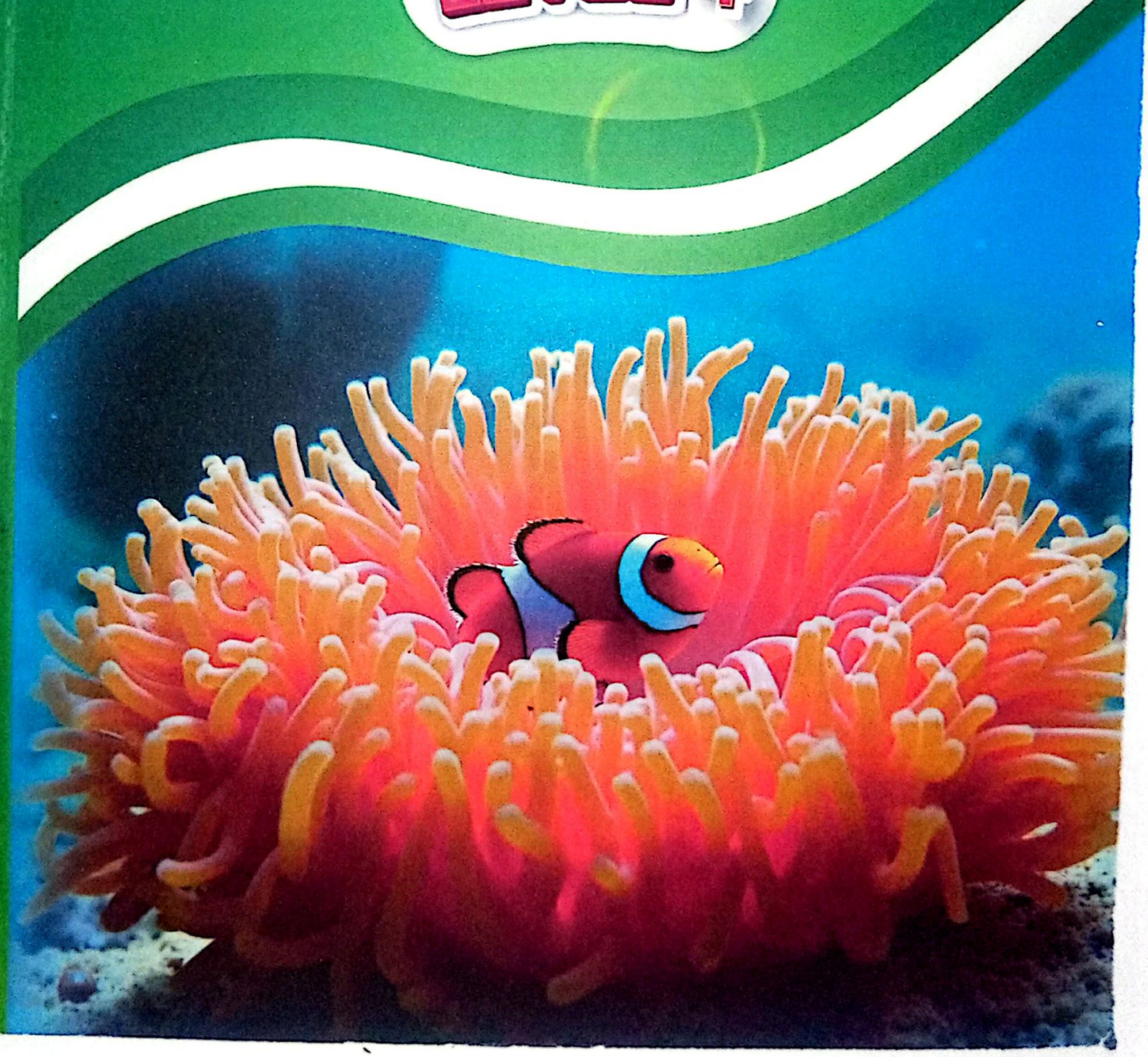
WORLD'S KEY

COMMON CORE State Standards

# Science

## LEVEL 4



WORLD'S KEY

SCIENCE • LEVEL 4

WORLD'S KEY

# SCIENCE

## LEVEL 4

2024

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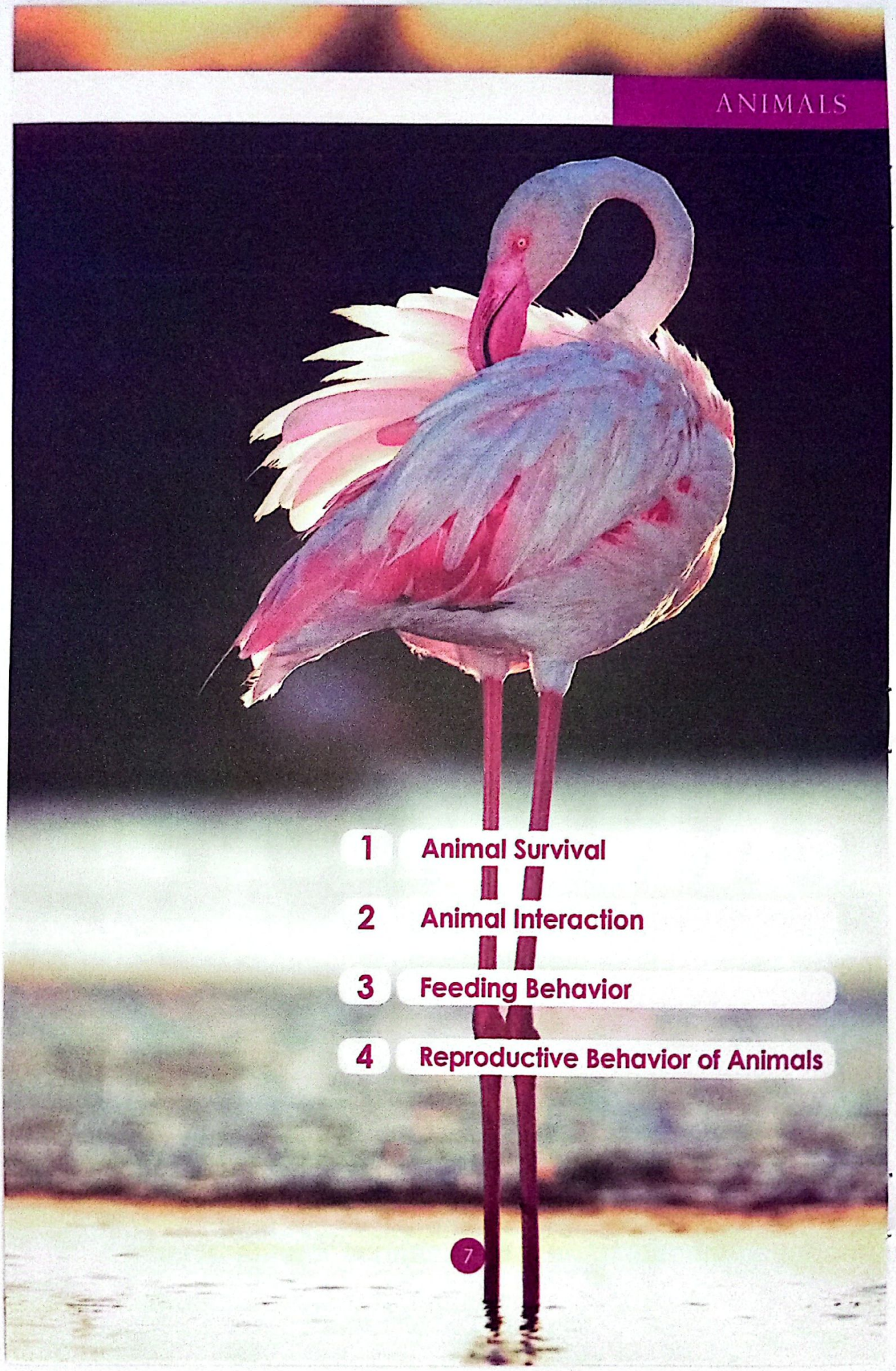
162 PROJECTS



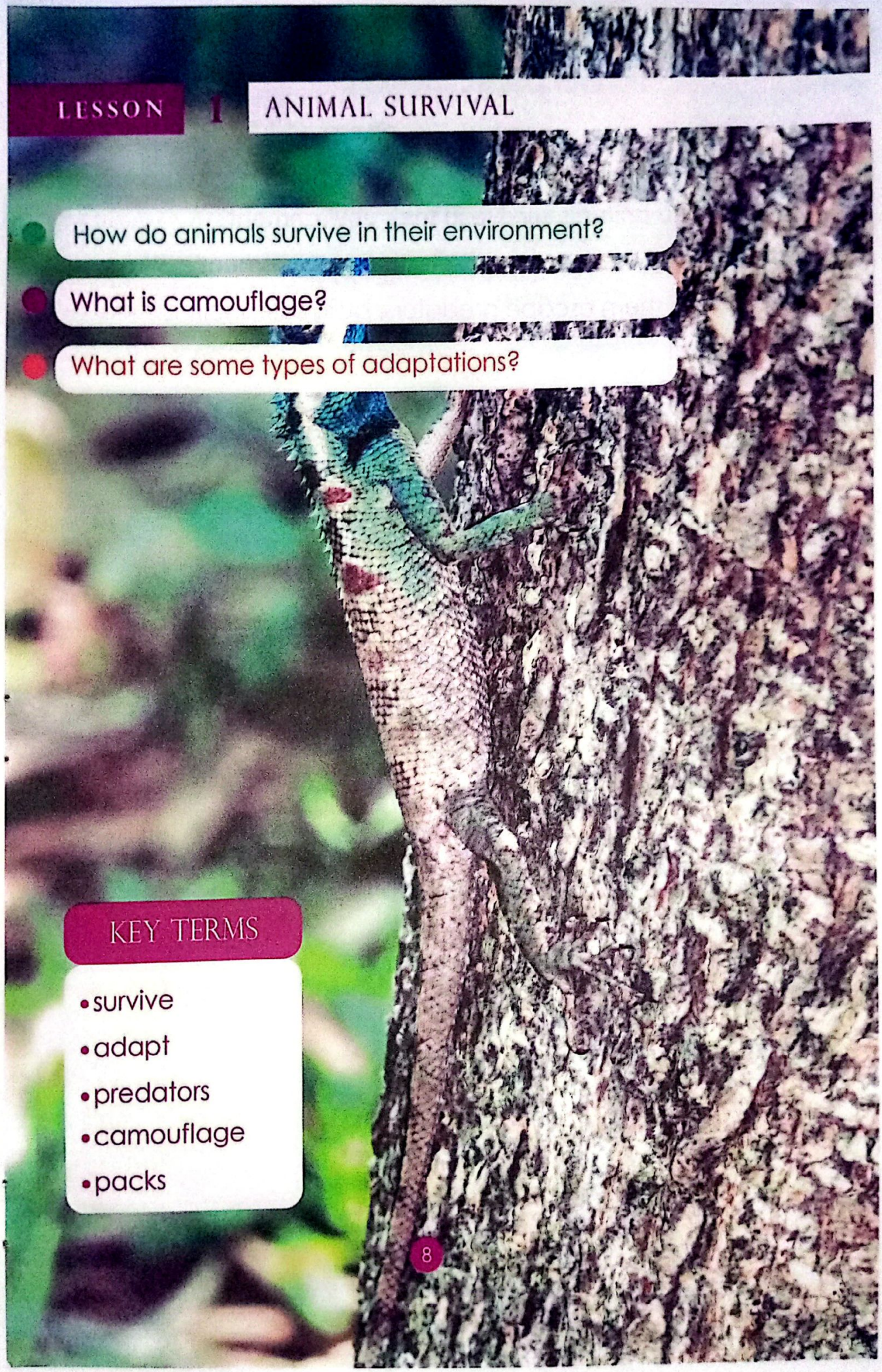
WORLD'S KEY

UNIT 1

# ANIMALS



1 Animal Survival
2 Animal Interaction
3 Feeding Behavior
4 Reproductive Behavior of Animals



LESSON 1

# ANIMAL SURVIVAL

- How do animals survive in their environment?
- What is camouflage?
- What are some types of adaptations?

