions of roots are given below.

1. **Anchoring the plant** Roots help to anchor the plant firmly into the ground.
2. **Absorption of water and nutrients from the soil** Roots help plants to absorb water and nutrients from the soil, which are essential for their survival.
3. **Preventing soil erosion** Roots help to bind the soil particles together, thereby preventing them from being carried away by water or wind.
4. Sometimes roots are modified to perform various other functions such as reproduction and nutrition.

### Activity

**Aim:** To observe anchorage by roots

**Method:** Try pulling out a handful of grass from the ground.

**Observation:** It would not be easy to pull out the grass and something would prevent the grass from being pulled out. Carefully dig out some grass and see what prevented the grass from being pulled out.

**Conclusion:** Roots bind soil particles and hold the plant firmly in one place to the ground.

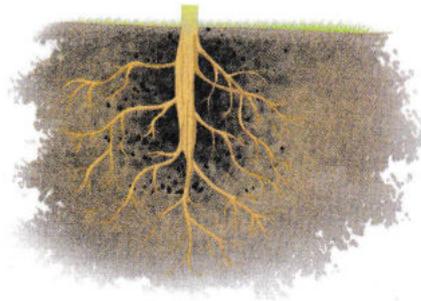


Fig. 8.1 Taproot system

### Fact File

Roots of the *Moringa* tree are rich in fibre, protein, as well as many important vitamins and minerals. They are therefore used to make ayurvedic medicines to treat malnutrition. *Moringa* is mostly grown in South India.

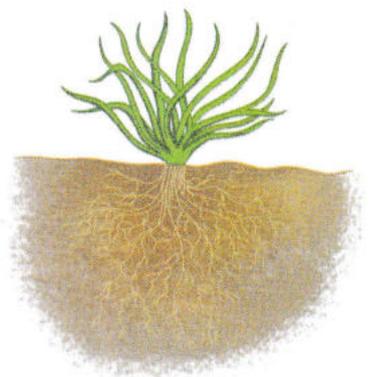


Fig. 8.2 Fibrous root system

### Fact File

Desert plants have relatively longer roots because they penetrate deep into the soil in search of water.

## Activity

**Aim:** To observe absorption by roots

**Materials needed:** A carrot, a beaker of water, and blue colouring agent

**Method:**

1. Put a carrot in a glass of water containing some blue colouring agent.
2. Leave the carrot in water for some days.
3. Then cut it into half (lengthwise) and look inside.

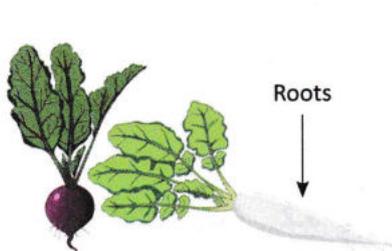


**Observation:** Blue colouring can be seen from the bottom to the top of the carrot.

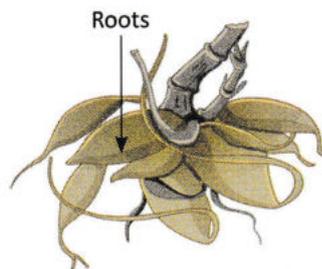
**Conclusion:** Water is absorbed by the tip of the carrot and travelled up inside it along with the blue colouring agent.

## Root Modifications

Roots of some plants are modified to perform additional functions. Let us study some of these modifications and their functions (Fig. 8.3).



1. For storage of food: the roots of some plants, such as radish, carrot, turnip, sweet potato, and beetroot, become fleshy.



2. For multiplication: roots of plants such as dahlia and asparagus can develop into new plants.



Parasitic roots  
Dodder

3. For nutrition: plants such as dodder have specialized roots called parasitic roots arising from their stem, which help them to absorb water and nutrients from the host.



4. For climbing: some plants have climbing roots that help the plant to climb up a support such as a wall, rock, and tree. Examples are money plant, black pepper, and betel.

Climbing roots



Prop roots

5. For extra support: roots of plants such as bamboo, sugar cane, and banyan give out extra roots from their branches. These roots grow downwards and give extra support to the stem of the plant. These are called prop roots.

**Fig. 8.3** Root modifications

## Let's Remember



Cross the odd one out. Give one reason for your choice.

1. Mango, grass, *Neem*, turnip  
Reason: \_\_\_\_\_
2. Grass, maize, beetroot, onion  
Reason: \_\_\_\_\_
3. Dodder, money plant, betel, black pepper  
Reason: \_\_\_\_\_
4. Radish, carrot, sugar cane, turnip  
Reason: \_\_\_\_\_

## SHOOT SYSTEM

LL

All parts of a plant that are above the ground form the shoot system. It includes stem, leaf, flower, fruit, etc.

### Stem

The stem is a very important part of the plant.

### Functions of a Stem

The following are the functions of a stem.

- It holds leaves in position and helps them to spread out as the stem and its branches grow. This ensures that they get enough light for photosynthesis.
- It bears flowers, buds, leaves, and fruits.
- It conducts water and mineral salts from the roots to the leaves. Similarly, it carries the food manufactured by the leaves to other parts of the plant.
- A green stem has chlorophyll and can carry out photosynthesis.
- It has nodes from which leaves or buds (that can grow into branches or flowers) arise. The space between two nodes is called an internode (Fig. 8.4).

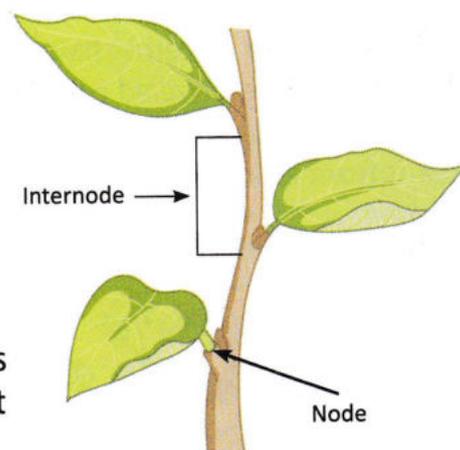


Fig. 8.4 A stem showing nodes and internodes

## Activity

**Aim:** To observe conduction by stem

**Materials needed:** A white flower with a short stem, a glass, some red food colouring agent, and water

**Method:**

1. Place the white flower in a glass containing some red food colouring agent such that the cut end of the stem is immersed in the coloured water.
2. Leave it for about a day.

**Observation:** The stem and the flower become reddish.  
**Conclusion:** This is because water is taken up by the stem.  
**Note:** This result is best observed in a white carnation.

### Stem modifications

Stems of certain plants are modified to perform special functions.

Some of the modifications and their functions are given below.

**For storage of water** Stems of plants such as cactus and jade swell up to store water in them.

**To manufacture food** Stems of some plants become flattened and leaf-like (like that of a cactus), and perform photosynthesis.

**For protection** Stems may be modified as thorns, such as in *Bougainvillea* or may be in the form of hard and sharp prickles as in rose (Fig. 8.5), to protect the plant from being eaten by animals.

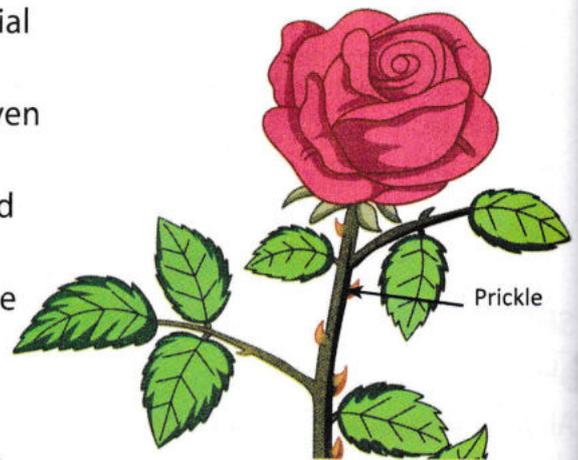


Fig. 8.5 Prickle on a rose stem

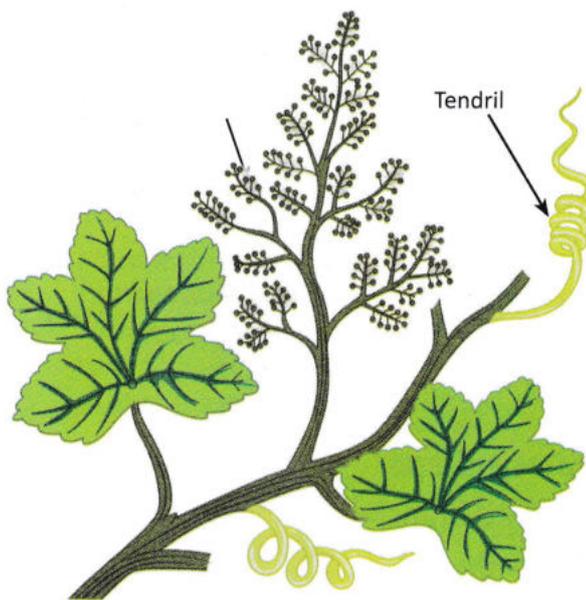
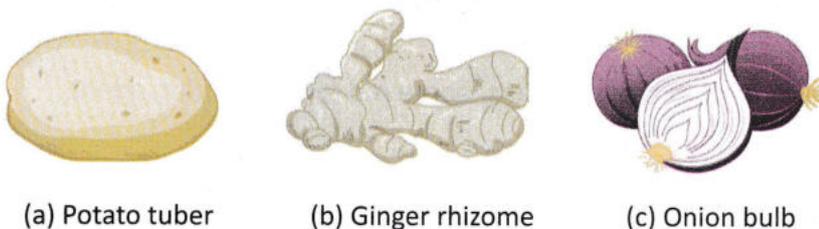


Fig. 8.6 Stem tendril

**For support** Stems of climbers such as grapes and passion flower are modified to form special structures called tendrils (Fig. 8.6). These help the climber plants, which have weak stems, attach themselves to others for support.

**For storage of food** Potato, onion, and ginger are modified stems that store food. There are three common kinds of underground stems: tubers (e.g., potato), rhizomes (e.g., ginger), and bulbs (e.g., onion and garlic) (Fig. 8.7).

**For multiplication of the plant** Rhizomes, bulbs, and tubers also help in the multiplication of plant. Plants such as rose, jasmine, and hibiscus grow into new plants through their stem cuttings.



(a) Potato tuber

(b) Ginger rhizome

(c) Onion bulb

Fig. 8.7 For multiplication of the plant

### Let's Discuss

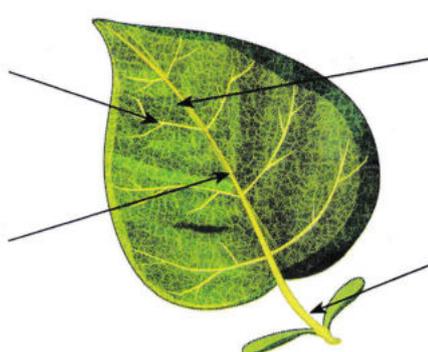
Discuss why the rhizome of a ginger plant grows underground and is still known as a stem.

## Leaves

Leaves are known as food factories of the plant. They arise from the nodes of the stems and have a characteristic shape and size. Let us study its different parts (Fig. 8.8).

A network of smaller branches of veins, called **veinlets**, forms a supporting framework and also serves to transport raw materials and manufactured food into and out of the lamina.

**Midrib**, a continuation of the petiole, is the central vein of the leaf. Smaller veins grow from the midrib.



The flat, green portion of the leaf is called leaf blade or **lamina**.

**Petiole** is a narrow, stalk-like structure that connects the leaf to the stem.

Fig. 8.8 Parts of a leaf

The arrangement of veins in a leaf is termed as *venation*. Venation is of two types: parallel and reticulate. If the veins run parallel to one another from the base to the tip of the leaf, the leaf is said to have *parallel venation*, e.g., banana and onion (Fig. 8.9). If the veins are arranged in a net-like pattern on both sides of the midrib, the leaf is said to have *reticulate venation*, e.g., peepal and mango (Fig. 8.10).

### Fact File

It is possible to predict the type of root of a plant by looking at the leaf venation. Plants whose leaves have parallel venation have fibrous roots, whereas those with reticulate venation have tap roots.

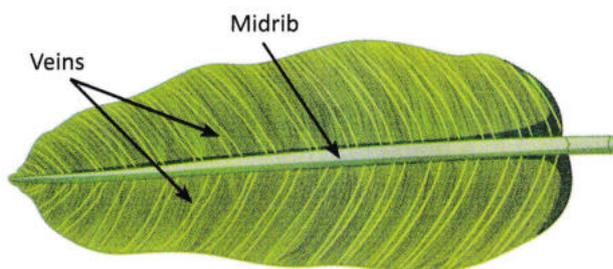


Fig. 8.9 Parallel venation

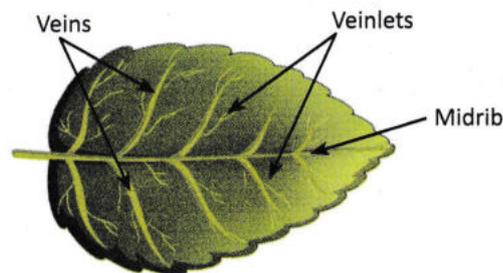
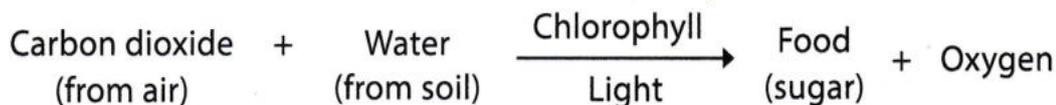


Fig. 8.10 Reticulate venation

## Functions of a leaf

A leaf performs various important functions for the plant.

- It is usually green due to the presence of a green pigment called chlorophyll. A leaf prepares food for the plants. The process of making food by the plant using carbon dioxide, water, chlorophyll, and light is called *photosynthesis*.



Plants store food in leaves, fruits, and stems in the form of starch.

- Plants breathe with the help of their leaves. Leaves of most plants have tiny openings called the stomata (*singular: stoma*) (Fig. 8.11) under their surface. The exchange of gases takes place through the stomata.
- Leaves also lose water through the stomata. The loss of water through the stomata is called *transpiration*.

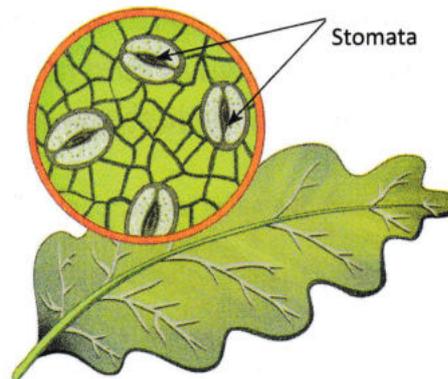


Fig. 8.11 Stomata

Transpiration helps the plant in the following ways.

- It helps in cooling the leaves, just as loss of water during sweating helps in keeping our bodies cool.
- During transpiration, more water is 'pulled' upwards from the roots to compensate for the lost water. This water brings along important nutrients from the roots, which are required by the leaf. Thus, transpiration helps in the transport of nutrients within the plant.
- Transpiration also plays an important role in water cycle.

### Get it Right

Not all photosynthetic plants appear green in colour. In plants like *Coleus*, the green colour is masked by other pigments.

## Activity

**Aim:** To observe transpiration in plants

**Materials needed:** A potted plant, water, and a polythene bag

**Method:**

- Take a potted plant and water it.
- Cover the plant with a polythene bag and keep it in a place that receives a lot of sunlight. Make sure only the plant is inside the polythene, and not the soil.
- Observe the polythene bag after a couple of hours.

**Observation:** You will find tiny droplets of water on its inner surface.

**Conclusion:** These droplets are formed due to water being lost from the potted plant. Water droplets are not seen when we leave an empty plastic bag (with its mouth closed) outside. This suggests that plants transpire.

## Leaf modifications

- Leaves of some plants are modified to form special structures called tendrils. Tendrils help plants to attach themselves to a support. Plants having tendrils are generally climbers.
- For protection, leaves of certain plants get modified to form spines. Spines also reduce the amount of water lost from the plant.

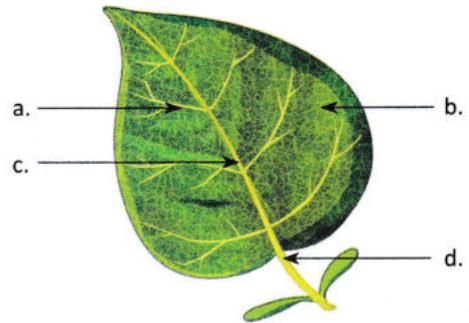
- Leaves of some plants store extra food and are mostly eaten as vegetables. Spinach, cabbage, and lettuce are such leaves.
- Leaves of *Bryophyllum* have buds that can grow into new plants.

## Let's Remember



Label the parts of the leaf given below. Then write the names correctly for each.

1. This is the flat part of the leaf.
2. This forms a network to transport raw materials within the leaf.
3. This is the central vein of the leaf.
4. This connects the leaf to the stem.

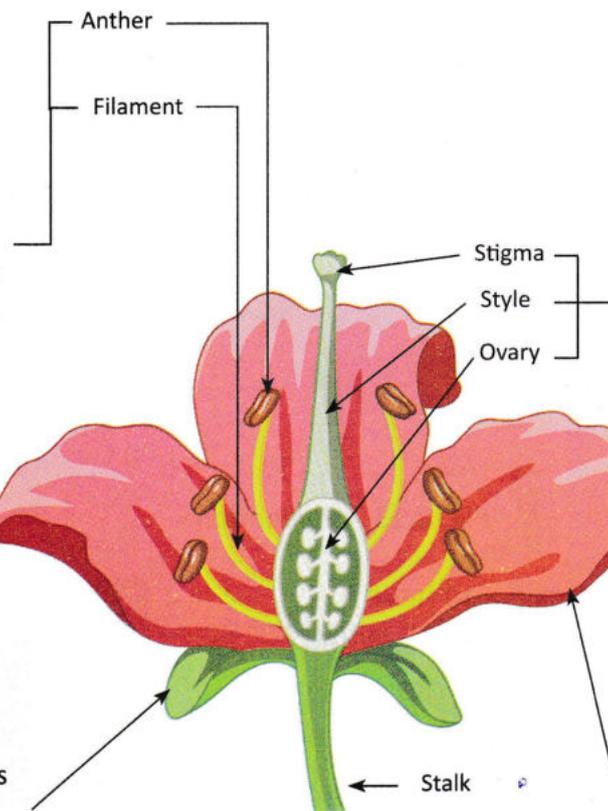


## Flowers, Fruits, and Seeds



A flower is the reproductive organ of a plant. Figure 8.12 shows the parts of a flower.

**Stamens** are the male reproductive parts of a flower. Each stamen has two parts: a thin stalk called **filament** and a knob-like structure called **anther**. The **anther** produces a powdery substance called pollen.



**Carpel (pistil)** is the female reproductive part of the flower. It has three parts: a top portion called **stigma**, an enlarged base called **ovary**, and a tube-like structure called **style** that connects ovary and stigma. The ovary contains tiny ball-like structures called **ovules**, which later become seeds.

**Sepals** are the green, leaf-like structures at the base of the flower. Sepals protect the flower during its development and support the petals when the flower blooms.

**Petals** are colourful structures that surround the inner parts of the flower.

Fig. 8.12 Parts of a typical flower

## Activity

**Aim:** To observe the parts of hibiscus (China rose) flower

**Materials needed:** A hibiscus flower, a blade (to be used under adult supervision), a glass slide, and a hand lens

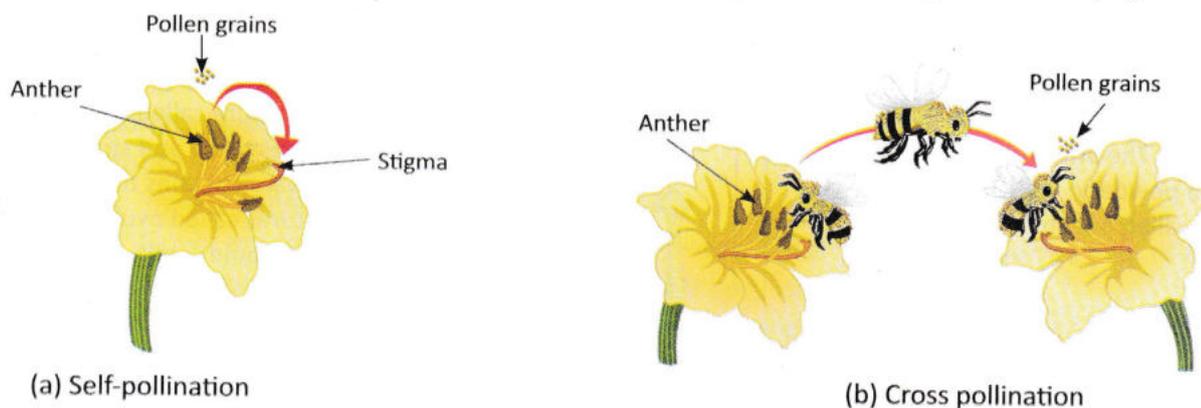
**Method:**

1. Take the flower and observe it for colour and number of sepals.
2. Open out the petals of the flower and place them on a slide.
3. Count the number of petals and stamens (if present).
4. Observe where the petals are attached. You should see a long tube-like structure with round tips. This structure is the carpel. The lower end of this tube is swollen. This swollen part is called ovary.
5. Now carefully slice the entire tube lengthwise with the help of a blade. Use a hand lens to observe what is inside the ovary. You will find tiny, ball-like structures called ovules inside the ovary.

## Pollination

For a flower to develop into a fruit and form seeds, pollen grains must be transferred from its anthers to the stigma.

The transfer of pollen grains from an anther to a stigma is called *pollination* (Fig. 8.13).



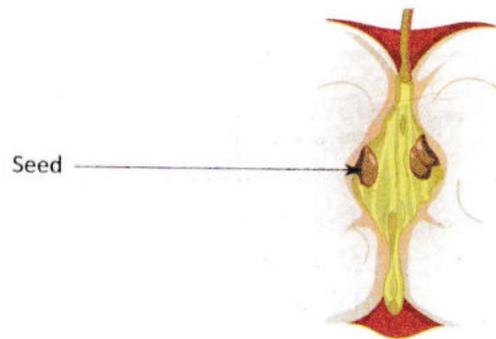
**Fig. 8.13** Pollination

Many flowers are brightly coloured and have a sweet smell to attract insects such as bees. When the insect sits on the flower, the pollen grains stick to its body and may get rubbed off when it sits on another flower. This helps in pollination.

### Green corner

Besides providing us with food and several useful products, plants help to maintain the delicate balance of gases in nature. It is therefore important to protect and conserve our green areas.

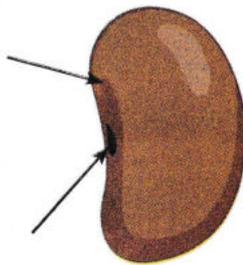
After pollination, the ovules change into seeds (Fig. 8.14). As seeds form, the ovary develops into a fruit. Figure 8.15 shows the structure of a bean seed. Under suitable conditions, i.e., availability of sufficient water, air, and warmth, a seed becomes a baby plant.



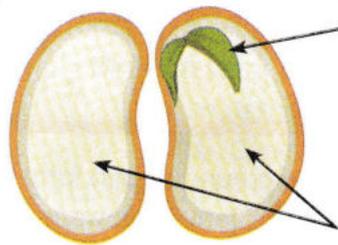
**Fig. 8.14** Seeds inside an apple

**Seed coat** protects the embryo.

**Pore** allows water to enter the seed.



(a) Outside



(b) Inside

Embryo contains a young root and a shoot, which develop into a baby plant.

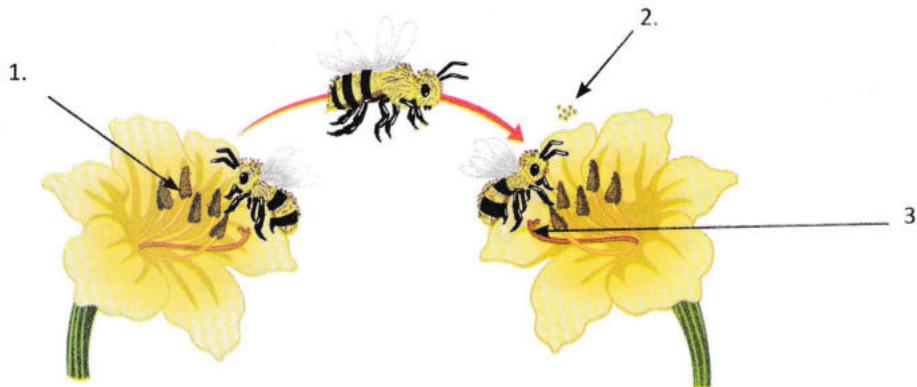
Cotyledons contain food for the baby plant.

**Fig. 8.15** Structure of a bean seed

## Let's Remember



Label the parts of the flower correctly and then fill in the blanks.



1. In pollination, the pollen grains must be transferred from the \_\_\_\_\_ to the \_\_\_\_\_ of a flower.
2. After pollination, the \_\_\_\_\_ changes into seeds, and the \_\_\_\_\_ changes into a fruit.
3. The bee helps in the process of \_\_\_\_\_.

## Key Words

<b>Node</b>	Part of the stem from where the leaves arise is called a node.
<b>Internode</b>	The distance between two nodes is called the internode.
<b>Venation</b>	The arrangement of veins in a leaf is called venation.
<b>Transpiration</b>	The loss of water through the stomata is called transpiration.
<b>Stamen</b>	Male part of a flower is called the stamen.
<b>Carpel</b>	Female part of a flower is called the carpel.
<b>Pollination</b>	Transfer of pollen grains from the anther to the stigma is called pollination.
<b>Seed coat</b>	The outer covering of a seed is called the seed coat.

## Summary

- The parts that remain under the ground (roots) form the root system.
- The parts above the ground (stem, leaves, flowers, and fruits) form the shoot system.
- There are two main types of root systems: tap root system and fibrous root system.
- Roots may be modified for support, storage of food, propagation, etc.
- Stems may be modified for support, protection, photosynthesis, food storage, and reproduction.
- Green leaves manufacture their food with the help of chlorophyll, carbon dioxide, water, and light.
- Flower is the reproductive organ of a plant. It has petals, sepals, stamens, and carpel.
- The pollen grains are transferred from the anthers to the stigma of the flower for pollination.
- The seed has an embryo that develops into a new plant under suitable conditions.

## Exercises

### LET'S UNDERSTAND



### I. Objective type questions.

#### A. Fill in the blanks with the correct words.

1. \_\_\_\_\_ (Fibrous/Tap) roots are thin and almost equal in size, having a bushy appearance.
2. Stems of \_\_\_\_\_ (sugar cane/jade) swell up to store water in them.
3. Leaves arise from the \_\_\_\_\_ (nodes/internodes) of the stem.
4. \_\_\_\_\_ (Transpiration/Pollination) helps in cooling the leaves.

5. \_\_\_\_\_ (Stamens/Carpel) are the male reproductive parts of a flower.
6. \_\_\_\_\_ (Embryo/Cotyledons) contain food for the baby plant.

**B. Write T for the True and F for the False statement. Correct the False statements.**

1. Lateral roots branch out from the primary root in a tap root system.
2. Roots can be modified for protection and strength but never for reproduction.
3. Stems can never carry out photosynthesis.
4. Plants breathe with the help of tiny holes called spines.
5. In pollination, the pollen grains are transferred from the carpel to the sepal of a flower.

**C. Choose the correct option.**

1. Which of these are special roots that help the plant to absorb nutrients from another plant called the host?
  - a. Prop roots
  - b. Parasitic roots
  - c. Tendrils
  - d. Rhizomes
2. Which of these plants can multiply through stem cuttings?
  - a. Potato, ginger and onion
  - b. Jasmine and hibiscus
  - c. Grapes and passion flower
  - d. Banyan and Dodder
3. Which of these modifications help a plant to reduce loss of water from it?
  - a. Tendrils
  - b. Spines
  - c. Bulbs
  - d. Parasitic roots
4. Which of these forms a carpel?
  - a. Stamens, filaments, and stalk
  - b. Stigma, style, and ovary
  - c. Sepals, petals, and anthers
  - d. None of these
5. Which of these would a seed need to become a baby plant?
  - a. Air and water
  - b. Water and warmth
  - c. Air, water, and warmth
  - d. None of these
6. Which of these plants bears a taproot system?
  - a. Grass
  - b. Neem
  - c. Onion
  - d. Sugar cane
7. Which of these plants has roots modified for reproduction?
  - a. Turnip
  - b. Dahlia
  - c. Dodder
  - d. Banyan
8. The stem of which of these plants is modified for water storage?
  - a. Rose
  - b. Cactus
  - c. Bougainvillea
  - d. Potato
9. The leaves of which of these plants have parallel venation?
  - a. Mango
  - b. Peepal
  - c. Banana
  - d. Rose
10. Which of these parts later becomes the seed?
  - a. Stigma
  - b. Style
  - c. Ovary
  - d. Ovule

**II. Very short answer type questions.**

**A. Give one word for each of the following**

1. Roots that grow from branches and give extra support to the stem of the plant \_\_\_\_\_
2. Part of the stem from which leaves or new buds arise \_\_\_\_\_
3. Structures that grow from the stem of climber plants to support them \_\_\_\_\_
4. Underground stem of potato \_\_\_\_\_
5. Transfer of pollen grains from an anther to a stigma \_\_\_\_\_

### III. Short answer type questions.

1. Differentiate between tap root system and fibrous root system.
2. What are prop roots?
3. How do stems of grapes help the plant to climb?
4. What is venation? Name the two types of venations with one example of each.
5. Why are the flowers of some plants brightly coloured and have a sweet smell?

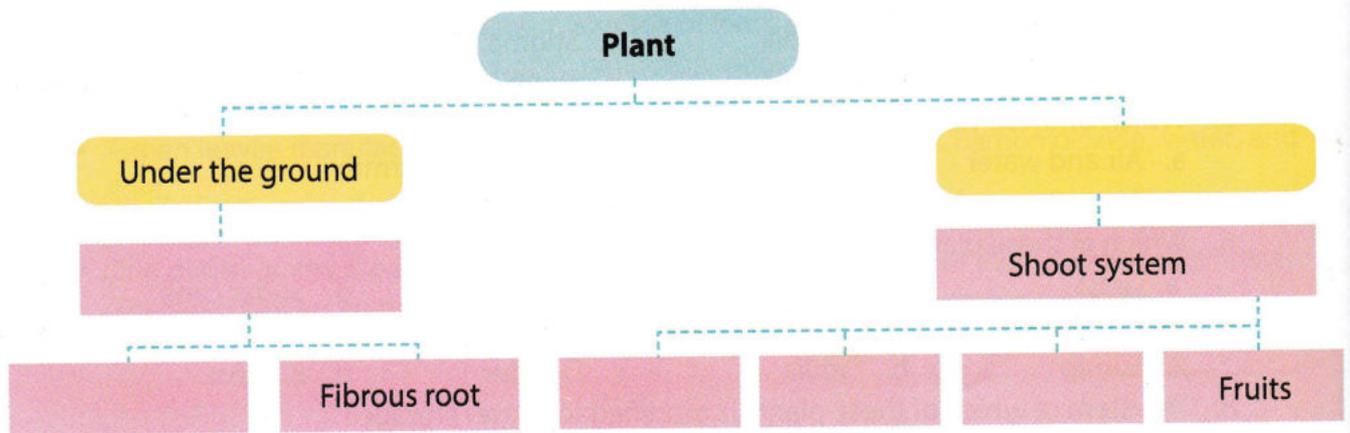
### IV. Long answer type questions.

1. Describe with examples, how roots are modified for additional functions.
2. Describe the functions of a stem.
3. What is transpiration? How does it help the plant?
4. Define pollination. What happens to the different parts of the flower after pollination?
5. What are the four main parts of a flower? Describe them in detail, with the help of a labelled diagram.

#### LET'S RECALL



Recall and complete the concept map given below.



#### LET'S OBSERVE



1. Observe the following pictures and answer the questions that follow. **LO 4**



Leaf A

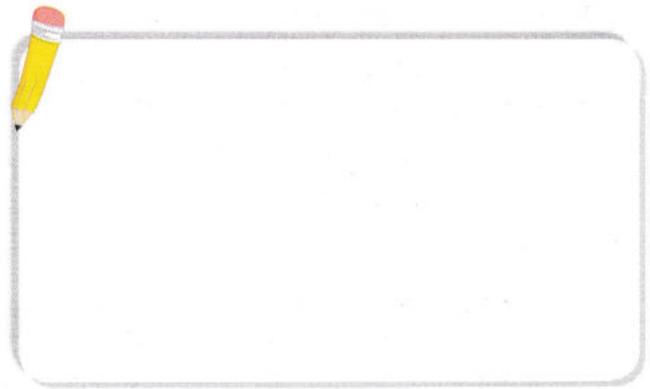
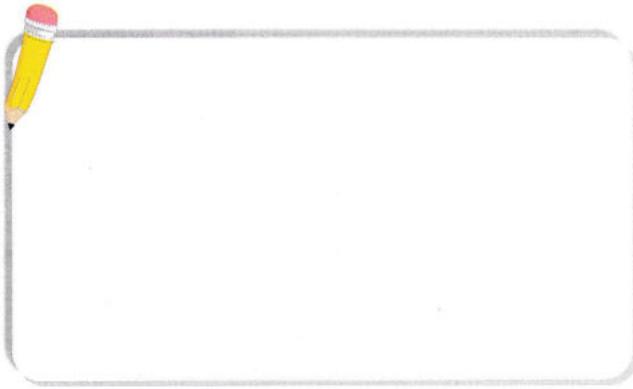


Leaf B

- a. What is the arrangement of veins in a leaf called?
- b. Is the pattern of vein arrangement similar in both leaves?
- c. What type of vein arrangement is shown in leaf A?
- d. What type of vein arrangement is shown in leaf B?

\_\_\_\_\_ (Yes/No)  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

2. Draw diagrams of the tap root and fibrous root systems and point out the differences between them.



### LET'S CONNECT ENGLISH

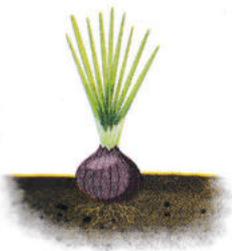
Name the subject, and underline the predicate in each of the following sentences.

1. Fibrous roots grow from the base of the stem and have a bushy appearance.
2. A stem bears flowers, buds, leaves, and fruits.
3. Leaves are known as the food factories of the plant.
4. A flower is the reproductive organ of the plant.
5. Insects are pollinating agents that help to transfer pollen grains from anthers to the stigma.

### LET'S APPLY

1. Large scale cutting down of trees causes soil erosion. Do you think this is possible? How do trees help the soil? 
2. One day, Yash covered a *Tulsi* plant that was growing in his garden with a polythene bag. That evening, he was surprised to see tiny droplets of water collected inside the bag. Where do you think this water came from?

### LET'S ANALYSE AND EVALUATE



(a) Onion plant



(a) Peepal leaf



(a) Banana leaf 

1. Examine the leaves and investigate which of them will have a tap root system.
2. Predict what would happen if we dig a pit in the garden and sow an onion from the kitchen and regularly water it for a few days. Would you get a similar result if you sow a peepal leaf? Justify your answer.   



1. In groups of five, make a chart on any one of the following: **LO 3** **LO 12**
- (i) Root modifications
  - (ii) Stem modifications
  - (iii) Leaf modifications
  - (iv) Parts of a flower
  - (v) Parts of a seed

Collect or draw pictures to highlight each modification with examples.

2. In groups of five, collect five different types of flowers and their leaves. Open the different parts of each flower and fill up the table. **LO 4** **LO 10** **LO 12**

Name of the flower	Flower 1	Flower 2	Flower 3	Flower 4	Flower 5
Number of petals					
Is the flower brightly coloured?					
Does it have a smell?					
Number of sepals					
Number of stamens					
Size of the leaf					
Venation of the leaf					
What kind of root system would this plant have?					

**Web Research**

- Browse the internet and find out how newer varieties of plants are being created using stem cuttings. Make a list of such plants.  
<https://content.ces.ncsu.edu/plant-propagation-by-stem-cuttings-instructions-for-the-home-gardener>  
 (accessed and checked on 12-08-2019)  
[https://www.researchgate.net/publication/322499104\\_Propagation\\_of\\_ornamental\\_plants\\_methods\\_and\\_structures](https://www.researchgate.net/publication/322499104_Propagation_of_ornamental_plants_methods_and_structures) (accessed and checked on 12-08-2019)
- Browse the internet and find out how tissue culture is used as a method of multiplying plants.  
<https://www.apsnet.org/edcenter/K-12/TeachersGuide/PlantBiotechnology/Documents/PlantTissueCulture.pdf>  
 (accessed and checked on 12-08-2019)  
<http://www.biologydiscussion.com/plants/plant-tissue-culture-environmental-condition-methods-types-and-application/1359> (accessed and checked on 12-08-2019)

# 9

## Form and Movement in Animals

Choose the correct body part, from the box below, which helps each of these animals to move.

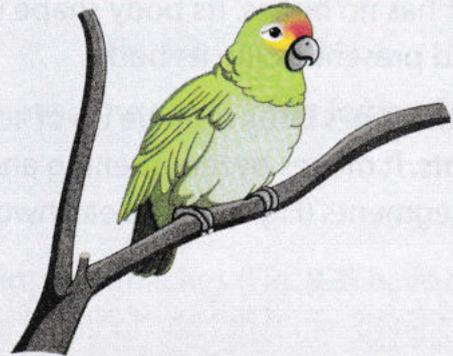
### You will learn about

- Movement in animals
- Movement in human beings
- Joints and movements

Whole body, wings, fins, legs



a. \_\_\_\_\_



b. \_\_\_\_\_



c. \_\_\_\_\_



d. \_\_\_\_\_

Animals show movement in many ways. The body structure of an animal directly corresponds to the way in which it moves. Let us learn about movement in different animals including human beings.

Answers: a. Legs; b. Wings; c. Legs; d. Fins

## MOVEMENT IN ANIMALS

AN

The body structure of an animal determines the kind of movement it exhibits. We know that our backbone helps us stand upright and enables us to move. Based on the presence or absence of the backbone (vertebral column), animals are divided into two groups:

**Vertebrates** Animals that have a backbone are called **vertebrates**. For example, fish, frog, lizard, horse, and birds.

**Invertebrates** Animals that do not have a backbone are called **invertebrates**. For example, earthworm, snail, and cockroach.

The movement of vertebrates is different from that of invertebrates. Let us learn about the movement of some animals to understand various kinds of **locomotion**.

### Movement in Earthworm

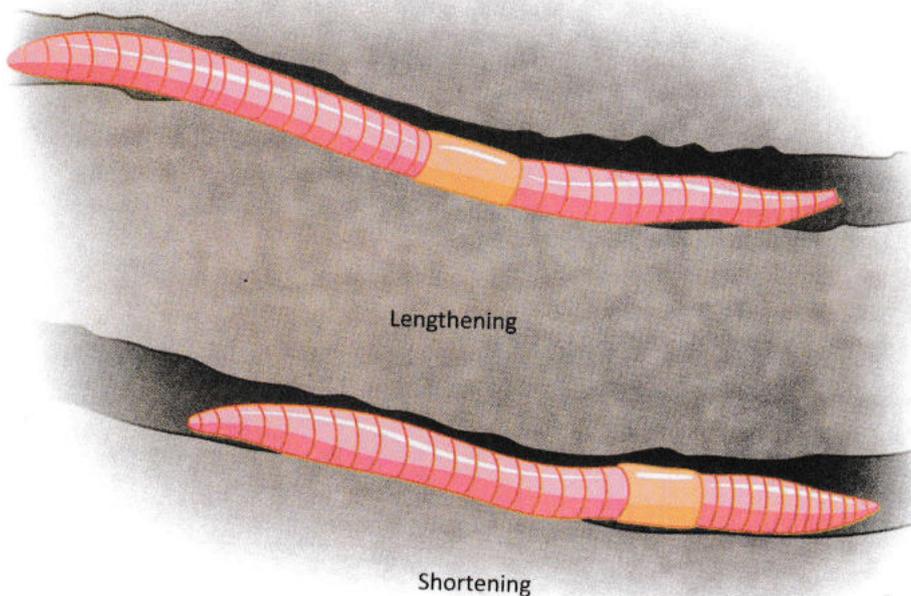
An earthworm is an invertebrate. It has a long, tube-like body. It has no bones. Its body shape is maintained by the fluid present inside its body.

An earthworm's body is made up of several parts called **segments**. It moves by lengthening and shortening these segments (Fig. 9.1). The earthworm extends the

#### Word help

**Locomotion** The ability to move from one place to another.

**Slimy** Thick, slippery liquid



front part of the body, keeping the rear end fixed to the ground. Then it fixes the front part and pulls the rear end. Its movement can be compared with that of a spring. Its body secretes a **slimy** substance to help in the movement. The segments also have tiny, hair-like bristles that help the earthworm to grip the surface and pull its body forward.

Fig. 9.1 Movement in earthworm

## Movement in Snail

The snail is a very slow-moving animal. Like an earthworm, a snail too has a liquid skeleton. Snails have a *shell*, inside which they can hide to protect themselves from the heat of the sun and enemies (Fig. 9.2). The shell is the outer skeleton, but it is not made of bones. They also have a pair of *tentacles* that bear eyes at the tips. Snails move by using a muscular organ called the *foot*. The foot produces a slimy substance called *mucous*. The snail actually crawls on the layer of mucous. The sticky mucous reduces the friction between the foot and the ground (or any other surface) by offering a smoother surface to crawl on and thus enabling the snail to move on a variety of surfaces.