## KEY TERMS

- survive
- adapt
- predators
- camouflage
- packs

## How do animals survive in their environment?

Animals survive by adapting to their environment in ways that help them escape predators, build safe shelters, and find food.

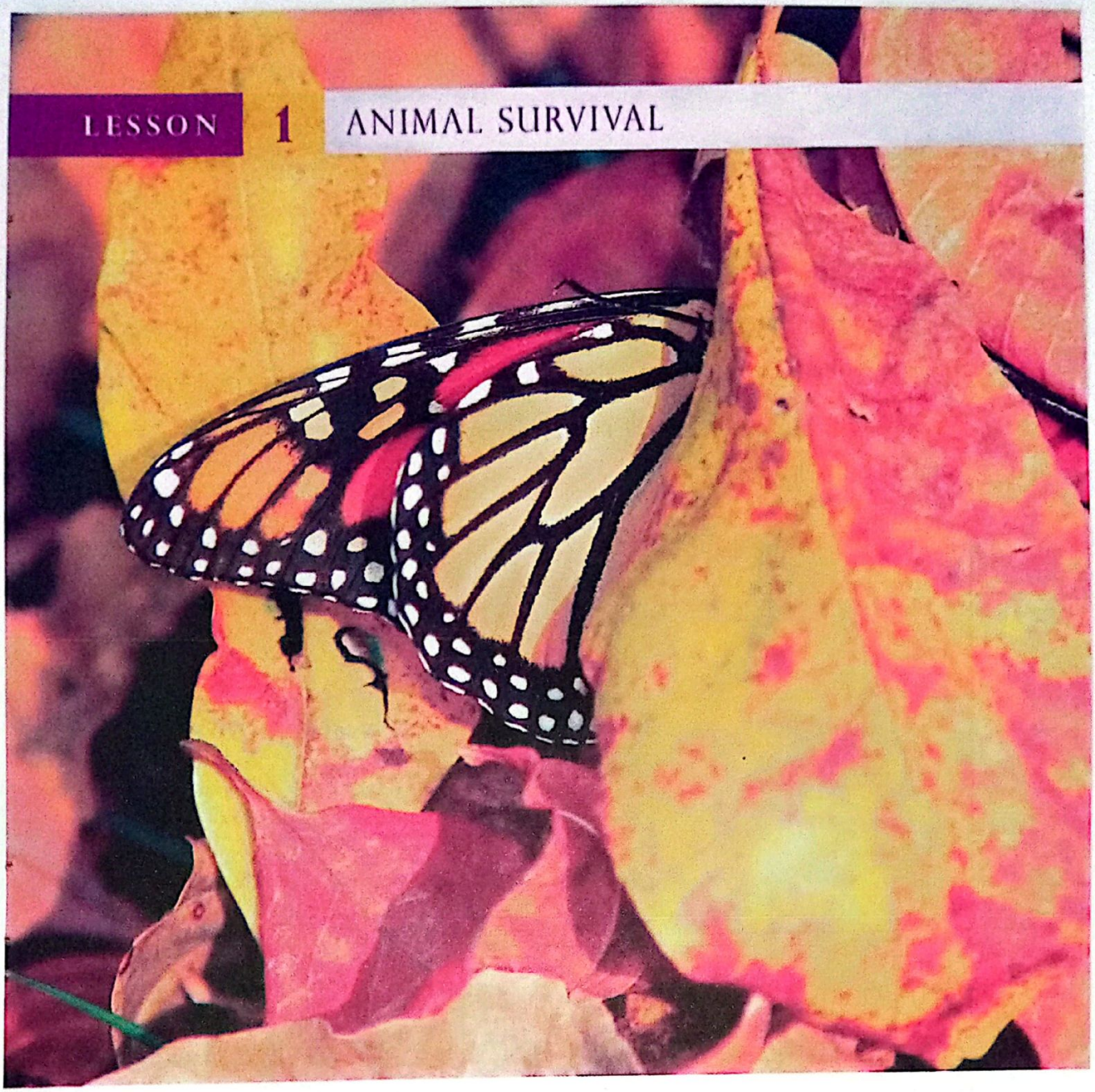






Rabbits survive the winter by growing white fur all over their bodies. They use this fur to blend into their snowy surroundings and withstand severe cold.





LESSON 1 ANIMAL SURVIVAL

## What is camouflage?

Some butterflies blend into their surroundings to avoid being seen by birds. This type of adaptation is called camouflage. Protecting their young is another aspect of animal survival.

## What are some types of adaptations?

Animals build shelters to live in. These shelters protect them from predators. For example, woodpeckers make holes in dead trees to build their nests. They use these nests to protect their young.



Some animals live in groups called packs to survive better. Such a way of living enables animals, such as wolves, to hunt more effectively and helps buffalo avoid predators.



## A Write true or false. Then correct the false statement(s).

Animals never adapt to their environment.

Rabbits have white fur to withstand severe hot environments and blend into them.

Shelters, such as nests, protect animals from predators.

Animals living in groups avoid predators and hunt better.

Camouflage is a type of adaptation used by animals to escape predators.

## B Tick (✓) the correct answer.

1. Wolves live in packs to ..... better.

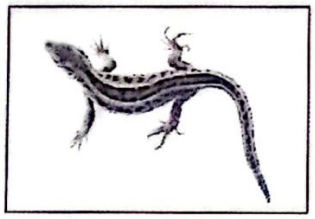
○ survive ○ sleep ○ hide

2. Animals adapt to their surroundings to escape ..... .

○ predators ○ prey ○ shelters

**C Match each animal to the environment where it can best survive through camouflage.**







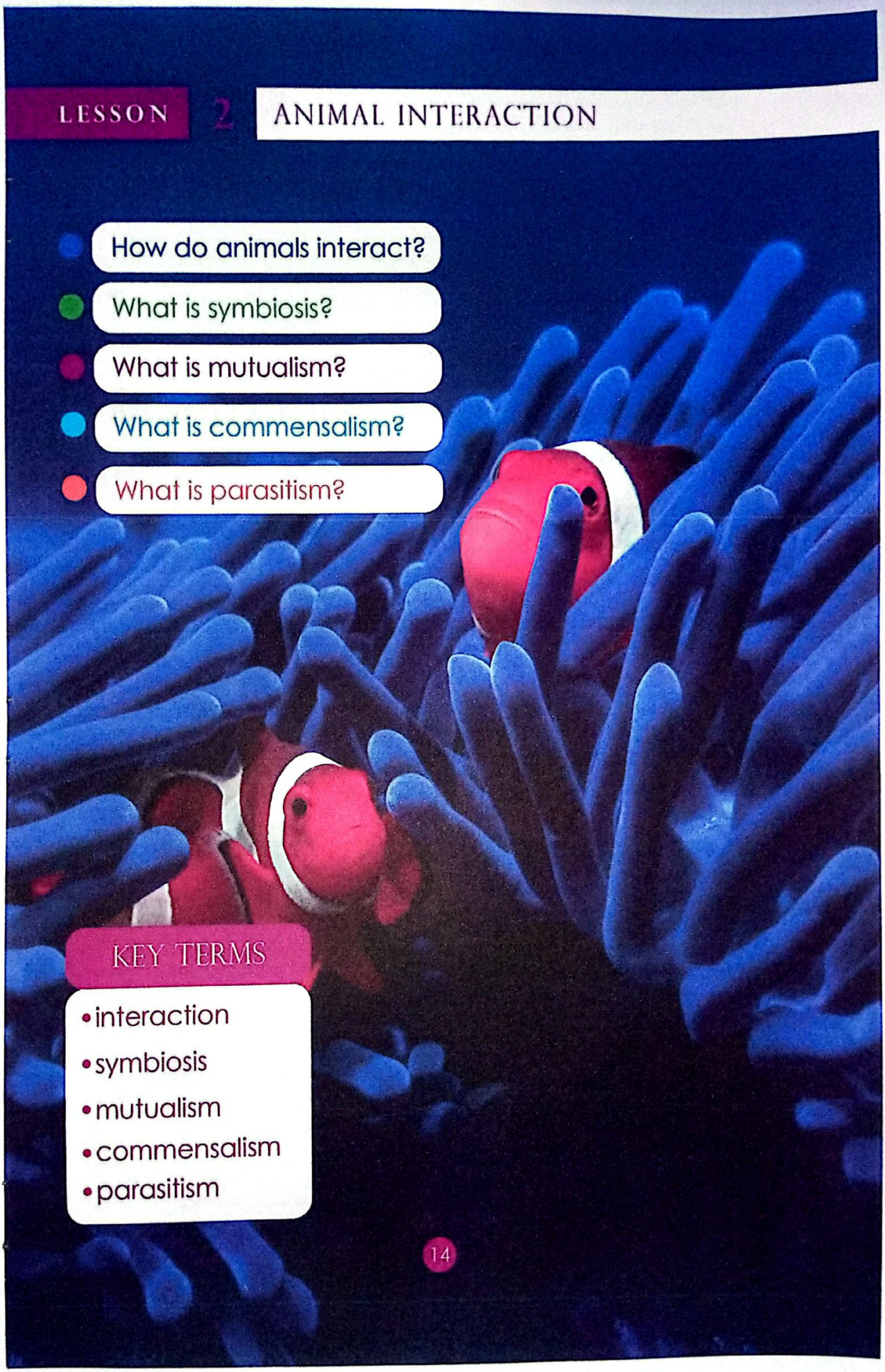

**D Fill in the following table with the required information.**

| Picture | Animal's Name | Characteristic | Importance |
|---|---|---|---|
|  | ..... | has long, powerful legs | ..... |
|  | ..... | stores water in its bloodstream | ..... |
|  | ..... | changes its fur to white during winter | ..... |

LESSON 2

# ANIMAL INTERACTION

- How do animals interact?
- What is symbiosis?
- What is mutualism?
- What is commensalism?
- What is parasitism?

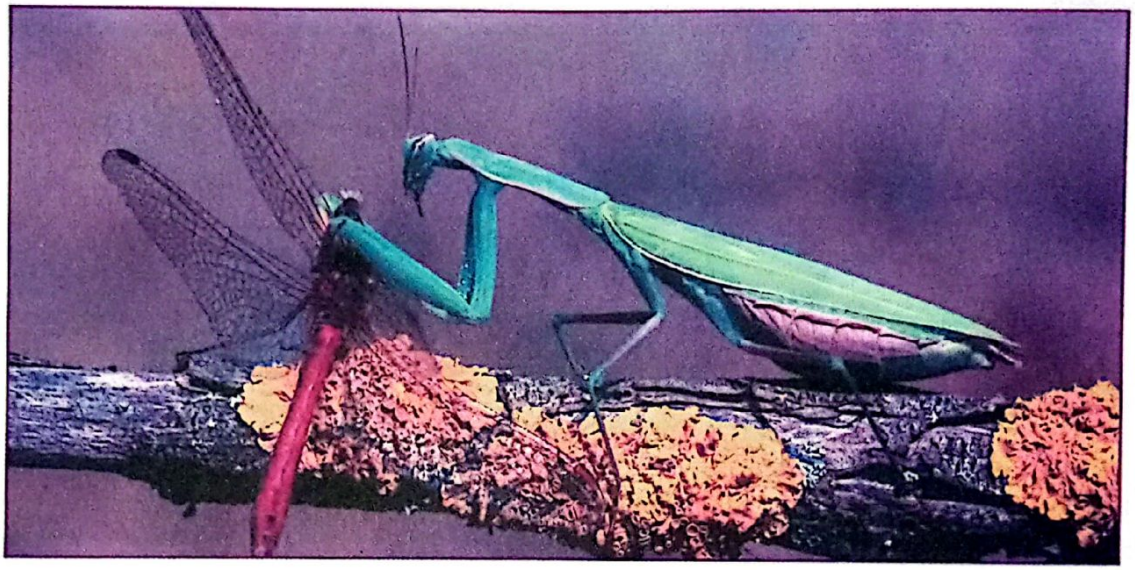


## KEY TERMS

- interaction
- symbiosis
- mutualism
- commensalism
- parasitism

## How do animals interact?

Most animals interact with their surroundings through their specialized systems, which mainly consist of their brains and sense organs. For instance, a mantis uses its antennae to detect an insect, sends olfactory signals to the brain to interpret, and then extends its powerful hands to capture it.



A chameleon uses its eyes to detect an insect, sends visual signals to the brain to interpret, and then extends its long, viscous tongue to trap it.



## What is symbiosis?

Animals interact with each other to survive. This interaction is called symbiosis.

There are three types of symbiosis: mutualism, commensalism, and parasitism.

In **mutualism**, two animals benefit from each other, such as the sea anemone and the clownfish.

The sea anemone offers protection to the clownfish, while the clownfish, in turn, lures other fish to approach the sea anemone. Another example is when the oxpecker eats the insects stuck on the rhino's back while using it as a shelter.



In **commensalism**, one animal benefits, while the other neither benefits nor gets harmed. One example is when the shrimp hides within the spines of the sea urchin, gaining protection against predators. Another example is the hermit crabs that live in shells, abandoned by snails.





In **parasitism**, one animal benefits, while the other is harmed. One example is when the cuckoo lays its eggs in the nest of the dunnock. The cuckoo chicks hatch, grow in size, and push away the dunnock chicks. Another example is when the isopod sucks blood from the body of the coney fish.





## Ⓐ Write true or false. Then correct the false statement(s).

In commensalism, only one animal benefits.

---

In parasitism, one animal benefits, while the other is harmed.

---

The rhino and the oxpecker symbiosis is parasitism.

---

In mutualism, two animals benefit from each other.

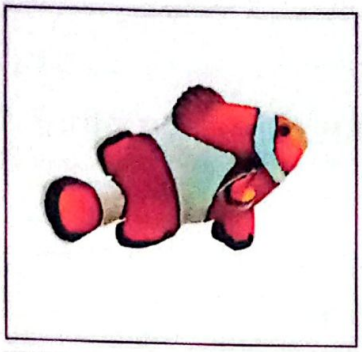
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## Ⓑ Fill in the table with the correct examples.

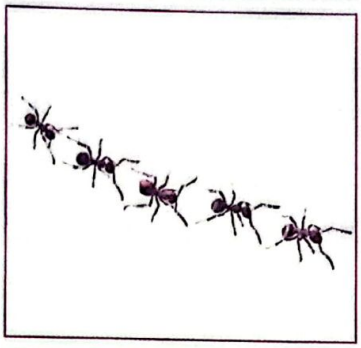
- The sea anemone and the clownfish
- The shrimp and the sea urchin
- The cuckoo and the dunnock
- The rhino and the oxpecker
- The hermit crab and the snail
- The isopod and the coney fish

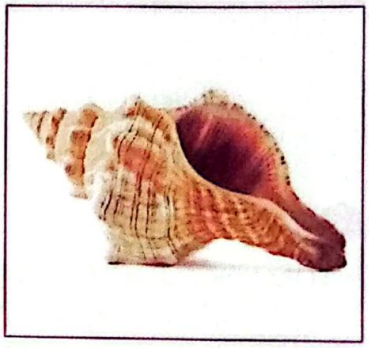
| Mutualism | Commensalism | Parasitism |
|---|---|---|
| ..... | ..... | ..... |
| ..... | ..... | ..... |
| ..... | ..... | ..... |
| ..... | ..... | ..... |

## C Match each animal to its symbiotic partner.

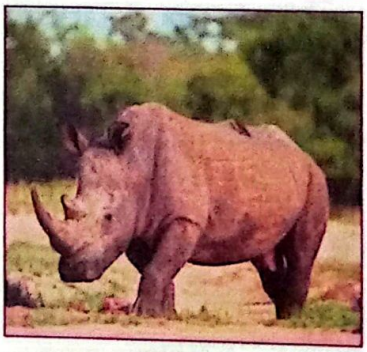


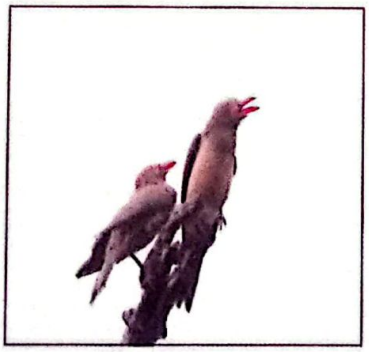














# LESSON 3 FEEDING BEHAVIOR

- What is feeding behavior?
- How do animals hunt from a hide?
- What are the different types of feeding behaviors?
- How do the senses help in hunting?



## KEY TERMS

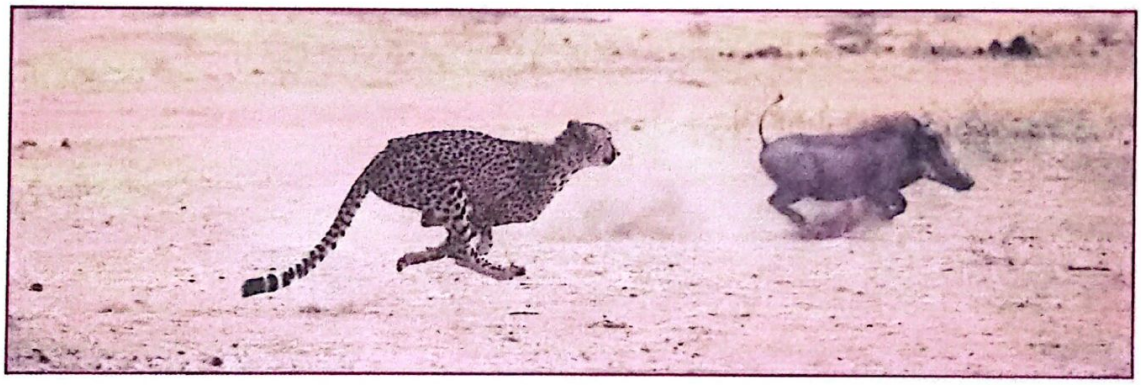
- feeding behavior
- hunt
- prey
- senses

## What is feeding behavior?

Living things need food for their growth and survival. In order to get food, they depend on feeding behavior, which is a specific method that differs from one animal to another.

## How do animals hunt from a hide?

Animals hunt in various ways. For example, a cheetah, the world's fastest animal, sneaks up on its prey upon spotting it. When the cheetah gets as close as possible to the prey, it runs very fast to chase and catch it.



Lions, tigers, and leopards also hunt in a similar manner.

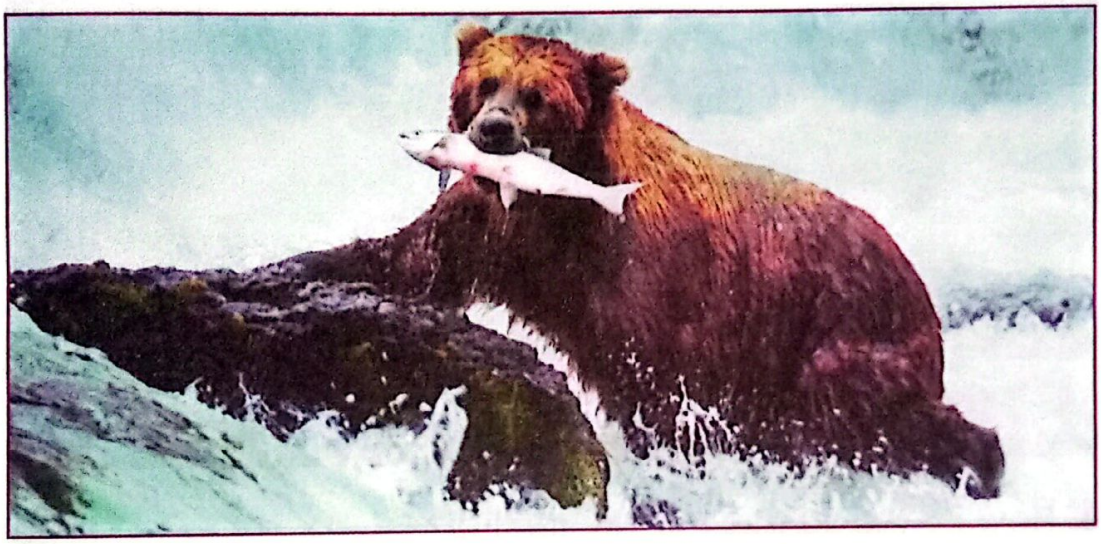






## What are the different types of feeding behaviors?

Some animals hunt by waiting for their prey to get close to them. For example, the brown bear sits in the river waiting for salmon. When it senses the fish in the water, it quickly strikes it with its paws and bites it with its sharp teeth.



A spider places its legs on its web, waiting for prey to get trapped. As the web threads vibrate, the spider moves toward the prey and eats it.





## How do the senses help in hunting?

The mechanism of hunting is highly specialized in animals that use different senses to catch their prey.

When a falcon spots its prey, it flies toward it to capture and kill it with its beak and claws.

Animals, like bats, depend on hearing. Some animals, like sharks, depend on smell. Others, like snakes, use thermal signals.

## LESSON 3 FEEDING BEHAVIOR

**A Write true or false. Then correct the false statement(s).**

_____ All animals hunt from a hide.

_____

_____ The brown bird waits for fish to get close to it.

_____

_____ The falcon spots its prey with its keen hearing.

_____

_____ Snakes depend on thermal signals to catch their prey.

_____

**B Indicate the feeding behavior of each animal.**

**1.** A leopard hides in the bush, waiting for its prey.

_____

**2.** A spider traps its prey in its web.

_____

**3.** A crocodile waits for its prey in the river.

_____

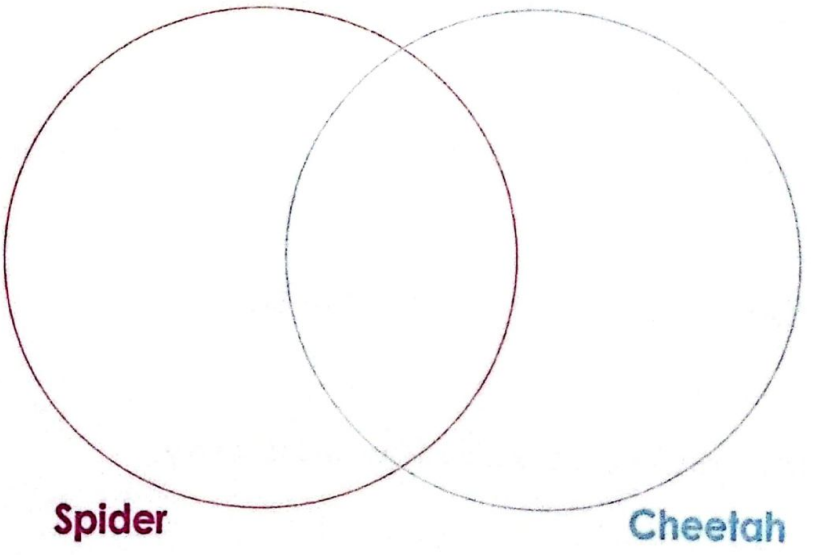
**4.** A cheetah sneaks up quickly toward its prey.