The muscular foot produces wave-like movements that push the snail's body forward. A trail of mucous is left behind when the snail crawls.

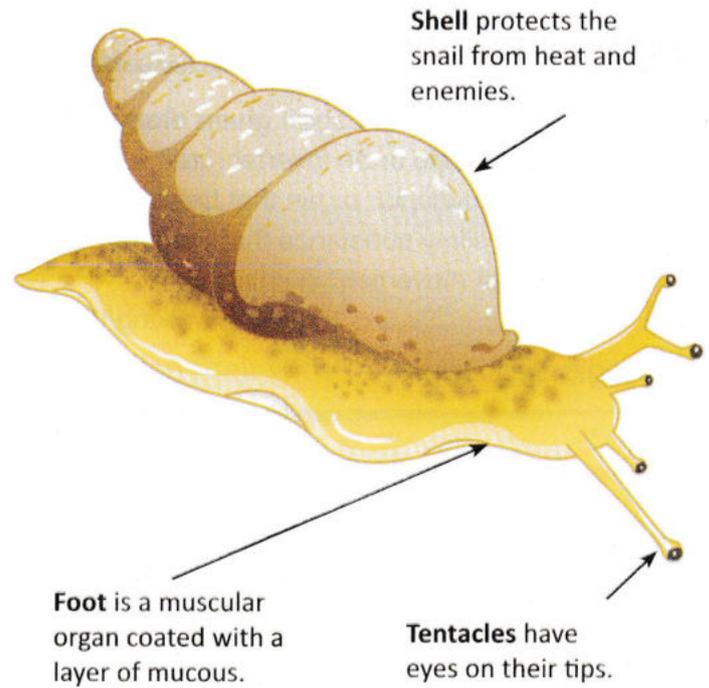


Fig. 9.2 A snail

## Movement in Cockroach

A cockroach's body is covered with a hard outer skeleton. Cockroaches (Fig. 9.3) have a pair of antennae that help them smell things. They also have a pair of cerci that can detect the slightest of movements and warn them of any danger from behind.

Though cockroaches have two pairs of wings, they can only fly short distances. However, they are able to run and climb very fast. Like all insects, cockroaches have three pairs of legs. They walk in a very interesting manner, moving three legs at a time (Fig. 9.3).

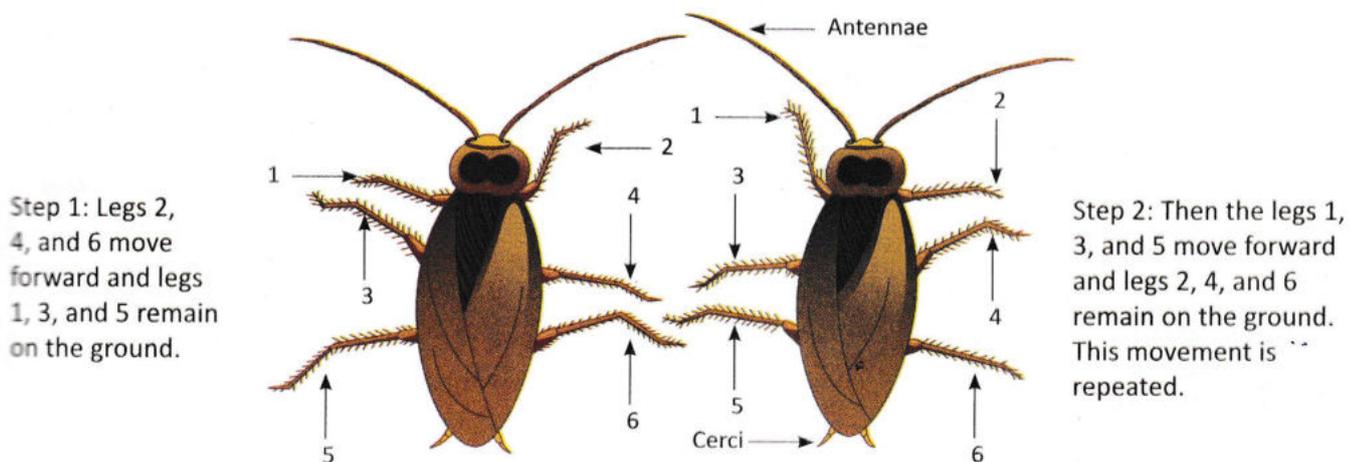


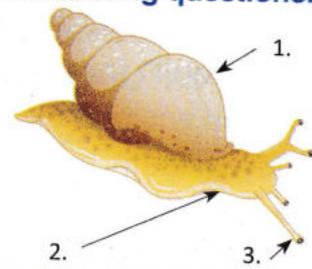
Fig. 9.3 Movement in cockroach

## Let's Remember



Label the parts of the snail given alongside. Then answer the following questions.

1. Is it a vertebrate or an invertebrate?
2. Name the muscular organ that helps the snail to move.
3. Name the slimy substance that the foot secretes.
4. The type of movement in snails is called \_\_\_\_\_ (crawling/walking/flying).



## Movement in Fish

Fish are vertebrates. All vertebrates have an internal skeleton made up of bones; a tough, elastic substance called *cartilage*; or both.

Most fish have a *streamlined* body—the head and the tail are narrow; the middle portion of the body is broader. This kind of shape offers least **resistance** to the flow of water and makes it easier for them to swim through water. Aeroplane, ship, and boat also have streamlined shapes to reduce resistance to the flow of air and water.

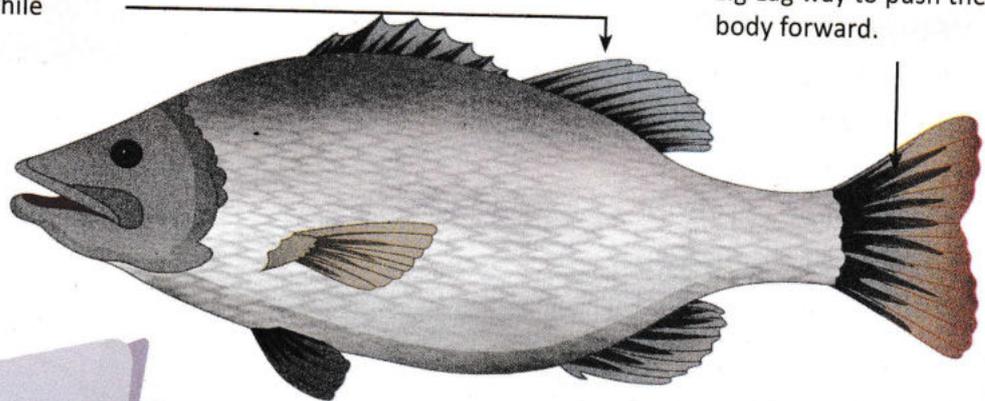
### Word help

**Resistance** A force that stops or slows down a moving object

Fish have fins and a flexible backbone, which help them to swim (Fig. 9.4). Most fish have a special structure called swim bladder that can be filled with air or emptied to help them move up and down in water.

Fins help in keeping direction and body balance while swimming.

The tail is moved in a zig-zag way to push the body forward.



### Get it Right

Fish, such as shark and ray fish, have no bones. Their skeleton is entirely made up of cartilage.

Fig. 9.4 Streamlined shape, fins, and tail help in swimming.

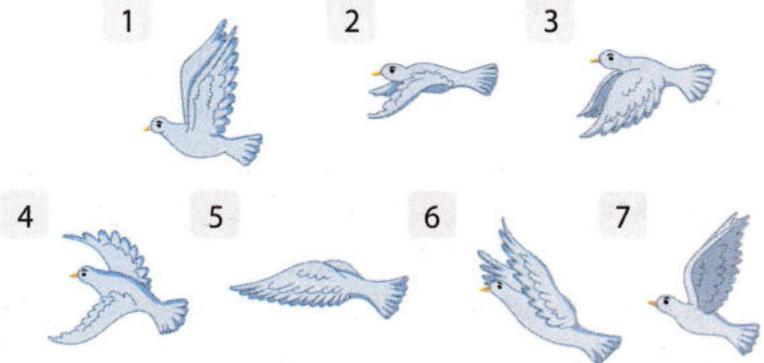
## Movement in Birds

Most birds are capable of flying. Birds can also walk, run, or hop on the ground. Birds such as swan and duck can even swim in water.

The following features help birds to fly.

1. Birds have streamlined bodies that make it easier for them to move through air.
2. Their bones are hollow that make them lightweight.
3. They have wings that help them to fly.
4. They have powerful chest muscles that help them flap their wings during flight. Figure 9.5 shows how most birds fly.

1–3 The wings are moved down and forwards, lifting the body in the air. This movement is termed as **downstroke**.



4–7 The wings are lifted upwards, in preparation for another downstroke. This movement is termed as **upstroke**.

Fig. 9.5 Downstroke and upstroke movements in birds

## Movement in Snakes

Snakes do not have limbs (legs, arms, or wings). They move by crawling on their bellies. They have scales that cover their bodies and help them to crawl.

Most snakes move in a wave-like manner. Their flexible backbones help them in this movement. The body curves like a wave. The wave-like motion pushes the body forward by pressing against the ground (Fig. 9.6).



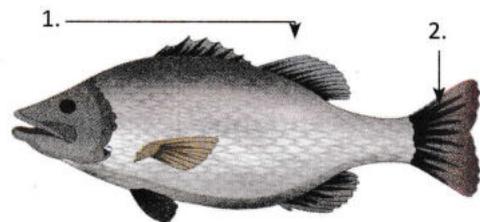
Fig. 9.6 The wave-like motion pushes the snake's body forward.

## Let's Remember



Observe the figure given alongside and answer the questions that follow.

1. Label the parts of the fish.
2. Name the part that helps the fish to move forward \_\_\_\_\_
3. What is the special body shape of a fish known as? \_\_\_\_\_
4. Give two examples of organisms that have a similar shape. \_\_\_\_\_



## MOVEMENT IN HUMAN BEINGS

The skeletal system along with the muscular system helps in movement in human beings. The human skeleton is made up of 206 bones. It performs the following functions:

- It helps in the movement of various body parts.
- It provides shape and support to the body.
- It protects the soft internal organs.
- Bones are filled with a substance called marrow that produces the blood cells.

Figure 9.7 shows different parts of the human skeleton.

**Skull** The skull protects the brain from injury. All bones in the skull are fixed, except the lower jaw. The lower jaw can move. Its movement allows us to talk and chew food.

**Rib cage** The rib cage provides protection to the heart and lungs. Human beings have 12 pairs of ribs. You can feel your ribs by running your fingers across your chest.

**Backbone** The backbone is made up of 33 small bones called vertebrae. It surrounds and protects the spinal cord.

**Limbs** We have two pairs of limbs. The hind limbs (legs) are used for walking. The forelimbs (arms) allow us to do a variety of tasks such as lifting and using objects. Bones are rigid structures that cannot bend. Then how are we able to bend elbows and knees? All our movements are brought about by joints and muscles. Joints are places where two or more bones meet. The bones are held together at the joints by the ligament.

### Fact File

Calcium is essential for strong, healthy bones. 99% of the calcium in our body is in our bones and teeth.

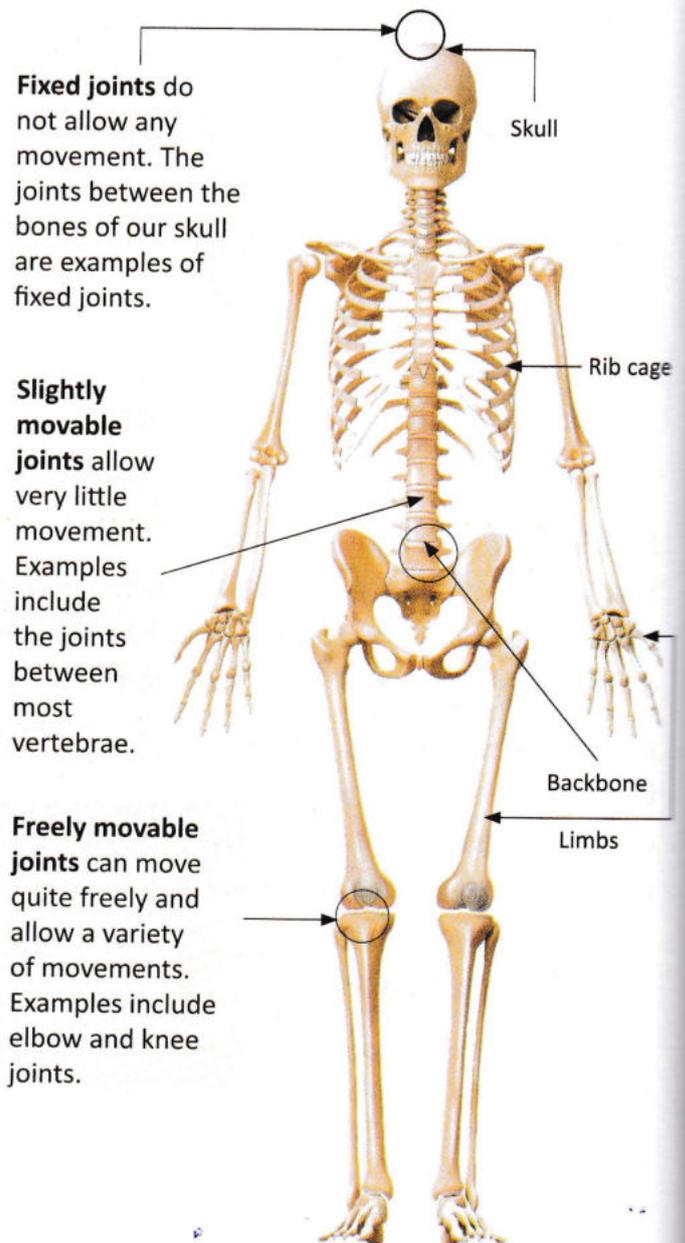


Fig. 9.7 Human skeleton

Fixed or immovable joints, like those of the skull, provide protection. Slightly movable joints provide support. Freely movable joints are the ones that allow us to perform a variety of movements. The four major movable joints in our body are:

AN

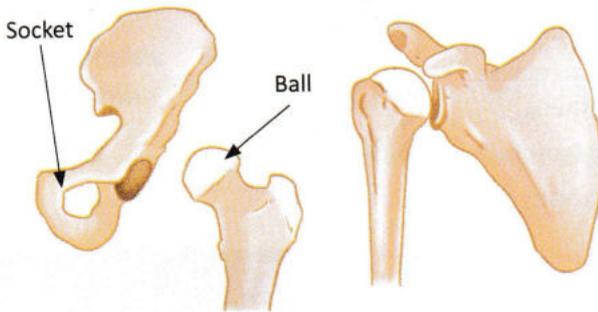
- ball-and-socket joint,
- hinge joint, and
- pivot joint,
- gliding joint.

Let us learn where these joints are found in our body.

### Let's Discuss

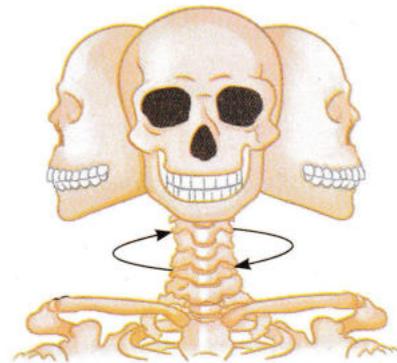
Why are we not able to move our elbows in all directions?

### Ball-and-socket joint



In this type of joint, the ball-like surface of one bone fits into a cup-like hollow in the other. A ball-and-socket joint allows maximum movement in all directions. Examples: joints at the hip and the shoulder.

### Pivot joint



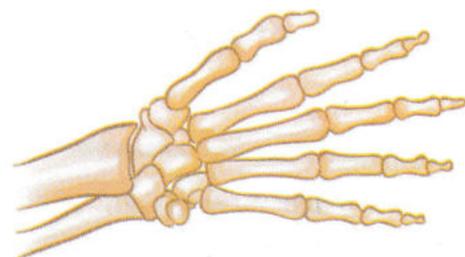
In this joint, the rounded surface of one bone fits into a ring formed by the other, such that one bone is able to rotate over the other. Example: joint where the neck joins the head.

### Hinge joint



This kind of joint provides back and forth movement similar to the hinges of a door. Examples: joints at the knee and the elbow.

### Gliding joint



This kind of joint allows bones to glide over each other, providing little movement in all directions. Examples: joints at the ankle and the wrist.

## How Bones Move

Muscles bring about movement by contracting (shortening) and relaxing (lengthening). One end of a muscle is attached to a movable bone, whereas the other end is attached to a fixed bone. When the muscle contracts, it pulls the movable bone. Muscles work in pairs. Figure 9.8 shows how a pair of muscles 'biceps and triceps' helps you to move your arm. The muscles in your legs work in a similar manner.

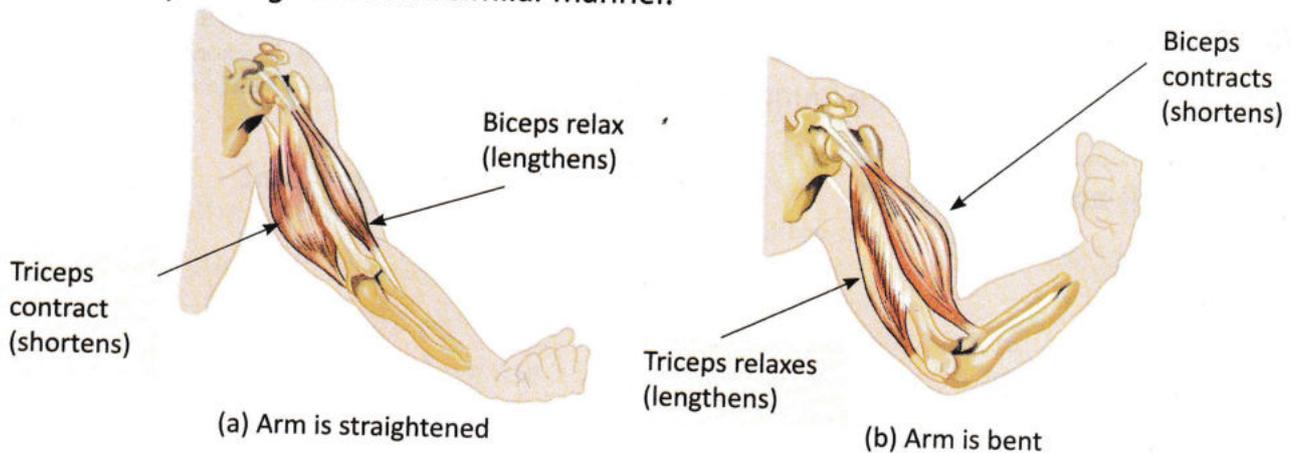


Fig. 9.8 How bones move

## Cartilage

The ends of the bones are covered with a tough, elastic tissue called cartilage. Cartilage makes the ends of the bones smooth and reduces friction between the bones during movement. Cartilage is also present in various other parts of our body. You can feel cartilage in the upper part of your ear and in the front part of your nose. These parts are not as hard as bones and can be bent.

## X-rays

Sometimes when we get hurt, doctors take an 'X-ray' photograph of the injured part to find out if there is any fracture in the bones. Figure 9.9 shows an X-ray image of the chest.

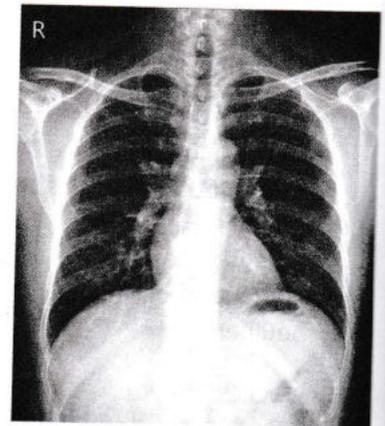


Fig. 9.9 X-ray photographs

## Know your Scientist

Wilhelm Conrad Roentgen was a German physicist, who discovered X-rays in 1895. Roentgen discovered these rays accidentally while working in his laboratory. In various experiments, he found that these rays were able to pass through tissues, but not through bones. Today, X-rays are commonly used in medicine (to diagnose fractures) and scientific research.



## Let's Remember



Study the X ray given below and label the parts according to the corresponding number below.

1. Name the part that protects the heart and lungs.

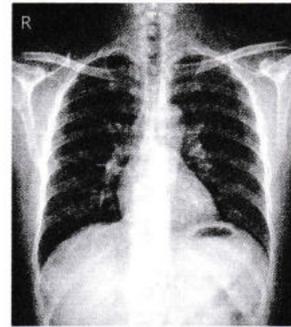
\_\_\_\_\_

2. Which part protects the spinal cord?

\_\_\_\_\_

3. What type of joint does the shoulder have?

\_\_\_\_\_



## Key Words

**Invertebrates** Animals that do not have a backbone are called invertebrates.

**Vertebrates** Animals that have a backbone are called vertebrates.

## Summary

- Based on the presence or absence of the backbone, animals can be vertebrates or invertebrates.
- An earthworm moves by shortening and lengthening its body segments.
- Snakes crawl on their bellies. Scales and a flexible backbone help them to crawl.
- There are three main types of joints in the human skeleton: fixed joints, slightly movable joints, and freely movable joints.
- Movable joints are of four types: ball-and-socket joint, pivot joint, hinge joint, and gliding joint.
- Bones move with the help of joints and muscles. Muscles contract and expand to move the bones.

# Exercises

## LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with suitable words.

1. The body structure of an animal determines the kind of \_\_\_\_\_ (movement it exhibits/food it eats).
2. An earthworm's body is made up of several parts called \_\_\_\_\_ (bristles/segments).

3. A snail has \_\_\_\_\_ (tentacles/foot) that bear eyes at the tips.
4. A fish has fins and a \_\_\_\_\_ (fixed/flexible) backbone.
5. Snakes move by crawling on their \_\_\_\_\_ (bellies/backbone).
6. The skull protects the \_\_\_\_\_ (brain/lungs) from injury.
7. The ends of the bones are covered with \_\_\_\_\_ (cartilage/joint).

**B. Write T for the True and F for the False statements. Correct the false statements.**

1. The earthworm extends the rear part of the body, keeping the front part fixed to the ground.
2. The foot of a snail produces a slimy substance called the shell.
3. A streamlined body is narrow at the head and tail and broader in the middle.
4. Upstroke and downstroke help a snake to crawl in a wave-like manner.
5. The backbone of a human body is made up of 33 vertebrae.
6. A pivot joint allows bones to glide over each other.

**C. Choose the correct option.**

1. Which of these helps to maintain the body shape of an earthworm?
  - a. Bristles
  - b. Segments
  - c. Body fluid
  - d. None of them
2. Which of these help to detect the slightest movement and warn a cockroach of any danger from behind?
  - a. Antennae
  - b. Cerci
  - c. Bristles
  - d. Tentacles
3. Which of these helps a fish to move up and down in water?
  - a. Streamlined shape
  - b. Fins
  - c. Tail
  - d. Swim bladder
4. Which of these features help birds to fly?
  - a. Streamlined body
  - b. Hollow bones
  - c. Wings and powerful chest muscles
  - d. All of these
5. Which of these joints does the elbow have?
  - a. Fixed joint
  - b. Slightly movable joint
  - c. Freely movable joint
  - d. None of these
6. Which of the following has a streamlined shape?
  - a. Aeroplane
  - b. Fish
  - c. Bird
  - d. All of these
7. Which of these animals do not have limbs?
  - a. Bird
  - b. Earthworm
  - c. Cockroach
  - d. Snake
8. Which of these protects the heart and lungs?
  - a. Skull
  - b. Rib cage
  - c. Backbone
  - d. Limbs
9. Which of the following has movable joints?
  - a. Skull
  - b. Rib cage
  - c. Backbone
  - d. Limbs
10. The ends of bones are covered with \_\_\_\_\_.
  - a. muscles
  - b. cartilage
  - c. vertebrae
  - d. None of these

## II. Very short answer type questions.

### A. Give two examples for each of the following.

1. Animals with streamlined bodies:
2. Animals that do not have limbs:
3. Parts of the human skeleton:
4. Parts of the body with freely movable joints:
5. Parts of the body that have cartilage:

_____;	_____
_____;	_____
_____;	_____
_____;	_____
_____;	_____

## III. Short answer type questions.

1. Differentiate between vertebrates and invertebrates.
2. How does a streamlined body help a fish to move in water?
3. Explain upstroke and downstroke movement in birds.
4. How does a snake move?
5. What is cartilage? How does it help the bones?

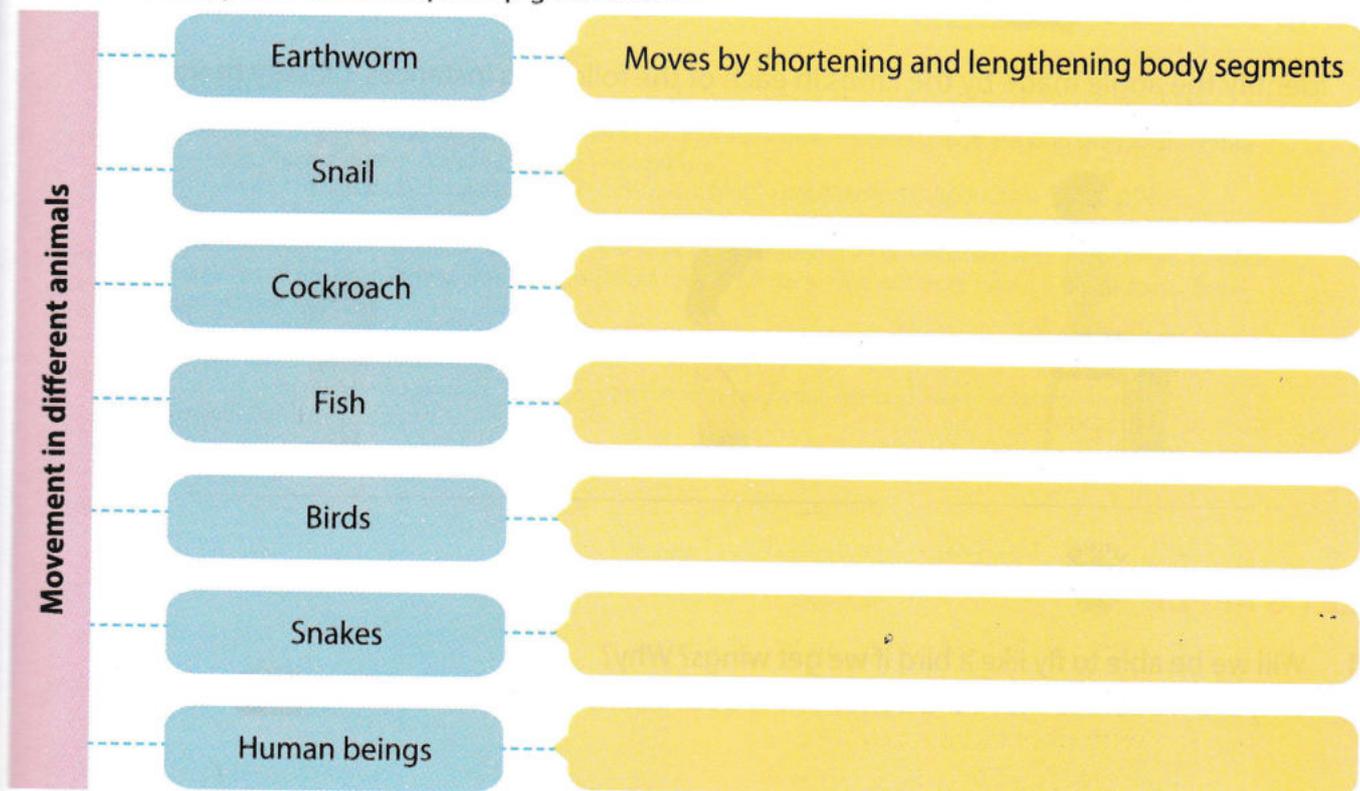
## IV. Long answer type questions.

1. List the various features that help a fish to move in water.
2. Describe the functions of the human skeleton.
3. What are joints? Explain the different kinds of movable joints and their movements with examples.
4. How do muscles bring about movement? Explain with the help of an example.

## LET'S RECALL



Recall and complete the concept map given below.



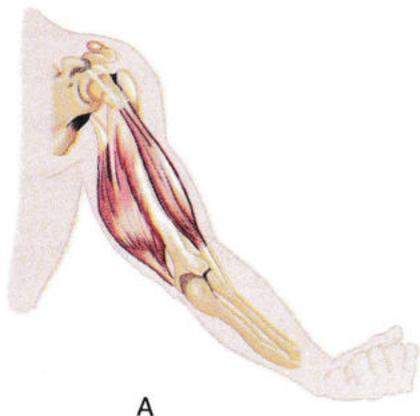
## LET'S OBSERVE



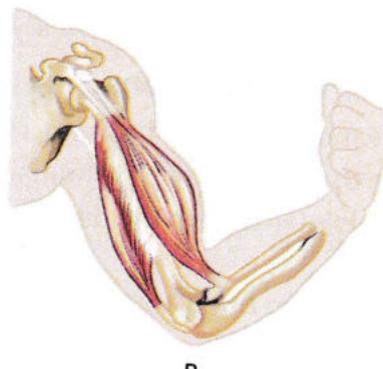
Observe the following pictures and answer the questions that follow.



- What is this shape known as?  
\_\_\_\_\_
  - Name two other organisms that have this shape.  
\_\_\_\_\_
  - How does this shape help these organisms in movement?  
\_\_\_\_\_
- Label the biceps and triceps, and identify them as relaxed and contracted muscles.



A



B

## LET'S CONNECT



MATHS

Identify the angle made by the limbs in each of the following instances. Classify them as acute, right, or obtuse angles.



## LET'S APPLY



- Will we be able to fly like a bird if we get wings? Why?
- Why are we able to move the bones of our back but not those in our skull?

LO 6

## LET'S ANALYSE AND EVALUATE

1. Compare both the pictures on the side, and analyse which of them will involve movement of the whole body in one direction. 



2. Evaluate which of them would be best suited for movement shown by the knee. Give one reason to justify your answer.   

## LET'S CREATE



 TD

1. Collect pictures of any twenty animals that you commonly see around you. Sort them into vertebrates and invertebrates and make a chart. Also, write a few lines on the kind of movement each of them exhibits.  
2. In groups of five, make a model of the human skeleton, using old cardboard shoe boxes, old shoe laces and plasticine. Discuss the different parts in class in your mother tongue. 
3. In groups of five, get at least two old X rays to class and then make a list of the various parts of the skeleton that can be seen, along with the different joints. Identify them all, and make a list. Share it in class as a group presentation.  

### Web Research

- Browse the internet and find out how the skeleton of animals is different and affects the kind of movement they show. Then make a report. Some suggested websites are:  
<http://www.oum.ox.ac.uk/thezone/animals/life/move.htm> (accessed and checked on 12-08-2019)  
<http://primaryhomeworkhelp.co.uk/skeletons/animals.htm> (accessed and checked on 12-08-2019)
- Did you know that over time, the cartilage of the knee goes through a lot of wear and tear. Nowadays, doctors do surgeries of the knee through the process called robotic surgery. Find out more about it and discuss. Some suggested websites are:  
<https://www.uwhealth.org/knee-surgery-rehabilitation/robotic-assisted-total-knee-replacement/49421> (accessed and checked on 12-08-2019)  
<https://www.orlandoortho.com/robot-helps-surgeons-deliver-better-hip-and-knee-replacements/> (accessed and checked on 12-08-2019)

Look at the picture of the animals below and identify the correct habitat of each from the box below. Can you guess one physical feature that may have helped each of them to survive in their habitat?

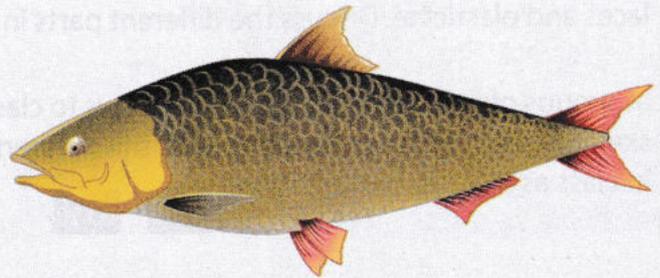
### You will learn about

- Habitats
- Adaptations
- Acclimatization

Arctic, Forest, Ocean, Desert



1. \_\_\_\_\_



2. \_\_\_\_\_



3. \_\_\_\_\_



4. \_\_\_\_\_

A variety of organisms is found at different places. Each organism lives in a particular area where it finds food and other resources it needs to survive. Now let us learn more about these areas and the animals that live there.

Answers: 1. Desert, 2. Ocean, 3. Arctic, 4. Forest

## HABITATS

LL

The area where a particular organism lives naturally is called its *habitat*. The five major habitats are—forests, grasslands, deserts, mountains and polar regions, and aquatic habitat. Oceans and freshwater together form the aquatic habitat.

### Forests

Forests are large areas covered with plants. Forests cover about one-third of our planet. Different types of plants and animals are found in forests.

There are three major types of forests on the Earth: tropical, temperate, and boreal.

**Tropical forests** Tropical forests, also known as *rainforests*, are found between the equator and the two tropics (Tropic of Cancer and Tropic of Capricorn). The temperature of these forests ranges from 20 °C to 34 °C. These regions receive heavy rainfall throughout the year; the annual rainfall is more than 200 cm. The variety of flora and fauna found in these forests is vast (Fig. 10.1).



Orchid



Toucan

**Fig. 10.1** *Plants and animals of tropical forest*

**Plants:** Orchid, vine, moss, and fern

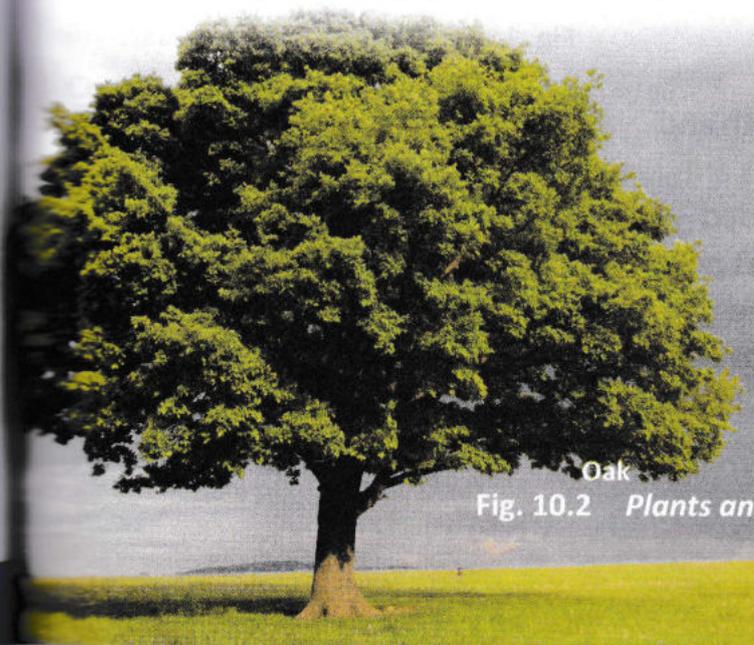
**Animals:** Bat, gorilla, monkey, jaguar, sloth, macaw, toucan, and a variety of insects

**Temperate forests** Temperate forests are found in eastern North America, northeastern Asia, and western and central Europe. The temperature of these regions ranges from -30 °C to 30 °C. The annual rainfall is about 150 cm and is even throughout the year. Most trees found here are *deciduous*, that is, they shed their leaves once a year (mostly in winter).

Temperate forests have well-defined winter and summer seasons.

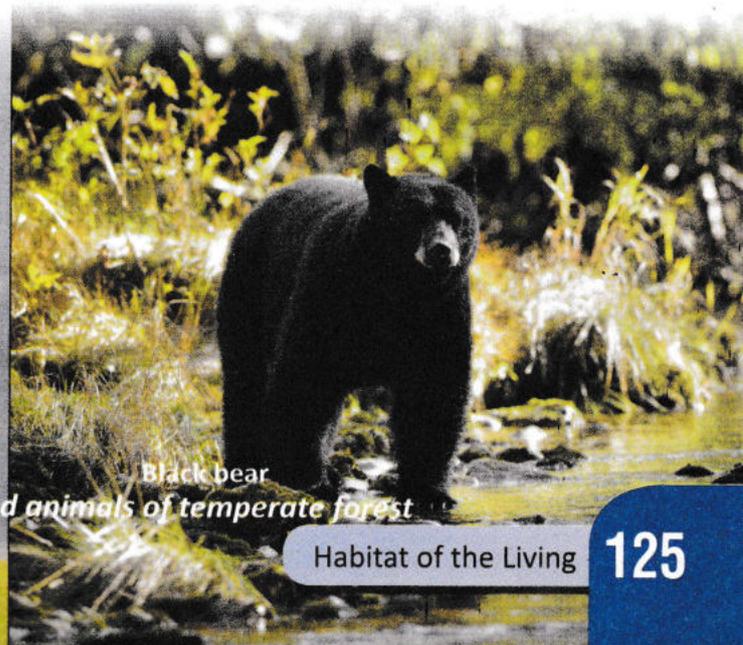
**Plants:** Maple, oak, and elm

**Animals:** Fox, bald eagle, mountain lion, bobcat, and black bear (Fig. 10.2).



Oak

**Fig. 10.2** *Plants and animals of temperate forest*



Black bear

**Boreal forests** Boreal forests are also called *taiga*. These forests are found in Canada, Russia, Scandinavia, China, Mongolia, and northern Japan. These forests are characterized by very low temperatures, that is, between  $-50^{\circ}\text{C}$  and  $-1^{\circ}\text{C}$ . The annual snowfall in these regions ranges from 40 cm to 100 cm.

**Plants:** Evergreen trees such as pine, fir, and spruce (Fig. 10.3)

**Animals:** Wolf, lynx, fox, deer, woodpecker, hare, bat, bear, moose, and chipmunk.

### Grasslands

Grasslands are regions dominated by grasses. There aren't too many trees and shrubs here. Temperature ranges between  $-20^{\circ}\text{C}$  and  $30^{\circ}\text{C}$ . The annual rainfall varies between 50 cm and 90 cm. Grasslands provide shelter to a large variety of animals including giraffe, zebra, lion, elephant, and gazelle (Fig. 10.4).

### Deserts

Deserts are areas that receive very little rainfall. Sahara, Kalahari, and Thar are some deserts. In hot deserts, daytime temperature in summer can reach  $45^{\circ}\text{C}$  or more. Annual rainfall is less than 25 cm. Though deserts are mostly considered to be hot, some are very cold (e.g., the Gobi desert in China). Organisms such as cactus, camel, rattlesnake, gila monster, and kangaroo rat are found in deserts (Fig. 10.5).

### Mountains and Polar Regions

The Earth's polar regions (the Arctic in the north and the Antarctica in the south) and tall mountains are extremely cold. The lowest temperature recorded ever in the Antarctica is  $-88^{\circ}\text{C}$ . Animals such as polar bear, penguin, seal, and walrus are found in the polar regions (Fig. 10.6). Mountain goat, sheep, yak, and snow leopard are some of the animals found in the mountains.



Fig. 10.3 Boreal forest

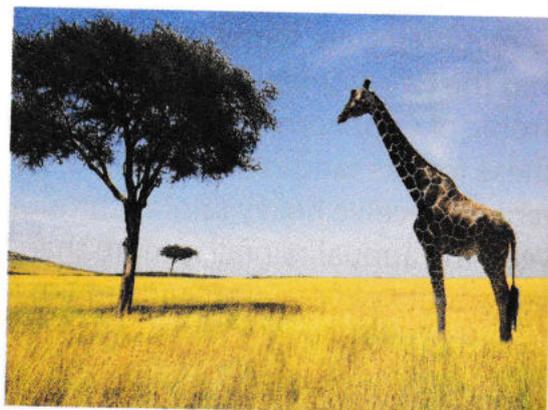


Fig. 10.4 Giraffe in grassland



Fig. 10.5 Rattlesnake in a desert



Fig. 10.6 Walrus use their long tusks to climb on ice.

## Aquatic Habitat

The aquatic habitat comprises all the water bodies on the planet. It is mainly of three kinds: freshwater, marine, and coastal.

**Freshwater habitat** Rivers, lakes, ponds, and streams are examples of freshwater habitat. Fish, frog, duck, lotus, and water lily are found in freshwater.

**Marine habitat** Oceans and seas form the largest habitat on the planet. Their water is salty.



Fig. 10.7 Marine habitat

A large variety of animals live in the marine habitat (Fig. 10.4), from tiny plankton to the largest animal in the world—the blue whale. Fish, whale, shark, jellyfish, crab, starfish, sea turtle, octopus, and seaweed are also found in marine habitat.



Fig. 10.8 Mangroves

include crab, oyster, waterfowl, and worm. Mangroves (Fig. 10.8), seaweed, and marsh grasses are plants found here. The Sundarban delta, spread across West Bengal and Bangladesh, is the largest mangrove forest in the world.

**Coral reefs** are rock-like structures made from calcium carbonate secreted by corals. They are also called 'rainforests of the sea' as they provide shelter to a large number of marine organisms (Fig. 10.9).