_____

**C Complete the following table with the sense used by each animal to detect its prey.**

| Animal | Sense |
|---|---|
| Falcon | |
| Bat | |
| Shark | |
| Lion | |

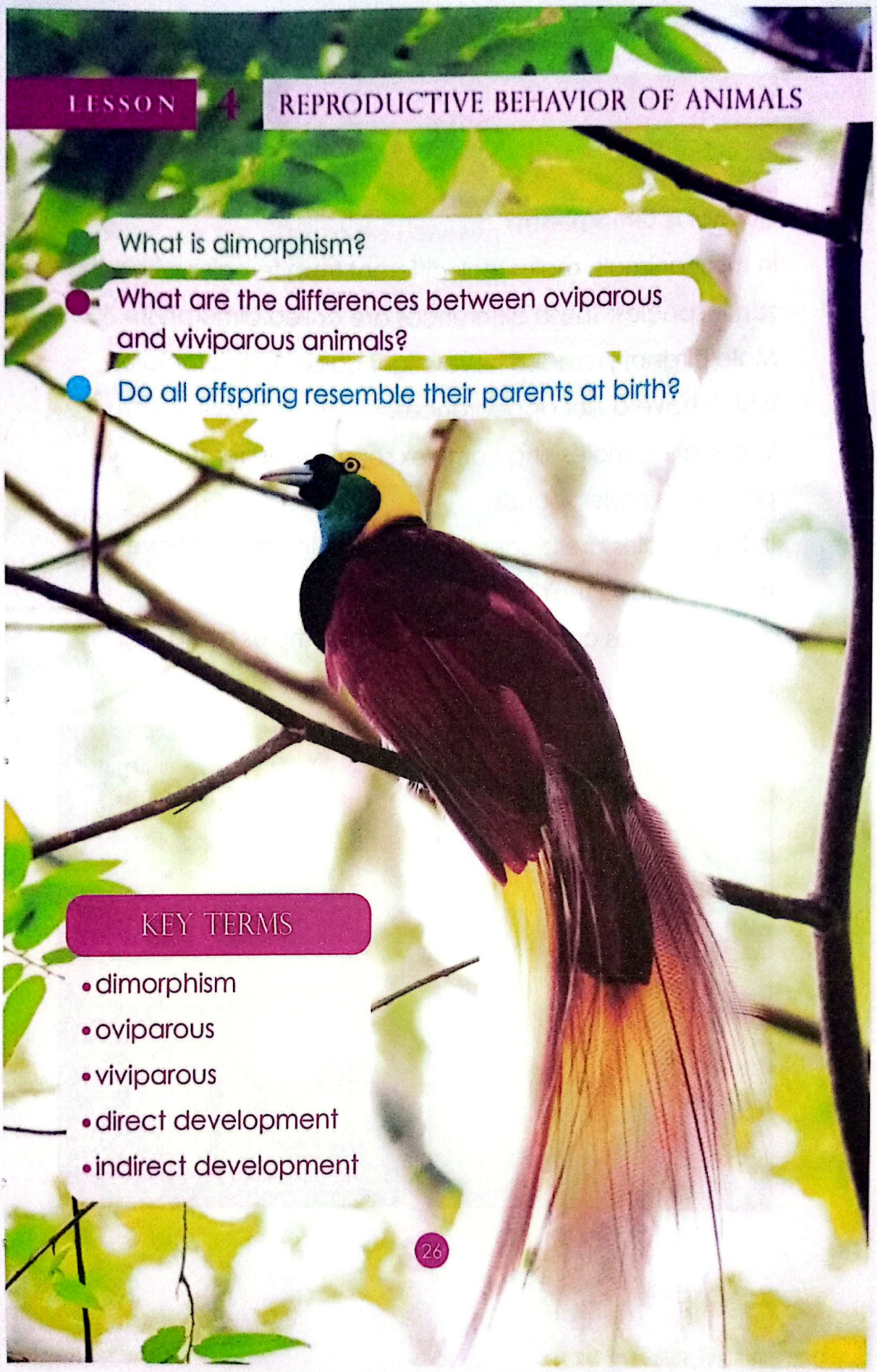
**D Fill in the Venn diagram to compare and contrast the feeding behaviors of the spider and the cheetah.**



LESSON 4

# REPRODUCTIVE BEHAVIOR OF ANIMALS

- What is dimorphism?
- What are the differences between oviparous and viviparous animals?
- Do all offspring resemble their parents at birth?



## KEY TERMS

- dimorphism
- oviparous
- viviparous
- direct development
- indirect development

## What is dimorphism?

In most animals, males look different from females within the same species. These differences are called dimorphism.

Male birds of paradise have bright colors, unlike females which have duller appearances.

In canaries, males sing complex songs, while females produce simpler sounds.

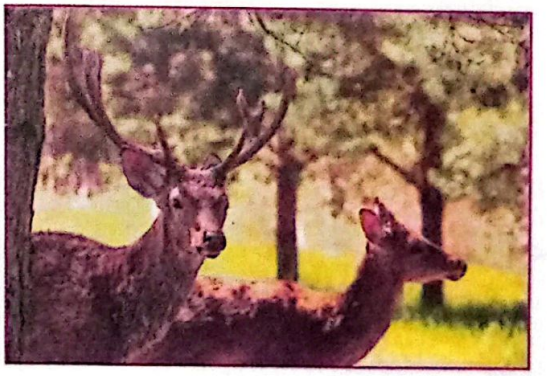
In lions, males are bigger than females in size and have manes around their necks.

In deer, males are distinguished from females by having large antlers.







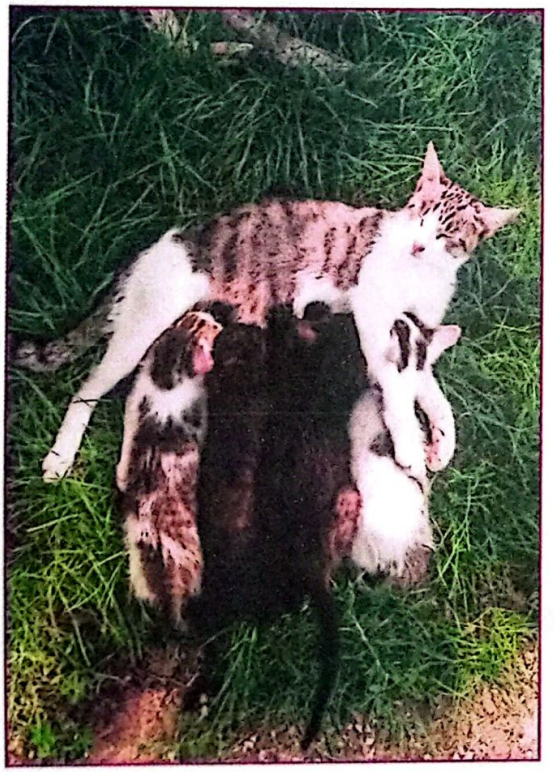


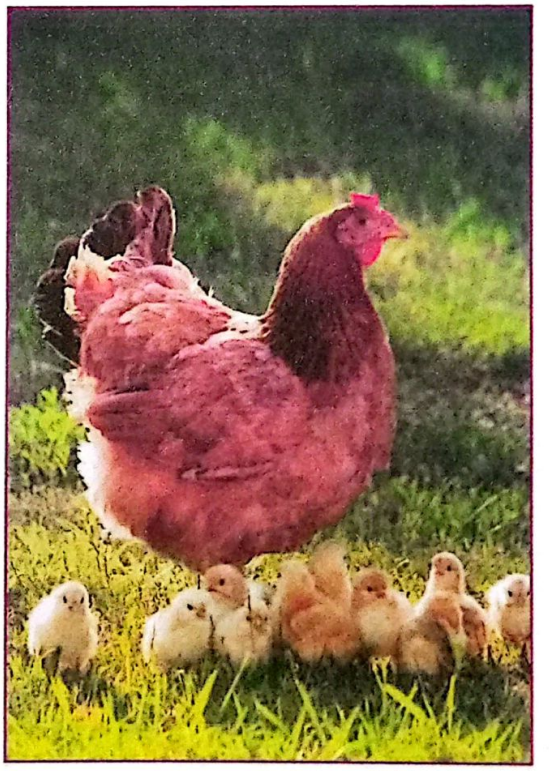
## What are the differences between oviparous and viviparous animals?

Most animals reproduce through sexual reproduction. Some animals are viviparous, while others are oviparous.

Viviparous animals, including all mammals, give birth to their young, nurse, and care for them.

Oviparous animals lay eggs, and the young hatch from these eggs. Some oviparous animals, such as hens and crocodiles, take care of their young, while others, like snakes and marine turtles, neglect them.





## Do all offspring resemble their parents at birth?

Some offspring resemble their parents at birth. This process is known as direct development. Tigers, cows, and birds undergo direct development.





Other offspring do not resemble their parents at birth. This process is called indirect development. Butterflies, frogs, and dragonflies undergo indirect development.





# LESSON 4 REPRODUCTIVE BEHAVIOR OF ANIMALS

**A Write true or false. Then correct the false statement(s).**

In most animals, males look different from females.

_____

Female lions are bigger than male lions.

_____

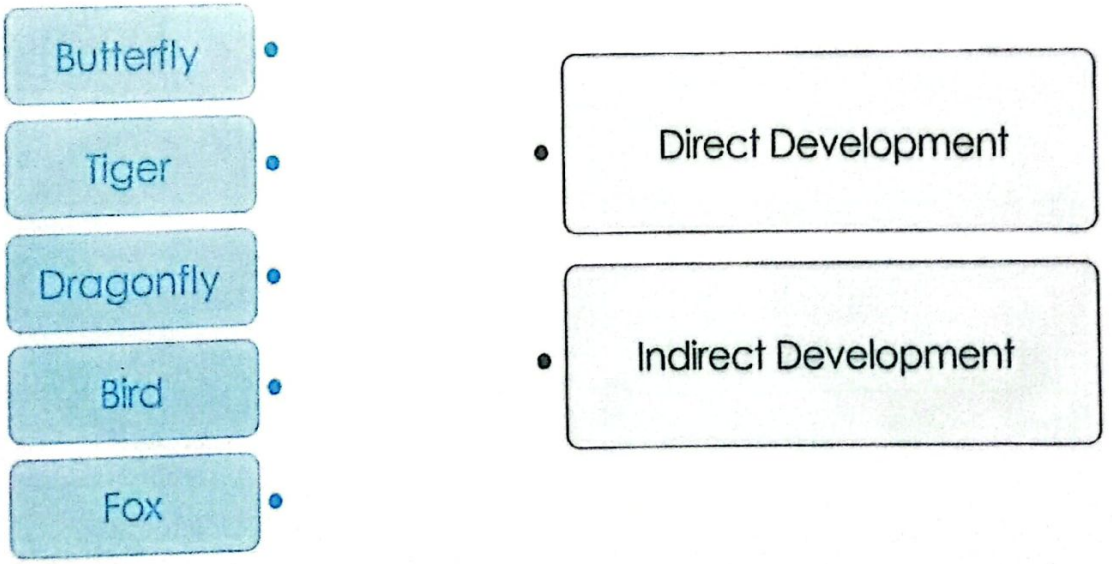
Cow offspring resemble their parents at birth.

_____

Frogs undergo indirect development.

_____

**B Match each animal to its suitable development.**

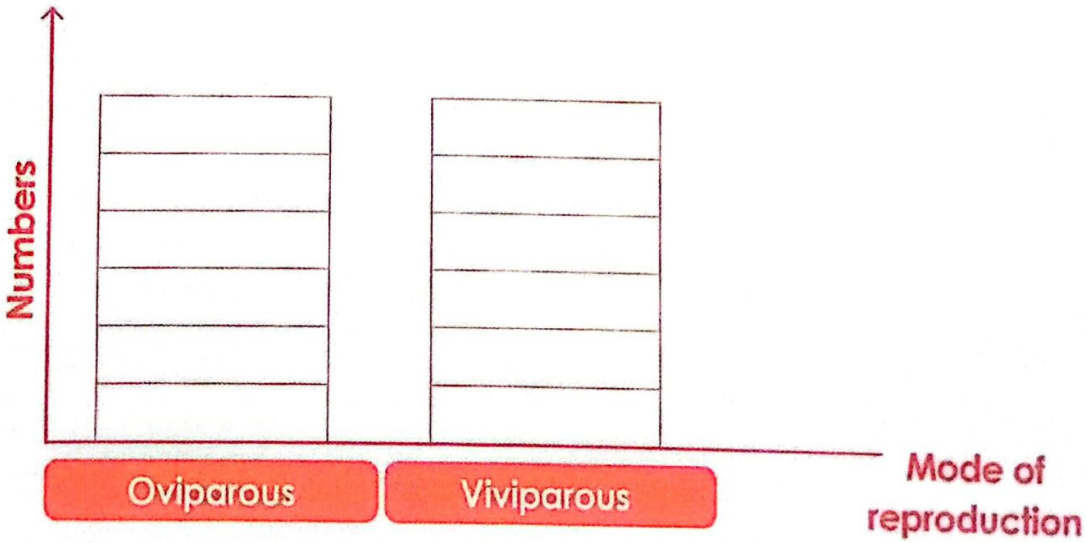


**1. Classify the animals listed in the word box as oviparous or viviparous.**

frog - cow - chicken - elephant - cat - crocodile - turtle - octopus - dog - deer

| Oviparous | Viviparous |
|---|---|
| | |
| | |
| | |
| | |
| | |

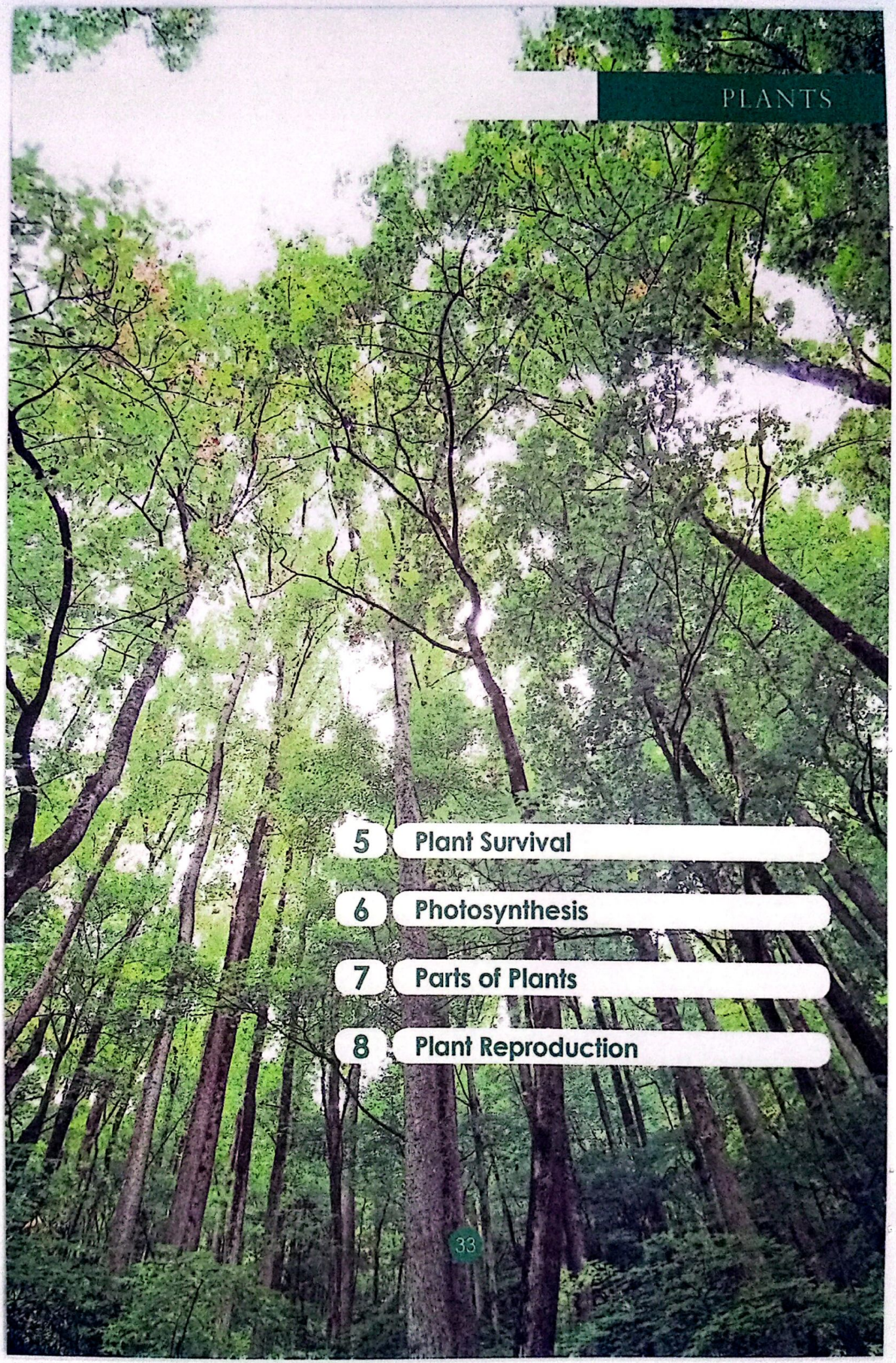
**2. Classify the animals listed above in the bar graph below.**



WORLD'S KEY

UNIT 2

# PLANTS



5 Plant Survival
6 Photosynthesis
7 Parts of Plants
8 Plant Reproduction



# LESSON 5 PLANT SURVIVAL

- What is plant adaptation?
- How do plants adapt in grasslands?
- How do plants adapt in deserts?
- How do conifers adapt to Arctic weather?
- How does the Venus flytrap adapt?

## KEY TERMS

- adaptation
- survival
- cacti
- grasslands
- desert
- conifers
- Arctic weather
- Venus flytrap

## What is plant adaptation?

Adaptation is a special feature that allows a plant to live in a particular place and acquire unique properties.
For instance, cacti do not live in polar regions, nor do tall trees thrive in grasslands.





## How do plants adapt in grasslands?

In grasslands, plants have narrow leaves that require a small amount of water and widespread roots to absorb water during dry conditions.

### How do plants adapt in deserts?

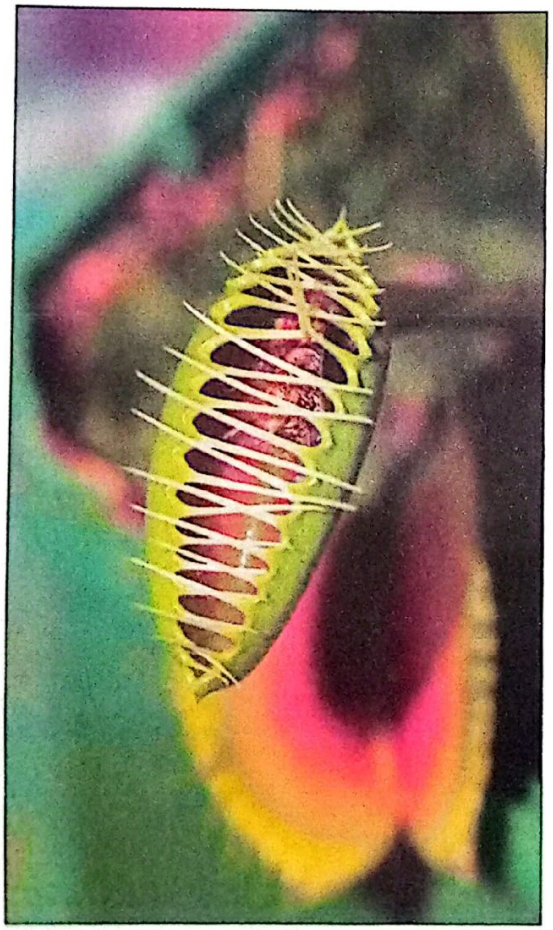
Cacti are plants that thrive in deserts, which are characterized by extreme dryness and often high temperatures with low rainfall throughout the year. To adapt to such harsh conditions, cacti store water in their waxy stems, shed their leaves to reduce water loss during photosynthesis, and develop very deep roots and spines to prevent animals from eating them.





### How do conifers adapt to Arctic weather?

Conifers, such as cedars and pines, thrive in cold climates. They have needle-like leaves that help them survive severe cold temperatures.



### How does the Venus flytrap adapt?

The Venus flytrap adapts to living in soil with very few nutrients. It maintains its nutrients by consuming insects and frogs through its leaves that act as traps. When a fly approaches the plant, its leaf closes, trapping the fly and later digesting it.

**A Write true or false. Then correct the false statement(s).**

Grassland plants have widespread roots.

Cacti store water in their waxy leaves.

Cedar trees have needle-like leaves to adapt to high temperatures.

Venus flytraps can eat insects.