Besides corals, sea anemones, starfish, octopus, sea urchins, and a variety of fish are found in coral reefs. Examples of coral reefs are the Great Barrier Reef of Australia and those of the Andaman and Nicobar Islands in India.

**Coastal habitat** Coastal habitat refers to the region where the land meets the sea.

**Estuaries** are regions where saltwater (from the ocean) mixes with freshwater (from rivers or streams). Thus, unique habitats provide shelter to several

marine animals and birds. Animals found here

### Fact File

Tiny organisms called plankton are abundant in the marine habitat. Plankton are a source of food for many marine organisms.

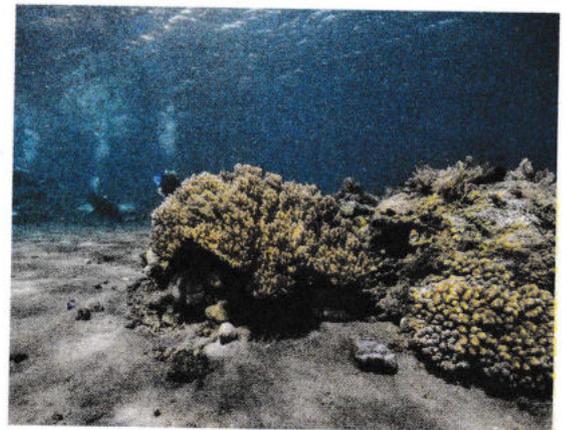


Fig. 10.9 Coral reefs

## Let's Remember



**Cross the odd one out. Give one reason for your choice.**

1. Deserts, tropical, temperate, boreal

**Reason:** \_\_\_\_\_

2. Orchid, maple, oak, elm

**Reason:** \_\_\_\_\_

3. Zebra, lion, kangaroo rat, elephant

**Reason:** \_\_\_\_\_

4. Cactus, camel, rattlesnake, Wolf

**Reason:** \_\_\_\_\_

5. Shark, jellyfish, Camel, Dolphin

**Reason:** \_\_\_\_\_

## ADAPTATIONS



What would happen if a polar bear is brought to a desert? It may not survive. That is because a desert is very hot and the polar bear is not suited to live there. Its natural habitat is the polar region, which is a very cold place.

Habitats differ in several ways. Some are hot, whereas some are very cold; some receive a lot of rain, whereas some are very dry; some are hilly areas, whereas some are plains. Because each habitat is different, animals and plants found in a particular habitat have changed or adapted themselves to survive there. For example, a polar bear is adapted to live in polar regions.

*Changes in the structure or behaviour of an organism, which allow it to survive in a particular habitat are called **adaptations**.* Adaptations in organisms take place gradually, over thousands of years.

Generally, organisms adapt to their habitat by the following means.

1. **Changes in body** Many plants and animals develop special body parts that help them to survive in their habitat. These changes are termed as modifications.
2. **Changes in behaviour** Many organisms show specialized behaviour to survive in their habitat. For example, some animals reduce their activities during winter months and go into a 'deep sleep' to deal with extremely low temperatures. The period of reduced activity in animals during winter months is known as *hibernation*.
3. **Changes in location** Certain animals (e.g., some birds and fish) move from one region to another in response to climatic changes. The seasonal mass movement of animals from one region to another in search of warmth and food is called *migration*.

## Adaptations for Tropical Forests (Rainforests)

**Plants:** The following are some adaptations shown by rainforest plants.

- Leaves of tropical rainforest trees have specialized tips, called *drip tips* (Fig. 10.10). Drip tips enable raindrops to run off quickly, without allowing them to stick to the leaf surface. This protects the leaves from rotting.
- Due to the dense vegetation of rainforests, very little light is able to reach the forest floor. Thus, very few plants are able to survive on the rainforest floor. Some plants have adapted in this habitat by climbing onto the trunks of nearby trees to reach the sunlight. Plants growing in lower levels have big leaves to absorb as much sunlight as possible.



Fig. 10.10 *Drip tip*

**Animals:** Animals in rainforests show the following adaptations.

- There is a huge variety of animals found in rainforests. Therefore, the competition for food is very high. Many animals have adapted by learning to eat a particular food, which is eaten by no other animal.
- The sloth exhibits camouflage (Fig. 10.11). The ability of certain animals to blend with the surroundings, making them difficult to spot is called *camouflage*. This adaptation enables them to hide from predators. Leaf insects and stick insects also show camouflage.



Fig. 10.11 *Sloth*

## Adaptations for Temperate Forests

**Plants:** The following are the adaptations shown by plants in temperate forests.

- Most trees are deciduous. They have thin, broad leaves that allow them to easily capture sunlight, which is required for making food.
- Broad leaves are not able to bear the freezing winter and can get damaged easily. To prevent damage, trees shed their leaves during winter.

**Animals:** Animals in temperate forests show the following adaptations.

- Many animals either hibernate or migrate to warmer regions during winter.
- Animals such as squirrels and chipmunks gather food during summer and store it for eating during winter, when food is scarce.

## Adaptations for Boreal Forests

**Plants:** The following are the adaptations shown by plants in boreal forests.

- Boreal forests receive heavy snowfall. Trees have a conical shape that allows the snow to slide off easily [Fig. 10.12(a)].
- Most trees found in boreal forests are evergreen. Trees have narrow, needle-like leaves [Fig. 10.12(b)]. This kind of structure protects the leaves from damage.

**Animals:** Animals in boreal forests show the following adaptations.

- Most boreal animals migrate to warmer regions during winter. Some animals hibernate during winter months.
- Some animals have a thick layer of fur or feathers to protect themselves from cold.

## Adaptations for Grasslands

**Plants:** The following are the adaptations shown by plants in grasslands.

- Grassland plants usually have flexible stems that bend instead of breaking when the wind is strong. These plants also have strong roots that prevent winds from uprooting them.
- Plants have narrow or tiny leaves to reduce water loss. The baobab tree can survive periods of low water availability by storing water in its huge trunk.
- Some plants have roots that extend deep into the soil to absorb as much water as possible. This also prevents grazing animals from pulling the roots out. Long roots of the acacia tree allow it to access water that is very deep in the ground.

**Animals:** Animals in grasslands show the following adaptations.

- Most grassland animals are able to run very fast (e.g., gazelles and zebras), which allows them to escape their predators. This ability also protects them from frequent grassland fires. Small animals survive the fire by digging and hiding themselves underground.
- The grasses found in dry grasslands are brown in colour most of the times. Many grassland animals have skin shades of brown that makes them hard to spot among the dry, brown grass (Fig. 10.13).



(a) Cone-shaped tree



(b) Needle-like leaves

**Fig. 10.12** Larch tree (a conifer) and its leaves



**Fig. 10.13** Lions are brown in colour.

## Adaptations for Deserts

**Plants:** Plants have developed adaptations to survive in the hot and dry climate of the deserts. Most plants have long roots that go deep into the soil in search of water.

A cactus has the following modifications.

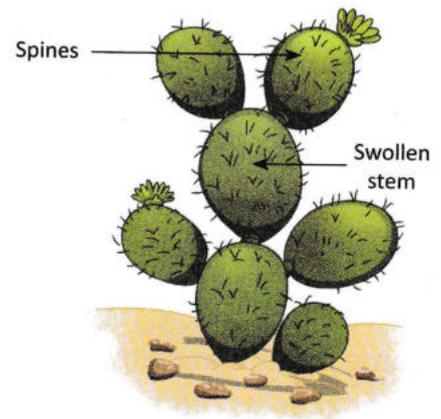
- The leaves are modified as spines to minimize water loss (Fig. 10.14).
- The stem is green, to make food for the plant.
- The stem is swollen and fleshy to store water.
- Cactus has a thick, waxy coating that prevents water loss and helps it to retain water.

**Animals:** Desert animals have adapted themselves to live in their habitat in the following ways.

- Camel's long eyelashes and ear hairs protect the eyes and ears from sand.
- Fat stored in a camel's hump acts as a food reserve (Fig. 10.15).
- Its long legs keep its body away from hot sand.
- Broad feet help in walking on the sand without sinking in it.
- It can drink a huge quantity of water at a time and can stay without water for a long time. Its body loses very little water in the form of urine.
- It can keep its nostrils closed to keep out sand.
- Many desert animals and insects stay in deep underground burrows during the day to escape from heat, e.g., the kangaroo rat (Fig. 10.16). It does not drink water. It gets all the water it needs from its food (mostly seeds). The oxygen that it takes in, combines with food to produce water inside the body.

### Let's Discuss

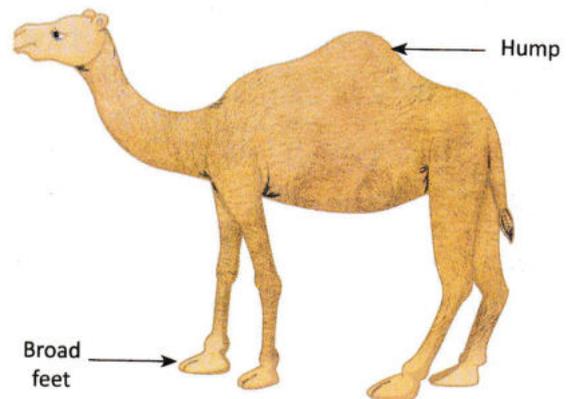
Animals in the deserts stay underground during the day and come out at night. Why is it so?



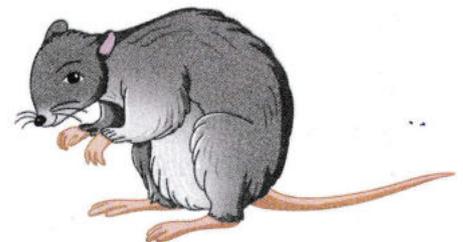
**Fig. 10.14** Cactus has spines to prevent loss of water.

### Get it Right

Plants lose water by transpiration. The water evaporates mainly through the stomata in the leaves.



**Fig. 10.15** Camel



**Fig. 10.16** The kangaroo rat

## Adaptations for Mountains and Polar Regions

**Plants:** Plants in these regions have adapted themselves in the following ways.

- Mountain plants grow close to the ground to avoid being uprooted by strong winds.
- Most plants found here produce smaller leaves to prevent water loss.
- Some plants are also able to grow under a layer of snow.

**Animals:** Animals in the mountains and polar regions show following adaptations.

- Some mountain animals hibernate or migrate to warmer areas during colder months.
- The polar bear has several adaptations to survive in the polar regions.
  - (i) White fur matches the surroundings (snow) making the polar bear difficult to spot (Fig. 10.17).
  - (ii) Small ears and tail minimize heat loss from the body.
  - (iii) Padded feet help the polar bear to walk on the snow.
  - (iv) Thick fur and a layer of fat under the skin protect the polar bear from cold.
- The yak has several adaptations to survive in the mountains (Fig. 10.18).
  - (i) The yak's mouth is adapted for grazing on a variety of plants.
  - (ii) Thick coat of hair protects the yak from cold.
  - (iii) Large chest and lungs help it to adapt to low oxygen content on the mountains.
  - (iv) The yak uses its hooves and horns to break the ice from frozen ground and graze on the grass below.



Fig. 10.17 Polar bear



Fig. 10.18 Yak

### Let's Remember



Match the columns correctly. Write one reason for matching them.

Column A

1. Sloth
2. Leaves of rainforest trees
3. Polar bear
4. Cactus
5. Yak
6. Gazelles

Column B

- small ears and tail
- camouflage
- thick coat of hair
- drip tips
- spines
- fast runners

## Adaptations for Aquatic Habitat

**Plants:** Freshwater plants show the following adaptations.

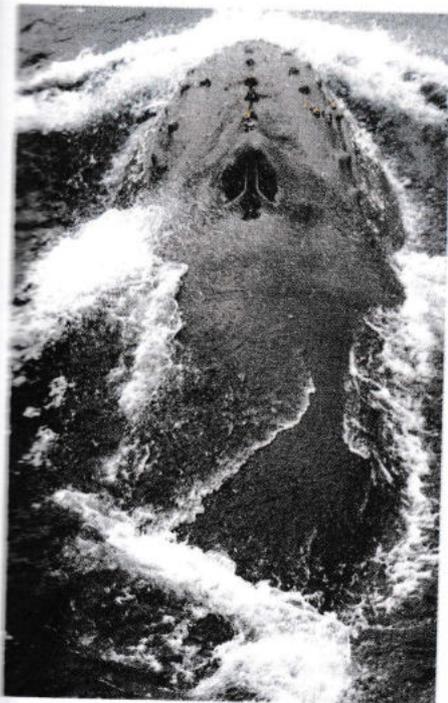
- Plants that live in flowing water have long, narrow stems. This prevents the plants from being carried away with water currents.
- Stems have air chambers that allow the aquatic plants to float in water.
- Leaves of plants such as lotus and water lily have a waxy covering that prevents them from rotting (Fig. 10.19).



**Fig. 10.19** Leaves of lotus have a waxy coating that makes them waterproof.



**Fig. 10.20** Fish swim in water



**Fig. 10.21** Whales have blowholes.

**Animals** Aquatic animals show a variety of adaptations to survive in water.

- Ducks have webbed feet that help them in swimming. They also have hollow bones that help them to stay afloat. Oil produced from under their tails makes their feathers waterproof.
- Fish also have modifications to live in water (Fig. 10.20). Gills are special organs that help fish to breathe underwater. Fins help them to swim and maintain the body balance. Their streamlined body allows them to swim fast by reducing resistance due to flowing water.
- Some sea animals such as octopus and squid do not have streamlined shape. However, as they move in water, they make their body streamlined.
- Animals such as dolphin and whale do not have gills to breathe in water. They instead breathe through lungs. They have blowholes located at the upper parts of their heads (Fig. 10.21). They come to the water surface and breathe in air through the blowholes from time to time. This allows them to stay under water for a long time.

### Fact File

When whales sleep, they float at the top of the water, with their blowhole above the water surface for breathing.



**Give one reason for each of the following adaptations.**

1. Stems of aquatic plants have air chambers.  
**Reason:** \_\_\_\_\_
2. Leaves of lotus have a waxy covering.  
**Reason:** \_\_\_\_\_
3. Ducks have webbed feet.  
**Reason:** \_\_\_\_\_
4. Ducks secrete oil from under their tail.  
**Reason:** \_\_\_\_\_
5. Fish have fins for movement.  
**Reason:** \_\_\_\_\_

## ACCLIMATIZATION

Adaptations refer to changes in an organism over a long period of time. There are certain changes that can occur in an organism over a short period of time, which help it to adjust to the changes in its surroundings. This is called *acclimatization*. For example, sheep grow very thick wool in cold climates. Another common example of acclimatization is altitude sickness. Many people (who live in the plains) suffer from altitude sickness when they go to high mountains, where there is low oxygen content. They feel breathless and nauseous. However, their body adjusts to the changes in a few days. They acclimatize to the changes in the surroundings. For this reason, high altitude climbers often stay a few days at a base camp and then climb up slowly to a higher camp. Thus, adaptation is different from acclimatization.

## Key Words

- Habitat** The area where a particular organism naturally lives is called its habitat.
- Deciduous trees** Trees that shed their leaves once a year are called deciduous trees.
- Evergreen trees** Trees that do not shed their leaves and remain green throughout the year are called evergreen trees.
- Adaptations** Changes in the structure or behaviour of an organism that help it to survive in a particular habitat are called adaptations.
- Camouflage** The ability of certain animals to blend with the surroundings, making them difficult to spot is called camouflage.

## Summary

- There are five major habitats on our planet—forests, grasslands, deserts, mountains and polar regions, and aquatic habitat.
- Tropical forests or rainforests receive heavy rainfall throughout the year and are extremely rich in flora and fauna.
- Most trees found in temperate forests are deciduous.
- Boreal forests are very cold and most trees found there are evergreen.
- Aquatic habitat can be of three kinds—freshwater, marine, and coastal.
- Organisms undergo various adaptations, over thousands of years, to survive in their habitats.

# Exercises

LET'S UNDERSTAND



QT

## I. Objective type questions.

### A. Fill in the blanks with suitable words.

- \_\_\_\_\_ (Tropical/Temperate) forests receive heavy rainfall throughout the year.
- Walrus are found in \_\_\_\_\_ (temperate forests/polar regions).
- \_\_\_\_\_ (Marine/Coastal) habitat refers to a region where land meets the sea.
- Coral reefs are rock-like structures made from \_\_\_\_\_ (calcium carbonate/calcium chloride) secreted by corals.
- Trees of boreal forests have \_\_\_\_\_ (needle-like/broad) leaves to protect them from damage.
- Stems of aquatic plants have \_\_\_\_\_ (air chambers/gills) that allow them to float in water.

### B. Choose the correct option.

- Which of these are regions dominated by grasses?  
a. Forests                      b. Grasslands                      c. Deserts                      d. Polar regions
- Which of these are aquatic habitats?  
a. Freshwater                      b. Marine and coastal  
c. Taiga and Tundra                      d. Both a and b
- Which of these are found in coastal habitats?  
a. Wolf, pine, and deer                      b. Mangroves and coral reefs  
c. Jellyfish, whale, and lotus                      d. None of these
- Which of these are adaptations that organisms show?  
a. Changes in body                      b. Changes in behaviour  
c. Changes in location                      d. All of these
- Which of these adaptations helps a camel to survive in a desert?  
a. Long eyelashes and ear hair                      b. Broad feet and hump  
c. Padded feet and thick fur                      d. Both (i) and (ii)
- Which of these help a fish to survive in water?  
a. Gills to breathe                      b. Fins to swim  
c. Streamlined body                      d. All of these
- Which plant is found in tropical forests?  
a. Orchids                      b. Oak                      c. Pine                      d. Spruce

8. Which of the following regions would you find rattlesnakes and kangaroo rats?
  - a. Forests
  - b. Grasslands
  - c. Mountains
  - d. Deserts
9. Which habitat is the Sunderban Delta an example of?
  - a. Marine
  - b. Estuary
  - c. Mangrove
  - d. Coral reef
10. Which of the following regions would you find a yak?
  - a. Grassland
  - b. Tropical forest
  - c. Mountains
  - d. Coastal region

## II. Very short answer type questions.

### A. Give one word for each of the following

1. Forests found between the equator and the two tropics \_\_\_\_\_
2. Trees that shed their leaves once a year (mostly in winter) \_\_\_\_\_
3. Areas that receive very little rainfall \_\_\_\_\_
4. The largest habitat on the planet \_\_\_\_\_
5. Rainforests of the sea \_\_\_\_\_
6. Certain changes that occur in an organism over a short period of time, which helps it to adjust to the changes in its surroundings \_\_\_\_\_

### B. Give two examples for each of the following

1. Animals found in tropical forests \_\_\_\_\_; \_\_\_\_\_
2. Regions where temperate forests are found \_\_\_\_\_; \_\_\_\_\_
3. Countries where boreal forests are found \_\_\_\_\_; \_\_\_\_\_
4. Animals found in boreal forests \_\_\_\_\_; \_\_\_\_\_
5. Plants found in grasslands \_\_\_\_\_; \_\_\_\_\_
6. Deserts \_\_\_\_\_; \_\_\_\_\_
7. Places with coral reefs \_\_\_\_\_; \_\_\_\_\_

## III. Short answer type questions.

1. What is a habitat? List the major habitats of the world.
2. Differentiate between tropical rainforest and boreal forest.
3. What is camouflage? Name two animals that show camouflage.
4. What are drip tips?
5. What do dolphin and whale use to breathe in water?
6. Define acclimatization.

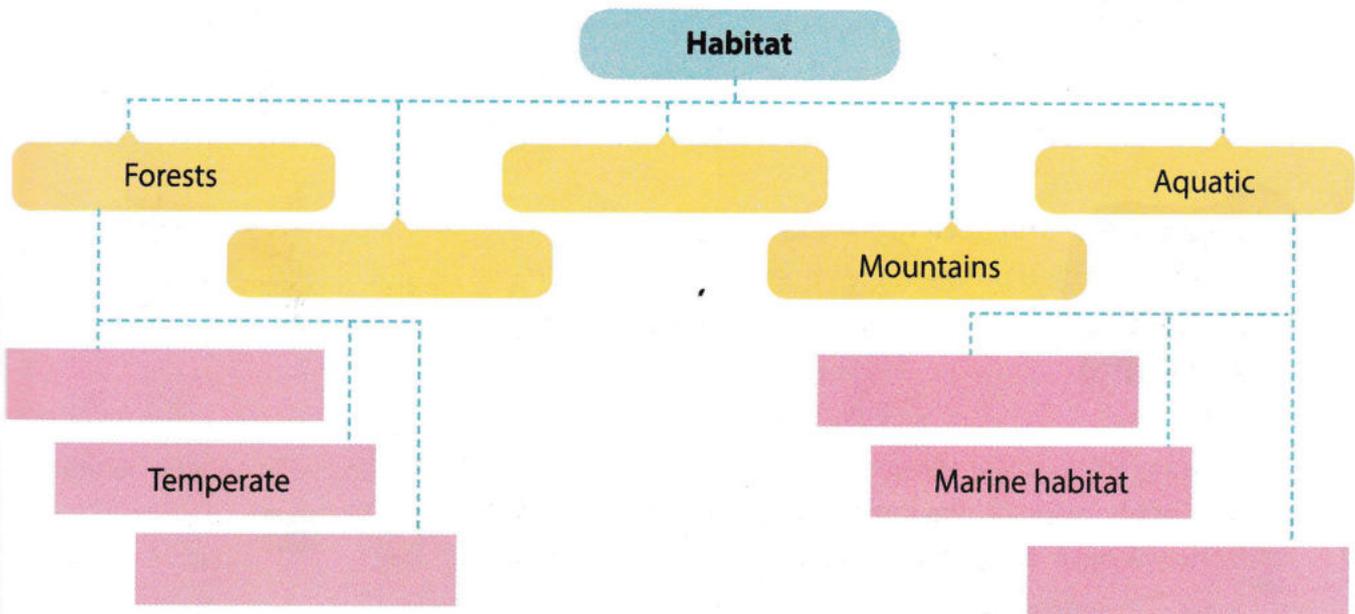
## IV. Long answer type questions.

1. Explain the different kinds of coastal habitats and plants and animals found there.
2. Describe adaptation. Describe the various means by which animals show adaptation.
3. Compare grasslands and deserts with respect to the type of plants and animals found in each.
4. Discuss the various modifications in a cactus that have helped it to survive in a desert habitat.
5. Explain how a polar bear is well suited to live in the polar regions.
6. How does a yak survive on the mountains?

## LET'S RECALL



Recall and complete the concept map given below.



## LET'S OBSERVE



Observe the picture and answer the questions that follow.

1. a. Name the animal and its habitat. **LO 5**  
 b. Give any two ways in which this animal is useful to us.  
 c. List two ways in which this animal is adapted to live in its habitat.



2. Look at the pictures of plants and animals given below. Write their natural habitats.



## LET'S CONNECT



GEOGRAPHY

On an outline map of the world, mark and label the following:

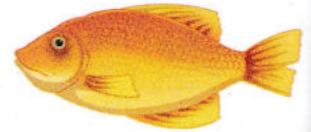
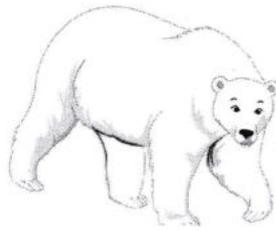
1. The tropics and the equator
2. The rainforests in green
3. The tundra regions in orange
4. The deserts in brown
5. The oceans in blue

## LET'S APPLY



1. Leaves of *Neem* will rot if left in water for a long time, whereas leaves of lotus will not. Why?
2. Maya says even polar bears can camouflage in the Arctic, as a sloth does in rainforests. Is she right? How?

## LET'S ANALYSE AND EVALUATE



1. Examine the animals and identify which of them would be best suited to live in aquatic habitat. Give reasons why the others cannot live in this habitat.
2. Justify how a yak is not suited to live in a desert.



## LET'S CREATE



TD

1. In groups of five, choose any one of the following habitats:  
  - (i) Boreal forests
  - (ii) Rainforests
  - (iii) Temperate forests
  - (iv) Deserts
  - (v) Aquatic habitat
  - (vi) Mountains
  - (vii) Arctic regions
  - (viii) Grasslands

Then, collect pictures of five animals and five plants that are found in that habitat and the adaptations each of them show. Make a chart displaying your information.

2. In groups of five, make a poster with a catchy slogan in your mother tongue to spread awareness among children on saving the forests.

 LO 11

 LO 12

### Web Research

- Deforestation on a large scale has been leading to animals getting endangered. Browse the internet and make a list of any 10 endangered animal species of India, along with the reason for them getting endangered. Make a report. Some suggested websites are:

<https://www.animalwised.com/endangered-animals-of-india-with-pictures-1195.html>

(accessed and checked on 12-08-2019)

- Camouflaging is a process widely displayed among animals. Find out how animals show camouflage, and make a report. Some suggested websites:

[https://www.boredpanda.com/animal-camouflage-39/?utm\\_source=google&utm\\_medium=organic&utm\\_campaign=organic](https://www.boredpanda.com/animal-camouflage-39/?utm_source=google&utm_medium=organic&utm_campaign=organic) (accessed and checked on 12-08-2019)

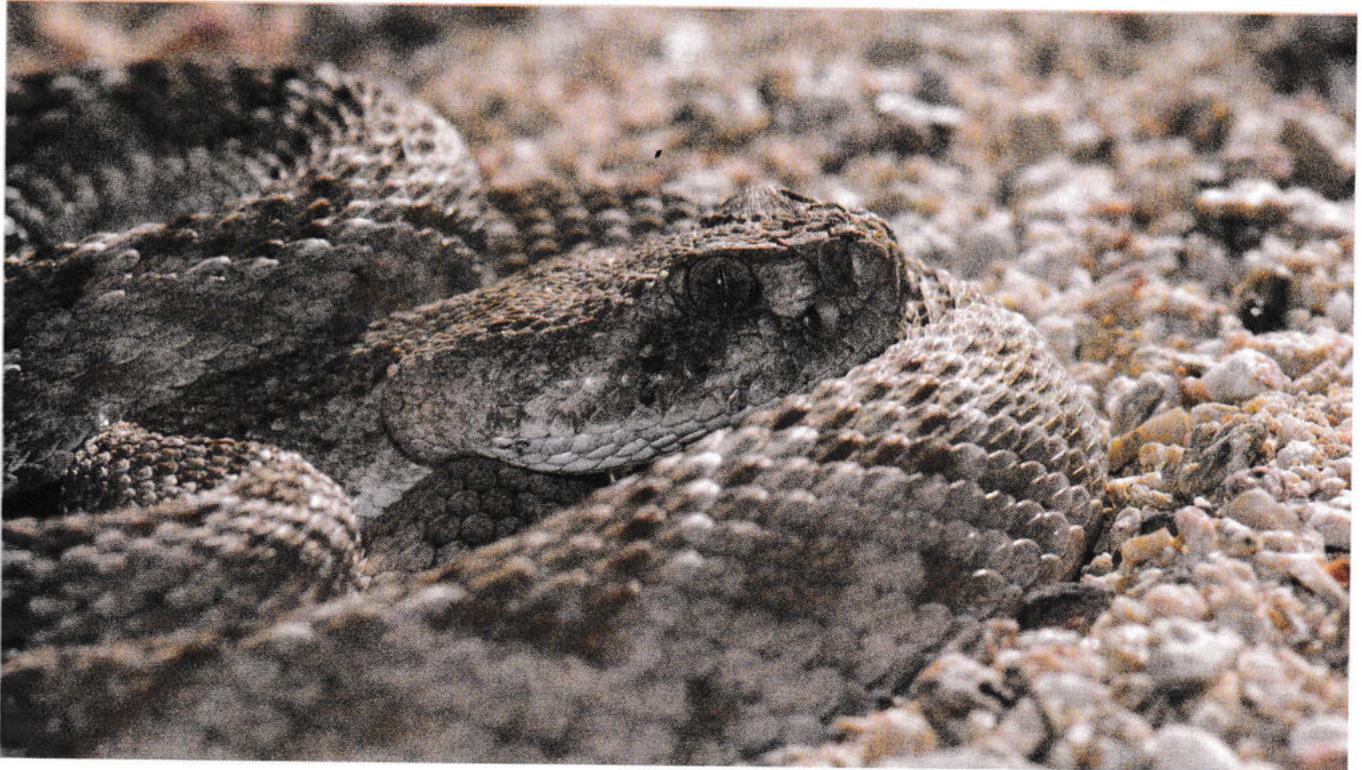
<https://www.plt.org/educator-tips/camouflage-nature-examples> (accessed and checked on 12-08-2019)

# Worksheet 3

**Skills assessed:**

Qualitative analysis

Look at the picture given below and answer the questions that follow:



1. Identify and circle the animal in the picture above.
2. Name the method by which animals blend with the environment and cannot be spotted.  
\_\_\_\_\_
3. Name any three other animals that show this feature.  
a. \_\_\_\_\_;      b. \_\_\_\_\_;      c. \_\_\_\_\_
4. How do snakes move?
  - a. They move by elongating their segmented body
  - b. They move by crawling on their bodies
  - c. They have fins to help them move
  - d. None of these
5. Is a snake a vertebrate or an invertebrate? \_\_\_\_\_

# 11

## UNIT 4: Moving Things, People, and Ideas

# Measurements and Motion

One of the most important things that scientists do is to perform experiments. Experiments are done by making 'measurements'. Measurement means giving a number to something that is measurable, such as length, mass, and volume.

We measure different things with certain instruments.

Look at the pictures of people measuring different things. Against each picture, write down what you think the person is measuring. Use the words 'length', 'volume', and 'weight/mass'.

### You will learn about

- History of transport
- Measurement
- Measurement of length
- Motion

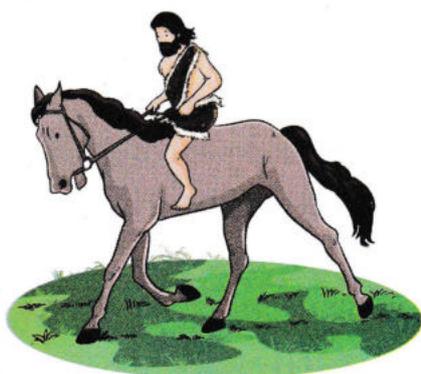


Answers: 1. Measuring weight/mass; 2. Measuring weight/mass; 3. Measuring length; 4. Measuring volume; 5. Measuring weight/mass

Measurement of most things is very simple today. We have many instruments and tools at our disposal. People in ancient times did not have those facilities. For example, when they travelled from one place to another, they had no way of telling how far they had travelled. They did not have a reliable method to measure distance.

## HISTORY OF TRANSPORT

Transportation is a means by which people or goods are taken from one place to another (on a vehicle of some sort). In ancient times, people travelled on foot from one place to another over land. They used simple boats to travel down waterways, such as rivers. Riding on the backs of animals, such as donkeys, horses, and camels, was a milestone in history of transport; it helped people travel faster and cover longer distances on land [Fig. 11.1(a)]. As trading grew, transportation of goods became important. In the beginning, people carried loads of goods on their backs. Later animals were used to carry the load [Fig. 11.1(b)]. The invention of the wheel caused a revolution in transport. Carts with wheels were much easier to pull, and larger loads could be carried faster.



(a) Horseback



(b) Animal-driven cart

**Fig. 11.1** Modes of transport in ancient times

The next revolution in transport came with the invention of the steam engine (Fig. 11.2). With the combination of the steam engine and the wheel, transportation became very efficient. Steam engines were used to power trains

on railroads, ships in water and wagons on land.

Then came the diesel and petrol engines that led to the development of most of the vehicles that we use for transportation today.



**Fig. 11.2** Steam engine

### Fact File

A **bullet train** is a highspeed passenger train. It runs on electricity. India will soon launch its first bullet train, which will run between Ahmedabad and Mumbai. It is expected to complete this seven-hour journey in 2 hours. This will give you an idea of how fast it is!

Now, in modern times, we have aeroplanes, helicopters, supersonic jets and rockets. We also have electric trains and cars, nuclear powered submarines and aircraft carriers. Engineers and scientists are also working on solar powered vehicles.

The different modes of transportation make it possible for people to travel to even the remotest corners of the Earth.

Human beings have not limited



Fig. 11.3 Space shuttle

### Fact File

**International Space Station** is a habitable man-made satellite that orbits the Earth. Astronauts can stay in it for long periods of time. Rockets transport astronauts and supplies routinely between the International Space Station and the Earth many times in a year.

their scope of travel just to the Earth they inhabit. Their quest to explore has led to the development of space shuttles that has made space travel possible (Fig. 11.3).

As technology is advancing, the means of transportation is becoming more and more exotic. Who knows what the popular means of transportation will be a century from now!

## WHY DO WE NEED TO MEASURE DISTANCE OR LENGTH?

When we go from one place to another, it is of interest to know how far we have travelled. That is, we need to know the distance between the two places. We may need to know the distance for several reasons. For instance, depending on how far your school is from your home, you may decide to travel on foot, by bus, car, or a bicycle. In this case, knowing the distance between your home and school helps you in choosing a suitable mode of transport.

**Measurement** of length is also important. A tailor needs exact measurements to stitch clothes that would fit perfectly. You may want to know how big your playground is, or if you are taller than your friend. Each of these examples need measurement of length.

### Word help

**Measurement** When we 'measure' something, we find out its size, amount or degree. The act of measuring something is called measurement.

## MEASUREMENT

**Measurement** is the process of finding the length, size, or quantity of a substance. When we talk of measurement, we have to think of two things:

- the measuring instrument, and
- how to represent the measurement

Ruler and measuring tape are the common instruments used to measure length. When we represent length, we say 8 centimetres, 15 kilometres, etc. You will notice that the representation of length has two parts: a number (8 or 15) followed by a unit (cm, km). A **unit** is a fixed quantity with respect to which a physical quantity (such as length) is measured.

### Fact File

People of the Indus Valley civilization measured lengths with great accuracy. Archaeologists have unearthed a piece of ivory with marking on it, like a scale.



(a) Hand span

Hand span is the distance between the tip of the thumb and the tip of the little finger of a fully stretched hand.



(b) Cubit

Cubit is the distance between the tip of the middle finger (outstretched) and the elbow.



(c) Fathom

Fathom is the length of the outstretched arms.

**Fig. 11.4** Ancient units of measurement

A unit is used as a standard of measurement. In early times, people used different body parts, such as hands, arms, and feet, as standards to measure lengths. This led to units such as hand span, cubit, yard, and fathom to measure lengths (Fig. 11.4).

Foot, pace, and yard are some other units of length based on body parts. However, these units are not reliable as the length of body parts varies from person to person. Therefore, people realized the need for standard units of measurement.

### Fact File

#### Indian Units of Length Measurements

After independence, realizing the importance of having standard units of measurements, the Government of India passed an Act called the Weights and Measures Act 1956, which led to the use of the metric system throughout the country.

## Standard Units of Measurements

AN

As we have seen in the previous section, it is very important to have a unit of measurement that remains the same regardless of who makes the measurement. Units that have a fixed quantity and do not vary from person to person and place to place are called *standard units*.

### Activity

**Aim:** To compare a measurement using non-standard and standard units of length

**Material needed:** A measuring tape, a group of about 5 students and an adult (teacher) (divide the class into many such groups), a long continuous wall in the classroom or corridor, coloured chalk piece.

**Method:**

1. Use the coloured chalk piece to make two marks at the two far ends of the wall. Make sure that they are as far away from each other as possible. Also make sure that they are about the same height above the floor.
2. Divide the class into groups of around five students each, and an adult (the teacher can be part of all the groups)
3. Measure the distance using ancient units like hand span, cubit and fathom. (Note: You may find that the last bit may be less than a hand span, cubit, etc. in such a case, you can approximate it to a fraction like  $\frac{1}{2}$ ,  $\frac{1}{4}$ , etc. Take your teacher's help for the last bit)
4. Measure the same distance using the measuring tape. (Take your teacher's help to measure with a tape)
5. Represent your observations in the form of a table as shown below.
6. Analyse the results obtained in the table, and also compare this with the results obtained by the other group

Name	Measurement in Hand span	Measurement in Cubit	Measurement in Fathom	Measurement using a measuring tape (metres/centimetres)

**Observation:** You will observe that the values obtained in the second, third and fourth column may vary from student to student, but the last column remains the same.

**Conclusion:** Measurements based on body parts like hand span, etc. are unreliable as they vary from person to person, whereas a measurement made using a standard measuring tape is more reliable.

The French introduced a standard system of units, called the metric system, and the British introduced the British Imperial system of units. There are several other systems of units adopted in different parts of the world. In the metric system, the basic unit of length is the metre and in the British Imperial System, it is the foot. As you can see, if people from

different parts of the world, using different systems of units want to trade, or communicate ideas, etc., it would lead to a lot of inconvenience and confusion, as a measurement in one system of units has to be converted into another system every time. To overcome this problem, scientists all over the world have adopted a common set of units. This system is called the *International System of Units* or the *SI units*. The adoption of SI units in 1960 made it easier for scientists of different countries to communicate their results to one another. The SI unit of length is metre.

Depending on the size of the object we need to measure, we have to choose an appropriate unit. Some common standard units of length are inch, millimetre, centimetre, and kilometre. For example, we use metres to measure the length of a piece of cloth, kilometres to measure the distance from one place to another, millimetres to measure the thickness of the hair, and so on. Centimetre (cm) and millimetre (mm) are used to measure shorter lengths, whereas kilometre (km) is used to measure longer distances.

One kilometre is divided into 1000 equal divisions, each called metre. One metre is divided into 100 equal divisions, each called centimetre that is again divided into 10 equal divisions called millimetre. See Table 11.1 to know how to convert one standard unit of length to another.

### Example 1

Raju and his friend Akhil live 2000 m from each other. Express the distance between their houses in kilometres (km).

**Solution:** We know that  $1000 \text{ m} = 1 \text{ km}$

Therefore,  $2000 \text{ m} = 2 \text{ km}$

Therefore, the distance between the two houses is 2 km.

**Table 11.1** Commonly used units of length

10 millimetres	1 centimetre (cm)
100 centimetres	1 metre (m)
1000 metres	1 kilometre (km)

## MEASUREMENT OF LENGTH

LL

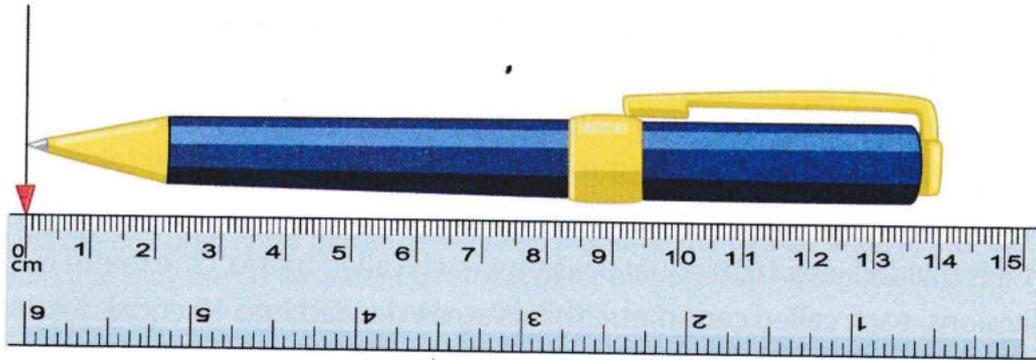
We have learnt just now that an important part of measurement is to decide the unit in which we are going to make a particular measurement. For example, depending on the length we can decide to use metre, centimetre, or kilometre to represent it. The second important part of measurement is to actually perform the measurement. In order to perform a measurement, we need measuring tools or instruments. Examples of measuring instruments are ruler, measuring tape, metre rod, and so on. *The distance of something from one end to the other is called length.*

### Tech Specs

An **odometer** is a device used for indicating distance travelled by an automobile.

While using instruments to measure length, so as to make an accurate measurement, we have to take certain precautions. For example, while measuring length using a ruler, we should take the following precautions.

1. Care should be taken to keep the ruler along the length of the object.
2. If the edge of the ruler is worn out or broken, the measurement should be started from any other mark that is fully clear. For example, if you measure from 2 cm mark to the 7 cm mark, the length is 5 cm ( $7\text{ cm} - 2\text{ cm} = 5\text{ cm}$ ) (Fig. 11.5).



**Fig. 11.5** Measurement should only be started from a mark that is fully clear.

3. Eyes should be exactly above the point where the measurement is to be taken. If your eyes are at different positions, you might get wrong readings.

### Using a Divider to Measure Length

A divider is used to measure the distance between two points. Let us see how.



1. The divider is placed such that each tip is at the points A and B.
2. Then, without disturbing the divider, the distance between the two points is measured with a ruler.

### Measuring the Length of a Curved Line

The length of a curved line can be measured using a string. The string is placed along the curved line and its ends are marked on the string [Fig. 11.6(a)]. The length of the string

between the marked points is measured with a ruler [Fig. 11.6(b)].

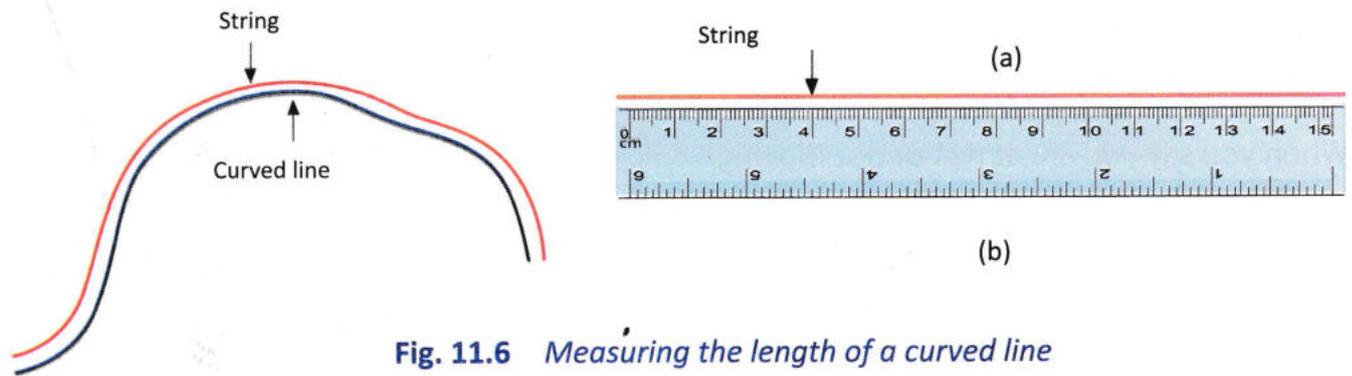


Fig. 11.6 Measuring the length of a curved line

### Activity

**Aim:** To find the length of a curved line

**Materials needed:** A ruler, a measuring tape, a string, a sketch pen, and a leaf

**Method:**

1. Draw a curved line on a piece of paper. Place the string along the curved line. Make sure the string covers every bit of the curved line.
2. Mark the points where the curved line begins and ends on the string.
3. Now stretch out the string along the length of a ruler (or a stretched out measuring tape, if the curved line is long) and measure the distance between the two marks on the string.
4. Try out different curved lines, like the outline of a leaf or even your waist (for this you can use the measuring tape directly).

### Let's Remember



**I. Write T for the true statement and F for the false one. Correct the false statement.**

1. Kilometre is an example of a non-standard unit of length.
2. The millimetre is the appropriate unit to measure distances between cities.
3. SI units vary from country to country.

**II. Convert the following.**

1. 900 mm = \_\_\_\_\_ cm
2. 50000 cm = \_\_\_\_\_ m
3. 3 km = \_\_\_\_\_ m

**III. Name an appropriate unit of length that can be used to represent the following.**

1. The thickness of a piece of paper
2. The distance between Mumbai and New Delhi
3. The length of cloth needed to stitch your uniform

## MOTION

Any object that moves is said to be in *motion*. When we say an object is moving, it is always with respect to another object. For example, when we say a vehicle is moving on a road, it is moving with respect to the trees and poles on the road, which are 'not moving'.

When you say you are at rest or not moving while sitting at your desk and reading a book, it is with respect to your chair or your desk.

When an object moves, its position (with respect to another object) changes with time. Let us take the example of a car moving away from a building (Fig. 11.7).

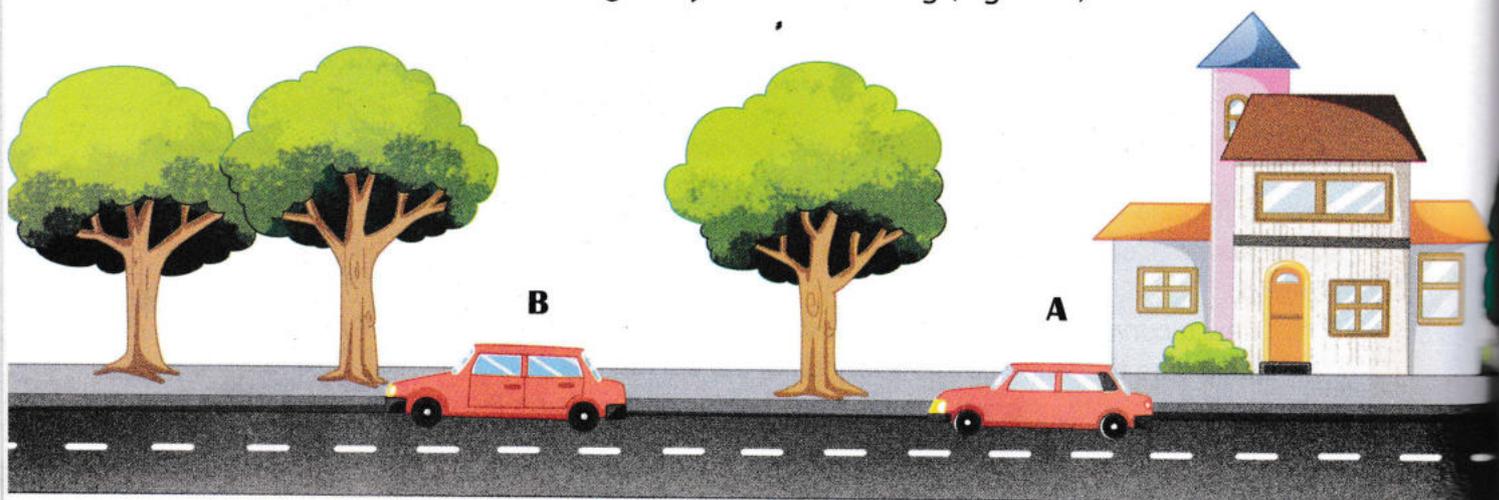


Fig. 11.7 Motion of car with respect to building

When the car is at position A, the distance between the car and the building is very small. As the car moves away from the building (Position B), its distance from the building increases. Another way of saying this is that when the car moves, its position with respect to the building changes with time.

An object is said to be in motion if its position (with respect to another object) changes with time.

## Types of Motion

AN

There are different types of motion: translational, rotational, periodic, and non-periodic motion.

### Translational Motion

A type of motion in which all parts of an object move the same distance in a given time is called *translational motion*. Examples are: vehicles moving on a road, a child going down a slide (Fig. 11.8), and a bird flying in the sky.



Fig. 11.8 Example of translational motion: A child going down a slide

Translational motion can be of two types: rectilinear and curvilinear. Table 11.2 shows the differences between the two.

**Table 11.2** Differences between rectilinear and curvilinear motions

Rectilinear motion	Curvilinear motion
1. When an object in translational motion moves in a straight line, it is said to be in rectilinear motion.	1. When an object in translational motion moves along a curved path, it is said to be in curvilinear motion.
2. Examples are a car moving on a straight road and a train moving on a straight track.	2. Examples are a stone thrown up in the air at an angle and a car taking a turn.

### Activity

**Aim:** To observe the motion of various objects around you and classify them as similar and dissimilar motions.

**Materials required:** a pencil and a notebook

**Method:**

1. Observe the different objects in motion all around you.
2. Make a table as shown below. Some boxes have been filled for you. Fill in the empty boxes with your observations.

Object in motion	Similar motion	Dissimilar motion
Athlete running on a straight track	Bus on a straight road	Blades of a rotating fan
Rotation of the Earth	Spinning top	
Birds in the sky	Fish in a tank	
Pendulum in a clock		

**Conclusion:** You will see from the above table that we are surrounded by various different objects that are moving and that objects move in a variety of different ways. In order to make it simpler to analyse the motion of objects, we can classify the different types of motion.

## Rotational Motion

When an object moves about an axis and different parts of it move by different distances in a given interval of time, it is said to be in rotational motion. Examples of objects undergoing rotational motion are blades of a rotating fan, merry-go-round (Fig. 11.9), and blades of a windmill.

When an object undergoes rotational motion, all its parts do not move the same distance in a given interval of time. For example, the outer portion of the blades of a windmill move a longer distance than the portion closer to the centre.



Fig. 11.9 A merry-go-round shows rotational motion

## Activity

**Aim:** To show that when a body performs rotational motion, all its parts do not move the same distance in a given interval of time.

**Material needed:** a newspaper, three sketch pens of different colour, adhesive tape, string, ruler, a door

**Method:**

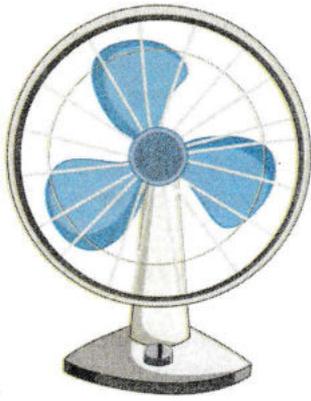
1. Spread out the newspaper under the door and fix the paper to the floor with adhesive tape.
2. Close the door and with the help of the adhesive tape, stick the sketch pens to the door (first one near the hinge, second one at the middle, and the third near the outer edge), in such a way that their tips just touch the newspaper.
3. Now open the door gently. You will see that the three sketch pens make curved lines on the newspaper.
4. Observe the curved lines closely. Do they all have the same length? Use the string and ruler to measure the lengths of the three curved lines. What do you observe?

**Observation:** You will observe that the lines made by the three sketch pens are of different lengths. The length of the curve made by the sketch pen closest to the hinge is the shortest and it increases as we go closer to the edge of the door.

**Conclusion:** This shows us that the different parts of the door move different distances during the same interval of time.

## Periodic Motion

A type of motion that repeats itself after equal intervals of time is called *periodic motion*. Examples of objects undergoing periodic motion are the to and fro motion of a pendulum, the Earth (rotating on its axis), the hands of a clock, the blades of a rotating electric fan, and the plucked string of a guitar (Fig. 11.10).



(a) Blades of a fan



(b) Hands of a clock



(c) Plucked string of a guitar

**Fig. 11.10** Objects undergoing periodic motion

### Non-periodic Motion

A motion that does not repeat itself at regular intervals or a motion that does not repeat itself at all is called *non-periodic motion*. Examples of non-periodic motion are a car moving on a road, a bird gliding across the sky (Fig. 11.11), and children playing in a park. In everyday life, we observe more than one type of motion, such as



- birds gliding across the sky (translational and non-periodic) and
- rotation of the Earth on its axis (rotational and periodic).

**Fig. 11.11** Birds gliding across the sky exhibit non-periodic motion.

### Let's Remember



**Categorize the type of motion exhibited by the following as rotational or translational.**

1. The steering wheel of a car \_\_\_\_\_
2. An aeroplane taking off \_\_\_\_\_
3. Screwing a water bottle cap \_\_\_\_\_
4. Rolling dough with a rolling pin \_\_\_\_\_
5. The wheels of a moving car \_\_\_\_\_
6. Screwing a nail \_\_\_\_\_

### Key Words

<b>Unit</b>	A fixed quantity with respect to which a physical quantity is measured is called unit.
<b>Standard units</b>	Units that have a fixed quantity and do not vary from person to person and place to place are called standard units.
<b>Motion</b>	An object is said to be in motion if its position (with respect to another object) changes with time.

<b>Translational motion</b>	A type of motion in which all parts of an object move the same distance in a given time is called translational motion.
<b>Rotational Motion</b>	When an object moves about an axis and different parts of it move by different distances in a given interval of time, it is said to be in rotational motion.
<b>Periodic motion</b>	A type of motion that repeats itself after equal intervals of time is called periodic motion.
<b>Non-periodic motion</b>	A motion that does not repeat itself at regular intervals or a motion that does not repeat itself at all is called non-periodic motion.

## Summary

- In ancient times, human beings used non-standard units of length such as hand span, cubit, and fathom.
- Standard units do not vary from person to person or place to place.
- In the SI unit, length is measured in metres.
- Motion can be of different types (e.g., translational, rotational, periodic, or non-periodic).
- An object can have more than one kind of motion.

## Exercises

### LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with the correct word.

1. \_\_\_\_\_ (yard/cube) is a unit of length.
2. \_\_\_\_\_ (standard/non-standard) units do not vary from person to person or place to place.
3. A train travelling on a straight track is an example of \_\_\_\_\_ (rotational/translational) motion.
4. The blades of a working fan show \_\_\_\_\_ (rotational/translational) motion.
5. A swinging pendulum executes shows \_\_\_\_\_ (periodic/non-periodic) motion.

#### B. Choose the correct option.

1. This is a modern mode of transport, that has come into use only recently.
  - a. Boat
  - b. Horse riding
  - c. Aeroplane
  - d. Bullock cart

2. Susheel lives 250 km away from his uncle's house. Which of the following means of transportation would be appropriate if his family wants to go to his uncle's house?
  - a. Walking
  - b. On a bicycle
  - c. Train
  - d. On horseback
3. This is an example of a standard unit of length.
  - a. Cubit
  - b. Kilometre
  - c. Hand span
  - d. Pace
4. The SI unit of length is
  - a. kilometre
  - b. inch
  - c. metre
  - d. millimetre
5. A measuring tape is a
  - a. standard unit of length
  - b. measuring instrument
  - c. a non-standard unit of length
  - d. a unit of distance
6. When a vehicle is moving on a road, it is moving with respect to
  - a. the trees on the road
  - b. electric poles on the road
  - c. the buildings by the roadside
  - d. all of these
7. We can measure the length of a curved line with
  - a. a ruler alone
  - b. a ruler and string
  - c. a clock
  - d. a divider
8. Translational, rotational, and periodic refer to
  - a. types of motion
  - b. measurements of lengths
  - c. modes of transport
  - d. none of the above
9. 20 cm equals
  - a. 200 m
  - b. 20 m
  - c. 200 mm
  - d. 20 km
10. When an object in translational motion moves in a straight line, it is said to be in
  - a. curvilinear motion
  - b. rotational motion
  - c. rectilinear motion
  - d. both a & b

## II. Very short answer type questions.

### A. Give two examples for each of the following.

1. Ancient modes of transport
2. Modern modes of transport
3. Modes of transport in air
4. Non-standard units of length
5. Standard units of length

### B. Define/explain the following.

1. Transportation
2. Standard unit
3. Translational motion
4. Periodic motion

## III. Short answer type questions.

1. Name any two inventions that revolutionised transportation.

- Name two units used in ancient times, along with their definitions.
- What is the main advantage of using standard units? Name one system of standard units.
- What are SI units? What is the SI units of length?
- What is motion? Name any two types of motion, with examples.

#### IV. Long answer type questions.

- Write a short note on how transportation has evolved from ancient to modern times.
- Discuss the importance of having standard units of measurements.
- Name two instruments that can be used to measure length. Explain how a ruler can be used to measure length.
- List the precautions to be taken while making measurements with a ruler.
- In what situation would it be more appropriate to use a string along with a ruler to make length measurements? Explain how such a measurement would be made.

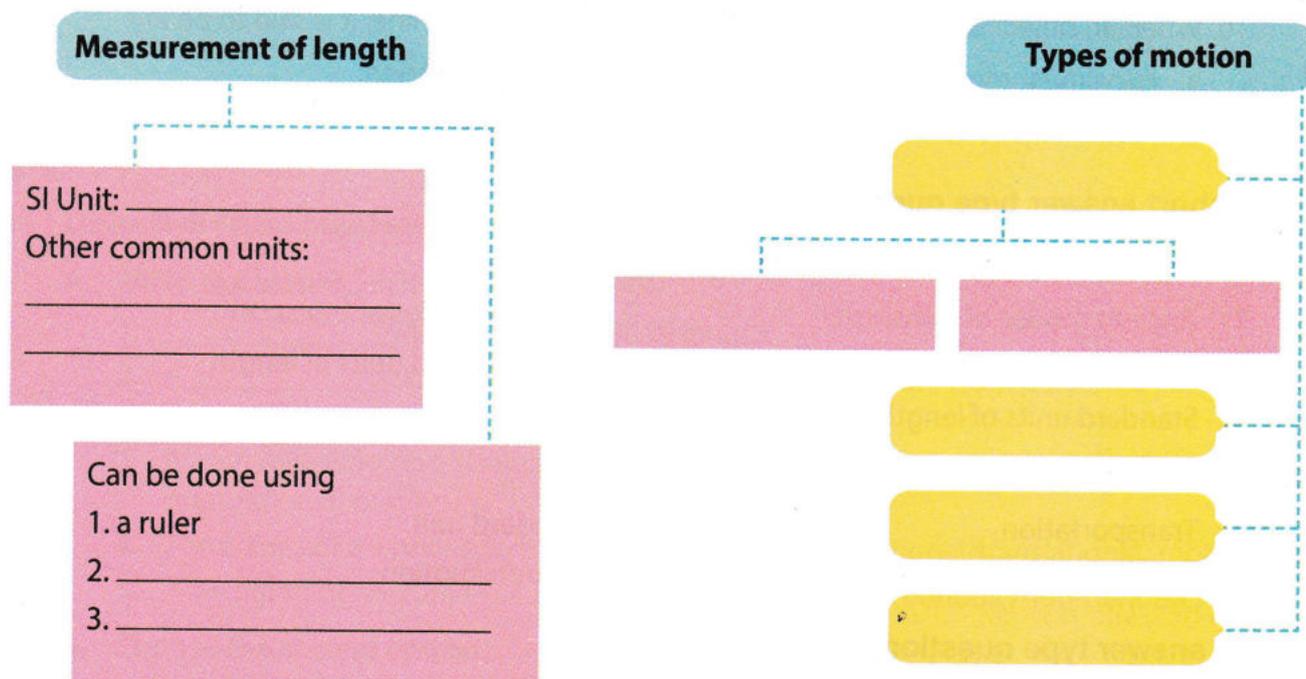
#### V. Numericals.

- Akshay needs 465 cm of cloth to stitch his uniform. Anil needs three and a half metres. Who needs more cloth for his uniform? By how much?
- Priya lives in a hostel 155000 m away from her parent's house. Express the distance in kilometres.

#### LET'S RECALL



Recall and complete the concept map given below.



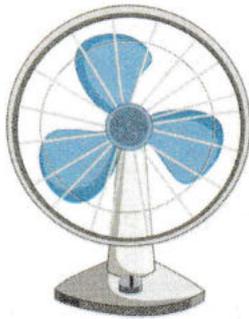
## LET'S OBSERVE



Observe the following pictures and answer the questions that follow.

1. a. Write down the type of motion of the car as a whole.
  - b. What kind of motion does the steering wheel perform?
  - c. What kind of motion does the boy have with respect to
    - i. the car door
    - ii. the plant outside
  - d. When the car is moving, what kind of motion do the wheels have?
2. Name the type of motion that these three objects show when they are in motion.

LO 3



## LET'S CONNECT



**Carbon footprint of our food:** The carbon footprint of your food is the total amount of greenhouse gases that is produced during farming/growing, processing, and transportation of your food. Let us focus on transportation. Do you think it matters if you eat food grown locally? Can you make a connection between the food you eat and the climate of the Earth? Fill in the table below to see where the food you eat comes from.

Food	Where did it come from	How many kilometres away? (approx.)

## LET'S APPLY



1. Do you think the distance between Mumbai and Pune would be different if we measured the distance in metres instead of kilometres? Name the factor that would change and the factor that would not. (*Hint: The same distance can be measured in different units.*)
2. Arun's school admits children who live within 5 km from the school. His cousin Rohit, who lives 2000 m from the school, wants to go to the same school. Do you think he will get admission in the school? (*Hint: Different units of measurement can be converted from one to another.*)

LO 7

## LET'S ANALYSE AND EVALUATE

- Classify the following examples of rotational motion into periodic and non-periodic motion.
  - Blades of a fan
  - Opening of door  
  - Opening of a book
  - Rotation of Earth on its axis
- Estimate the distance between the following and decide on the most appropriate means of transport for each of them. 
  - Earth to moon
  - Agra to Delhi
  - London to Hyderabad
  - Classroom to cafeteria

## LET'S CREATE



- Make a list of unusual vehicles and collect pictures and write a line or two about each. Present this in the form of a chart. Here is a sample list. Maglev train, Self-driving cars, Escalators and elevators, Army tanks, Snow mobile, you can add many more to the list!  
- Have a debate on the pros and cons of advancement in transportation. Here are some pointers
  - Pros:** Advancement in transportation has led to easier access to remote areas; goods can be transported; medical aid, etc can reach everyone
  - Cons:** Pollution, destruction of natural habitat to build roads, using non-renewable resources like petrol, diesel.  
- Ancient units such as inches, foot, and yard have been standardised and can now be used as standard units. Use the internet to find out the ancient definition of familiar modern units like inch, foot, yard, etc. Add as many units as you can find. Also find out the modern definition of the same units. Make a table to present your findings. Use figures and drawings to illustrate the ancient definition of the unit.  

Unit	Ancient Definition	Modern Definition
Inch	Width of a man's thumb	25.4mm

### Web Research

- Look at the video on the following website and write a report on Galileo:  
<https://www.youtube.com/watch?v=NMM8vx9vDiE> (checked and assessed on 20-08-2019)
- Watch the video on the history of transport and make a timeline on the advancements that led to modern means of transportation.  
<https://www.youtube.com/watch?v=FaLCQo8NJFA> (checked and assessed on 20-08-2019)

# Worksheet 4

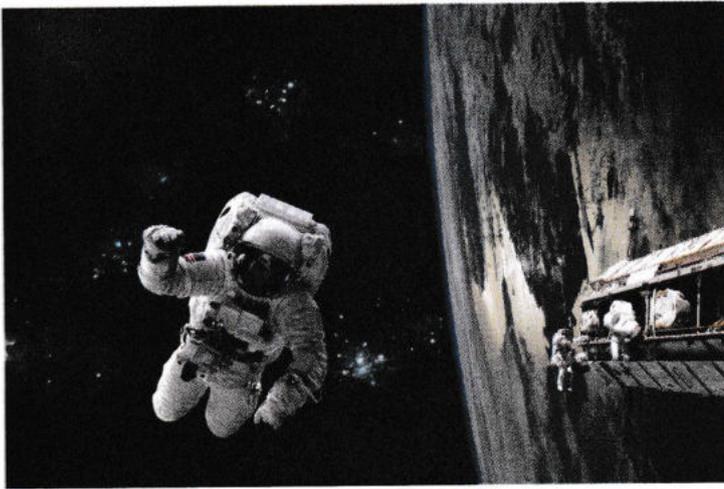
**Skills assessed:**

Problem solving and qualitative analysis

## Space travel

Read the passage below and answer the questions that follow.

We have learnt about different types of vehicles that are used for travel. There are some vehicles that are used to travel in space; these are called spacecrafts. People cannot ordinarily travel in a spacecraft. Outer space is the region outside the Earth's atmosphere where all the other planets and stars are present. Specially trained people whose job involves travelling into space and working in a spacecraft are called astronauts. In outer space, astronauts have to face many challenges. One of them is weightlessness. Working with weightlessness is not very easy, and astronauts must be trained in order to be able to work under weightless conditions. One method of mimicking weightless working conditions is to train under water, which is part of an astronaut's training.



1. What is a spacecraft?

---

---

2. What is outer space with reference to the passage above?

---

---

3. Who are astronauts?

---

---

4. Why do astronauts need training to handle weightlessness?

---

---

5. How can weightlessness be simulated on Earth?

---

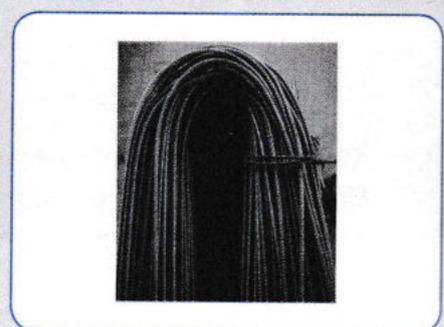
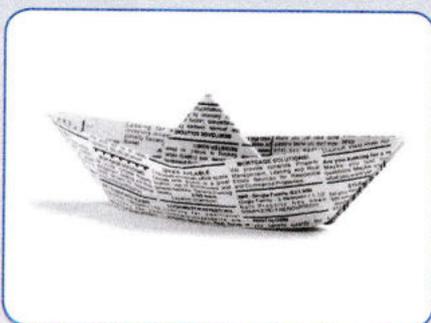
---

## Fun with Magnets

Magnets are very interesting. The first thing that we notice about magnets is that they stick to each other or some objects. Look at the pictures shown below. Write M against the objects that you think would stick to a magnet and write NM against the objects that would not stick to a magnet.

## You will learn about

- Discovery of magnets
- Magnets
- Poles of a magnet
- Using a magnet to find directions
- Attraction and repulsion
- Types of magnets
- Care of magnets
- Uses of magnet

1. Iron pan 2. Plastic tray 3. Iron rods 4. Wooden logs 5. Paper boat 6. Metal keys 

Let us now learn more about magnets.

Answers: 1. M, 2. NM, 3. M, 4. NM, 5. NM, 6. M

## DISCOVERY OF MAGNETS

There are many stories about how magnets were discovered. It was so long ago and not well documented, that people do not know for sure, but according to a popular story, magnet was discovered by a Greek shepherd named *Magnes*. It is said that the nails in his shoes and the iron tip of his staff got stuck to a large black rock on which he was standing. Greeks named this strange type of rock 'magnetite'. The Chinese also knew about magnets. Ancient Chinese sailors used magnets for navigation.

## MAGNETS

A magnet attracts objects made of certain substances such as iron, cobalt, and nickel.

Magnets come in various shapes and sizes (Fig. 12.1). They can be found in the shape of horseshoe, ring, cylindrical, or bar.

Not all objects are attracted to magnets. Materials that are attracted by a magnet are said to be magnetic, e.g., iron and nickel. Materials that are not attracted by a magnet are said to be non-magnetic, e.g., wood and plastic.

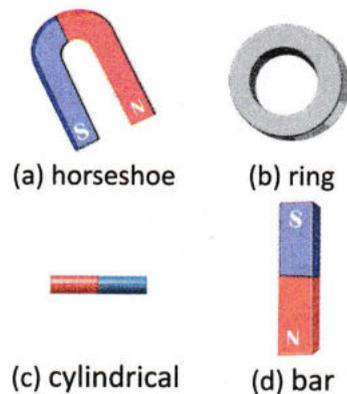


Fig. 12.1 Shapes of magnet

### Activity

**Aim:** To find out which materials get attracted to magnets and which do not.

**Materials needed:** a magnet, plastic pen-caps, metal safety pins, coins of different denominations, pencil, eraser, a book, porcelain cup, stainless steel spoon, keys, items around you made of different materials.

**Method:**

1. Hold the magnet close to each of the items listed above (and any other items that you want to test) and see if the magnet is attracted to it. What do you observe?
2. Write down your observations in the form of a table as shown below.

Object and material it is made of	Is it attracted by the magnet?
Pen cap - plastic	no
Safety pin - steel (contains iron)	yes

**Observation:** You will notice that materials such as plastic pen caps, pencil, eraser, book, porcelain cup, etc. do not get attracted to magnets, while materials such as metal safety pins, certain coins, stainless steel spoon, and keys get attracted to magnets.

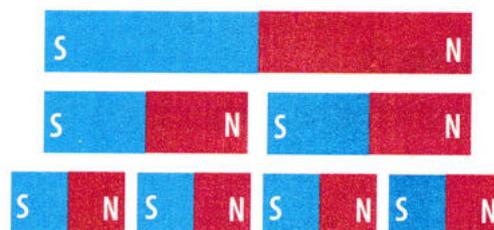
**Conclusion:** Materials, such as plastics, paper, wood, rubber, porcelain, etc. are called non-magnetic substances, whereas materials, such as iron are magnetic.

## POLES OF A MAGNET

TD

When magnetic materials (such as iron filings) are brought close to a magnet, they do not stick evenly to all parts of the magnet. Most of them stick on certain parts of the magnet. These are called the *poles* of the magnet. Magnetic forces are the strongest at the poles. For example, the two ends of a bar magnet are its poles.

There are two types of poles in every magnet, irrespective of its shape. These are, by convention, called the north pole (N) and the south pole (S) (Fig. 12.2). The two poles cannot exist independently. That is, they always come in pairs. If we break a bar magnet, we would get two pieces, each having a north pole and a south pole. We could go on breaking the magnet into smaller pieces, and everytime we would get both the poles in each piece.



**Fig. 12.2** Each piece of magnet would have a north pole and a south pole, no matter how small.

### Activity

**Aim:** To find the poles of a magnet

**Materials needed:** Iron filings (powdered iron), a magnet, a small sheet of transparent polythene, and a sheet of white paper

**Method:**

1. Spread the iron filings on a sheet of white paper.
2. Wrap the magnet in the polythene sheet and run it through the iron filings.

**Observation:** Most of the iron filings will stick to two portions of the magnet.

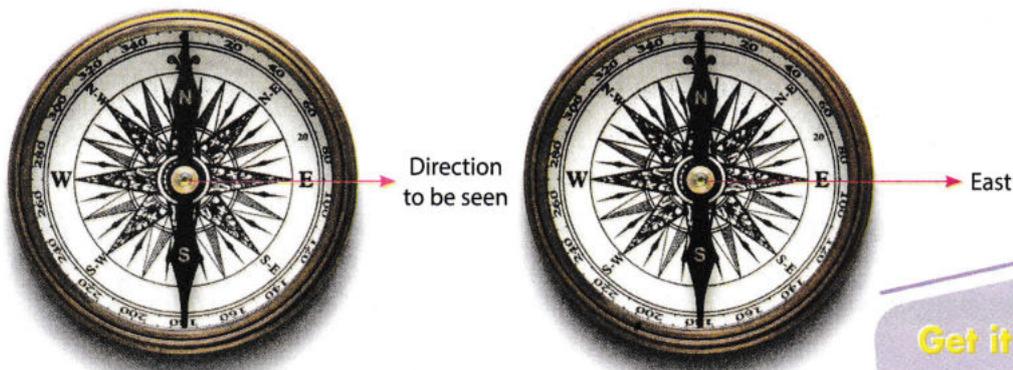
**Conclusion:** The two portions of the magnet where most of the iron filings stick are the poles of the magnet.

### USING A MAGNET TO FIND DIRECTIONS

If a magnet is allowed to move freely, it comes to rest in a direction very close to the Earth's North–South direction. This property of a magnet was used to find directions on the surface of the Earth by travellers. An instrument with a magnet, which is used to find directions is called *magnetic compass*.

A magnetic compass is usually a small box with a small magnetic needle at its centre. This needle can rotate freely and always points in the Earth's North–South direction. Different directions (north, south, east, and west) are marked on the compass.

Figure 12.3 shows how one can find directions using a magnetic compass.



1 The compass is rotated till the 'North' marking coincides with the end of the needle pointing north.

2 The desired direction is read on the compass (East in this case).

**Fig. 12.3** Finding directions using a magnetic compass

### Get it Right

The Earth's geographical poles and the magnetic poles are not the same. The magnetic pole found deep inside the Northern hemisphere of the Earth is a south type magnetic pole. And the Earth's magnetic north pole is geographic South Pole.

### Activity

**Aim:** To prove that a freely suspended magnet always aligns itself in a particular direction

**Materials needed:** A ruler/wooden stick, a heavy book, a table, a bar magnet, a string, a magnetic compass, a sheet of white paper, and adhesive tape

**Method:**

1. Stick the sheet of white paper on the table and place the magnetic compass on it. Ensure that no magnet or magnetic object is kept near the compass. Mark the north and south directions on the paper.
2. Tie one end of the string to the middle portion of the bar magnet and the other end to the ruler/wooden stick.
3. Place the ruler on the table so that the end tied to the magnet sticks out about 6–8 inches beyond the edge of the table. Place the book on the ruler so that it does not slip-off the table.  
Make sure that the magnet can move freely.
4. Leave the magnet undisturbed for a little while and observe the direction in which it comes to rest. Make a note of the direction. Compare this with the directions you have marked on the paper.
5. Give the magnet a twist and again observe the direction in which it comes to rest.

**Observation:** You will see that the magnet always comes to rest in a particular direction (North–South).

**Conclusion:** If a freely suspended magnet is allowed to rotate, it comes to rest such that it is aligned in the Earth's North–South direction.

Do you know why a freely suspended magnet always points in the Earth's North–South direction? It behaves like it is under the influence of another magnet. But where is this other magnet? It is the Earth itself. This alignment happens because of the influence of the Earth, which itself acts like a giant bar magnet (Fig. 12.4). It influences all the magnets (within its region of influence) to align themselves along its North–South direction.

### ATTRACTION AND REPULSION



When two magnets are brought close to each other, they are either pulled towards each other, or pushed away from each other. When the magnets are pulled towards each other, they are said to attract each other. When they are pushed away from each other, they are said to repel each other. Whether the magnets attract or repel depends on which poles of the magnets are facing each other.

When like poles of the magnets (N–N or S–S) are brought close to each other, they repel. This is called *repulsion* [Fig. 12.5(a)].

When unlike poles of the magnets (N–S or S–N) are brought close to each other, they attract. This is called *attraction* [Fig. 12.5 (a)].

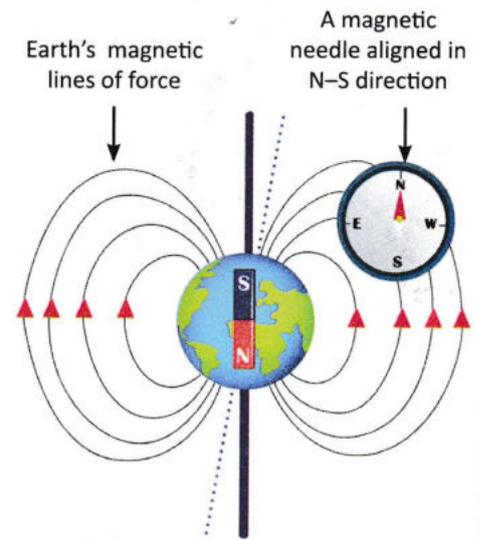
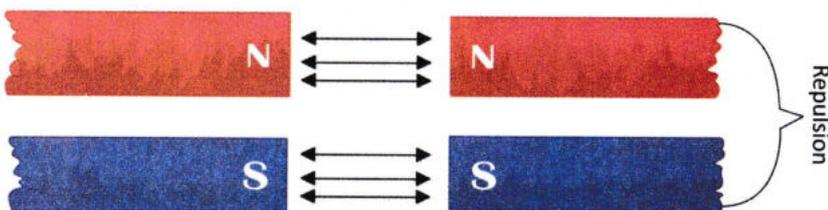
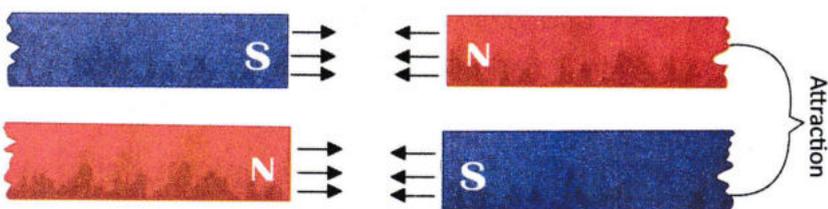


Fig. 12.4 Earth is a giant bar magnet.



(a) repulsion between like poles



(b) attraction between unlike poles

Fig. 12.5 Like poles of a magnet repel and unlike poles attract each other.

### Tech Specs

Have you heard of trains that do not have wheels? These trains, called Maglev, have special arrangement of magnets that enable them to float over the track experiencing minimal friction. Maglev stands for magnetic levitation. It makes use of the principle that like poles repel and unlike poles attract to lift themselves from the tracks leading to a speed as high as 603 km/h (a new record made in April, 2015).

## Let's Remember



Fill in the blanks with the correct words.

- \_\_\_\_\_ (Iron/Copper) is attracted to a magnet.
- When brought near a magnet, iron filings stick to the \_\_\_\_\_ (poles/middle) of the magnet.
- A freely suspended magnet will always point in the Earth's \_\_\_\_\_ (North-South/ East-West) direction.
- \_\_\_\_\_ (Like/Unlike) poles of a magnet repel each other whereas \_\_\_\_\_ (like/unlike) poles attract each other.

## TYPES OF MAGNETS

There are two types of magnets: temporary and permanent. Magnets that retain their magnetic properties only for a short period of time are called *temporary magnets*. Magnets that retain their magnetic properties for a long period of time are called *permanent magnets*.

Temporary magnets are usually made of iron, cobalt, or nickel. These materials behave like magnets only when they are near a strong magnet. They quickly lose their magnetic property if the influence of the strong magnet is removed.

Permanent magnets are made from mixtures of iron, cobalt, or nickel with other materials. These make strong magnets and retain their magnetic properties for a long time.

## Activity

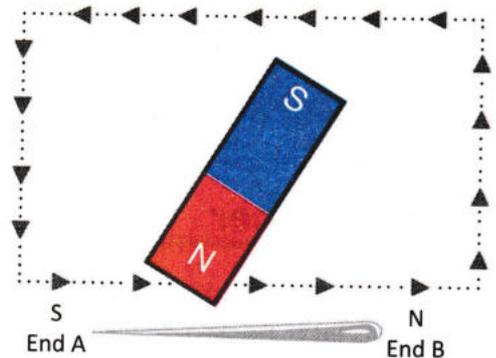
**Aim:** To make a magnet

**Materials needed:** A (steel/iron) needle, a magnetic compass, small pins (made of iron), and a bar magnet

**Method:**

- Place the needle on a table.
- Rub the magnet along the length of the needle, starting from one end of the needle (end A). When you reach the other end of the needle, lift the magnet and start again at end A.
- Repeat the process many times.
- Keep the bar magnet away and bring a magnetic compass near the needle you have magnetized. See if it deflects the compass needle. If it does not, repeat Step 2. If it does, your needle has now been magnetized.
- Bring the needle close to some iron pins. They will be attracted to your newly made magnet.

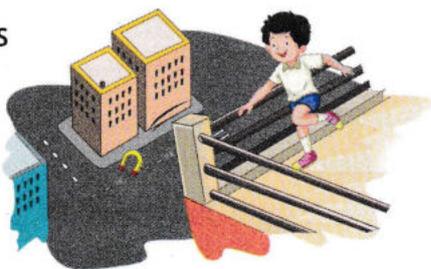
**Observation:** The iron pins will get attracted to the needle.



## CARE OF MAGNETS

A magnet can lose its properties due to the following activities.

- Dropping from a height
- Hitting with a hard object such as a hammer
- Applying heat
- Improper storage can also cause loss of magnetic properties.



Bar magnets should be stored in pairs, with unlike poles alongside each other. A horseshoe magnet should be stored with a piece of **soft iron** kept across its poles.

### Word help

**Soft iron** Iron that has low carbon content; can easily lose or gain its magnetic properties

## USES OF MAGNETS

Magnets have several uses.

1. Credit cards (Fig. 12.6), ATM cards, and identity cards have a strip of magnetic material that stores information.
2. Head phones and speakers of stereo systems use magnets.
3. Refrigerator doors are kept closed with the help of magnets.
4. Magnets are used in picking up substances made of iron from scrapyards.
5. Magnets are used in the food processing industry to purify raw materials by removing impurities in them, such as mud balls, small iron pieces, etc.

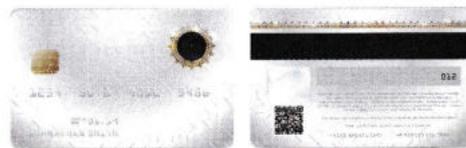


Fig. 12.6 Credit card

### Fact File

The Ancient Indian surgeon, Sushruta (600BC) used magnets during surgery.

## Let's Remember



Fill in the blanks with the correct word.

1. If a magnet is heated, it will \_\_\_\_\_ (gain/lose) its magnetic property.
2. A horseshoe magnet should be stored with \_\_\_\_\_ (straw/soft iron) kept across its poles.
3. A credit card has a \_\_\_\_\_ (magnetic strip/compass) that stores information.
4. Magnets are used to pick \_\_\_\_\_ (cardboard/iron) from scrapyards.

## Key Words

<b>Magnet</b>	An object that attracts substances like iron, cobalt, and nickel is called a magnet.
<b>Magnetic compass</b>	An instrument with a magnet that is used to find directions is called a magnetic compass.
<b>Temporary magnets</b>	Magnets that retain their magnetic properties only for a short period of time are called temporary magnets.
<b>Permanent magnets</b>	Magnets that retain their magnetic properties for a long period of time are called permanent magnets.

## Summary

- Only magnetic materials are attracted by magnets.
- Every magnet has two poles: the north pole and the south pole.
- Magnetic forces are strongest at the poles of the magnet.
- A freely suspended magnet will come to rest in the Earth's North–South direction.
- Like poles of two magnets repel each other.
- Unlike poles of two magnets attract each other.
- Magnets can lose their properties if they are dropped from a height, hit with a hard object, heated, or stored in an improper manner.

## Exercises

### LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with the correct words.

1. A magnet will attract a piece of \_\_\_\_\_ (glass/iron).
2. A ring magnet has \_\_\_\_\_ (two/four) magnetic poles.
3. The Earth has \_\_\_\_\_ (magnetic/non-magnetic) properties.
4. Bar magnets should be stored in pairs with \_\_\_\_\_ (like/unlike) poles alongside each other.
5. Applying heat can \_\_\_\_\_ (destroy/create) a magnet.