**B Match each plant to its suitable habitat.**







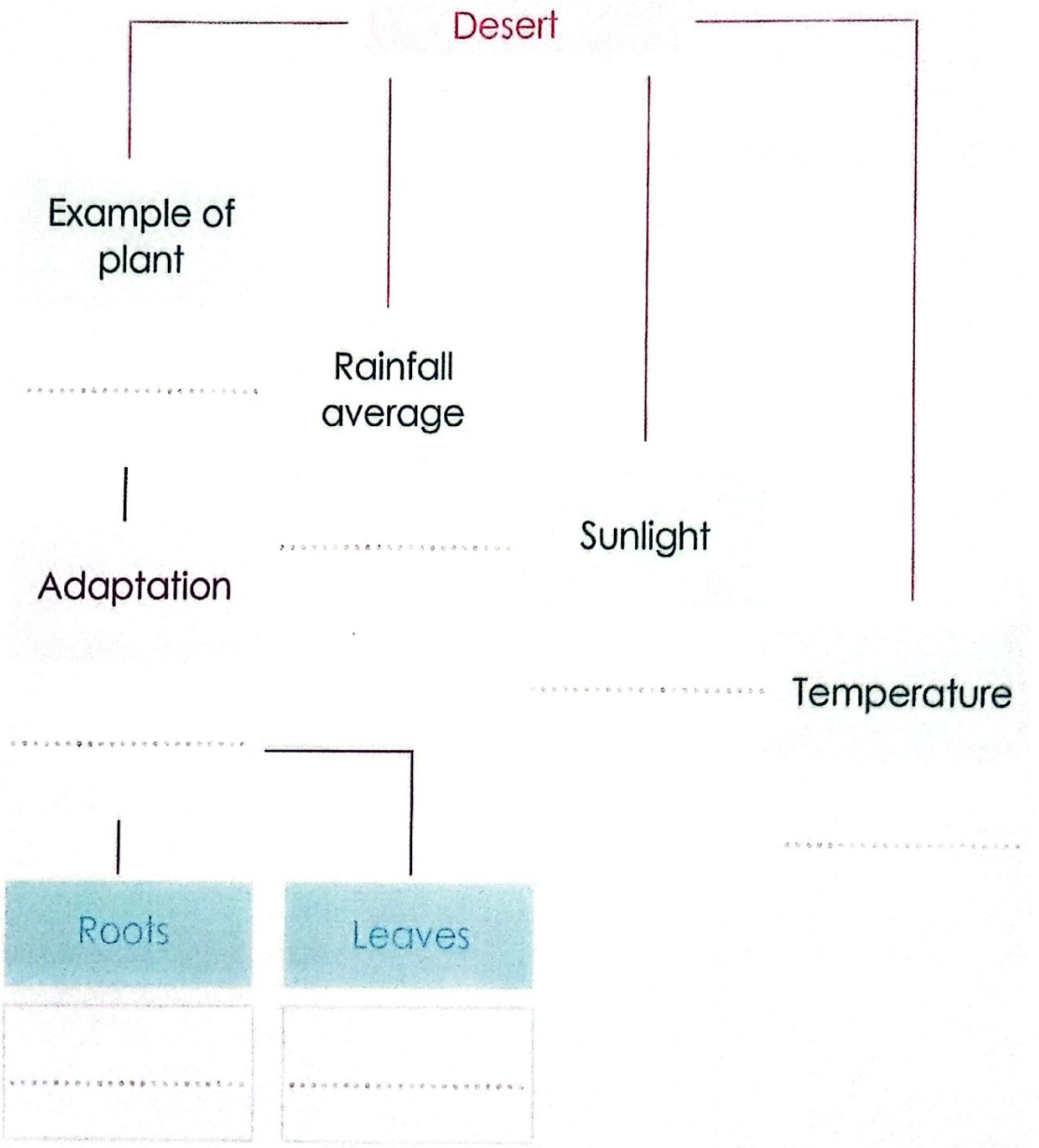


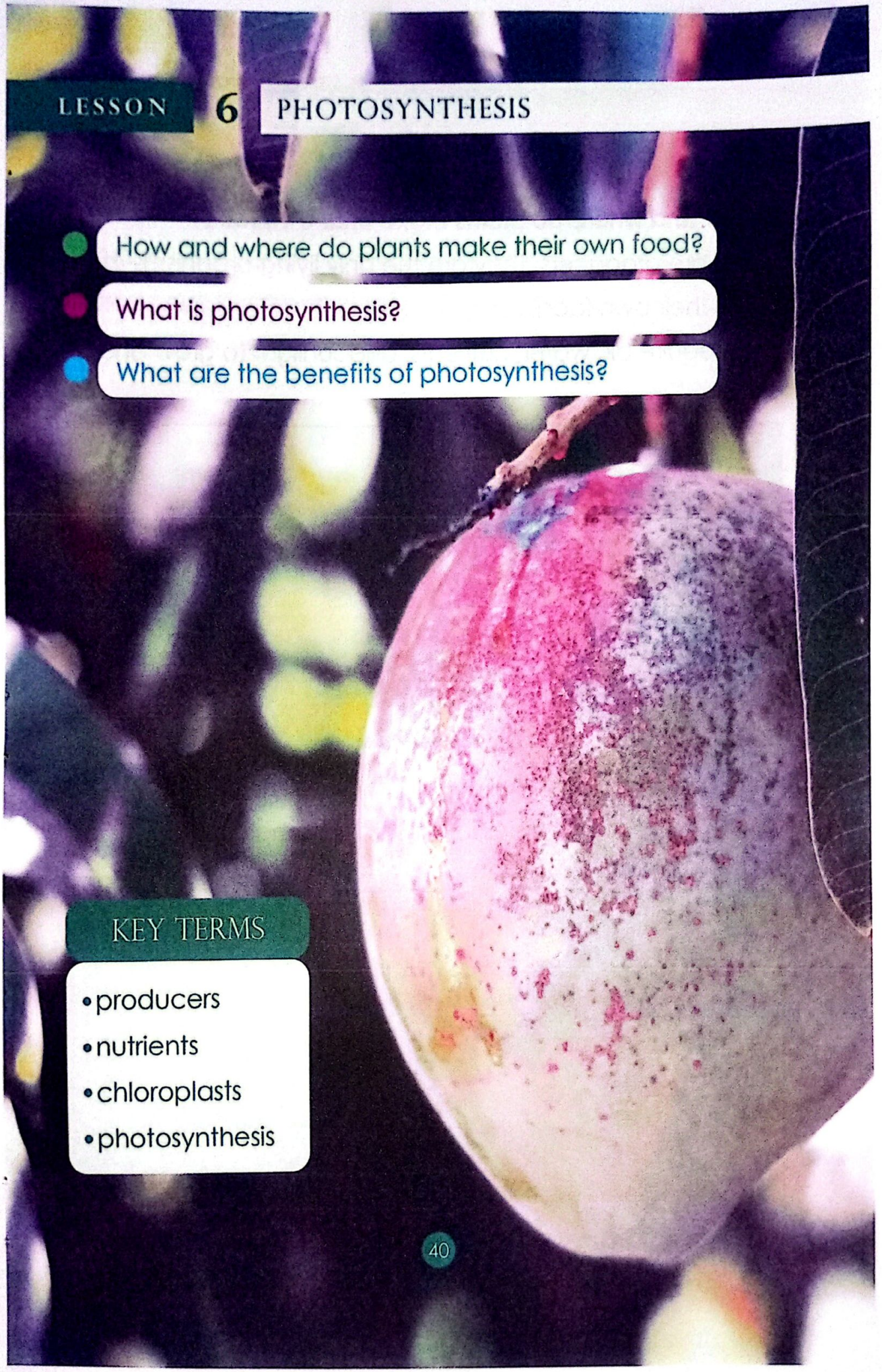




**C Fill in each box below with the correct information using the words provided in the word box.**

cactus - low - high - hot - dry climate - deep - spines





LESSON 6

# PHOTOSYNTHESIS

- How and where do plants make their own food?
- What is photosynthesis?
- What are the benefits of photosynthesis?

## KEY TERMS

- producers
- nutrients
- chloroplasts
- photosynthesis

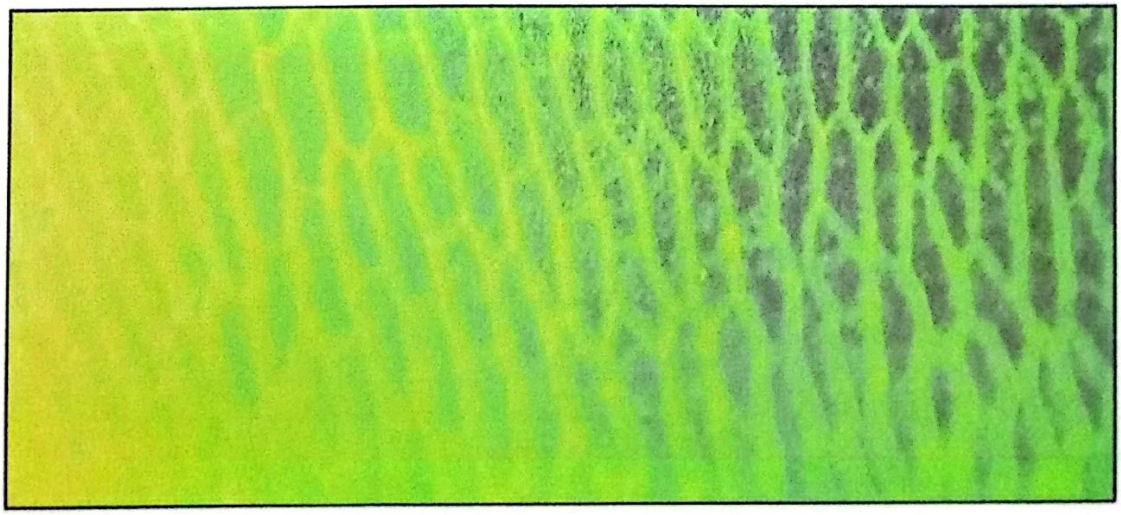
## How and where do plants make their own food?

Plants are producers. They are the only living organisms that make their own food.

They require air, water, nutrients, and sunlight to grow and survive.



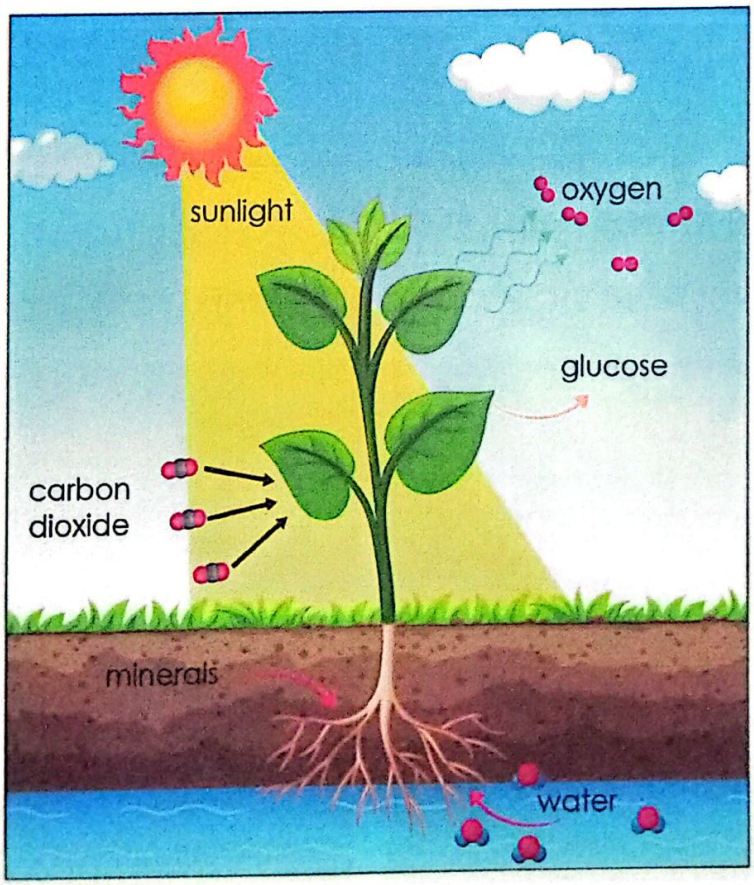
Plants contain little green structures called chloroplasts. Chloroplasts are factories in which plants make food.



## What is photosynthesis?

The process through which plants make their own food is called photosynthesis. In most plants, photosynthesis occurs mainly in the plants' leaves.

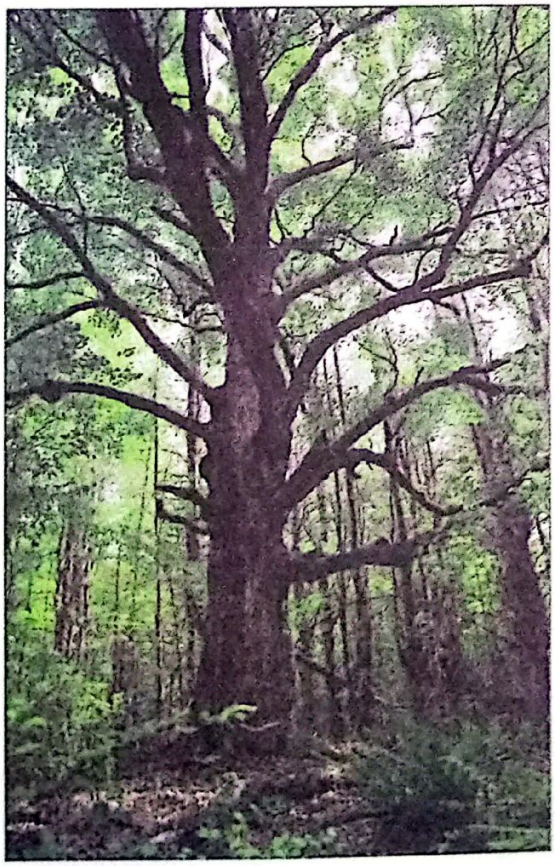
During photosynthesis, plants use water and carbon dioxide to make food, such as glucose and starch, and produce oxygen. This process takes place in the presence of sunlight.

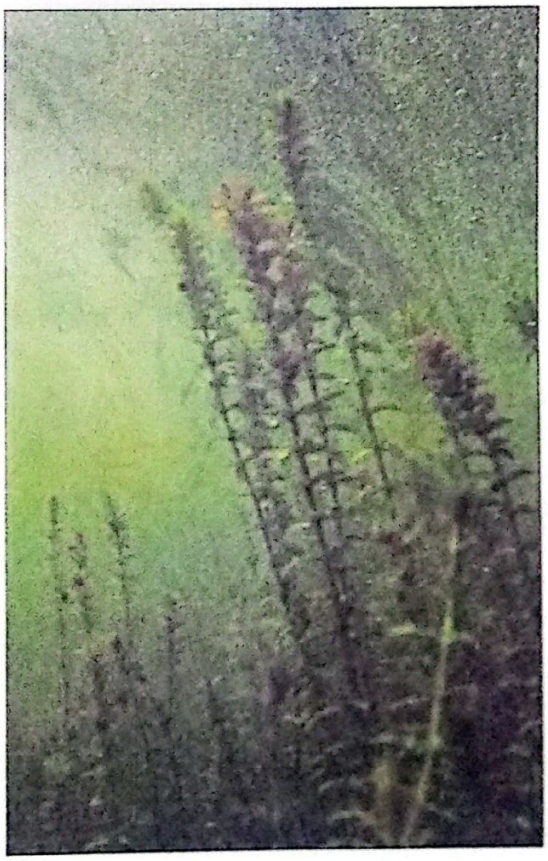


### What are the benefits of photosynthesis?

The glucose and starch produced by plants through photosynthesis are used by the plants themselves to get nutrition.

Additionally, plants play a very important role in maintaining the balance of gases in the atmosphere. During photosynthesis, plants use carbon dioxide and produce oxygen, which is necessary for the respiration of other living things.





# LESSON 6 PHOTOSYNTHESIS

**A Write true or false. Then correct the false statement(s).**

Plants are consumers.

_____

Plants make food in green structures called chloroplasts.

_____

Photosynthesis is the process by which plants make their own food.

_____

Sunlight is not necessary for photosynthesis to occur.