#### B. Choose the correct option.

1. The number of magnetic poles in a horseshoe magnet is  
a. one                      b. two                      c. three                      d. none

2. If we run a magnet through iron filings, most of the iron filings will stick to the
  - a. North pole
  - b. South pole
  - c. middle
  - d. both the north and the south poles
3. A magnetic compass aligns in the
  - a. North-East direction
  - b. North-South direction
  - c. North- West direction
  - d. South-West direction
4. When we bring two magnets together, they will
  - a. attract each other if the north pole of one magnet is facing the north pole of the other
  - b. repel each other if the north pole of one magnet is facing the south pole of the other
  - c. attract each other if the south pole of one magnet is facing the south pole of the other
  - d. attract each other if the south pole of one magnet is facing the north pole of the other
5. A magnet that can retain its magnetic properties for a very long time is called a
  - a. magnetic compass
  - b. permanent magnet
  - c. temporary magnet
  - d. electromagnet
6. Which of these materials will a magnet stick to?
  - a. Iron
  - b. Plastic
  - c. Wood
  - d. Paper
7. A magnet attracts objects made of
  - a. iron
  - b. nickel
  - c. cobalt
  - D. all of these
8. Magnets can be made in the following shapes
  - a. ring
  - b. bar
  - c. horseshoe
  - d. all of these
9. If we break a magnet into two pieces, and both the pieces retain their magnetic property, we will find that each piece has
  - a. one pole
  - b. two poles
  - c. three poles
  - d. four poles
10. The South pole of a magnet repels
  - a. the North pole of another magnet
  - b. the South of another magnet
  - c. any object made of wood
  - d. any object made of iron

## II. Very short answer type questions.

### A. Give one word for the following.

1. An object that attracts certain substances such as iron, nickel or cobalt \_\_\_\_\_
2. Parts of a magnet where the magnetic strength is the strongest \_\_\_\_\_
3. A magnetic instrument used to find directions \_\_\_\_\_

### B. Give two examples of each of the following.

1. Shapes of magnets \_\_\_\_\_
2. Materials that are not attracted to a magnet \_\_\_\_\_
3. Types of magnets \_\_\_\_\_

### III. Short answer type questions.

1. What is a magnetic compass used for?
2. How do small pieces of iron behave when brought close to a magnet?
3. How does a magnet behave when brought close to another magnet?
4. What are the materials used to make a permanent magnet?
5. Give one property of a permanent magnet.
6. Why does a freely suspended magnet always align itself in a certain direction?

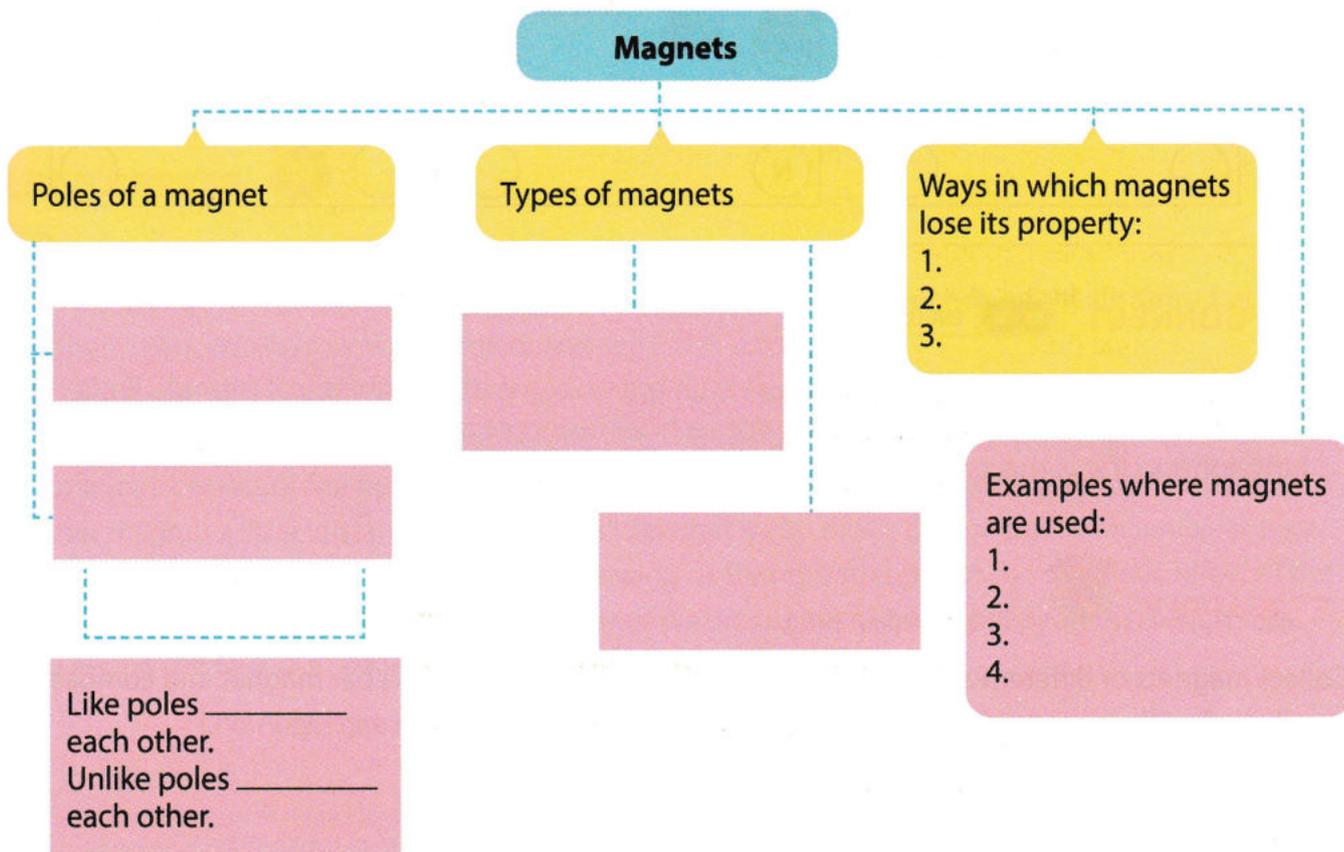
### IV. Long answer type questions.

1. Give a short description of an activity to find the poles of a given magnet.
2. Explain a simple method by which an iron needle can be magnetised.
3. Write a short note on 'Care of Magnets'.
4. What are magnets used for?

### LET'S RECALL



Recall and complete the concept map given below.

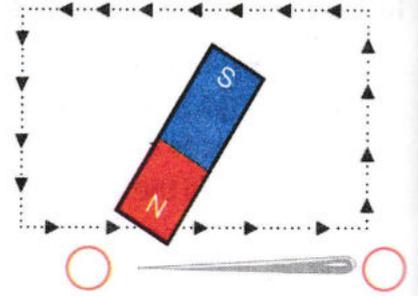


## LET'S OBSERVE



Observe the following pictures and answer the questions that follow.

1. The picture below shows a method by which an object can be magnetised. **LO 4** **LO 10**
  - a. What material should the needle be made of if we want to magnetise it?
  - b. Fill in the empty circles showing the magnetic poles the needle will get when it is magnetised.
  - c. Name the kind of magnet that is used in the picture.
  - d. Does the needle, when magnetised, become a temporary magnet or a permanent magnet?



2. Label the poles in the empty circles so that the magnets facing each other experience repulsion.


## LET'S CONNECT ENGLISH

Magnetite is a mineral containing iron. It is an ore of iron with the chemical formula  $\text{Fe}_2\text{O}_3$ . Find out more about this mineral and write a brief report of about 250 words on it, also highlighting if it is the same as lodestone.

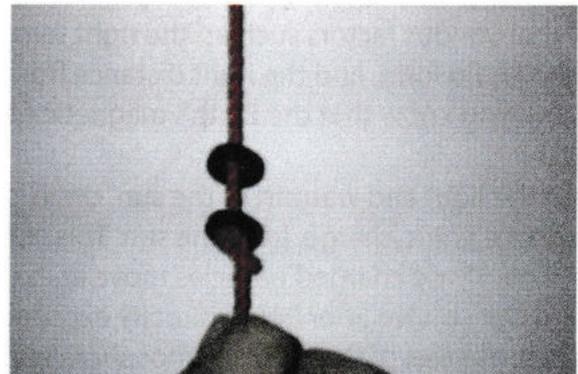
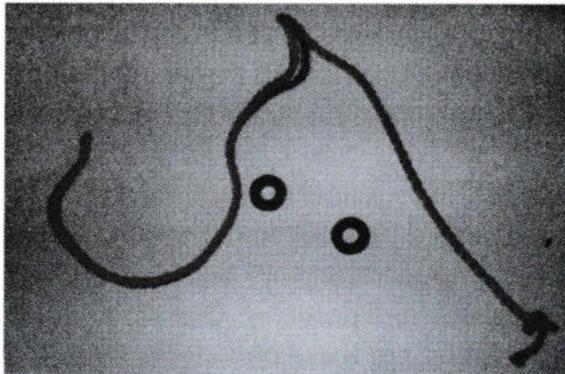
## LET'S APPLY



Collect magnets of different shapes, like a ring, disc, or a horseshoe. Use a bar magnet and compass needle to find their magnetic poles. (*Hint: apply the principle of attraction and repulsion.*)

## LET'S ANALYSE AND EVALUATE

The pictures alongside shows two ring magnets beaded on a string, one after another. Observe the picture and answer the following questions.



1. Why do you think the second magnet is hanging/levitating in the air?  
2. If we bring a magnetic compass close to this arrangement of magnets, what do you think will happen to the needle of the compass? Why?  

## LET'S CREATE



- 1 The strength of attraction or repulsion between two magnets depends on the distance between them. Perform the following activity and see if this is true.  
Take a compass needle and a bar magnet. Keep the compass needle on a table and bring the bar magnet close to the compass needle. You will see that the compass needle turns due to the magnetic effect of the bar magnet. Keep the compass needle in the same place and move the bar magnet a little distance away. You will see that if you move the magnet sufficiently far away, the compass needle no longer moves, showing us that the strength of the magnetic effect of the bar magnet on the compass needle becomes weaker as the distance between them increases. Discuss the effects in your mother tongue.  

### Web Research

- Learn about some more uses of magnets and draw diagrams to show them.  
[https://www.youtube.com/watch?v=tsWa\\_jZBQiA](https://www.youtube.com/watch?v=tsWa_jZBQiA) (checked and assessed on 20-08-2019)
- Learn about the Earth's Magnetic field and, using available resources, make a model to depict its effects.  
<https://www.youtube.com/watch?v=XXFVpwecixY> (checked and assessed on 20-08-2019)

# Worksheet 5

**Skills assessed:**

Problem solving, and qualitative analysis

**Read the passage given below carefully and answer the questions that follow.**

We know that various factors such as, the right temperature, presence of oxygen in the atmosphere, water in the liquid form, and the right distance from the sun, have contributed in making life possible on Earth. Did you know that the Earth's magnetic field is also an important factor for the presence of life on Earth?

Along with the light and warmth of the sun, there is also a continuous flow of tiny particles, containing an electric charge, from the sun. This stream of charged particles from the sun is called the solar wind. These charged particles move at extremely high speeds and are quite harmful to us. No life form can survive after being directly exposed to these charged particles. One would think that the thick blanket of the Earth's atmosphere would protect us, but these particles carry so much energy that they can rip apart even the molecules of gases in our atmosphere.

These harmful charged particles can, however, be deflected by a magnetic field. This is where the magnetic field of the Earth comes into play. The Earth's magnetic field is very effective in deflecting these charged particles and keeping the atmosphere and the life on Earth safe. It is believed that the planet Mars has a very weak magnetic field and, therefore, a very thin layer of atmosphere. Some scientists are of the opinion that Mars lost its magnetic field about 4.2 billion years ago. Due to this, the solar winds destroyed the planet's atmosphere.

1. Name two factors that make life possible on Earth.

---

---

2. What is a 'solar wind'?

---

---

3. In what way is it harmful to us?

---

---

4. Can the thick blanket of atmosphere protect us from solar wind?

---

---

5. How is our Earth protected from the effects of solar wind?

---

---

6. Name a planet which has a weak magnetic field.

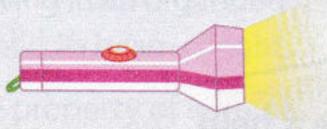
---

---

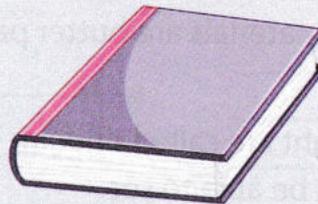
## Light, Shadows, and Reflection

The minute we open our eyes, we see our surroundings. We see a variety of objects of different colours, shapes and sizes. When are we not able to see things around us? It is when our eyes are closed or when it is dark. At these times, what do you think is preventing us from seeing objects around us? Is there something missing? It is the absence of 'light'. Light is something that enables us to 'see' the things around us. We cannot see anything if there is no light. Objects that give out light are called *luminous* objects. Objects that do not give out light are called *non-luminous* objects.

Observe the pictures given below. State whether the following objects are luminous or non-luminous.



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_

Let us learn more about light.

Answers: Luminous objects: torch, candle, computer screen (turned on), tubelight; Non-luminous objects: Book, t-shirt

## SOURCES OF LIGHT

Any object that gives out light is called a **source of light**. Luminous objects are also called sources of light. Sources of light can be *natural* or *artificial* (man-made) (Fig. 13.1).

Examples of natural sources of light are the sun and other stars, and insects such as the firefly. Examples of artificial sources of light are candle, electric bulb, and laser.



(a) Stars: Natural source of light



(b) Lamp: Artificial source of light

Fig. 13.1 Sources of light

## TRANSPARENT, TRANSLUCENT, AND OPAQUE MATERIALS

AN

Light behaves differently when it passes through different materials. Based on the way light passes through them, we can classify materials into three broad categories: transparent, translucent, and opaque. Let us study about them in more detail.

Materials that allow light to pass through without significant scattering or absorption [Fig. 13.2(a)] are called *transparent materials*. We will be able to see through these materials very clearly. Examples of transparent materials are clear air, clear glass, clean water, some kinds of plastic, and cellophane paper.

Materials that allow light to pass through them, but **scatter** or diffuse the light as it passes through, i.e., a parallel beam of light comes through in all directions, are called *translucent materials* [Fig. 13.2(b)]. That is why an object cannot be seen clearly through a translucent material. Examples of translucent materials are butter paper, frosted glass, paper smeared with oil, and smoked glass.

Materials that completely block light are called *opaque materials* [Fig. 13.2(c)]. We will not be able to see through these materials at all. Examples of opaque materials are metal, mud, cement, coal, and wood. A mirror is a very good example of an opaque material. An ideal mirror does not let any light to pass through it.

### Word help

**Scatter:** When a beam of light is incident on a material and the rays get deflected in many directions



(a) Transparent material



(b) Translucent material



(c) Opaque material

Fig. 13.2 Different types of materials

## Activity

**Aim:** To classify different materials as transparent, translucent, or opaque

**Materials needed:** Different materials such as clear glass, frosted/smoked glass, paper, wood, and a source of light (e.g., a candle or torch)

**Method:**

1. Hold each material against a source of light.
2. See if the source of light can be seen clearly (that is, its outlines, etc.).
3. Classify them as transparent, translucent, or opaque. One has been done for you.

Materials	Classification
1. Clear glass	Transparent

## PROPAGATION OF LIGHT

TD

Usually light travels in a straight line. When we want to represent the **propagation** of light with a diagram, we represent it with the help of *rays* and *beams*.

**Ray** A ray is a line with an arrow that shows the direction of the propagation of light, and such a diagram is called a ray diagram.

**Beam** A group of light rays moving in an organized manner is called a beam of light.

The property of light of travelling in straight lines explains many interesting phenomena related to light,

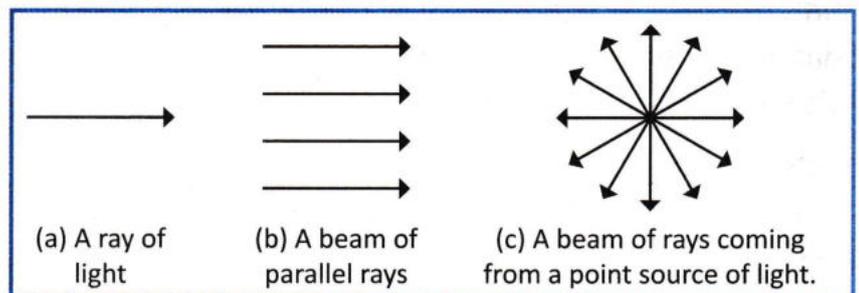
such as the formation of shadows by opaque objects and the formation of images in a pinhole camera.

## SHADOWS

An opaque object blocks the light falling on it. This creates an area of darkness on the side of the object away from the source of light. A translucent object also creates a faint area of darkness. An area of darkness formed by an opaque object obstructing light is called a *shadow*.

### Word help

**Propagation** In Physics, propagation is a process by which sound or light waves travel.



**Fig. 13.3** Representation of light as rays and beams

The following three things are required for a shadow to form (Fig. 13.4).

- A source of light
- An opaque object
- A screen or surface behind the object

A shadow will not form if any of these is absent. This explains why we cannot see a shadow in the dark. It is only when light rays are obstructed by an opaque object that we get a shadow of the object.



Fig. 13.4 Formation of shadow

### Characteristics of a Shadow

A shadow has the following three characteristics.

1. It is always black, regardless of the colour of the object used to make the shadow.
2. It only shows the shape or outline of the object and not the details.
3. The size of a shadow varies depending on the distance between the object and the source of light, and the distance between the object and the screen.

Let us perform an activity to learn about the characteristics of a shadow.

### Activity

**Aim:** To obtain a shadow and study its characteristics

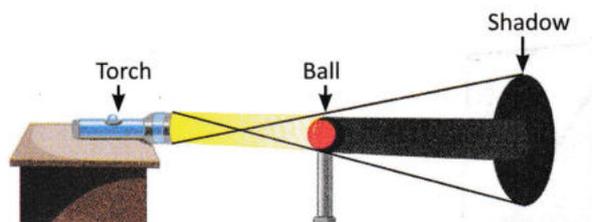
**Materials needed:** A torch, a few small opaque objects of different shapes and sizes, and a white screen (a piece of cardboard covered with white paper)

**Method:**

1. Turn on the torch and place the object (whose shadow you want to study) in front of it.
2. Hold the screen on the other side of the object to get the shadow.
3. Ask your friend to trace out the outline of the shadow on the screen.
4. Now, keeping the positions of the torch and the screen intact, move the object closer to the torch. What do you see?
5. Note the colour and the size of the shadow.
6. Repeat steps 1 to 5 for different objects.

**Observation:** The shadow

becomes bigger when the object is moved closer to the torch and smaller when it is moved closer to the screen. The colour of the shadow is always black.



## Let's Remember



Fill in the blanks with the correct word.

1. A \_\_\_\_\_ (candle/firefly) is a man-made source of light.
2. Clear glass and clear water are examples of \_\_\_\_\_ (transparent/translucent) material.
3. Wood is a \_\_\_\_\_ (translucent/opaque) material.
4. A shadow is an area of \_\_\_\_\_ (darkness/brightness) when an opaque object blocks light falling on it.
5. A shadow is formed on \_\_\_\_\_ (the source/a screen or surface)
6. The shadow of an object shows \_\_\_\_\_ (details/shape)

### REFLECTING SURFACES

We say light is reflected when it bounces off a surface. Reflection of light helps us to see most of the things around us.

Reflection of light by a surface depends on the nature of the surface. A rough and bumpy surface (also called an irregular surface) reflects a parallel beam of light incident upon it in different directions (Fig. 13.5). This is the reason why we cannot see a reflected image on an ordinary rough wall. Good examples of rough surfaces are normal paper and a rough wall. This kind of reflection is called *diffused reflection*.

A smooth surface (a highly polished surface) reflects a parallel beam of light incident upon it in one direction. This kind of reflection is called a *regular reflection* (Fig. 13.6). A good example of a smooth surface is a mirror. When you stand in front of a mirror, you can see yourself in the mirror. This is called your *image*.

A very interesting phenomenon occurs when an object forms an image by reflection. This is something all of us must have noticed while seeing ourselves in the mirror. When we lift our right hand, the image in the mirror appears to lift its left hand. This seeming left-right reversal is called *lateral inversion*.

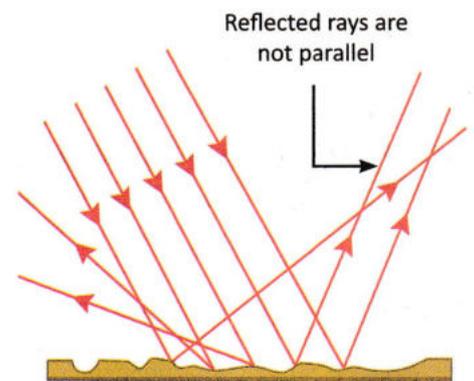


Fig. 13.5 Reflection from a rough surface

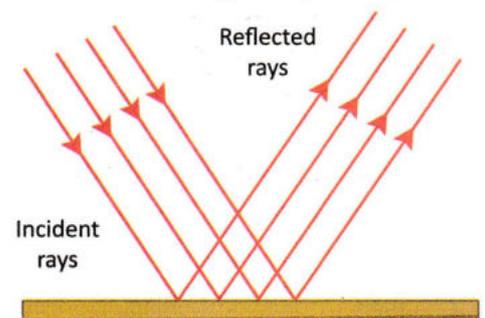


Fig. 13.6 Reflection from a smooth surface

#### Get it Right

At a microscopic level, all surfaces have 'bumps'. Highly polished surfaces have very small 'bumps' whereas rough surfaces have much larger 'bumps'.

## Activity

**Aim:** To observe differences between the image and the shadow of the same object

**Material needed:** A mirror

**Method:** Go out during the day and study your shadow. Compare it with your image as you see it in a mirror. Write down the similarities and differences.



An image is different from a shadow. Some of the differences between an image and a shadow are given in Table 13.1.

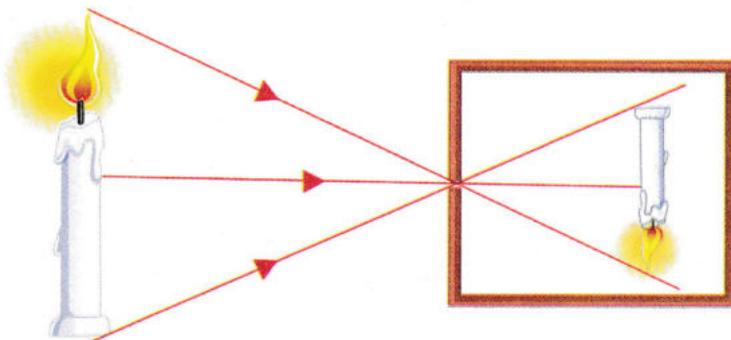
**Table 13.1** Differences between the image and the shadow of an object

Image	Shadow
1. Has the colour of the object.	1. Is always black, regardless of the colour of the object.
2. Gives the details as well as the outline of the object.	2. Gives only the outline of the object.
3. Undergoes lateral inversion (i.e., left-right reversal).	3. Does not undergo lateral inversion.

## A PINHOLE CAMERA

A pinhole camera is just a box (Fig. 13.7) with a very tiny hole on one of its sides. Light falls on the hole, and an inverted image is formed on the side opposite to the hole. The size of the image depends on the distance between the object and the pinhole. If the distance is increased, the size of the image decreases. If distance is decreased, the size of the image increases.

The human eye acts very much like a pinhole camera.



**Fig. 13.7** Image formation in a pinhole camera

### Fact File

There is an ancient temple in Hampi, India, called the Virupaksha Temple, where the pin-hole effect can be seen in a small room with a small opening on one side. This is like an enormous pin-hole camera made of stone!

## Let's Remember



### Fill in the blanks with the correct word.

1. An \_\_\_\_\_ (even/uneven) surface will produce a diffused reflection.
2. The shadow of a blue door will be \_\_\_\_\_ (blue/black).
3. \_\_\_\_\_ (Images/Shadows) give only the outline of the object.
4. We get an \_\_\_\_\_ (upright/inverted) image with a pinhole camera.
5. If an object is taken far away from a light source, its shadow \_\_\_\_\_ (increases/decreases) in size.

## Key Words

<b>Source of light</b>	An object that gives out light (luminous object) is called a source of light.
<b>Transparent material</b>	A material that transmits all the light falling on it is called a transparent material.
<b>Translucent material</b>	A material that transmits some amount of light falling on it is called a translucent material.
<b>Opaque material</b>	A material that completely blocks the light falling on it is called an opaque material.
<b>Shadow</b>	An area of darkness formed by an opaque object obstructing light is called a shadow.

## Summary

- Objects can be transparent, translucent, or opaque, depending on how much light can pass through them.
- A shadow is formed when an opaque object blocks the light falling on it.
- A shadow is always black regardless of the colour of the object.
- We say light is reflected when it bounces off a surface.
- A rough and bumpy surface reflects light in different directions.
- A smooth surface reflects light in only one direction.
- An image shows the colour, outline, and details of the object.

## Exercises

### LET'S UNDERSTAND



QT

#### I. Objective type questions.

##### A. Choose the correct option.

1. Light enables us to  
a. hear                      b. see                      c. taste                      d. none of the above

2. Which of these is not a natural source\* of light?
  - a. A star
  - b. Firefly
  - c. Tubelight
  - d. The sun
3. Pick out the opaque material from the following.
  - a. Grass
  - b. Air
  - c. Clear glass
  - d. Clean water
4. Which of these is not necessary to form a shadow?
  - a. The sun
  - b. A source of light
  - c. An opaque object
  - d. A screen or surface
5. A pinhole camera produces a
  - a. Coloured inverted image
  - b. Black and white inverted image
  - c. Coloured upright image
  - d. Black and white upright image
6. Which of these is not a source of light?
  - a. A star
  - b. A lit light bulb
  - c. A lit candle
  - d. A book
7. Which of these is transparent?
  - a. Butter paper
  - b. Pure air
  - c. Mud
  - d. A mirror
8. When we look at an object through a translucent material
  - a. We can see it very clearly
  - b. Can not see it at all
  - c. We can see it, but not very clearly
  - d. We can see its image
9. The shadow of an object shows its
  - a. Size
  - b. Colour
  - c. Shape or outline
  - d. All of these
10. Unlike its shadow, the image of an object shows its
  - a. outline
  - b. shape
  - c. colour
  - d. none of these

**B. Write T for the true statement and F for the false one. Correct the false statement(s).**

1. We cannot see an object through a transparent material.
2. Clear air is opaque.
3. Shadows cannot be formed without a source of light.
4. The shadow of an object shows its colour.
5. The image formed by a pinhole camera is coloured.

**II. Very short answer type questions.**

**A. Give two examples of the following.**

1. Man-made sources of light \_\_\_\_\_, \_\_\_\_\_
2. Opaque materials \_\_\_\_\_, \_\_\_\_\_
3. Objects that can form a shadow \_\_\_\_\_, \_\_\_\_\_
4. Irregular surfaces (with respect to reflection) \_\_\_\_\_, \_\_\_\_\_
5. Regular surfaces (with respect to reflection) \_\_\_\_\_, \_\_\_\_\_

**B. Define the following terms.**

1. A natural source of light
2. Transparent material

3. Translucent material
5. Shadow

4. Opaque material
6. Diffused reflection

### III. Short answer type questions.

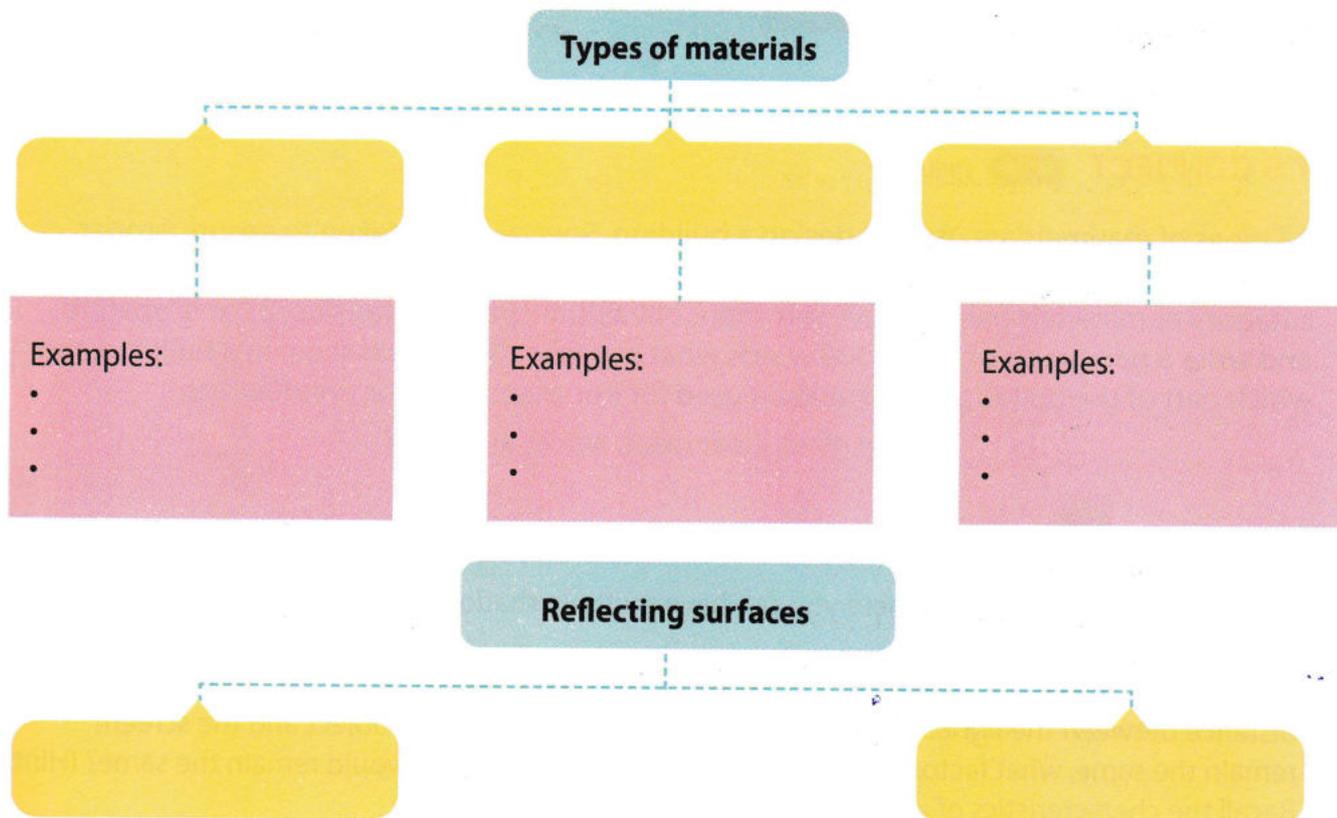
1. Classify the following as 'luminous' and 'non-luminous'.  
A table, a cup, a star in the night sky, candle flame, a cupboard, a book, water
2. What are natural sources of light? Give two examples.
3. If you want a wall, so that you can see clearly on the other side, what kind of material would you use to build it?
4. What property of light is demonstrated by formation of shadows and pinhole camera?
5. Write down any two characteristics of a shadow.

### IV. Long answer type questions.

1. Can you see clearly through a transparent material? Give two examples of transparent materials. Describe an activity to determine whether a given material is transparent or not.
2. Why is it that we cannot see a reflected image on a rough wall?
3. Draw a diagram to illustrate reflection from a smooth surface.
4. Draw a diagram to show how an image is formed in a pinhole camera. Label all the parts of the pinhole camera.

### LET'S RECALL

Recall and complete the concept map given below.



## LET'S OBSERVE

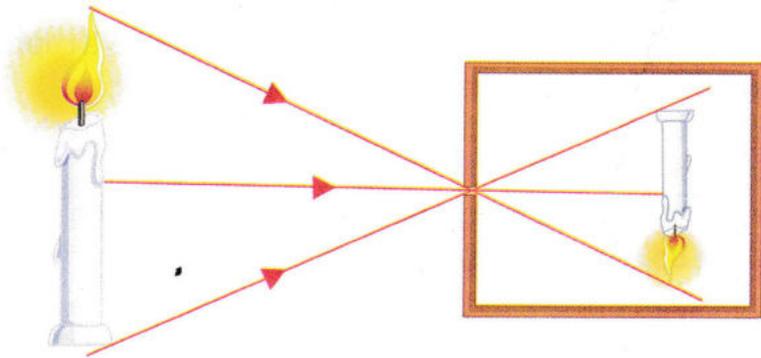


Observe the following pictures and answer the questions that follow.

1. Both pictures (A & B) show images. In what ways are they similar? How are they different? LO 6 LO 10

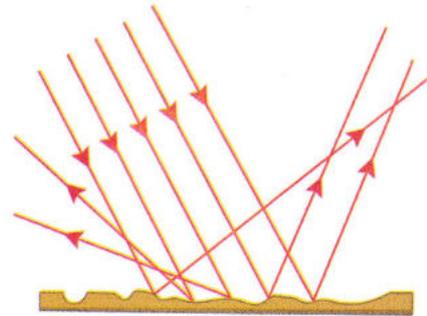
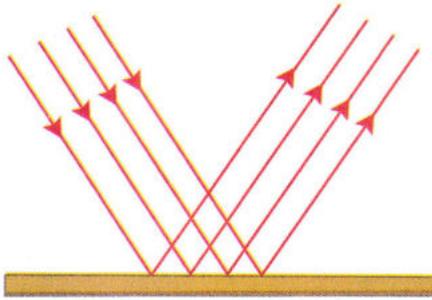


A



B

2. Name the type of reflection shown in the pictures given below.



## LET'S CONNECT ENGLISH

All types of materials are used to design a building. Special care is taken to ensure proper lighting, need for privacy and safety of the people occupying the building. From the category of materials given below, sort them out as 'transparent', 'translucent' and 'opaque' and write a paragraph of about 300 words what purpose they would serve in a building and which part of the building they could be used for (for example, door, window, etc.).

frosted glass, clear glass, wood, and brick

## LET'S APPLY



- Can you think of a situation where you can have multiple shadows? (Hint: Think of more than one source of light.)
- Assume a shadow being formed of a cricket ball and then a football. If the distances (like the distance between the light source and object, distance between the object and the screen) remain the same, what factors of the shadow would change? What would remain the same? (Hint: Recall the characteristics of a shadow.)

LO 6

## LET'S ANALYSE AND EVALUATE

1. Select any tall object in your neighbourhood or in your school, which casts a good shadow. Observe the shadow throughout the day at regular intervals of time. What do you find? Do the size and position of the shadow change through the day? Can you suggest a reason for this? Can you build a similar situation with a pencil and a torchlight? Illustrate with the help of a diagram.  
2. Evaluate the importance of transparent, translucent and opaque materials. Discuss situations in which one is more useful than the other. What do you conclude? 

## LET'S CREATE



TD

1. Based on how much light passes through them, transparent, translucent and opaque materials have different uses. For example, transparent materials are used to make windowpanes, when you want to see the view outside without actually opening the window. Look around you and find out where translucent and opaque materials are used and why.  

### Web Research

- Search on the internet and find out about the different theories on what is light, how it works, what is the nature of light, etc. Some suggested websites are:  
<https://science.howstuffworks.com/light1.html> (Checked and accessed on 13-08-2019)  
<http://www.ux1.eiu.edu/~cfadd/3050/Ch16R&R/Nat.html> (Checked and accessed on 13-08-2019)

# 14

## Electricity and Circuits

Electricity is used by all of us almost all the time. We use it for various reasons. If we look around us, anywhere we go, we will find a number of objects that run on electricity. Here is a picture of a kitchen showing a few objects. Pick out the ones that run on electricity. Write their names in the space provided below.

### You will learn about

- Electric current
- Source of electric current
- Flow of electric current
- Electric switch
- Electric torch
- Conductors and insulators
- Electrical safety



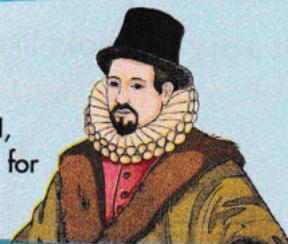
Things that run on electricity have electric current passing through them. They are called *electrical appliances*. An electrical appliance works when an electric current passes through it. A refrigerator, electric light bulb, electric fan, and washing machine are examples of electrical appliances.

Answer: 1. Mixer/grinder, 2. Fridge, 3. Exhaust fan, 4. Microwave, 5. mobile, 6. laptop

In this, chapter, you will learn about electric current, what is needed to produce it, the conditions required to make an electric current flow, and the materials through which current can flow. You will learn some very interesting things like how to make a small bulb glow and how to make an electric switch.

### Know your Scientist

William Gilbert (1544-1603) was an English physicist to Queen Elizabeth I, who coined the modern Latin word *electricus* from the Greek word *Elektron* for amber. This soon gave rise to the English words 'Electric' and 'Electricity'.



## ELECTRIC CURRENT

Most of the devices and machines we use, such as an electric iron, oven, room heater, refrigerator, ceiling fan, and an electric bulb, work when an electric current flows through them.

The common electric bulb is also called an *incandescent bulb*. With help from an adult, look at what is inside a transparent electric bulb (Fig. 14.1). Among other things, you will see that it has a thin filament (a very thin metal wire). The filament heats up when an electric current is passed through it. It heats up so much that it begins to glow and give out light. It is filled with an inert gas (inert means does not react) so that the filament does not burn up when it gets hot.

Now, we will learn what produces an electric current.

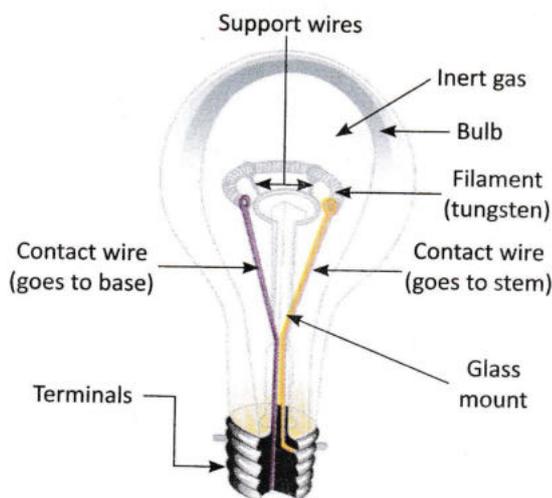


Fig. 14.1 Electric bulb

### Fact File

Nowadays the incandescent light bulb is being replaced by CFL and LED light bulbs, as they are more energy efficient.

## SOURCE OF ELECTRIC CURRENT

A device that can be used to produce an electric current is called a source of electric current. Common sources of electric current are cells and batteries (collection of cells), which comes in various shapes and sizes (Fig. 14.2), and electric current that we get from plug points in houses. A very useful kind of cell that we use very often is the dry cell. Due to a chemical reaction that takes place in cells and batteries, electric current is produced. Flowing water or steam is used for the large-scale generation of electricity.



Fig. 14.2 Different types of cells and batteries

## The Dry Cell

AN

A dry cell is a very convenient source of electric current. The dry cell, as its name suggests, contains dry or semi-solid ingredients.

Here is what a dry cell looks like on the inside [Fig. 14.3(a and b)]. **Precaution: Please don't open up a cell yourself. It contains toxic and very harmful substances.**

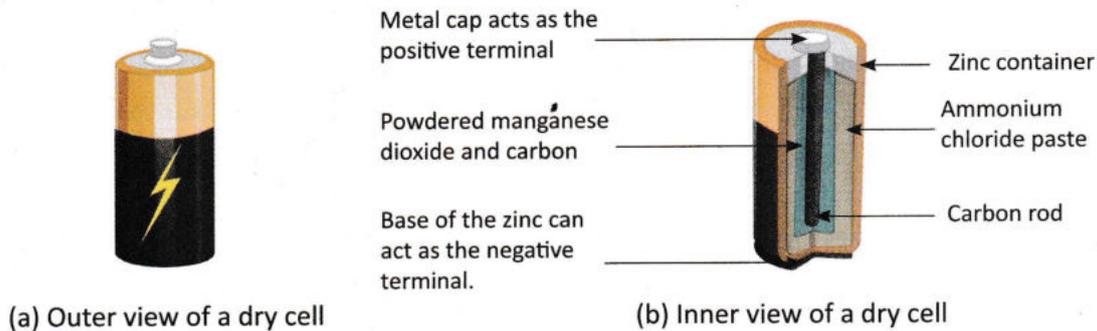


Fig. 14.3 Dry cell

The dry cell contains a paste of ammonium chloride inside a zinc container. Inside the paste, a cardboard container containing powdered manganese dioxide and carbon is placed. The cardboard container has microscopic 'holes' in it (such materials are called porous materials) through which a chemical reaction takes place between ammonium chloride paste and powdered manganese dioxide. A rod, usually carbon, with a metal cap is dipped into the manganese dioxide. The whole thing is then sealed (with only the metal cap sticking out), so that the contents do not spill out. The zinc can is also wrapped so that only the base is exposed. Every source of electric current has two ends or terminals where conducting wires are connected to draw electric current. The tip of the metal cap and the base of the zinc can are called the *positive* and *negative terminals* of the dry cell, respectively. Electric current can be thought of as 'flowing in' from one terminal and 'flowing out' from the other. If the tip of the metal cap and the base of the zinc can are connected by a metal wire, current will flow through it. Dry cells are used in remote controls for televisions, air conditioners, toy cars, etc. They are also used in electric torches, hearing aids, wrist watches, digital watches and timers, and so on.

### Get it Right

Did you know that a cell and battery are not the same? A cell is a single unit, whereas two or more cells can be connected end-to-end to make a battery.

## Different Types of Electric Cells

Apart from the simple primary cells such as dry cells, there are different types of electric cells. Different cells use different methods for producing an electric current. Primary cells can be used only once, and have to be thrown away once they have been used up.

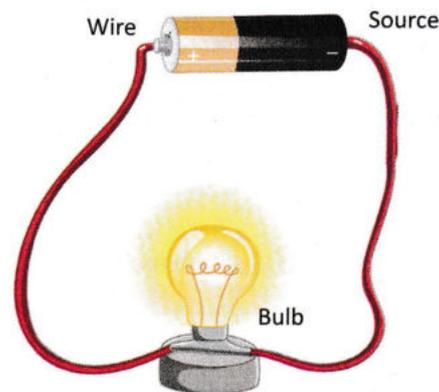
There are cells that can be recharged once they are drained. These are called *secondary cells*. They are used in mobile phones, laptops, and car batteries. Nowadays, solar cells are being used in many applications. Solar cells use sunlight to produce electric current.

Many calculators are powered with solar cells. Solar panels made up of solar cells are used to light up streets and many homes.

### FLOW OF ELECTRIC CURRENT

Three basic conditions (Fig. 14.4) are required for an electric current to flow.

- A device such as a cell, a battery, or a plug point acting as a source used to produce an electric current.
- A wire made of a metal such as copper, silver, or aluminium, which will allow electric current to flow through easily.
- An unbroken loop (of the wire) running from one terminal of the source through various appliances, back to the other terminal of the source.



Electric current will flow through the wire even if the bulb is not a part of the set up. But using a bulb will help us find out if an electric current is flowing in the wire. Notice that the source, wires, and the bulb form an unbroken loop.

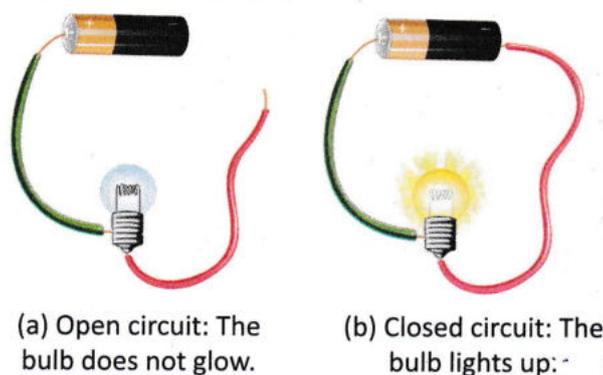
**Fig. 14.4** Conditions needed for an electric current to flow

### Making a Simple Electric Circuit

**Precaution:** Never connect the two terminals of a cell with a wire without an appliance connected in a circuit. This will cause overheating of the wire and also destroy the cell.

When we connect the terminals of a pencil cell (name given to the cell due to its shape) to a bulb using two wires, the bulb glows. This happens because we provide a path for the current to flow. A path for an electric current to flow is called an electric circuit.

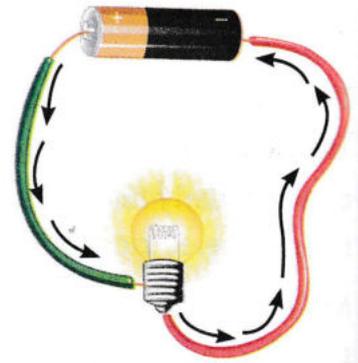
In Figure 14.5(a), one wire from the pencil cell is connected to the torch bulb, whereas the other wire is not. The electric circuit is not complete here. In Figure 14.5(b), both the wires from the cell are connected to the torch bulb. The electric circuit is complete in this case. Electric current flows only if there is an unbroken path or closed circuit starting from one terminal of the source, through the torch bulb, to the other terminal of the source. Thus, the bulb glows in Figure 14.5(b) but not in Figure 14.5(a). The circuit in Figure 14.5(a) is not complete. Hence, current cannot flow through the circuit and the bulb does not glow. Such a circuit is called an *open circuit*. The circuit in Figure 14.5(b) is



**Fig. 14.5** Electric circuit

complete. Electric current flows through the circuit and as a result, the bulb glows. Such a circuit is called a *closed circuit*.

Electric current flows in a particular direction. By convention, it has been agreed to regard electric current as flowing from the positive terminal of a source to the negative terminal of the source. Figure 14.6 shows the direction of flow of electric current in a circuit.



**Fig. 14.6** The direction of electric current in the circuit

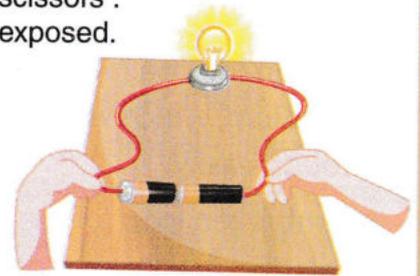
## Activity

**Aim:** To make a simple circuit (adult supervision required)

**Materials needed:** Electrical wire about 1 m (from your local electrical shop), pencil cell, small torch bulb (from your local electrical shop), blade, scissors, and sticky tape/insulation tape (from the local electrical shop)

**Method:**

1. Cut out two pieces of the wire about 8 inches each, using scissors .
2. Strip the ends of the wire with a blade so that the metal is exposed.
3. You will see the signs '+' and '-' at the two ends of the pencil cell. These are the positive and negative terminals of the cell. Use sticky tape and attach one end of a wire to the negative terminal of the pencil cell.
4. Attach the other end of the same wire to the side of the bulb. Use a small piece of sticky tape to stick it well. Make sure that the bottom portion of the bulb is left open and also that the wire does not touch it. (You could also get a bulb holder and connect the wire to the two screws as shown in the picture.)
5. Take the second wire and attach one end of it to the positive terminal of the cell.
6. Touch the other end of this wire to the bottom end of the bulb and see what happens.



**Observation:** When you touch the bottom end of the bulb with the wire, the bulb will glow.

**Note:** Do not use any source other than a pencil cell for any of the activities given in this book. Using the electrical output at the plug points in your house or school could be extremely dangerous.

## Let's Remember



### I. Fill in the blanks with the correct word.

1. A \_\_\_\_\_ (light bulb/dry cell) is a source of electric current.
2. In an incandescent bulb, the \_\_\_\_\_ (glass casing/filament) heats up and begins to glow.
3. A dry cell contains \_\_\_\_\_ (solid, semi-solid/ semi-solid, liquid) ingredients.
4. Electric current will flow if the circuit is \_\_\_\_\_ (open/closed).
5. An electric current will flow through a wire made of \_\_\_\_\_ (aluminium/cotton).

### II. Answer the following questions orally.

1. Name five electrical appliances that are used in your house.
2. Name three devices/appliances that run on batteries. Which of these run on dry cells?
3. What are the requirements for an electric current to flow in an electric circuit?

## ELECTRIC SWITCH

We use electric switches (Fig. 14.7) to turn on or turn off electrical devices and machines. But do you know how it works?

An *electric switch* is a device that is used to open or close an electric circuit. When we open an electric circuit, the flow of electric current in the circuit stops [Fig. 14.8(a)], and when we close an electric circuit, an electric current flows through it [Fig. 14.8(b)]. In an electrical circuit, a switch is sometimes referred to as a 'key'.

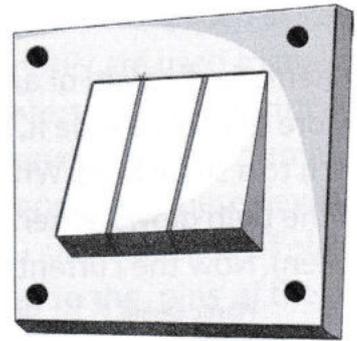


Fig. 14.7 An electric switch

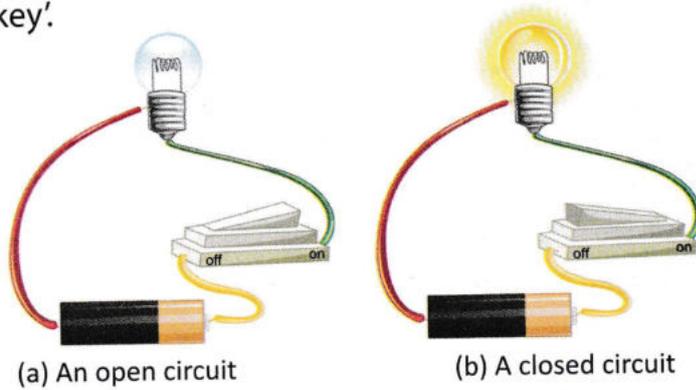


Fig. 14.8 Electric current with switch

### Tech Specs

A fuse, short for fusible link, is a safety device that prevents a large amount of current from flowing into a device or appliance. It consists of metal wire that melts easily when heated.

The key is represented by the symbol  $\bullet\text{---}\bullet$  when it is 'ON' (closed circuit)  
and  $\bullet\text{---}\swarrow\bullet$  when it is 'OFF' (open circuit).

### Activity

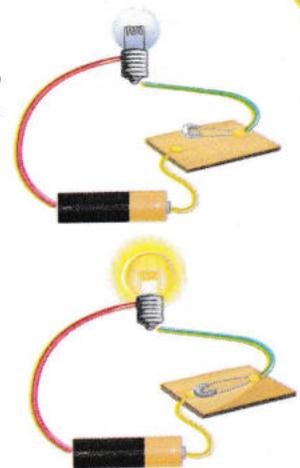
**Aim:** To make an electric switch (adult supervision required)

**Materials needed:** Three pieces of wire about 10 cm each, a safety pin, two board pins, a piece of cardboard, a pencil cell, a sharp blade, and a small torch bulb

**Method:**

1. Take the piece of cardboard and place the safety pin on it.
2. Strip the ends of the three pieces of wire so that about 1 cm of the metal wire is exposed.
3. Attach a piece of wire to a drawing pin. Push the drawing pin through the end loop of the safety pin into the cardboard.
4. Attach the second piece of wire to the second drawing pin. Push the drawing pin into the cardboard, about 1 cm away from the first drawing pin. Make sure that the safety pin held in place by one drawing pin can be turned to touch the other pin. Now your switch is ready.
5. Do you want to test the switch? Connect the free end of one of the wires to one terminal of the pencil cell. Connect the third wire to the other terminal of cell and to the bulb.
6. Connect the free wire from the switch to the other side of the bulb.
7. Turn the safety pin such that it touches both the drawing pins.

**Observation:** The bulb glows when the safety pin is turned such that it touches both the drawing pins.



## ELECTRIC TORCH



A schematic diagram of an electric torch is shown in Figure 14.9. An electric torch has one or more dry cells inside it, which act as the 'source'. These cells are connected through a switch to a small bulb. When the switch is pushed to the 'on' position, the circuit is complete and the bulb glows. When the switch is pushed to the 'off' position, the circuit is incomplete (broken). Now the current cannot flow through the circuit, and the light goes out.

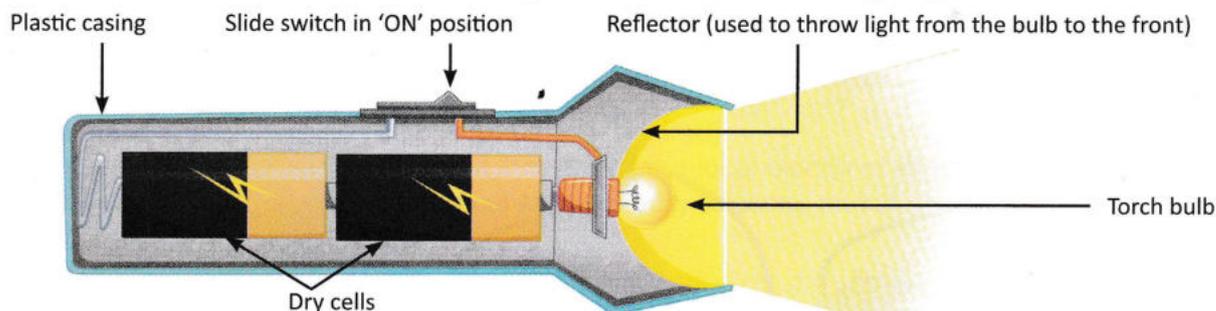


Fig. 14.9 Schematic diagram of an electric torch

## CONDUCTORS AND INSULATORS



Look at Figures 14.10(a)–(d). Each shows a complete electric circuit. Then why is it that the bulb glows only in circuits (b) and (d)? It is because not all materials allow electric current to pass through them.

A material that allows electric current to pass through it is called a *conductor* of electricity, such as the key and the safety pin [Figs. 14.10(b) and (d)] that are made of metal. A material that does not allow electric current to pass through it is called an *insulator* of electricity, such as the rubber band and the plastic ruler [Figs. 14.10(a) and (c)].

All metals are conductors of electricity, whereas some are better conductors than others. A few non-metals such as graphite (pencil lead is made of graphite) are also conductors of electricity.

Examples of insulators are glass, wood, rubber, pure water, and dry air. However, the smallest impurity in water (impurities are substances, such as salts, dissolved in water) makes it a conductor.

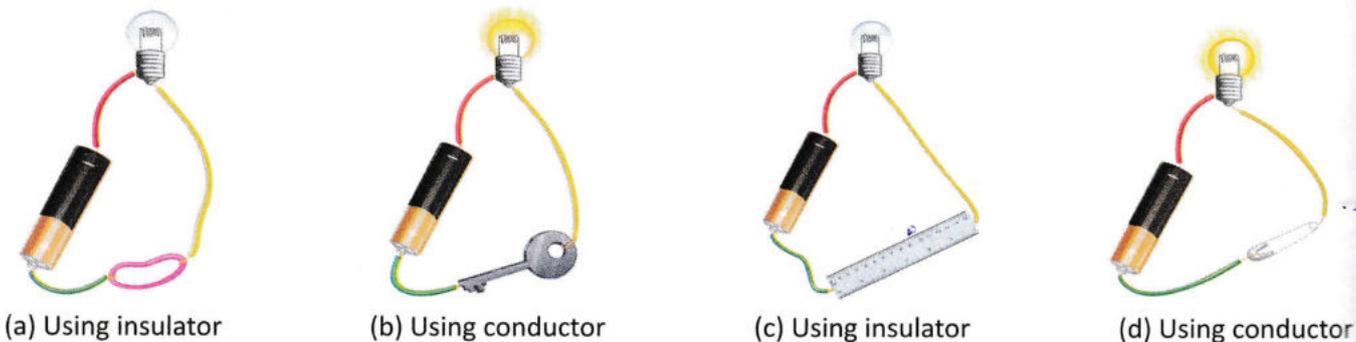


Fig. 14.10 Circuits using insulators and conductors

## Importance of Conductors and Insulators

Both conductors and insulators are equally important to us. Good conductors, such as silver and aluminium, which allow electric current to pass through easily are used to make electrical wires and connectors. The handles of screwdrivers and testers used by electricians are made of insulating materials, such as wood or hard plastic, to prevent electric current from flowing through it and giving an electric shock to the person operating these devices. Electrical plugs (attached to most electrical devices and appliances) are also made of plastic or other insulating materials on one side, so that we are not exposed to the 'pins' of the plug while handling it. People operating electrical equipment should also wear rubber gloves as a safeguard against electric shocks.

### Activity

**Aim:** To identify conductors and insulators from a given set of materials (adult supervision required)

**Materials needed:** Three pieces of wire, about 8–10 inches each (from your local electrical shop), a small torch bulb, a thick sheet of cardboard or wood (about 4 inches x 4 inches), sticky tape, pencil cell, and objects like metal spoon, eraser, piece of wood, etc.

**Method:**

1. Fix the bulb and the cell on the cardboard sheet or wood, as shown in the figure.
2. Touch the two free ends of the wire to the two ends of various objects, such as a metal spoon, an eraser, a piece of wood, the tips of your pen, the tips of your pencil lead (the pointed portion and the flat portion at the back of the pencil), and so on.

**Observation:** The bulb will glow if the object you touch with the free ends of the wire is a conductor, and the bulb will not glow if it is an insulator.

**Conclusion:** This way you will be able to classify various materials as conductors and insulators.

### Let's Remember



**I. Write T for the true statement and F for the false one. Correct the false statement/s.**

1. A dry cell does not contain chemicals.
2. An electric circuit is not complete without a source of electricity.
3. Primary cells can be recharged.
4. Two or more cells put together is called a secondary cell.
5. A rubber band is a good conductor of electricity.

**II. Cross at the odd one out.**

1. Electric fan, washing machine, wires, light bulb
2. Dry cell, car batteries, electric power points, ceiling fan
3. Wood, silver, rubber, plastic

## ELECTRICAL SAFETY

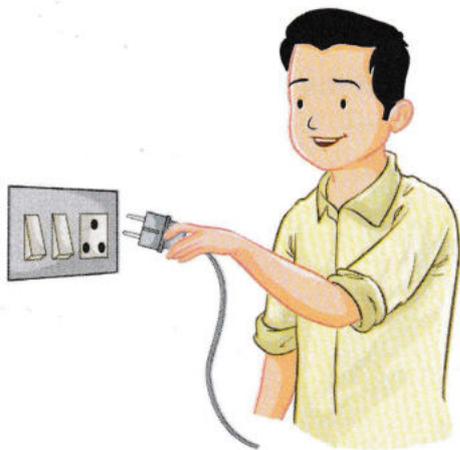
LL

Electricity can be very dangerous if electrical devices are not handled carefully. We should be aware that careless handling of electrical devices can lead to serious consequences. It may also result in death. Here are a few safety guidelines that one must follow while handling electrical devices.

1. Never play with electrical wires and sockets.
2. Electricity generated from generators, even small portable ones) should not be used for experiments.
3. Your hands should always be dry when you touch electrical appliances, plugs, sockets, and any device through which current flows.
4. When removing or putting in plugs into sockets, care should be taken not to touch the metal pins of the plug, even if the switch is off.
5. After charging devices like mobile phones and laptops, many people are in the habit of leaving the plug in the socket while removing the connection to the device, thus leaving the exposed port of the charger loose, with its other end plugged in. This is a very dangerous practice. One should always turn off the switch and then remove the plug from the socket before removing the connection from the device. This will prevent the chances of nasty electric shocks.
6. When there are small children in the house, it is advisable to cover all plug points (within reach of the children) with insulation tapes, so that they do not put their little fingers into the holes of the plug points.
7. Electrical devices such as laptops and mobile phones should not be connected to an electrical socket (for charging) while using earphones.

### Fact File

Do not plug in or take out the cords of any electrical appliances with wet hands. This can give you an electrical shock.



(a) Do not touch metal pins of the plug.



(b) Do not leave plug points exposed when there are children around.

Fig. 14.11 Electrical safety

## Key Words

<b>Source of electric current</b>	A device that can be used to produce an electric current is called a source of electric current.
<b>Electric circuit</b>	A path for an electric current to flow is called an electric circuit.
<b>Closed circuit</b>	A circuit which has an 'unbroken path' through which an electric current can flow is called a closed circuit.
<b>Open circuit</b>	A circuit with a break in it is called an open circuit.
<b>Electric switch</b>	A device that is used to open or close a circuit is called an electric switch.
<b>Conductor (in this chapter)</b>	A material that allows electric current to pass through it easily is called conductor.
<b>Insulator (in this chapter)</b>	A material that does not allow electric current to pass through it easily is called an insulator.

## Summary

- In a dry cell, a chemical reaction takes place to produce an electric current.
- A dry cell contains solid or semisolid ingredients.
- All cells have two terminals: a positive and a negative terminal.
- Electric current flows only if there is an unbroken or complete path of conducting material, starting from one terminal of the source, through various devices back to the other terminal of the source.
- An electric switch is a device that is used to open or close a circuit.

## Exercises

### LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with the correct word/s.

1. \_\_\_\_\_ (pencil cell/flowing water) is used for the large-scale generation of electricity.
2. Solar cells use \_\_\_\_\_ (chemicals/sunlight) to produce electric current.
3. By convention, electric current flows from the \_\_\_\_\_ (positive/negative) terminal of the source to its \_\_\_\_\_ (positive/negative) terminal.
4. An electric switch is used to open or close an electric \_\_\_\_\_ (bulb/circuit).
5. People operating electrical equipment are asked to wear rubber gloves to safeguard against electric \_\_\_\_\_ (wastage/shocks).

**B. Choose the correct option.**

1. Which of these is a part of a dry cell?  
a. Filament            b. Terminals            c. Inert gas            d. Glass mount
2. Which of these produces electricity?  
a. car battery            b. Ceiling fan            c. Light bulb            d. Refrigerator
3. Which of these is necessary for an electric current to flow through a circuit?  
a. Switch            b. Light bulb            c. Insulation tape            d. Source of electricity
4. A dry cell has  
a. Two positive terminals  
b. Two negative terminals  
c. Two negative and one positive terminal  
d. One positive and one negative terminal
5. Which of these is a good conductor of electric current?  
a. Wood            b. Graphite            c. Pure water            d. Rubber
6. Which of these works when an electric current flows through it?  
a. An electric torch            b. A chair            c. A book            d. A wax candle
7. Support wires, filament, glass mount, inert gas, would be components of  
a. an electric fan            b. an incandescent bulb  
c. a dry cell            d. an electric switch
8. An electric switch is a device that is used to  
a. produce electricity            b. open or close an electric circuit  
c. fuse an electric bulb            d. produce heat
9. A material that is not a conductor of electricity is called a/an  
a. filament            b. switch            c. insulator            d. bulb
10. Which of these devices is also referred to as a 'key'?  
a. an electric torch            b. an electric switch            c. a filament            d. a dry cell

**II. Very short answer type questions.**

**A. Give two examples of places/appliances where the following could be used.**

- |                     |       |       |
|---------------------|-------|-------|
| 1. A dry cell       | _____ | _____ |
| 2. A secondary cell | _____ | _____ |
| 3. Electric switch  | _____ | _____ |
| 4. Conductors       | _____ | _____ |
| 5. Insulators       | _____ | _____ |

**B. Explain the following terms.**

- |                         |                                 |
|-------------------------|---------------------------------|
| 1. Electrical appliance | 2. A source of electric current |
| 3. Electrical circuit   | 4. An electric switch           |
| 5. Insulator            |                                 |

### III. Short answer type questions.

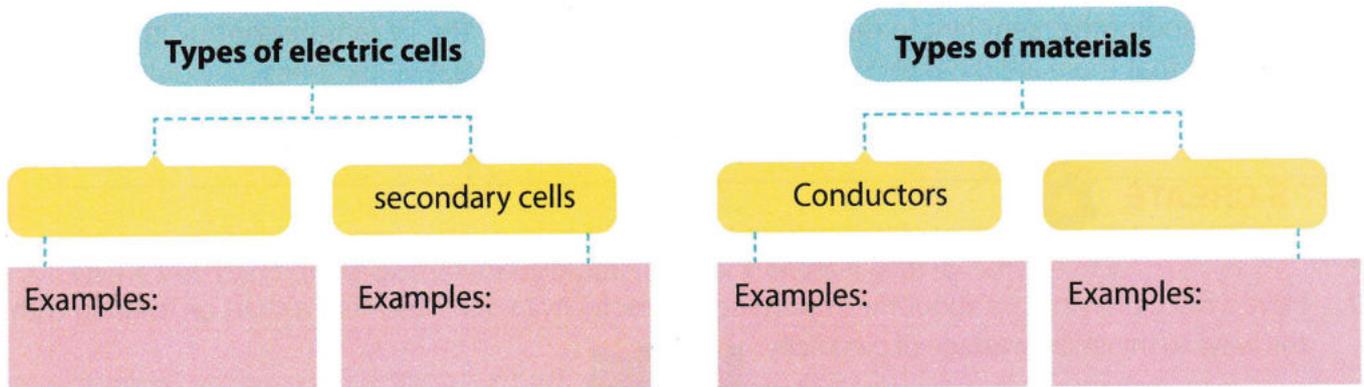
1. Name a source that uses chemical reactions to produce electric current.
2. Name an appliance that uses electric current to produce light.
3. Name a kind of cell that uses sunlight to produce electric current.
4. Name a device that is used to make or break an electrical circuit.
5. What name is given to cells that cannot be recharged?

### IV. Long answer type questions.

1. Draw a simple electrical circuit and label the parts. Explain how we can connect a bulb in a circuit and how it can show us if an electric current is flowing in the circuit or not.
2. Using a bulb, cell and key, draw diagrams and explain the flow of electric current in an 'open circuit' and in a 'closed circuit'.
3. What is a dry cell? What is inside it? Why is it useful to us?
4. How does an electric torch work? Explain with the help of a diagram.
5. One class of materials allow the flow of electric current and some do not. What are these different classes of material called?

### LET'S RECALL

Recall and complete the concept map given below.



### LET'S OBSERVE

Observe the following pictures and answer the questions that follow.

1. Identify the correct device for each of the following from the list of devices given. 

**Car, hand held calculator, mixer grinder, wrist watch, mobile phone, television remote**

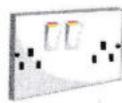
a.



b.



c.



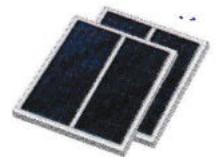
d.



e.



f.



- Identify and label the electric cell, switch, and the electric bulb in the circuit. Also label the direction of the flow of electric current.



## LET'S CONNECT ENGLISH

Most of the electric energy we use daily is produced by hydroelectric, thermal, or nuclear power plants. However, using running water, coal and fossil fuels, or nuclear energy can cause harm to the environment. Write a formal letter to the environment officer of your state, suggesting switching to eco friendly alternatives for our energy needs and the reasons for doing so.

## LET'S APPLY

- Electricity is used in many different fields and in many different ways. In today's world, if the supply of electricity is stopped, it is not just an inconvenience, but a lot is at stake. Can you think of at least four such places that could have drastic consequences due to loss of power supply?

## LET'S ANALYSE AND EVALUATE

 LO 13

- Pratik told his parents to place the geyser switch outside the bathroom rather than inside it. Do you think this is a good idea? Justify your answer. 
- Raju's grandmother sent him to the market to buy batteries for the TV remote control. In the shop, he found that there are different types of batteries, pencil cells, flat 9V batteries, tiny button cells, and big torch batteries. Which one of these should he buy? 

## LET'S CREATE

 TD

- Have a discussion in class about the importance of electricity in our lives. Make a chart on it, along with the ways to minimize wastage of electricity.  LO 10  LO 11
- Bring the following things to class: a piece of wire, a pencil cell, a small torch bulb, and some tape. Try to set up an electric current using these materials (under supervision of your teacher).  LO 9
- Write a report on the working of an electric torch and a switch. In groups of five, devise a project demonstrating the concept behind the torch and electric switch.  LO 9  LO 12

### Web Research

- Watch the following video and write a report.  
[https://www.youtube.com/watch?v=zOM7\\_HPSi14](https://www.youtube.com/watch?v=zOM7_HPSi14) (checked and assessed on 20-08-2019)
- Watch the following video on how electrical signals make our hearts beat: Discuss in class.  
<https://www.youtube.com/watch?v=zqi4u3H5H7A> (checked and assessed on 20-08-2019)

# Worksheet 6

## Skills assessed:

Problem solving, and qualitative analysis

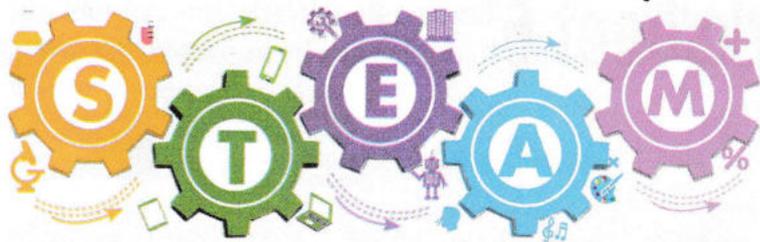
### Electricity in our body

Electric activity happens in our bodies all the time. Our every action requires electricity. Electric signals are transmitted in our bodies through nerve cells, which have access to every part of our body. The maximum amount of electrical activity happens in the brain. For example, when we 'think', there is a lot of electrical activity in the brain. If we want to move, the brain sends electrical signals to that part of the body and the muscle contracts (because of electrical activity of the muscle cells) and that part of the body 'moves'. Our hearts also beat because of electrical signals. In fact, when doctors want to check if a person's heart is functioning properly, they ask for an ECG, which is a graph of the electrical activity of the heart. This is one of the tests that give an indication of the normal functioning of the heart.

While we depend on electrical signals for our actions, we do not produce too much electricity, and we can definitely not produce enough electricity to harm anyone. However, there are some animals that have the ability to produce very large amounts of electricity and actually use them to hunt and catch prey. One such animal is a type of knife fish, generally called the electric eel. They have a large number of cells called electrocytes stacked like a battery that have the capacity to produce short bursts of electricity, dangerous enough to kill small prey.

Use the information in the above passage to answer the following questions.

1. Do humans have electrical activity in their body?  
\_\_\_\_\_  
\_\_\_\_\_
2. Name two parts of the human body where a lot of electrical activity takes place.  
\_\_\_\_\_  
\_\_\_\_\_
3. Name a test that examines the electrical activity of the heart.  
\_\_\_\_\_  
\_\_\_\_\_
4. Can humans harm anyone with the amount of electricity they produce within their bodies? Give a reason to justify your answer.  
\_\_\_\_\_  
\_\_\_\_\_
5. Do animals also have electrical activity? Name an animal that uses electricity to catch prey.  
\_\_\_\_\_  
\_\_\_\_\_



Teacher facilitation required\*

# Activity

## Skills learnt:

Collaborating, communicating, critical thinking, and creating

**Aim:** To study an electric circuit with different combinations of bulbs and observing how the light of the first bulb is affected when more bulbs are added to the circuit

1. Discuss amongst your groups, and make rough sketches, in the drawing space below, of the circuit you made using:
  - a. one bulb
  - b. two bulbs
  - c. three bulbs

**After conducting the activity, write down the answers to the questions given below.**

2. What happened to the brightness of the bulb when the second and third bulbs were connected?
  - a. brightness increases
  - b. brightness decreases
  - c. no change in brightnessWhy? \_\_\_\_\_
3. Is there another way of connecting the bulbs in the circuit?  
\_\_\_\_\_
4. What will happen if we add one more cell to the circuit?  
\_\_\_\_\_
5. Now try this. Put on one light and see how bright it is. Keep watching this bulb and then switch on a second bulb. What happens to the brightness of the first bulb?
  - a. brightness increases
  - b. brightness decreases
  - c. no change in brightnessCan you guess why? \_\_\_\_\_
6. How can we increase the brightness of the bulb?  
\_\_\_\_\_

\*For the Teacher: Please refer to the teacher's manual for more details

# Water and its Importance

Identify the different ways in which water is being used in the picture given below.

### You will learn about

- Water available
- Uses of water
- Different states of water
- Cloud formation
- Water cycle
- Drought
- Flood
- Conservation of water



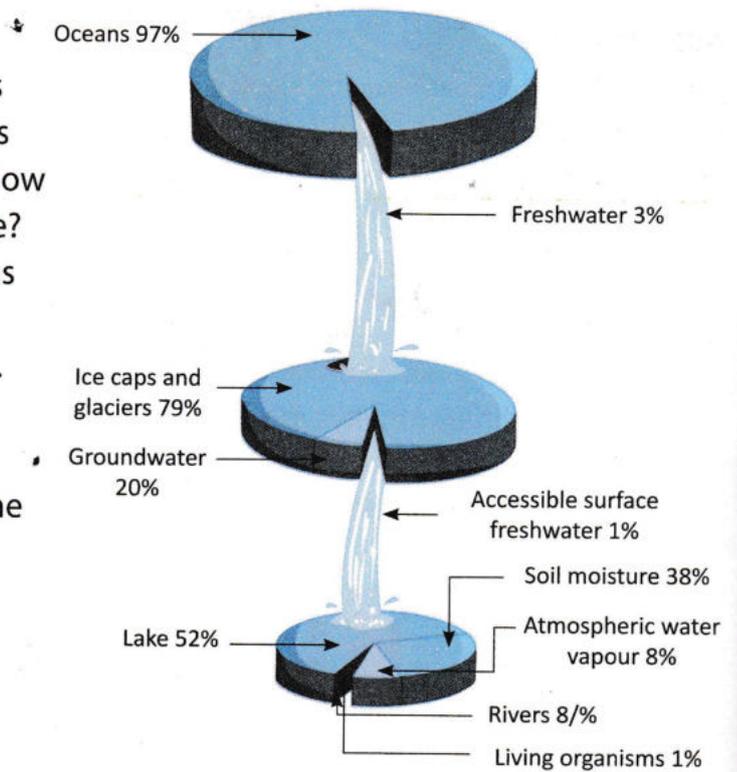
- \_\_\_\_\_ ;
- \_\_\_\_\_ ;
- \_\_\_\_\_ ;
- \_\_\_\_\_ ;
- \_\_\_\_\_ ;

Answers: 1. Brushing/washing; 2. Drinking; 3. Cooking; 4. Washing car; 5. Gardening

## WATER AVAILABLE FOR USE

About three-fourth of the Earth's surface is covered with water. That is why the Earth is also called the water planet. But do you know how much water is readily available for use? Most of the water (about 97%) is in the seas and oceans as salt water. This water is too salty to be used for drinking and irrigation. Thus, only a tiny fraction (about 3%) of the Earth's water is available to us as fresh water. Out of this, 2.997% is locked up in the mountains or glaciers or is buried so deep under that it costs too much to extract.

So, only about 0.003% of the fresh water is easily available to us in the form of groundwater, river, lake, stream, soil moisture, and water vapour (Fig. 15.1).



If there were 100 litres of water available on the Earth, only 0.003 litres (1/2 teaspoon) could be available for human use.

## USES OF WATER



Besides being essential for life, water is used for many other purposes. In India, about 70% of the total water available is used for agriculture, 20–22% by industries, and only 8% is used for personal or domestic needs.

Let us learn more about the various uses of water.

**Agricultural needs** Our country depends a lot on agriculture. Farmers rely on water to sustain their agricultural crops such as wheat and paddy. Many a times, rainfall is not sufficient to water these crops, and farmers have to use artificial watering systems, referred to as *irrigation*.



Fig. 15.2 Agricultural needs

**Industrial needs** Factories use a large amount of water every day—as raw material, for cleaning, heating, cooling, generating electricity (e.g., hydroelectric power plant), etc. The amount of water required depends on the kind and size of the factory.



Fig. 15.3 Hydroelectric power plant



Fig. 15.4 Ship: Water transportation

**Personal/domestic needs** We need water to drink. Water that is suitable for human consumption is called *potable water*. We also need water to bathe, wash clothes and dishes, clean our house, and to water plants.

Apart from these uses, water is also used for transportation and recreation (Fig. 15.4). It also regulates the climate of a place and provides homes to many plants and animals.

## DIFFERENT STATES OF WATER

In nature, water exists in three states. It could be in the form of liquid (e.g., rain, river, sea), solid (e.g., ice, snow, hail), or gas (e.g., water vapour, steam) (Fig. 15.5).

You can heat water over a stove to convert it into vapour.

What happens if you leave water in an uncovered vessel on a summer afternoon outside your house? After a few hours, you will find that the level of water in the vessel has decreased. This is because a lot of it would have escaped into the atmosphere in the form of water vapour. *The process by which a liquid is converted into its vapour at a temperature below the boiling point is called **evaporation**.*

What about the reverse process? *The process by which the vapour of a substance is converted into its liquid form is called **condensation**.* Water vapour is also added into the air by the leaves of plants, through the process of *transpiration*.

Evaporation and condensation of water take place on a very large scale on the surface of the Earth and its atmosphere.

These processes play a key role in cloud formation and rain.

### Let's Discuss

Which activities cause the most water wastage? Suggest some ways that can be used to conserve water at home.



(a) Solid: Ice



(b) Liquid: Water and Gas: Steam

Fig. 15.5 Three states of water

## Activity

**Aim:** To observe condensation of water

**Materials needed:** A glass or metal tumbler, ice-cold water, and a handkerchief

**Method:**

1. Take the tumbler and wipe it dry, both inside and outside.
2. Pour ice-cold water into the tumbler.
3. Wait for sometime and see what happens to the outer surface of the tumbler.

**Observation:** You will find that the outer surface of the tumbler becomes foggy with water droplets on it.

**Conclusion:** This is because water vapour in the atmosphere condenses on the cold surface of the tumbler.



## Activity

**Aim:** To demonstrate condensation of steam

**Materials needed:** A vessel with boiling water and a metal lid

**Method:**

1. Ask an adult to boil some water in a vessel and carefully place the vessel on a table.
2. Hold the lid on top of the vessel so that the steam coming from the water touches it.

**Observation:** After a short while, you will find that the side of the lid facing the steam will have droplets of water.

**Conclusion:** This is because steam from the water condenses on the metal lid. The same can be done by holding a spoon over a steaming cup of water, tea, or coffee.

## CLOUD FORMATION

When the temperature of air increases, it expands (i.e., its particles move away from one another). This makes the air lighter and it rises in the atmosphere, taking water vapour with it. As the air rises, it begins to cool. The water vapour condenses on dust particles present in the atmosphere to form millions of tiny droplets. Tiny ice crystals will be formed instead if it is very cold. This cluster of tiny water droplets floating in air is what we call a cloud.

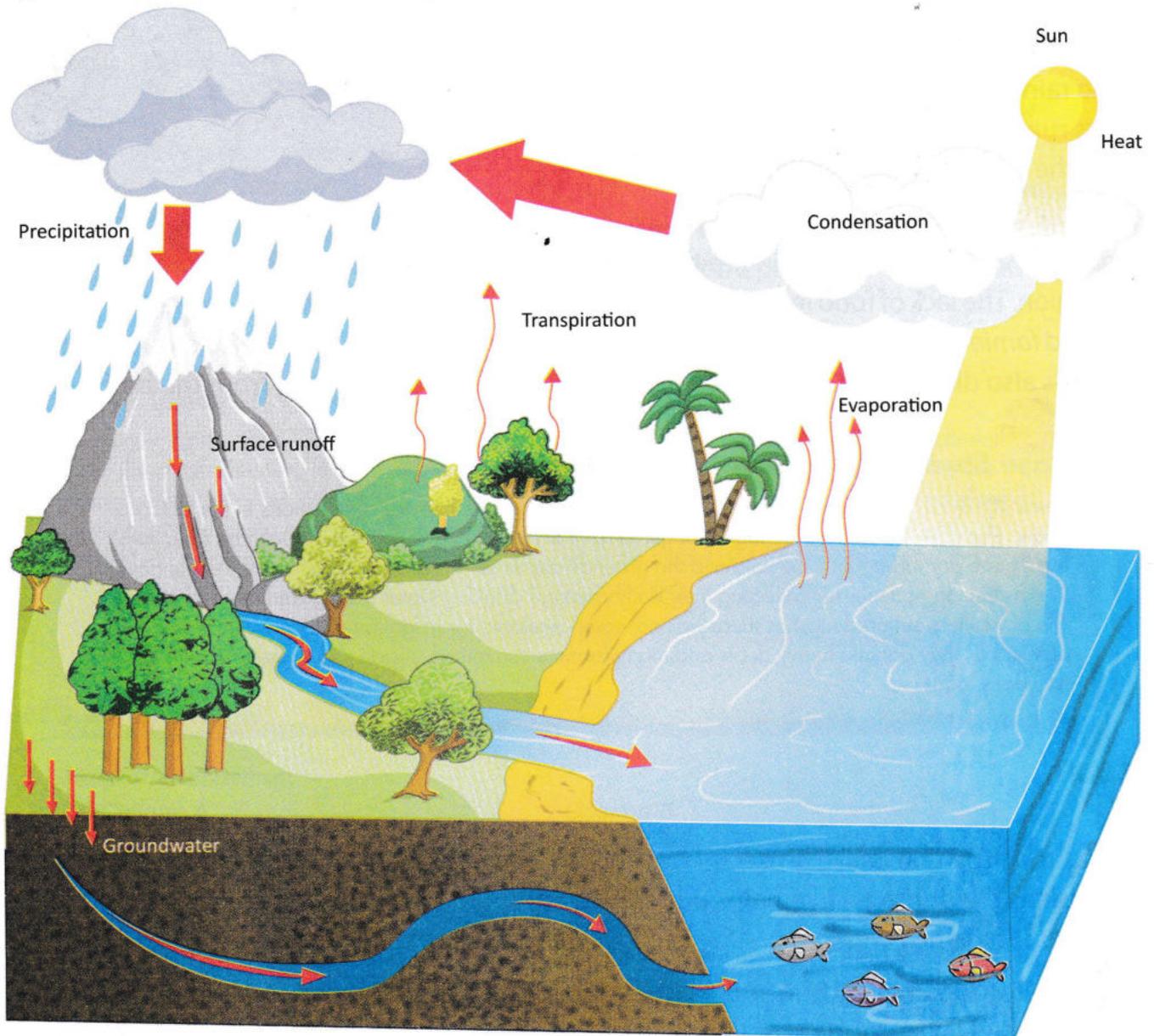
## WATER CYCLE

↓ AN

Water droplets in the clouds keep bumping against one another, and sometimes stick to form bigger drops. When these drops become too heavy to float in the air, they drop down back to the Earth as rain. The water that comes down as rain, in time, evaporates and goes up to form clouds again. This leads to the formation of a cycle, known as the *water cycle*.

**Water cycle** is the cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes.

Figure 15.6 shows how the water cycle works.



**Fig. 15.6** Water cycle in the atmosphere

- Evaporation** Sun's heat changes the water in oceans, rivers, ponds, and other water bodies into water vapour.
- Transpiration** Plants give off water vapour through their leaves.
- Condensation** Water vapour rises up and condenses on dust particles to form clouds.
- Precipitation** Water stored in clouds reaches the Earth in the form of rain, snow, etc.
- Collection** Some rainwater seeps into the ground, forming ground water. Rainwater also flows into streams and rivers, and then finds its way into seas and oceans.

## DROUGHT

LL

Sometimes it does not rain for a long time—for an entire month, two months, the whole season, two years, etc. The abnormally long period of insufficient or no rainfall at all is called *drought*. During drought, rivers run dry, water level in lakes goes down, and even the water in the soil dries up (Fig. 15.7).