_____

**B Tick (✓) the correct answer.**

**1.** The process plants use to make food is called ..... .

◯ respiration ◯ photosynthesis ◯ reproduction

**2.** ..... is not involved in photosynthesis.

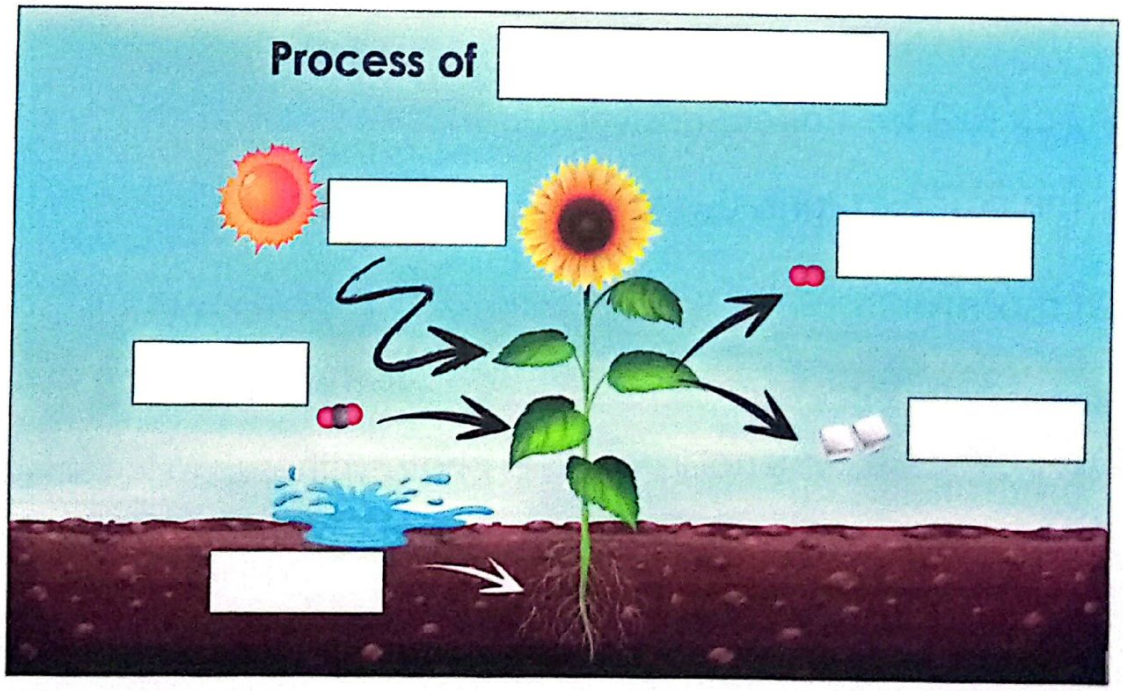
◯ Sunlight ◯ Water ◯ Nitrogen

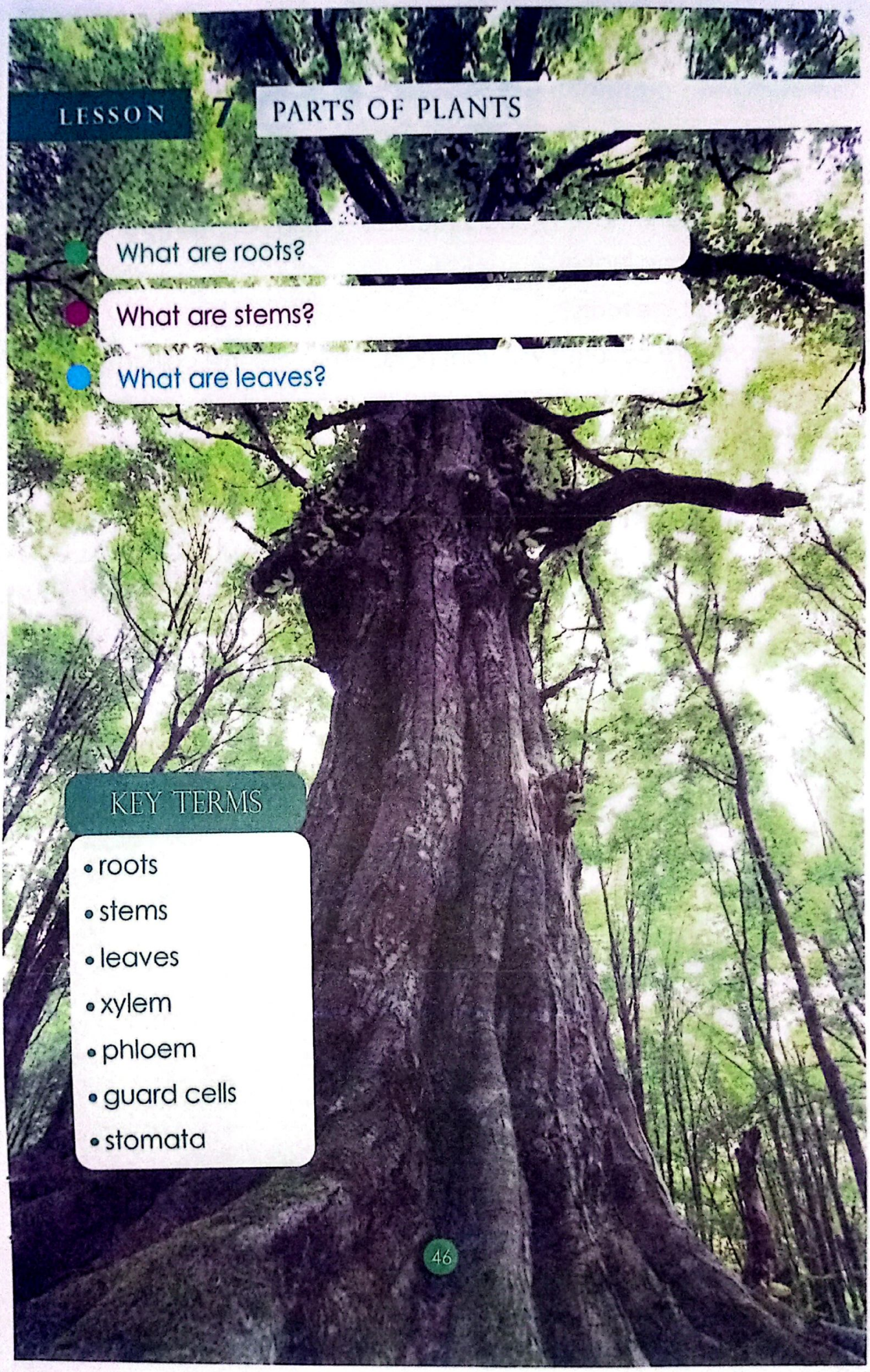
**C Complete the following paragraph using the words in the box.**

| photosynthesis - chloroplasts - glucose - carbon dioxide - producers - oxygen - water |
|---|

Plants are ..... that make their own food by a process called ..... . Plants absorb ..... from the soil, use ..... gas from the atmosphere, and release ..... gas. In the presence of sunlight, they make their food, such as ..... and starch in green structures called ..... .

**D Label the following figure.**





LESSON 7

# PARTS OF PLANTS

- What are roots?
- What are stems?
- What are leaves?

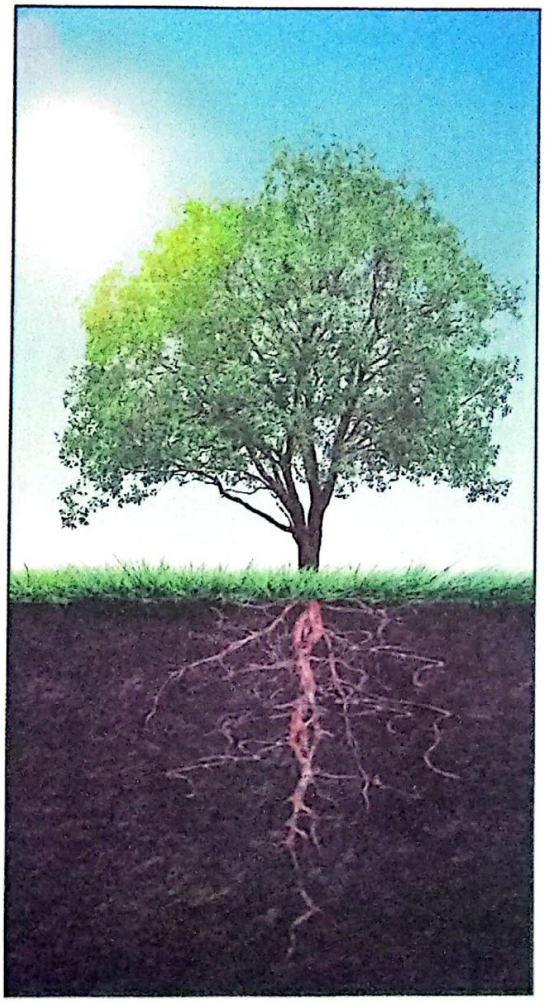
## KEY TERMS

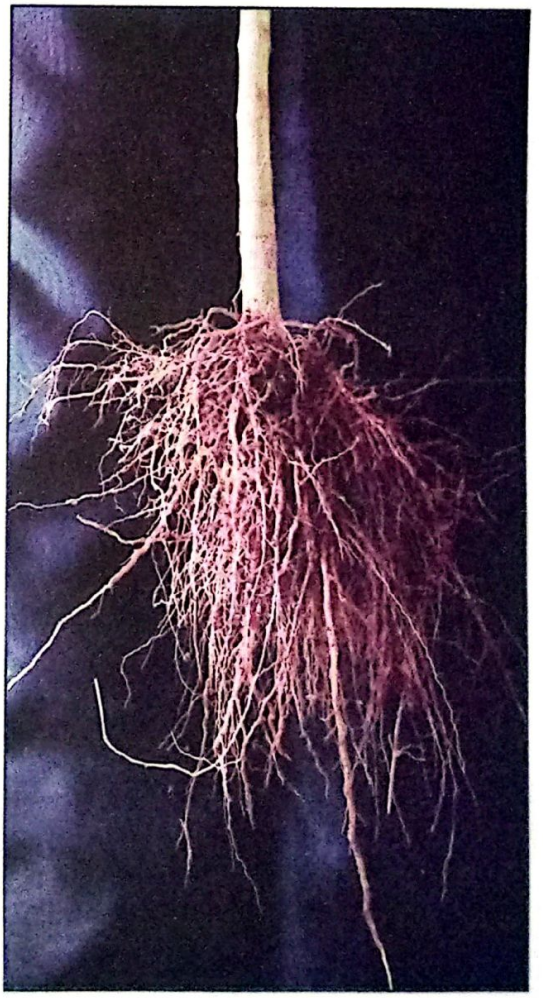
- roots
- stems
- leaves
- xylem
- phloem
- guard cells
- stomata

Most plants have typical structures, which are the roots, stems, and leaves.

### What are roots?

Roots are covered with root hairs, which are thin cells that increase plants' abilities to absorb water and minerals from the ground. They also keep plants fixed in the soil. Some roots store food, like carrots.