There is very little or no water available during a drought. Most plants die leading to the lack of food in the region. The lack of food in a region for a long period is called *famine*. When there are no plants, animals that survive on plants also die. Animals and humans also die due to thirst and dehydration (excessive loss of water from the body).



Fig. 15.7 Drought

### Case Study: Drought in Tamil Nadu

Since 2016-17, the state of Tamil Nadu is facing drought due to the worst monsoons in the last 140 years. The state has been receiving inadequate rainfall almost 60% lower than usual. The reservoirs have gone dry throughout the state and the groundwater level has dropped drastically. People have to stand in long queues for collecting their daily quota of drinking water from government tankers. The agriculture suffered most as there was no water available for irrigation. Millions of farmers were affected as they got into heavy debts and many farmers committed suicide due to their inability to pay back loans.

## FLOOD

LL

Just as too little rain is bad, too much rain is bad as well. It leads to water being everywhere, sometimes the entire area remains under water or *submerged*. A condition when the ground becomes submerged under water due to heavy rain and overflowing of rivers is called **flood**.

During a flood, plants and crops die either due to suffocation by excess water or due to soil being washed away, robbing their roots of support.

### Green corner

Trees help in the process of water cycle through transpiration. If deforestation continues with the same pace, there will be insufficient rainfall. So, we should plant more and more trees.



Fig. 15.8 Flood

In such waterlogged conditions, many disease-causing germs start multiplying and cause water-borne diseases. Sometimes water-borne diseases affect thousands of people at the same time. *A disease affecting thousands of people at the same time is called an epidemic.*

A flood can thus lead to many conditions—disease, starvation, loss of life, and property. A flood also can have the same effect on the food chain as a drought does.

Both drought and flood are *natural disasters*—unfortunate events brought about by nature—that can have a very strong effect on the lives of people. The economy of a country can crumble as a result of the loss of property and life, and many more things. But we can and must try to reduce the bad effects of these disasters as much as possible. We must understand that such things can happen, and so we must be prepared to face them as and when they happen.

### Case Study: Kerala Floods

In August 2018, Kerala faced one of the worst floods of the state. It was due to 75% extra rainfall than the usual. This natural disaster is believed to be the consequence of the global warming due illegal stone quarrying, cutting down forests and grasslands, changing drainage patterns, and sand mining on river beds. About a million people had to be evacuated from 14 districts; hundreds of people lost their lives and a large number was placed in the missing list. The floods affected hundreds of villages, destroyed an estimated 10,000 km of roads and thousands of homes.

## Let's Remember



### I. Match the following:

#### Column A

1. 3% of Earth's water
2. Artificial watering
3. Epidemic
4. Famine
5. Flood

#### Column B

- a. Disease affecting thousands of people at the same time
- b. Lack of food in a region for a long period
- c. Condition in which the ground becomes submerged in water due to heavy rain
- d. Fresh water
- e. Irrigation

### II. Write T for the true statement and F for the false one.

1. About 8% of the total water available in our country is used for agriculture.
2. Water is added into the air through the process of transpiration and condensation.
3. Hail is the liquid state of water.
4. Precipitation is the water stored in clouds that reaches the Earth in the form of rain, snow, etc.

## CONSERVATION OF WATER

Since only a small percentage of water on our planet is usable, it is very important that we use water carefully. The conservation of water can be done by building dams, avoiding wastage of water at homes, both indoors and outdoors, harvesting rainwater, and preventing pollution of water.

### Building Dam

A dam is a structure built to hold back water in order to prevent floods, and to provide water for irrigation and storage. Building a dam is a solution to both drought and flood (Fig. 15.9).

Dams are also used to produce electricity. Built on rivers, a dam has high walls and has many openings or gates to both let in and hold back water. During heavy rainfall, when the rivers fill up, water enters the dam. When water is needed later, the gates are opened to let out water.

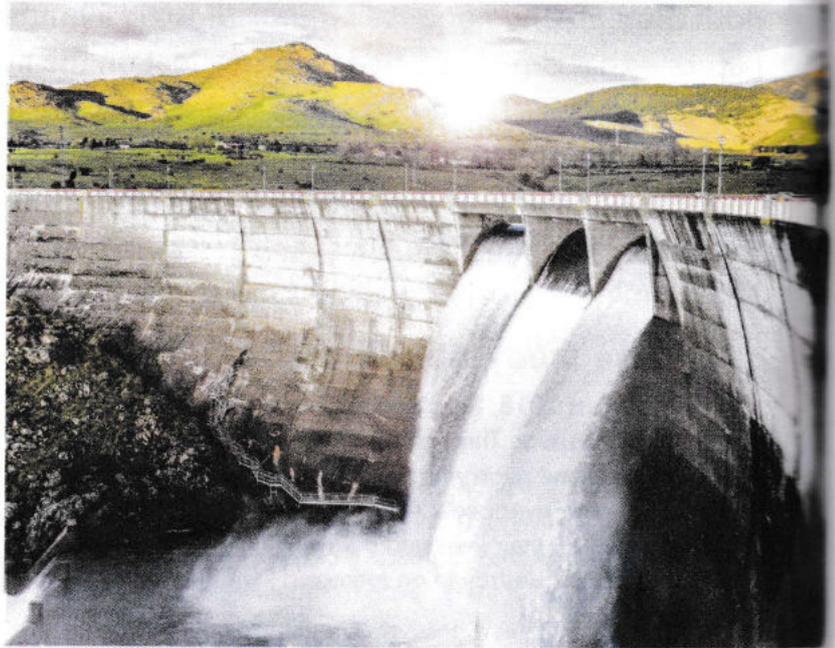


Fig. 15.9 A dam

### Avoiding Wastage at Homes



Some ways to avoid wastage of water at homes are given below.

1. Take water in a bucket for your bath instead of using the shower. A bath in a tub uses the largest amount of water. Always remember to shut the tap tight after each use.
2. Repair all leaky pipes and taps. Inform the municipality or call a plumber if you spot any leaking pipes in your neighbourhood.
3. Do not leave a tap running while brushing your teeth.
4. Use a wet cloth to clean the car instead of using a hose.
5. Instead of using running water for washing utensils, soak them first in one tub or sink and wash them in another, using a thin trickle only to rinse off.
6. Water plants and grass early in the morning so that the water gets absorbed before the sun evaporates it. Watering by hand saves a lot of water as against using a hose.
7. Try not to throw away used or extra water down the drain if it can be used for some other purpose, e.g., you could use water remaining in your water bottle to water the plants.

## Rainwater Harvesting

The process of collecting and storing rainwater from roofs or a surface catchment is called **rainwater harvesting** (Fig. 15.10). Storing rainwater that collects on roofs instead of letting it go down the drain, is a practical solution in case of droughts. This technique is known as *rooftop rainwater harvesting*. This involves collecting rainwater from rooftops in dugout ponds, vessels, or underground tanks to store water for long periods. Another option is to allow water to go into the ground directly from the roadside drains that collect rainwater. The stored rainwater is treated before use because it may contain bird faeces, chemicals, and other pollutants, which need to be removed before use.



Fig. 15.10 Rainwater harvesting

## Preventing Water Pollution

Another method to conserve water is to safeguard our freshwater bodies from pollution. Garbage and harmful chemicals pollute the water and make it unfit for use. Polluted water is also very bad for aquatic life. Plants and animals in and around polluted water may die or get infected. And when human beings consume the contaminated fish, etc., they are also put at a risk of diseases.

### Tech Specs

The *Playpump* is a merry-go-round for playground, developed by PlayPumps International in Africa, which uses the boundless energy of children to pump water out of the ground. Apart from bringing joy to children, it helps providing clean drinking water.

## Let's Remember



Fill in the blanks with the correct words.

1. We should use a \_\_\_\_\_ (hose/wet cloth) to clean the car.
2. \_\_\_\_\_ (Dams/Rainwater harvesting systems) are also used to produce electricity.
3. Used water can be \_\_\_\_\_ (thrown away/used for some other purpose).
4. Storing rainwater that collects on roofs is a practical solution in case of \_\_\_\_\_ (floods/droughts).

## Key Words

<b>Salt water</b>	Water of the seas and oceans that has a high salt content, making it unfit for drinking and irrigation, is called salt water.
<b>Fresh water</b>	Water found in rivers, lakes, and ponds used for domestic and commercial purposes is called fresh water.
<b>Irrigation</b>	Watering crops by artificial means is called irrigation.
<b>Potable water</b>	Water fit for human consumption is called potable water.
<b>Transpiration</b>	The release of water vapour into the atmosphere through the leaves of plants is called transpiration.
<b>Water cycle</b>	The cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes is called water cycle.
<b>Drought</b>	Abnormally long period of insufficient or no rainfall is called drought.
<b>Famine</b>	Lack of food in a region for a long period is called famine.
<b>Flood</b>	A condition when the ground becomes submerged under water, due to heavy rain and overflowing of rivers is called flood.
<b>Epidemic</b>	A disease affecting thousands of people at the same time is called an epidemic.
<b>Dam</b>	A structure built on a river to store and hold back water is called a dam.
<b>Rainwater harvesting</b>	The process of collecting and storing rainwater from roofs or a surface catchment is called rainwater harvesting.

## Summary

- Only a tiny fraction of the Earth's water is available as fresh water.
- We need water for many purposes—drinking, personal needs, agricultural needs, industrial needs, for transportation and recreation, and regulating the climate. It is home to various plants and animals.
- Water exists in solid, liquid, and gaseous states.
- Evaporation and condensation play an important role in cloud formation.
- Water cycle is the cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes.
- Abnormally long period of insufficient or no rainfall is known as drought.
- When there is too much rainfall in an area, rivers overflow and water covers all the area around. This is called a flood. A flood can cause great destruction.
- Rainwater harvesting is one of the ways to conserve water.

# Exercises

## LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks with the correct words.

1. Water exists in the form of gas in nature as \_\_\_\_\_ (water vapour/snow) and \_\_\_\_\_ (sea/steam).
2. \_\_\_\_\_ (Water cycle/Water pollution) is the cyclic movement of water from the atmosphere to the Earth and back to the atmosphere through various processes.
3. \_\_\_\_\_ (Drought/Flood) is condition when the ground is submerged under water, due to heavy rain and overflowing of rivers.
4. \_\_\_\_\_ (Bridge/Dam) is a structure build on a river to store and holds back water.
5. \_\_\_\_\_ (Rainwater harvesting/Irrigation) is the process of collecting and storing rainwater from roofs or surface catchment.

#### B. Choose the correct option.

1. How much of the Earth's water is present in seas and oceans as salt water?  
a. 3%                      b. 97%                      c. 0.003%                      d. 2.997%
2. Water found in rivers, lakes, and ponds used for domestic and commercial purposes is called  
a. potable water      b. sea water                      c. fresh water                      d. salt water
3. The conversion of the vapour of a substance to its liquid form happens by the process of  
a. condensation      b. evaporation                      c. transpiration                      d. precipitation
4. Abnormally long period of insufficient or no rainfall is  
a. flood                      b. epidemic                      c. famine                      d. drought
5. What are the tiny ice crystals of water droplets floating in the air called?  
a. Water vapour      b. Clouds                      c. Precipitation                      d. Water cycle
6. Which of the following is not the result of a drought?  
a. Rivers run dry      b. Lack of food                      c. Water logging                      d. Thirst and dehydration
7. Which of the following is an outcome of a flood?  
a. Water-borne diseases                      b. No rainfall  
c. Fresh water                      d. Drought
8. The plants give off water vapour through their leaves by the process of  
a. condensation      b. evaporation                      c. transpiration                      d. precipitation
9. Which of the following is not a method of conservation of water?  
a. Avoiding wastage of water                      b. Building dams  
c. Rainwater harvesting                      d. Pollution of water
10. Which of the following will lead to wastage of water?  
a. Shower bath                      b. Repair of leaky pipes and taps  
c. Watering plants in the morning                      d. Using a wet cloth to clean the car

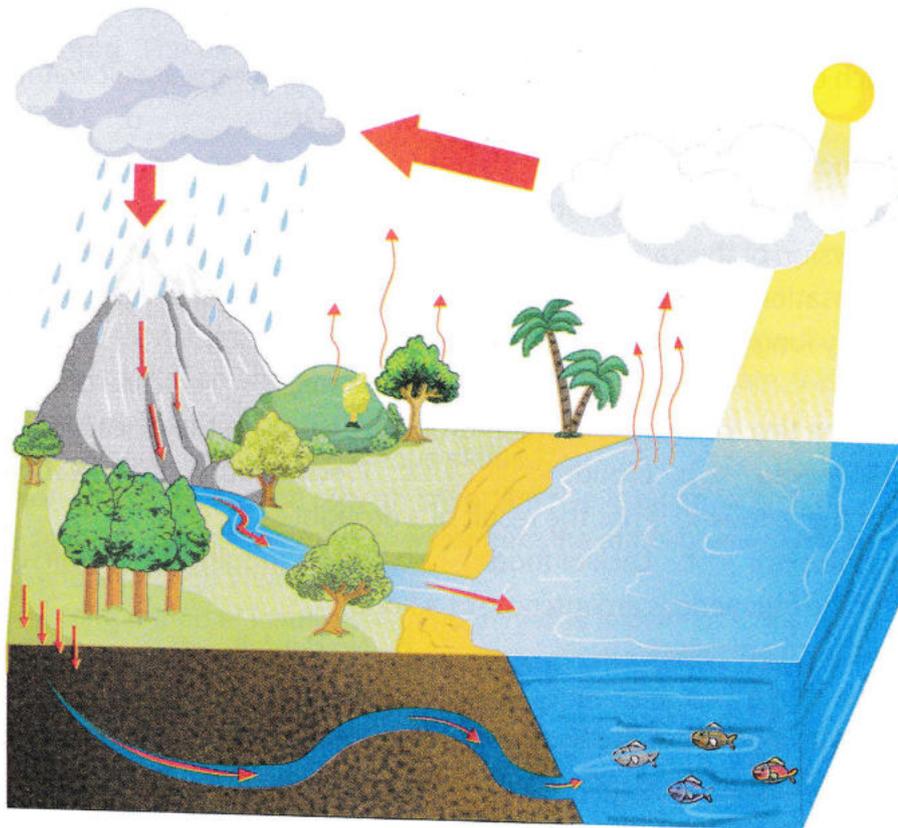
## II. Very short answer type questions.

### A. Give one word for the following.

1. Watering crops by artificial means \_\_\_\_\_
2. Water fit for human consumption \_\_\_\_\_
3. Release of water vapour into the atmosphere through the leaves of plants \_\_\_\_\_
4. Lack of food in a region for a long period \_\_\_\_\_
5. A disease affecting thousands of people at the same time \_\_\_\_\_

## III. Short answer type questions.

1. Explain the following with the help of simple activities:
  - a. Condensation of water vapour present in air.
  - b. Condensation of steam.
2. How are clouds formed?
3. State four ways to avoid wastage of water at home.
4. Explain the formation of water cycle.
5. Label the following diagram of water cycle.



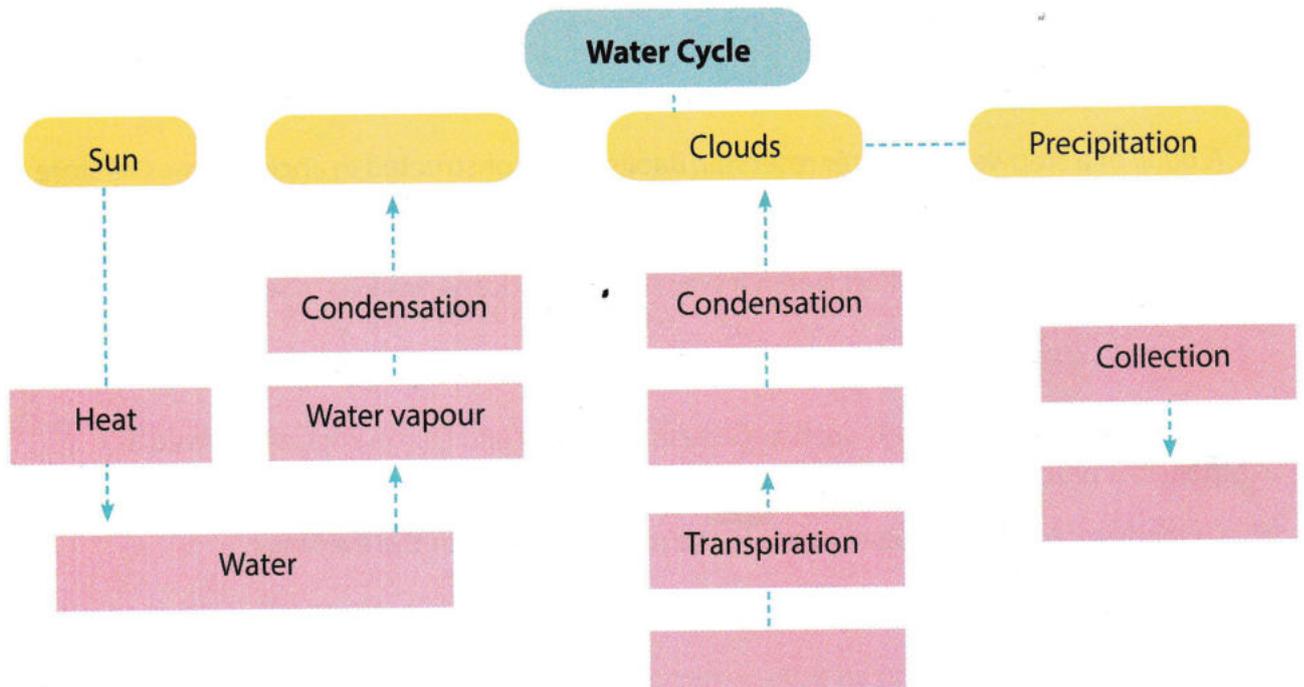
## IV. Long answer type questions.

1. Explain how water is used for various purposes in India.
2. What are natural disasters? Explain any two natural disasters.
3. Describe how can dams, water harvesting and prevention of water pollution help in conservation of water.

## LET'S RECALL



Recall and complete the concept map given below.



## LET'S OBSERVE



Observe the following pictures and answer the questions that follow.



- What does the above picture depict?
  - What are the adverse effects of the above phenomenon?
  - Why is it called a natural disaster?
  - Suggest a measure that can ensure that such natural disasters do not happen.



- List the different types of conversions taking place in the picture given below.



### LET'S CONNECT HISTORY

- A *baoli* or a stepwell is a water reservoir. Baolis were constructed in ancient times to store water to be used in the times of water shortage or drought. There are numerous baolis in India. Collect pictures of five baolis, paste them on a chart paper, and write relevant information such as location, when it was constructed, and who constructed it, etc.

### LET'S APPLY



- Idol immersion during festivals, such as Ganesh Chaturthi and Durga Puja, are viewed as irresponsible practices. Give reasons. 
- Why is it advisable to water plants early in the morning or late in the evening?

### LET'S ANALYSE AND EVALUATE

- Our country is currently facing an acute water crisis. Analyze the effect this phenomenon will have on our lifestyle.  
- In such a situation, estimate the cost at which water may be available and what activities we must prioritize in order to use water judiciously.  

### LET'S CREATE



- Compare situations of flood and drought in two different areas, with respect to effect on life in the area, agriculture, availability of food, occurrence of diseases, and harm to property and make a powerpoint presentation.  
- Water crisis in India is now a realistic problem. Write a report on the causes of this crisis, consequences, and what steps should be taken by the government and by the individual to cope with this water crisis.  

#### Web Research

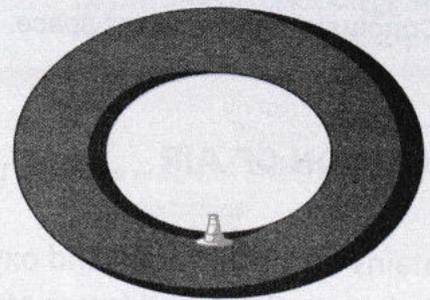
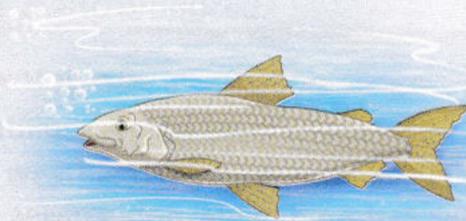
- Browse the internet and find out about different methods, techniques and equipment that can be used to conserve water and prepare a report. Suggested websites:  
<https://wateruseitwisely.com/> (Checked and accessed on 13-08-2019)  
<https://www.unenvironment.org/explore-topics/water> (Checked and accessed on 13-08-2019)
- Browse the internet and do a brief research and prepare a report on water problem in our country and measures taken by the government and various NGOs to help overcome this problem. Suggested websites:  
<http://delhijalboard.nic.in/daily-drinking-water-quality/delhi-jal-board-djb> (Checked and accessed on 13-08-2019)  
<https://www.indiawaterportal.org/> (Checked and accessed on 13-08-2019)

All organisms on the Earth need air to survive. Moving air or wind also helps us in many ways.

Look at the pictures given below. Can you think of one purpose for which air is required in each of the four cases? Write it in the space below each picture.

### You will learn about

- Air is all around us
- Composition of air
- Air supports life
- Balance of oxygen and carbon dioxide in the air
- Air pollution



Air cannot be seen but can be felt when it moves. Air is present all around us. Let us learn more about air.

Answers: 1. for breathing; 2. for inflating the tube; 3. for flying; 4. for moving the blades of windmills

## AIR IS ALL AROUND US

A thick blanket of air, called the atmosphere, surrounds our Earth. Air is also present in things that seem to be empty. Let us find this out by doing an activity.

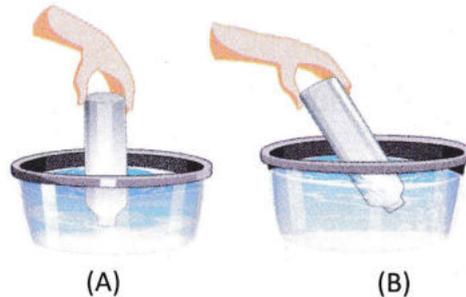
### Activity

**Aim:** To show the presence of air in a bottle that looks empty

**Materials needed:** An empty plastic/glass bottle and a tub of water

**Method:**

1. Take an empty bottle.
2. Open its cap.
3. Now immerse the bottle in water with the open end inside the water (Fig. A). Does water rush inside the bottle? Now tilt the bottle (Fig. B). What do you see? Does water rush inside the bottle?



**Observation:** You will see bubbles at the mouth of the bottle. This is because there was air inside the bottle which comes out on tilting the bottle (as it finds an opening). Before tilting, water does not enter the bottle as all the space inside the bottle is taken up by air. But as you tilt the bottle, air rushes out from the opening and water rushes in to fill the empty space.

**Conclusion:** Air occupies space.

## COMPOSITION OF AIR



Air contains mainly nitrogen and oxygen. It also contains carbon dioxide, noble gases, water vapour, dust particles, and traces of other gases. The composition of air is shown in Figure 16.1. Let us now verify the presence of some constituents of air.

### Nitrogen and Oxygen

Air contains about 78% nitrogen and 21% oxygen. Oxygen in air supports burning, whereas nitrogen does not. Let us prove this by doing a simple activity.

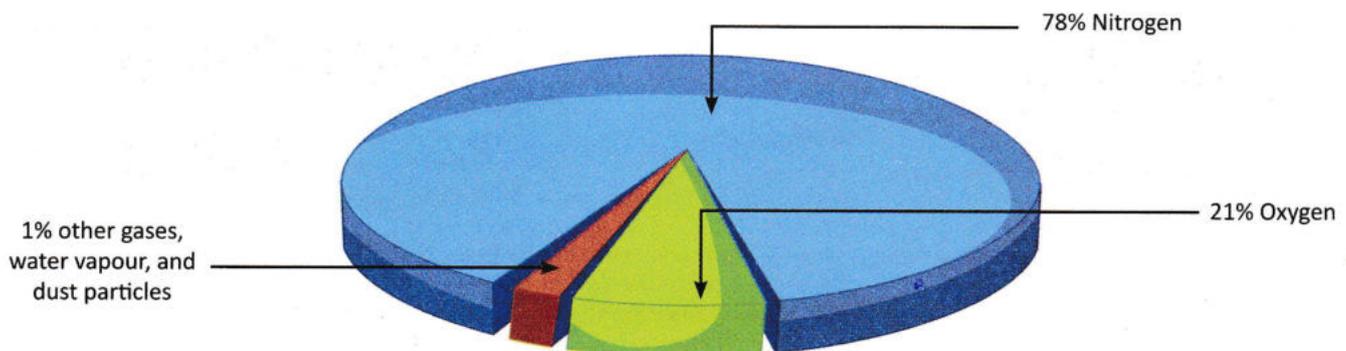


Fig. 16.1 Composition of air

## Activity

**Aim:** To show the presence of oxygen in air (adult supervision required)

**Materials needed:** Big bowl, water, a candle, a matchbox, and a glass

**Method:**

1. Take a candle and place it in a big bowl.
2. Now fill the bowl with some water.
3. Light the candle and cover it with an inverted glass.

**Observation:** The candle keeps burning for some time. After some time, the candle blows out.

**Conclusion:** Oxygen helps in burning. When the oxygen inside the glass is used up, the candle is put out.



## Carbon Dioxide

Air contains about 0.03% of carbon dioxide. Plants and animals take in oxygen and give out carbon dioxide during *respiration*. When you burn something, carbon dioxide is also produced.

## Water Vapour

Air contains varying amounts of water vapour depending on the weather of a place. You have learnt about the water cycle. The sun heats up the water in seas and oceans. This water evaporates and forms water vapour. Where does the water from these wet clothes disappear? The water from the wet clothes forms water vapour and mixes with the air. You can verify the presence of water vapour in air by observing condensation of water outside a glass of iced water.

## Dust and Smoke

Have you seen sun rays entering a dark room? Have you noticed tiny particles in the rays? These are dust particles. Air contains dust. Air also contains smoke released from factories and vehicles (Fig. 16.2).

## Fact File

The Earth's atmosphere also has a portion that contains high levels of ozone gas. This layer, called the ozone layer, protects us from the harmful ultraviolet rays of the sun, thus preventing many eye problems and skin cancer in human beings.

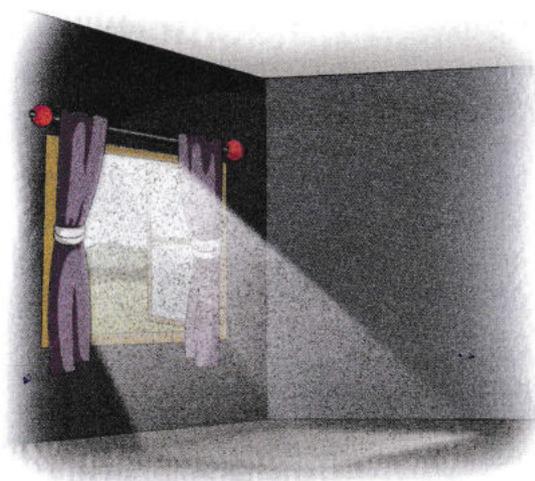


Fig. 16.2 Air contains dust



### Fill in the blanks with the correct words.

1. Air contains mainly \_\_\_\_\_ (nitrogen/carbon dioxide) and oxygen.
2. \_\_\_\_\_ (Oxygen/Nitrogen) constitutes about 21% of air.
3. Air contains about \_\_\_\_\_ (0.03%/0.3%) of carbon dioxide.
4. \_\_\_\_\_ (Carbon dioxide/Oxygen) in air supports burning.
5. Water evaporates to form \_\_\_\_\_ water ( cycle/ vapour)
6. Air contains \_\_\_\_\_ (dust/fire) and smoke.

## AIR SUPPORTS LIFE



We all need air to survive. Air contains oxygen and carbon dioxide, which are useful to plants and animals. Plants use carbon dioxide present in the air to make their own food by a process called *photosynthesis*. Let us see how air supports life in plants and animals.



Fig. 16.3 *Stomata on the underside of a leaf*

### In Plants

Plants have tiny pores called *stomata*, found on the underside of a leaf (Fig. 16.3). Air containing carbon dioxide and oxygen enters the plant through these openings where carbon dioxide gets used in photosynthesis and oxygen in respiration.

### Get it Right

Sometimes, we wrongly use the terms **breathing** and **respiration** interchangeably. Breathing is a physical act of taking in oxygen and giving out carbon dioxide, whereas respiration is a chemical process by which glucose in the body breaks down to give energy.

### In Animals

All animals need to respire, be it a cockroach, a fish, or an elephant. It is just that they use different organs and mechanisms for respiration.



Insects such as cockroach and housefly respire through tiny holes in their bodies called spiracles.



Earthworms take in air through their skin surface. The skin is kept moist with the help of a substance called mucous. Oxygen of the air gets directly absorbed through the moist skin and carbon dioxide is given out.

## Activity

**Aim:** To show the presence of air in soil

**Materials needed:** A jar, some soil, and a jug of water

**Method:**

1. Take some soil in a jar.
2. Pour water into it. Can you see bubbles coming out? What does it suggest?

**Observation:** The bubbles show the presence of air in soil.

**Conclusion:** Animals living inside the soil take in air present in soil.

## In Aquatic Animals and Plants

Most aquatic animals, such as fish, tadpole, crab, and shrimp, have special organs for respiration called *gills* (Fig. 16.4). Gills help to take in oxygen and give out carbon dioxide. Some aquatic animals such as dolphin and whale come to the surface of the water regularly to take in air, since they breathe with the help of lungs.

Aquatic plants, such as *Hydrilla*, also breathe in oxygen dissolved in water through their body surface.

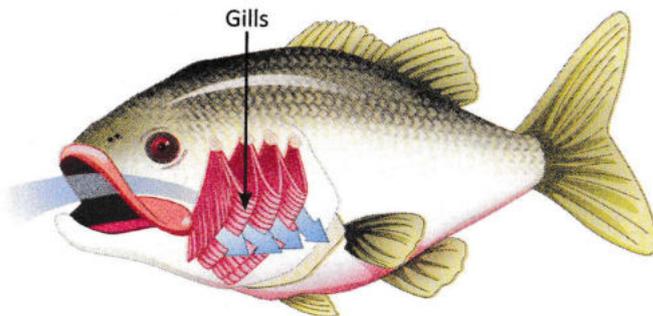


Fig. 16.4 Gills in fish

## In Amphibians

Amphibians, such as frog, newt, and salamander, need breathing systems for both air and water. Crocodile and alligator swim through water with part of their snout above the water surface to breathe easily through nostrils.



Frogs have well-developed lungs to breathe in air when on land. In water, frogs breathe with the help of their moist skin.

## Fact File

Have you seen earthworms in driveways and sidewalks in rainy season? Do you know why they come out? Earthworms come to the surface during rains because they can move more quickly in moist conditions. Exposure to direct sunlight can kill the earthworms. Therefore, they come out only in moist conditions so that they can move without dehydrating. It is also believed that when there is excessive rain, the soil becomes waterlogged and the earthworms cannot breathe.

## In Birds

Birds have an efficient respiratory system as they need high levels of oxygen during flight. Birds have a pair of lungs with air sacs that remain open all the time, so that air can easily pass through them (Fig. 16.5).

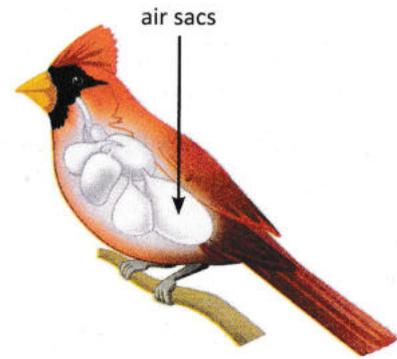


Fig. 16.5 Birds have air sacs in their lungs

## In Mammals

Most mammals breathe with the help of lungs. They take in oxygen and give out carbon dioxide.

## BALANCE OF OXYGEN AND CARBON DIOXIDE IN THE AIR

The balance of oxygen and carbon dioxide in the atmosphere is maintained through respiration in plants and animals, and by photosynthesis in plants. Plants produce oxygen during photosynthesis and utilize oxygen during respiration. They produce much more oxygen during photosynthesis than they consume during respiration. This is how the oxygen consumed by plants and to a large extent by animals is replenished in the air through photosynthesis.

## Let's Remember



### Fill in the blanks with the correct words.

1. Plants have tiny pores called \_\_\_\_\_ (stomata/spiracles) through which they exchange gases.
2. Cockroaches respire through \_\_\_\_\_ (spiracles/skin surface).
3. Shrimps and crabs have \_\_\_\_\_ (gills/lungs) for respiration.
4. Plants such as *Hydrilla* breathe in oxygen dissolved in water through \_\_\_\_\_ (body surface/snout).
5. Birds have a pair of lungs with \_\_\_\_\_ (gills/air sacs) for breathing.

## AIR POLLUTION

The addition of substances in the environment in quantities that are harmful to living beings is called *pollution*. Air is getting polluted day by day because of various human activities. Burning of fuels such as coal and petroleum, excessive burning of fuels such as wood, smoke and harmful gases released from factories (Fig. 16.6), smoke released by vehicles (Fig. 16.7), and machines releasing gases are the major causes of air pollution. These gases spread and mix in the air and spoil the quality of air, thereby making it impure.



Fig. 16.6 Industrial pollution

Air pollution has major adverse effects on plants, animals as well as human beings. Harmful gases present in the polluted air make breathing difficult. Air pollution also leads to a lot of lung diseases such as asthma and lung cancer. Air pollution also damages crops.

If we do not start looking after the quality of air around us, the oxygen and carbon dioxide levels will no longer be

balanced and living beings will be the ones getting affected.

There are a number of ways by which we can reduce air pollution. Some of them are: planting more and more trees, recycling plastics, regular checking of vehicles for the emission of harmful gases, etc.



**Fig. 16.7** Vehicular pollution

## Key Words

### Atmosphere Pollution

A thick blanket of air surrounding the Earth's surface is called the atmosphere. The addition of substances in the environment in quantities that are harmful to living beings is called pollution.

## Summary

- All living organisms need air to survive. Air cannot be seen but can be felt when it moves.
- Air is a mixture of several gases.
- Oxygen is needed for respiration. Carbon dioxide is given out as a by-product after respiration.
- Insects take in air with the help of tiny holes in their bodies called spiracles; earthworm breathes through their skin, which is kept moist with the help of a substance called mucous.
- Aquatic animals such as whale and dolphin as well as mammals breathe with the help of lungs.
- Amphibians such as frog breathe with the help of lungs, when on land. In water, these animals breathe with the help of their moist skin.
- Birds breathe through lungs and air sacs that are open all the time.
- There are several causes of air pollution: excessive burning of fuels such as wood, coal, and petroleum, machines releasing gases, vehicles releasing smoke, and several types of harmful gases released by industries.

# Exercises

## LET'S UNDERSTAND



TD

### I. Objective type questions.

#### A. Match the following.

##### Column A

1. Plants
2. Cockroach
3. Earthworm
4. Fish
5. Dolphin
6. *Hydrilla*

##### Column B

- a. moist skin
- b. body surface
- c. stomata
- d. lungs
- e. spiracles
- f. gills

#### B. Choose the correct option.

1. Which of the following gases is present in air in the highest percentage?  
a. Oxygen                      b. Carbon dioxide      c. Noble gases              d. Nitrogen
2. Which of the following do frogs use for breathing in water?  
a. Lungs                      b. Moist skin              c. Gills                      d. Stomata
3. Which of the following animals have a pair of lungs with air sacs?  
a. Birds                      b. Fish                      c. Humans                      d. Frogs
4. Which of the following swim through water with part of their snout above the water surface to breathe through nostrils?  
a. Amphibians              b. Dolphins              c. Alligators              d. Fish
5. Which of the following does not lead to air pollution?  
a. Burning of fuels                      b. Planting trees  
c. Smoke from vehicles                      d. Harmful gases from industries
6. Which of the following practices can reduce air pollution?  
a. Recycling plastics                      b. Planting more trees  
c. Regular checking of vehicles for the emission of harmful gases  
d. All of these
7. Which of the following are present in air?  
a. Water vapour      b. Smoke                      c. Dust                      d. All of these
8. Air pollution does not lead to  
a. lung cancer              b. asthma                      c. good health              d. Difficulty in breathing
9. Which of the following do not breathe through lungs?  
a. Earthworm              b. Mammals                      c. Dolphins                      d. Whales
10. Which of the following processes produces carbon dioxide?  
a. Photosynthesis      b. Burning                      c. Breathing                      d. Both (b) and (c)

## II. Very short answer type questions.

### A. Give one word for the following.

1. A thick blanket of air surrounding the Earth's surface
2. Process by which plants use carbon dioxide present in the air to make their own food
3. Tiny pores on the underside of a leaf
4. Tiny holes on the body of insects for respiration
5. The addition of substances in the environment in quantities that are harmful to living beings

---

---

---

---

---

## III. Short answer type questions.

1. Write the composition of air.
2. How do wet clothes dry?
3. What are stomata? Discuss their function.
4. Why earthworms come out on surface during rainy season?
5. How is the balance of oxygen and carbon dioxide maintained in nature?

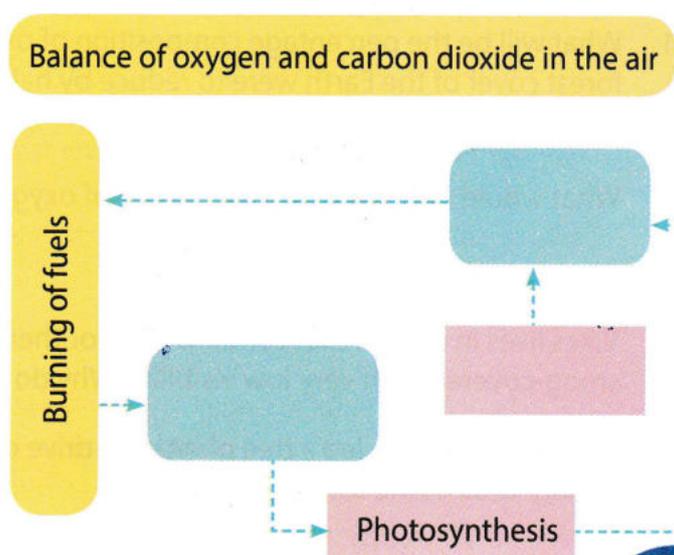
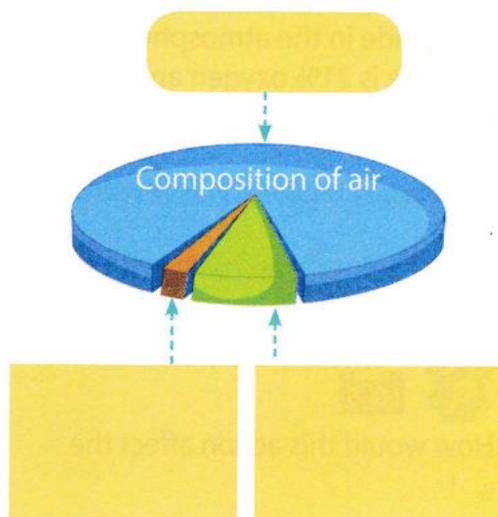
## IV. Long answer type questions.

1. Describe an activity to demonstrate the following:
  - a. Presence of air in an empty bottle.
  - b. Presence of oxygen in air.
  - c. Presence of air in soil
2. Discuss the mechanisms for respiration in insects, earthworm, aquatic animals, amphibians and birds.
3. Discuss the causes, effects, and measures to reduce air pollution.

### LET'S RECALL



Recall and complete the concept map given below.



## LET'S OBSERVE



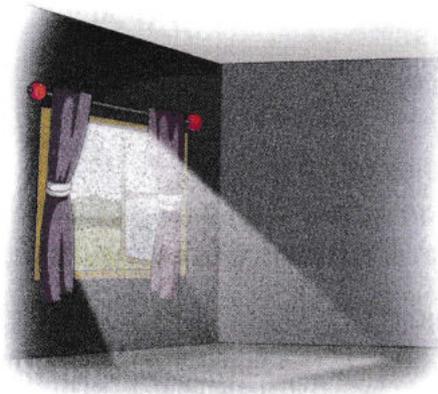
Observe the following pictures and answer the questions that follow.

- a. What can you see in the picture on the side?  
b. How does air pollution affect our health?  
c. Suggest two methods to reduce air pollution.  
d. Write any two ways that can help in decreasing air pollution due to vehicles.

LO 5 LO 11



2. What does the picture given below show?



It shows that air contains \_\_\_\_\_.

## LET'S CONNECT COMPUTER SCIENCE AND GEOGRAPHY

1. Research from internet and prepare a power point presentation on the burning of crop residue by farmers in India and its effect on the quality of air. Also mark on a map of India, any three states where crop residue is burnt.

## LET'S APPLY



1. What will be the percentage composition of oxygen and carbon dioxide in the atmosphere if the forest cover of the Earth were to reduce by half? (Hint- In nature, there is 21% oxygen and 0.03% carbon dioxide.)

LO 6

2. What would happen if the percentage of oxygen and nitrogen in the atmosphere was reversed?

## LET'S ANALYSE AND EVALUATE

1. Vikas lives in a town that contains a major thermal power plant. The air over the town is often smog-covered with very low visibility. Why do you think so?



LO 5

2. People of the town led a tree plantation drive on a mass scale. How would this action affect the quality of air in the town?



## LET'S CREATE



1. Find out the various problems related to air pollution faced by people in your locality/colony. Also you can make notes and take snapshots of the different sources of air pollution. Make a report on its impact on people, plants, animals, buildings, etc. and how we can protect ourselves.  
2. Air pollution has led to the degradation of the air quality around major Indian cities. It has led to creation of smog-like conditions in which visibility also reduces drastically, making life practically impossible. Find out about a similar instance of smog in a major city and make a report on its causes, consequences. You can also suggest a few methods by which such a situation can be avoided in the future.   

### Web Research

- Browse the internet and do a brief research and prepare a report on the topic 'Air pollution' and the changes observed in our environment due to air pollution. Suggested websites:  
<http://www.environnet.in.th/observed-changes> (Checked and accessed on 13-08-2019)  
<https://www.epa.vic.gov.au/your-environment/air/air-pollution> (Checked and accessed on 13-08-2019)



## SEGREGATION OF WASTES

LL

Garbage or waste may be in the form of fruit or vegetable peels, discarded objects, wrapping materials, wasted food as household garbage, or discarded chemicals and fertilizers washed into rivers, domestic sewage, etc. These wastes can be segregated into biodegradable and non-biodegradable. Wastes that rot (undergo **degradation**) by the action of decomposers (tiny organisms found in the soil) are called *biodegradable wastes*. Dead plants and animals and their products (e.g., fruit and vegetable peels, paper, and leaves) decay very easily. These wastes mix with the soil and produce manure. Wastes that do not rot by the action of decomposers are called *non-biodegradable wastes*. For example, glass, plastic, and metals. Many of them can be recycled to produce new things.

Depending on the type of wastes, two garbage bins—one for biodegradable wastes and other for non-biodegradable wastes should be used. This will help in easy sorting and recycling of wastes to make beneficial products.



Green bins are for biodegradable wastes such as vegetables and fruit peels, spoilt food, tea leaves, egg shells, tissue paper, leaves, and hair.



Blue bins are for recyclable wastes such as glass bottles, plastic wastes, old batteries, chocolate wrappers, and polythene bags.

### Word help

**Degradation** The process by which substances are broken down by tiny organisms called decomposers

### Fact File

#### Best out of waste

The Rock Garden in Chandigarh is an excellent example of how solid wastes can be utilized. Every item in this garden is made from waste materials such as tyres, plastic bottles, egg shells, and tube lights. This innovative idea of utilizing solid waste has made the Rock Garden a very popular tourist attraction.

## Activity

**Aim:** To show that materials rot in soil and this rotting is affected by wrapping materials in plastic bag

**Materials needed:** A wooden crate, soil, dried leaves and grass, fruit and vegetable peels, and a plastic bag

**Method:**

1. Keep dried leaves and fruit and vegetable peels inside the wooden crate.
2. Place some leaves and vegetable/fruit peels in a plastic bag and tie its mouth. Place the plastic bag inside the same wooden crate.
3. Put moist soil inside the wooden crate such that the objects are covered inside it. Keep the crate outside, taking care that the soil remains moist. Observe the contents after about three weeks.

**Observation:** Dried leaves and fruit and vegetable peels rotted and got mixed with the soil. The contents inside the plastic bag rotted but could not get mixed with soil because plastic bag could not be degraded.

**Conclusion:** Biodegradable materials degrade over a period of time but non-biodegradable materials do not.

## MANAGEMENT OF BIODEGRADABLE WASTES

LL

Some of the ways to manage biodegradable wastes are as follows.

**Composting** Since biodegradable or organic wastes such as vegetable peels, waste food, leaves, dead flowers, and egg shells cannot be recycled, they are converted into manure by burying them in compost pits. Recycling of organic wastes, such as vegetable peels, waste food, and leaves, by burying them in compost pits is called *composting*. Composting is a simple and almost effortless process of recycling. The biodegradable wastes are degraded by the action of small organisms such as bacteria and fungi. There is also a different kind of composting where a kind of earthworm called red worms (or red wigglers) act on wastes and degrade them. This type of composting with the help of a type of earthworm called red worms, is called *vermicomposting* (Fig. 17.1). Red worms break down the organic matter into nutrient-rich manure which increases soil fertility. Vermicompost can be made in 3–4 weeks and it appears as loose soil-like material. One should not put animal product or oily substance in the pit as it could lead to the growth of disease-causing organisms.

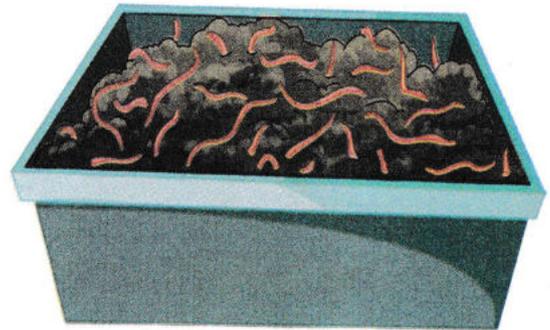


Fig. 17.1 Vermicomposting

**Landfills** Large areas used for waste disposal are called *landfills*. Landfill is another method to manage huge amount of biodegradable as well as non-biodegradable wastes. In a landfill, garbage is buried in such a way that it does not damage the environment (Fig. 17.2). Garbage buried inside landfills stay here for a long time as it decomposes very slowly. After a landfill is full, it can be converted into a park. For example, Indraprastha Park in New Delhi is built on a landfill site.

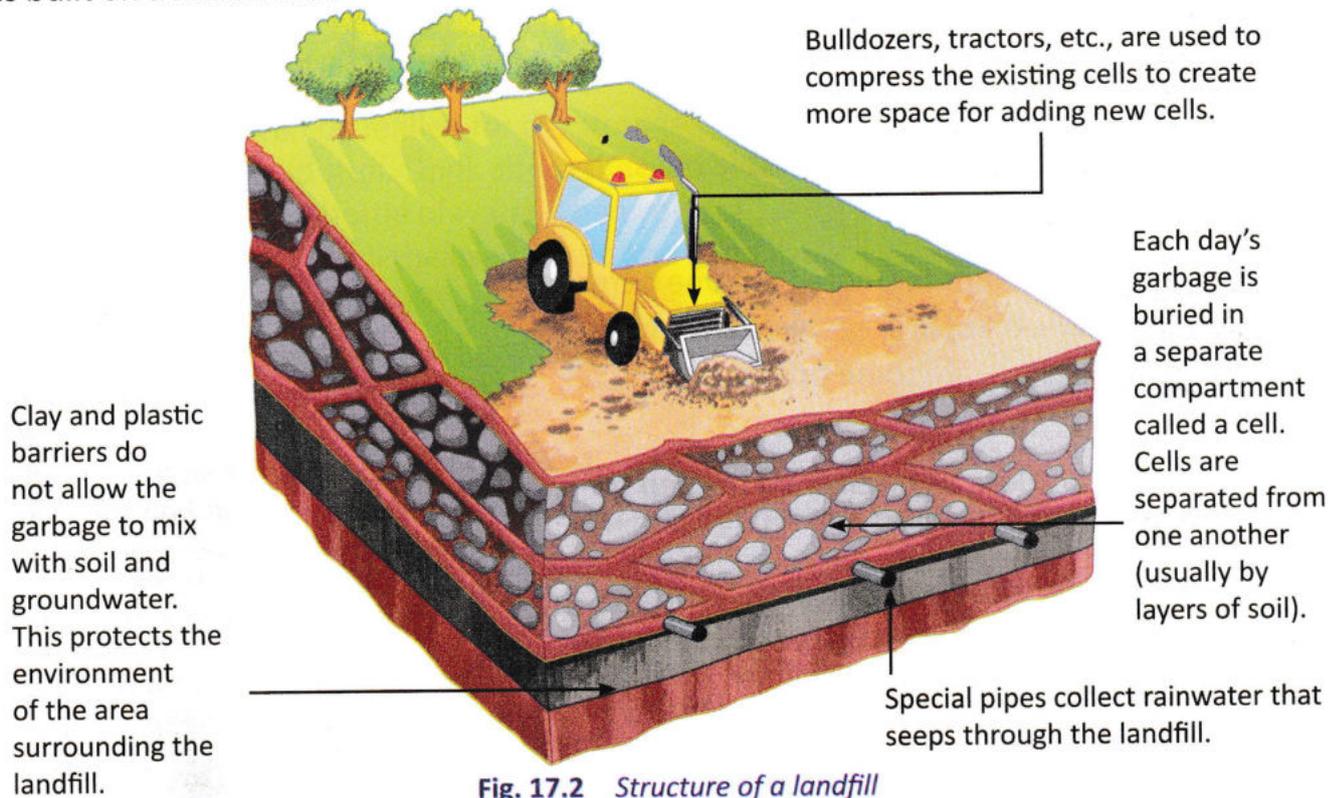


Fig. 17.2 Structure of a landfill

**Let's Remember**



Identify which of the following should be disposed of in the green bin or blue bin.

- |                          |                        |
|--------------------------|------------------------|
| 1. Soft drink cans _____ | 2. Spoilt food _____   |
| 3. Polythene bags _____  | 4. Egg shells _____    |
| 5. Plastic bottles _____ | 6. Kitchen waste _____ |
| 7. Computer parts _____  |                        |

**MANAGEMENT OF NON-BIODEGRADABLE WASTES**



As non-biodegradable wastes such as plastic bags and glass bottles cannot be broken down by decomposers, their disposal poses a big problem.

Non-biodegradable wastes can be managed by practicing the concept of 3Rs—*Reduce, Reuse, and Recycle*.

## Reduce

We need to reduce the amount of wastes generated by consuming more and throwing away less. We often buy more things than we really need. Nowadays, disposable items have become popular, for example, ballpoint pen, plastic bag, and disposable napkins. We are using them frequently without giving a thought to their hazardous effects. Here are some tips for reducing wastes.

- Use fountain pen in place of a ballpoint pen.
- Use old newspapers for packaging.
- Use cloth napkins in place of disposable ones.

## Reuse

We can reuse certain things for more than one purpose. If we reuse them for other purposes, we can help in reducing the waste. Here are some tips for reusing things.

- Small jars and bottles can be cleaned to keep some other kitchen stuffs.
- One should prefer glass bottle to metal can or plastic bottle when buying juice or soft drink. The glass bottles can be refilled.
- Old clothes can be made into other usable items such as cushion cover and handkerchief.
- Old mobile phones can be donated to friends or family.

## Recycle

The process by which waste materials are used to make new products is called *recycling*. Materials such as glass, metal, plastic, and paper are collected, separated, and recycled to make new things.

### Recycling of Plastics

Bucket, bottle, toy, shoe, bag, pen, and comb are a few things made of plastic. Use of plastics has become a major concern nowadays because they are non-biodegradable and release harmful gases upon heating or burning. They can also contaminate foodstuffs. If eaten by animals, plastics can choke and kill them. Therefore, one should reduce and reuse plastic items as far as possible. When plastic items are to be discarded, they should be recycled to make new things.

### Get it Right

**The Mobius Loop** All plastic containers with recycle logo comprising 3 chasing arrows icon with a number in middle do not necessarily indicate the recyclability of plastic. The number inside the arrows only denotes the type of resin used and not the recyclability.

### Fact File

Chor Bazaars and scrapyards of our country have been recycling smaller to larger products for a long time even before the system of recycling was officially in.

Not all the plastics generated are recycled, hence causing much damage to life on the Earth. In many places in India, plastics are totally banned seeing its adverse effects on the environment. Some of the ways to reduce, reuse, and recycle plastics are as follows.

- Paper, cotton, and jute bags should be preferred over plastic bags
- Disposable plastic containers and jars can be used to grow plants
- Empty bottles can be refilled for the storage of water or any other liquid stuff. Think about the number of times you buy a bottle of water when you are out. Instead you can fill the used bottle and carry it whenever you are out.
- Zip foils can be reused after cleaning thoroughly each time after storing foodstuffs.

### Green corner

Natureworks LLC is a company that makes plastic from corn under the brand name, Ingeo. This bioplastic can be used for manufacturing a wide variety of articles like packaging materials, bottles, clothes, furnishings, etc. This plastic is 100% biodegradable and under proper disposal conditions can turn into compost within 80 days.

### Recycling of paper

Paper is made from trees and trees are essential for our survival on the Earth. So, even if paper is biodegradable, depletion of trees at a fast pace is a big concern. Therefore, to save trees we must use paper carefully. Some ways to save paper are as follows.

- We should always write on both sides of paper sheets.
- Unused pages from old notebooks can be torn off and made into a new notebook for doing rough work and other miscellaneous work.
- We can also reuse envelopes and covers by using stickers to write new addresses.
- We can also make fresh paper from old newspapers.

By now, we know how harmful garbage accumulation can be. But, by following the 3Rs concept, we can manage the garbage generated in our surroundings so that it is beneficial to the environment.

### Fact File

If each child saves 1 sheet of paper a day, then almost 40,000 trees are saved per year by Delhi students alone.

### Let's Remember



**Write T for the true statement and F for the False one. Correct the false statements.**

1. Disposal of biodegradable wastes is a big problem since they can be decomposed.
2. Reduce, Reuse, and Recycle are the 3 R.
3. Old newspapers should be used for packaging instead of plastic wrappers.
4. Plastic bottles should be preferred over glass bottles for juices and soft drinks.
5. When plastic items are to be discarded, they should be recycled to make new things.

## Key Words

<b>Biodegradable wastes</b>	Wastes that rot by the action of decomposers are called biodegradable wastes.
<b>Non-biodegradable wastes</b>	Wastes that do not rot by the action of decomposers are called non-biodegradable wastes.
<b>Composting</b>	Recycling of organic wastes, such as vegetable peels, waste food, and leaves, by burying them in compost pits is called composting.
<b>Vermicomposting</b>	Composting with the help of a type of earthworm, called red worms, is called vermicomposting.
<b>Landfills</b>	Large areas used for waste disposal are called landfills.
<b>Recycling</b>	The process by which waste materials are used to make new products is called recycling.

## Summary

- There are mainly two types of wastes based on their ability to rot over a period of time: biodegradable and non-biodegradable wastes.
- Dead plants and animals and their products decay, whereas objects such as plastic and glass do not.
- Composting and landfills are two ways of managing solid wastes.
- By practicing the concept of 3Rs (Reduce, Reuse, and Recycle), we can manage our wastes well.

## Exercises

### LET'S UNDERSTAND



QT

### I. Objective type questions.

#### A. Fill in the blanks.

1. One should prefer \_\_\_\_\_ (plastic/paper) bags over \_\_\_\_\_ (plastic/paper) bags.
2. We should use \_\_\_\_\_ (ballpoint/fountain) pens in order to reduce wastage.
3. The \_\_\_\_\_ (green/blue) bins are used for recyclable wastes.
4. Biodegradable wastes are converted into \_\_\_\_\_ (compost/plastic) by burying them in compost pits.

## B. Choose the correct option.

- Wastes that rot by the action of decomposers are called
  - biodegradable waste
  - non-biodegradable waste
  - household waste
  - recyclable waste
- Which of the following should be put in green bin?
  - Old batteries
  - Glass bottles
  - Fruit and vegetable peels
  - Chocolate wrappers
- Which of the following is a biodegradable waste?
  - Tissue paper
  - Hair
  - Tea leaves
  - All of them
- Which of the following are used in vermicomposting?
  - Black worms
  - Brown worms
  - Tape worms
  - Red worms
- What makes the excessive usage of plastics a major concern?
  - It is non-biodegradable.
  - It is environment friendly.
  - It releases harmful gases on burning.
  - Both (a) and (c)
- Which of the following is an example of biodegradable waste?
  - Paper cup
  - Plastic cup
  - Glass bottle
  - Copper tumbler
- Which of the following organisms cannot degrade biodegradable waste?
  - Virus
  - Bacteria
  - Red worms
  - Fungi
- Which of the following is not a part of 3Rs?
  - Reduce
  - Reuse
  - Repeat
  - Recycle
- Which of the following should be put in blue bin?
  - Polythene bags
  - Old batteries
  - Chocolate wrappers
  - All of them
- What are large areas used for waste disposal called?
  - Garbage dump
  - Landfill
  - Green bin
  - Parks

## II. Very short answer type questions.

### A. Give one word for the following.

- Wastes that do not rot or decompose by the action of decomposers \_\_\_\_\_
- Recycling of organic wastes by burying them in compost pits \_\_\_\_\_
- Composting with the help of red worms \_\_\_\_\_
- Large areas used for waste disposal \_\_\_\_\_
- Process by which waste materials are used to make new products \_\_\_\_\_

## III. Short answer type questions.

- Differentiate between biodegradable and non-biodegradable wastes.
- What should be the colours of the bins for biodegradable and non-biodegradable wastes? Why should we have different bins for different types of wastes?
- Describe the concept of 3Rs that can help reduce the amount of wastes.
- Why is it important to use paper carefully? Suggest four ways to save paper.
- Suggest two tips each for reducing, reusing and recycling wastes.

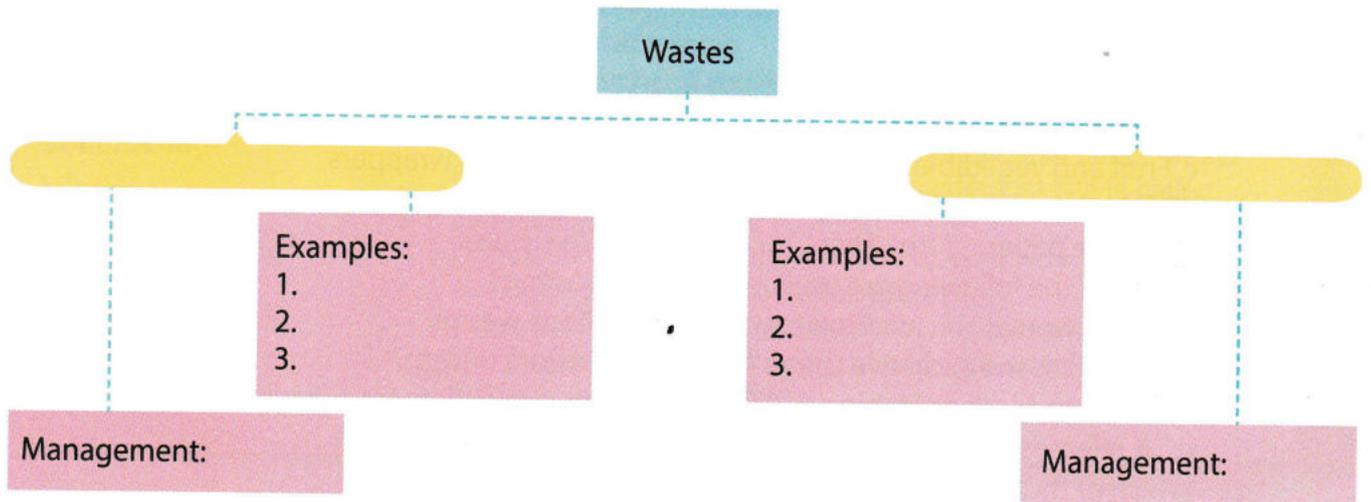
## IV. Long answer type questions.

- Explain the difference between composting and vermicomposting.
- What are landfills? Draw a well-labelled diagram for a landfill. Give one example of a landfill.
- Why it is important reduce and reuse plastic items? Suggest four ways to reduce, reuse, and recycle plastics.

**LET'S RECALL**



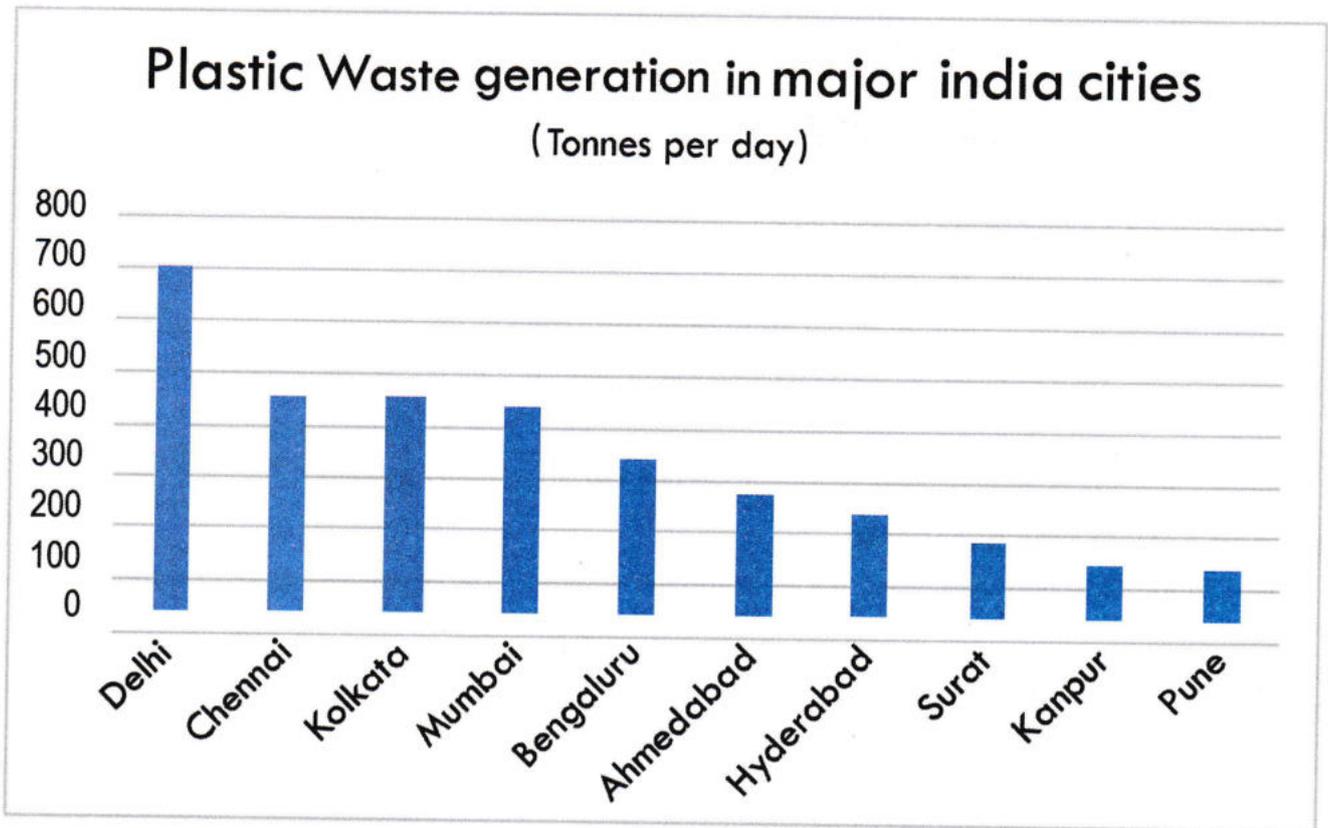
Recall and complete the concept map given below.



**LET'S OBSERVE**

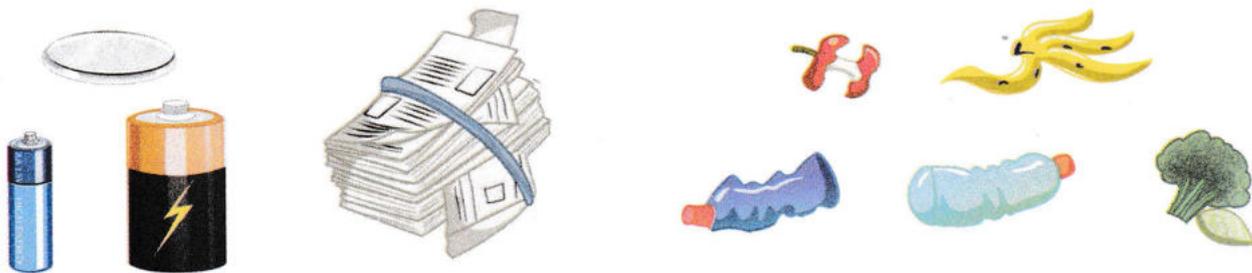


Observe the following pictures and answer the questions that follow.



- Which city produced the most plastic waste?
  - Which city produced the least plastic waste?
  - How can we reduce, reuse, and recycle plastic waste?
  - Calculate the percentage contribution of waste by the cities mentioned in the graph.

2. Match the pictures to the correct bins by drawing lines.



**LET'S CONNECT**  **COMPUTER SCIENCE**

Make a power point presentation on the topic 'Hospital Waste.' Research from the internet and include relevant information about the type and quantity of waste produced in a year and how it is disposed.

## LET'S APPLY



1. Why is it better to consume fresh fruit juice instead of buying the packaged juice from the market?

LO 4



## LET'S ANALYSE AND EVALUATE

1. Examine how the use of electronic media, such as emails, online payment of bills, e-tickets, etc., have decreased the dependence and therefore wastage of paper.
2. Evaluate the use of paper bags versus plastic bags on the following parameters -cost, durability, reusability, impact on environment and pollution.



LO 11

## LET'S CREATE



1. Make paper bags from old newspapers and use them instead of poly bags. You will need newspaper, strings/rope, glue and scissor. Follow the following steps:
  - a. Take a sheet of newspaper and fold it twice.
  - b. Glue two sides of it to make a bag.
  - c. Attach handles using old strings or ropes.

LO 12

### Web Research

- Browse the internet and do a brief research and prepare a report on management of different types of wastes to protect the environment.

<https://www.epa.gov/environmental-topics/land-waste-and-cleanup-topics>

(Checked and accessed on 13-08-2019)

<https://www.thebalancesmb.com/an-introduction-to-solid-waste-management-2878102>

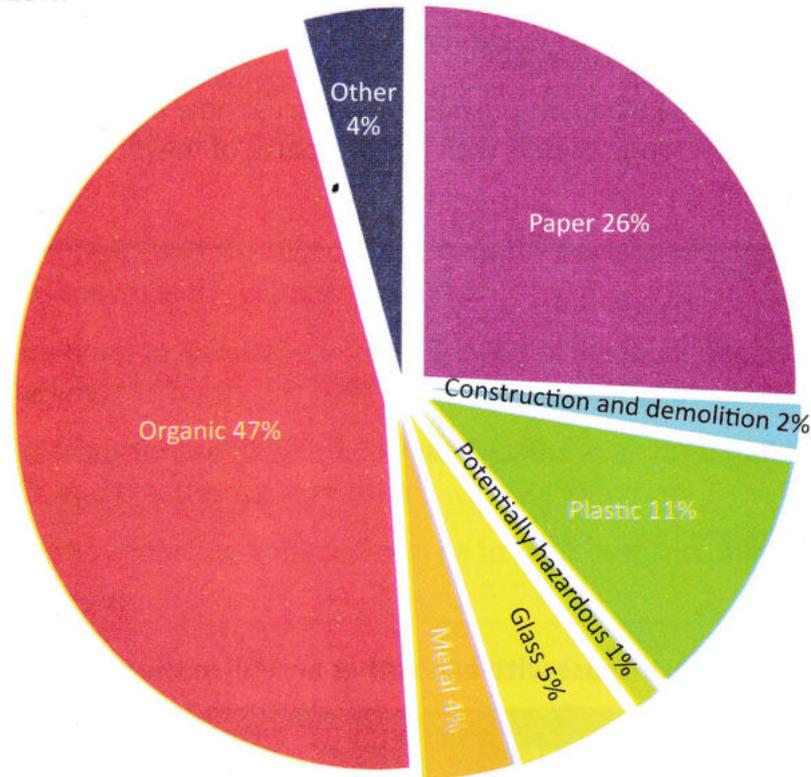
(Checked and accessed on 13-08-2019)

# Worksheet 7

## Skills assessed:

Problem solving, quantitative analysis, and qualitative analysis

The pie chart given below depicts the average percentage of different types of waste generated in households. Observe the pie chart and answer the questions that follow.



1. Identify any two types of biodegradable wastes, along with their percentage. Give any four examples of each type.  
\_\_\_\_\_  
\_\_\_\_\_
2. Identify any two types of non-biodegradable wastes, along with their percentage. Give any four examples of each type.  
\_\_\_\_\_  
\_\_\_\_\_
3. Which out of the above wastes can be recycled? Suggest one method to recycle those wastes.  
\_\_\_\_\_  
\_\_\_\_\_
4. Which categories of waste should be reduced and why?  
\_\_\_\_\_  
\_\_\_\_\_
5. Suggest four methods to reuse different types of wastes depicted here.  
\_\_\_\_\_  
\_\_\_\_\_



# SCIENCE FAIR

## Skills learnt:

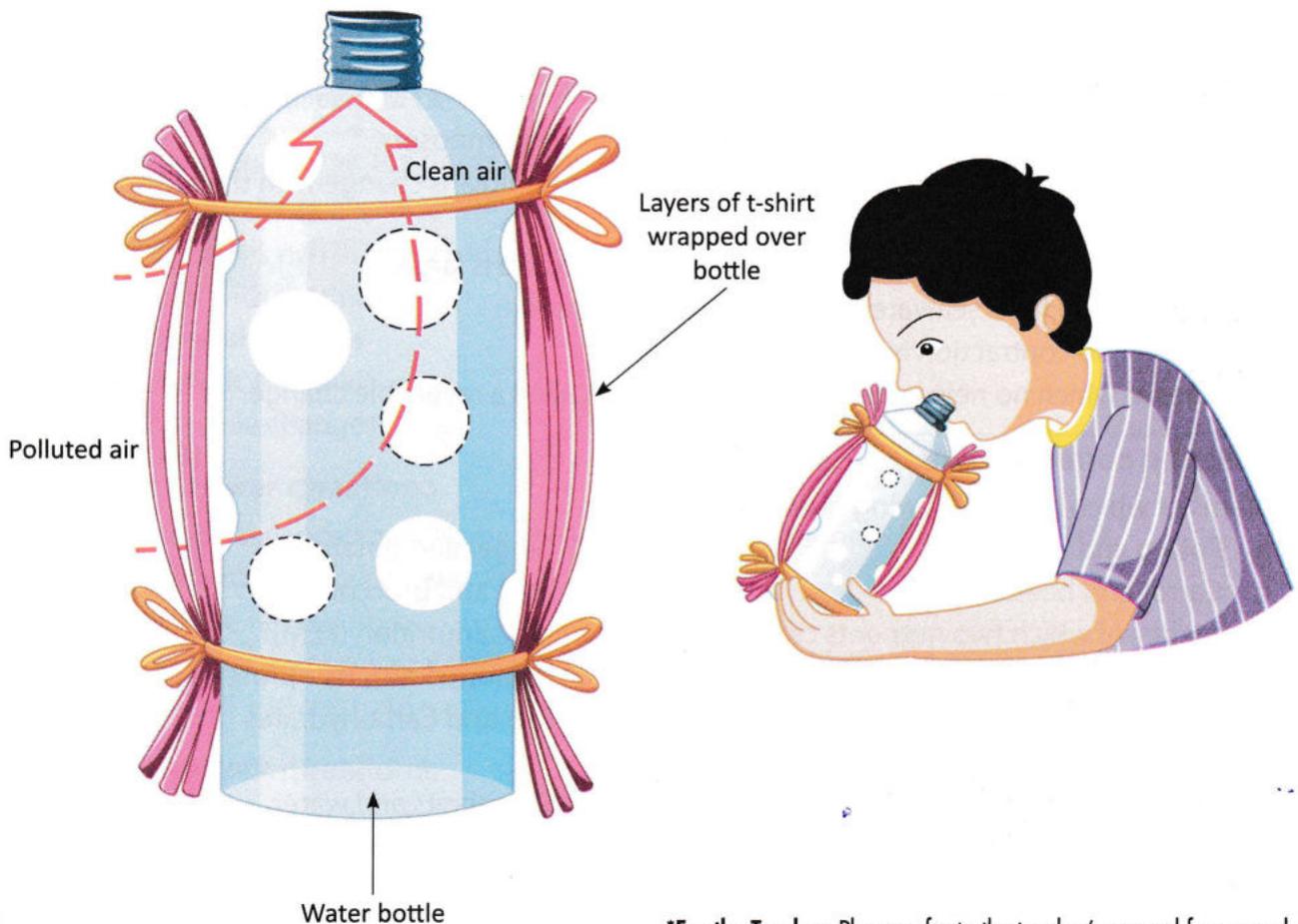
Collaborating, Communicating,  
Creating, and Critical thinking

**AIM:** To create an air mask that can filter out air pollutants from readily available materials

**Materials required:** a 500 mL plastic bottle (such as a mineral water bottle), a pair of scissors, one old but clean t-shirts, and a few pieces of strings or rubber bands

**Method:**

1. Make groups of five. Then, with the help of scissors, make few big holes in the middle section of the plastic bottle, as shown in the picture.
2. Fold the t-shirt a few times to make layers (upto 20 layers of the fabric should also do). Then wrap the folded t-shirt around the bottle. Secure it with strings or rubber band tightly to avoid any gaps.
3. The air mask is now ready for use. Unscrew the cap, breathe in air through bottle opening with the help of your mouth, and breathe out from nose.
4. In the fair, talk about how effective this mask will be to keep dust and pollutants away.



\*For the Teacher: Please refer to the teacher's manual for more details

# Semester 1 Test Paper

(Chapters 1 to 8)

Time : 3 hours  
Maximum marks: 80

## I. Fill in the blanks with correct words.

(8x1 marks)

- \_\_\_\_\_ (Scavengers/Decomposers) feed on dead plants and animals.
- \_\_\_\_\_ (Constipation/Dehydration) causes loss of salts and leads to weakness in the body.
- A group of similar cells that perform a particular function form a/an \_\_\_\_\_ (tissue/organ).
- After pollination, the ovary swells to form a \_\_\_\_\_ (seed/fruit).
- Banana leaves have \_\_\_\_\_ (parallel/reticulate) venation.
- The particles of the insoluble solid should be \_\_\_\_\_ (bigger/smaller) than the holes in the filtering device.
- Melting of butter is an example of \_\_\_\_\_ (reversible/irreversible) change.
- A taut wire, on \_\_\_\_\_ (expansion/contraction) in winters, can snap.

## II. Write T for the true statement and F for the false one. Correct the false statement(s).

(9x2 marks)

- Squirrels have sharp canines in each jaw.
- Lack of iron in our food over a long period causes of time goitre.
- The money plant has climbing roots.
- Animals can make their own food, and are thus called decomposers.
- The body temperature of most reptiles, insects, and amphibians change with the outside temperature.
- Handpicking is preferred when the quantity of the mixture is large.
- Salt is separated from seawater by the method of filtration.
- Expansion and contraction is maximum in solids.
- Changes in which no new substances are formed is called a reversible change.

## III. Choose the correct option.

(8x1 marks)

- Stems of which of the following plants are eaten?
  - Potato and carrot
  - Ginger and potato
  - Carrot and beetroot
  - Mint and broccoli
- Deficiency of which two nutrients causes Protein Energy Malnutrition (PEM)?
  - Proteins and fats
  - Carbohydrates and proteins
  - Dietary Fibre
  - Fats and Carbohydrates
- Biotic components include
  - air, water, and plants
  - Soil, plants and water
  - air, water, and soil
  - plants and animals
- Which of these is not a female part of the flower?
  - Stamen
  - Stigma
  - Pistil
  - Style

5. Which of these refers to the process by which living things utilize oxygen to release energy stored in the food they eat?
  - a. Excretion
  - b. Respiration
  - c. Reproduction
  - d. Growth
6. Which of the following is a physical change?
  - a. Burning of a candle
  - b. Ripening of fruits
  - c. Cutting of vegetables
  - d. Curdling of milk
7. Which of the following is a reversible change?
  - a. Ice melting
  - b. Baking a cake
  - c. Candle burning
  - d. None of them
8. Electric wires are never hung tautly between poles because taut wires can snap due to
  - a. contraction in winters
  - b. expansion in summers
  - c. expansion in winters
  - d. contraction in summers

**IV. Give one/two word(s) for each of the following. (9x1 mark)**

1. The process of soaking seeds, draining the water, and leaving them untouched till they germinate \_\_\_\_\_
2. Disease caused due to long term deficiency of iodine in the diet \_\_\_\_\_
3. The process of separating cotton fibres from its seeds \_\_\_\_\_
4. The bottom most layer of the soil \_\_\_\_\_
5. The measure of how hot or cold something is \_\_\_\_\_
6. Loss of water through leaves \_\_\_\_\_
7. A change where a new substance is formed \_\_\_\_\_
8. A solution that can dissolve no more of the solute \_\_\_\_\_
9. A change that cannot be reversed \_\_\_\_\_

**IV. Give two examples for each of the following. (6x2 mark)**

1. Dairy products \_\_\_\_\_
2. Food items rich in dietary fibres \_\_\_\_\_
3. Plants with tendrils \_\_\_\_\_
4. Chemical changes \_\_\_\_\_
5. Magnetic materials \_\_\_\_\_
6. Reversible changes \_\_\_\_\_

**VI. Short answer questions. (5x2 marks)**

1. Define a balanced diet. Name the food groups that should be included in it.
2. Differentiate between weaving and knitting
3. What are natural fibres? Give two examples.
4. How do scavengers and decomposers help in the recycling of nutrients?
5. How will you separate a mixture of salt and sand?

**VII. Long answer questions. (5x3 marks)**

1. With the help of examples, describe how different plant parts serve as sources of food.
2. Discuss the functions of any four vitamins, their sources and symptoms of their deficiency.
3. State three characteristics each of solids, liquids, and gases.

# Semester 2 Test Paper

(Chapters 9 to 17)

Time : 3 hours  
Maximum marks: 80

## I. Fill in the blanks with correct words.

(7x1 marks)

1. An earthworm's body is made up of several parts called \_\_\_\_\_ (segments/tentacles).
2. Mangroves are found in \_\_\_\_\_ (boreal forests/swamps).
3. Watering crops by artificial means is called \_\_\_\_\_ (agriculture/irrigation).
4. Gas with highest percentage in air is \_\_\_\_\_ (oxygen/nitrogen).
5. \_\_\_\_\_ (0.003%/0.03%) of the Earth's water is easily available to us as fresh water.
6. The SI unit of length is \_\_\_\_\_ (metres/inch).
7. Rubber and wood are \_\_\_\_\_ (attracted/not attracted) to magnets.

## II. Write T for the true statement and F for the false one. Correct the false statement(s).

(9x2 marks)

1. Fish have fins but no backbone, which helps them to swim.
2. Coral reefs are rock-like structures made from the skeletons of small oceans.
3. Millimetre is an appropriate unit to measure the distance between two cities.
4. Green bins are used for non-biodegradable waste.
5. A bath in a tub uses the least amount of water.
6. Lack of food in a region is called drought.
7. If we bring two magnetic poles close to each other, we will find that like poles repel and unlike poles attract each other.
8. Pure water is transparent.
9. Since paper is biodegradable, depletion of trees is not a big concern.

## III. Choose the correct option.

(7x1 marks)

1. Name the type of joint found in the knee
  - a. pivot joint
  - b. hinge joint
  - c. ball-and-socket joint
  - d. gliding joint
2. Which of these features helps the leaves of lotus plants from rotting?
  - a. They have hollow stems.
  - b. Leaves have air chambers
  - c. Leaves are large in size
  - d. Leaves have a waxy coating
3. Which of these execute rotational motion?
  - a. An oscillating pendulum
  - b. A train moving on a straight track
  - c. The blades electric ceiling fan when it is working
  - d. A bird gliding in the sky
4. A box with a tiny hole on one of its sides can act as a
  - a. pinhole camera
  - b. mirror
  - c. source of light
  - d. All of the above

5. Abnormally long period of insufficient or no rainfall is called \_\_\_\_\_.  
 a. flood                      b. epidemic      c. famine                      d. drought
6. Cloud is a cluster of \_\_\_\_\_.  
 a. Water vapour              b. steam              c. tiny droplets of water      d. fog
7. Which of these gases is required for photosynthesis?  
 a. oxygen                      b. nitrogen              c. carbon dioxide              d. water vapour

**IV. Give one/two word(s) for each of the following. (9x1 marks)**

1. A special structure that can be filled with air or emptied to help a fish move up and down in water \_\_\_\_\_
2. The area where a particular organism naturally lives \_\_\_\_\_
3. The seasonal mass movement of animals from one region to another \_\_\_\_\_
4. Special organs for respiration in fish \_\_\_\_\_
5. The addition of harmful gases and substances in air \_\_\_\_\_
6. Large areas for waste disposal \_\_\_\_\_
7. Magnets that retain their properties for a long period of time \_\_\_\_\_
8. A material that completely blocks the light falling on it \_\_\_\_\_
9. Wastes that rot by the action of decomposers \_\_\_\_\_

**IV. Give two examples for each of the following. (6x2 mark)**

1. Ball-and-socket joints \_\_\_\_\_
2. Animals found in temperate forests \_\_\_\_\_
3. Things that can be composted \_\_\_\_\_
4. Non-biodegradable waste \_\_\_\_\_
5. Standard units of length \_\_\_\_\_
6. Uses of magnets \_\_\_\_\_

**V. Short answer questions. (6x2 marks)**

1. How do snakes move?
2. Define habitat. Name the five major habitats on the Earth.
3. On what kinds of surfaces can we see images?
4. List the basic conditions needed for an electric current to flow.
5. Discuss any two ways by which we can conserve water.
6. Describe any two ways to save paper.

**VII. Long answer questions. (5x3 marks)**

1. Describe with the help of examples, how the different kinds of joints bring about movement in different places of the human body.
2. How are clouds formed?
3. Differentiate between a shadow and an image of an object.