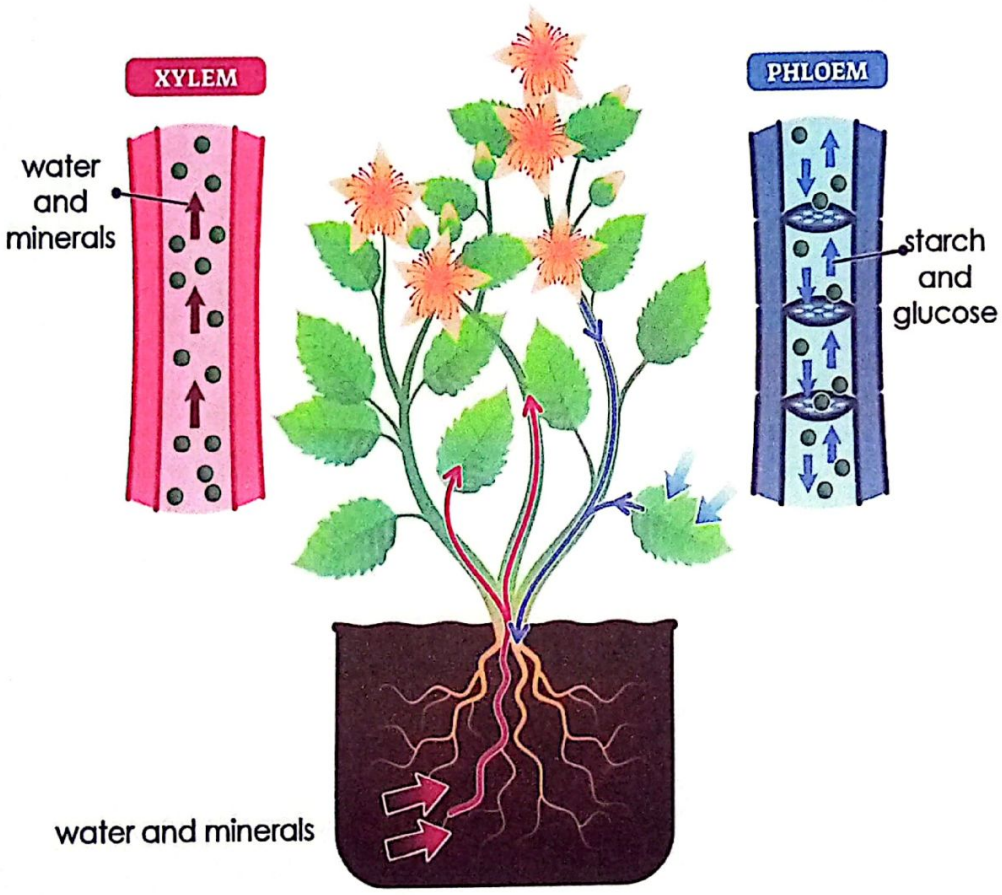
## What are stems?

Stems provide support for plants. Small plants have soft, green, and bendable stems, while trees have woody, strong, and hard stems.

Most stems contain two types of vessels:

Xylem vessels conduct water and mineral salts upward from the roots to the leaves.

Phloem vessels conduct the starch and glucose from the leaves to other parts of the plant.

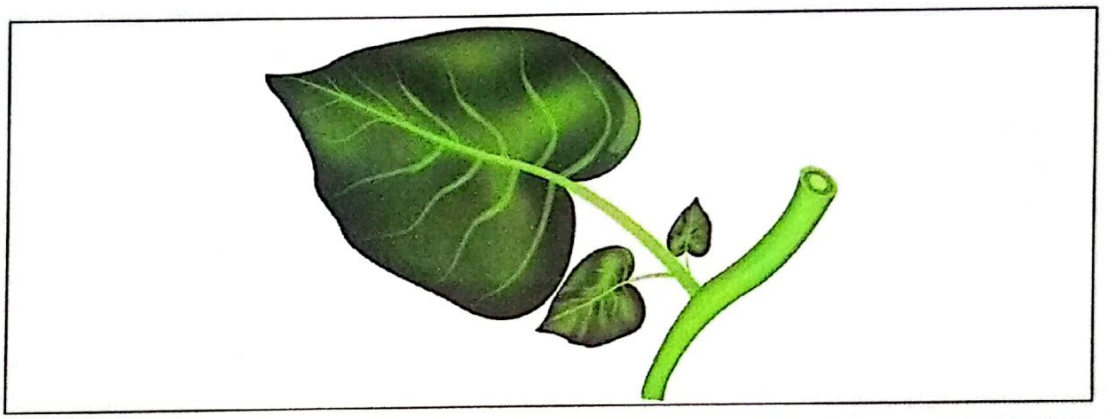


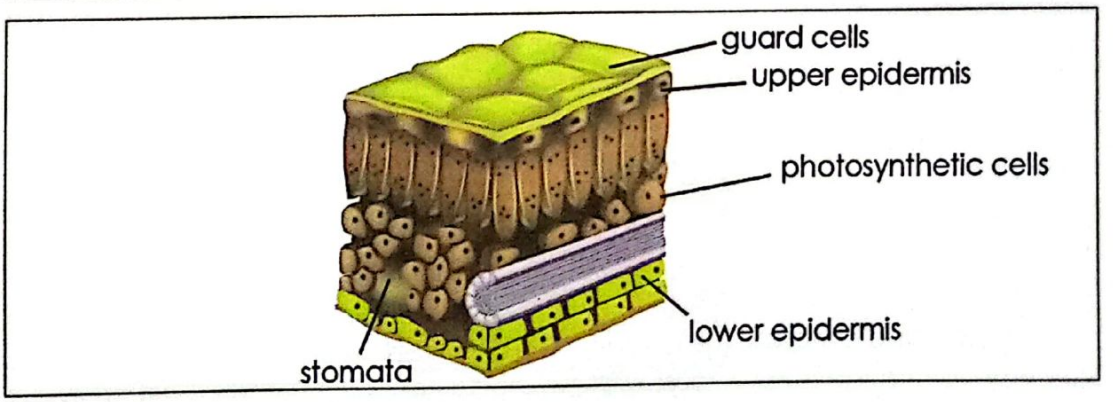
## What are leaves?

Most leaves are green because they contain chloroplasts, which are essential for photosynthesis.

The shape, thickness, and size of leaves are determined by environmental factors.

A leaf consists of an upper epidermis and a lower epidermis, both of which contain guard cells that control the opening of stomata, regulating the entry and exit of oxygen, carbon dioxide, and water vapor.





**A Write true or false. Then correct the false statement(s).**

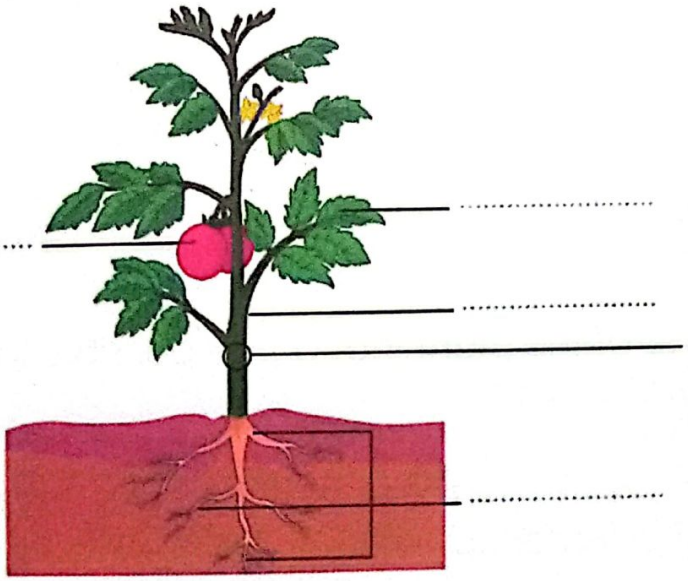
Root hairs absorb water from the soil.

The xylem conducts water and mineral salts downward.

The phloem gives the plant its green color.

The chloroplast openings in the guard cells regulate the entry of gases.

**B Label the following parts of the plant.**





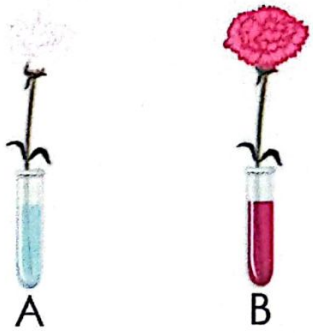
..... and .....

## Experiment

### Procedure

- Place two similar white flowers in two test tubes.
- Put water in Test Tube A and red ink in Test Tube B for three days.
- Observe what happens after three days.

**1.** Check the differences between the two flowers. Write your observation in the table below.




| Test Tube / Color of the Flower | A | B |
|---|---|---|
| At the beginning of the experiment | | |
| Three days after the experiment | | |

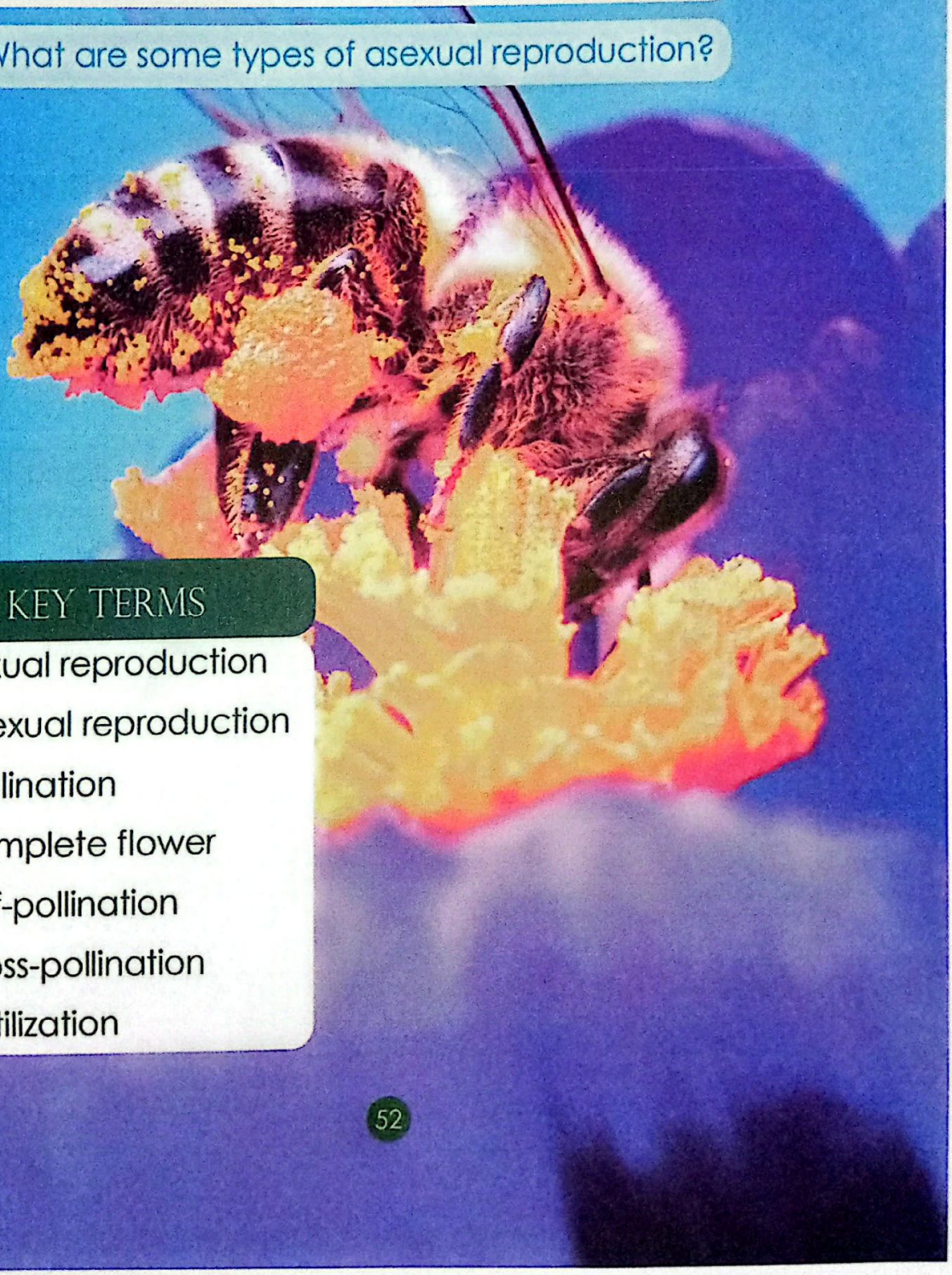
**2.** The structures of the plant that are responsible for absorbing water are the ..... .

**3.** The ..... of the stem is responsible for the conduction of water upward.

LESSON 8

# PLANT REPRODUCTION

- What are the types of plant reproduction?
- What are the parts of a complete flower?
- What are self-pollination and cross-pollination?
- What are some types of asexual reproduction?



## KEY TERMS

- sexual reproduction
- asexual reproduction
- pollination
- complete flower
- self-pollination
- cross-pollination
- fertilization

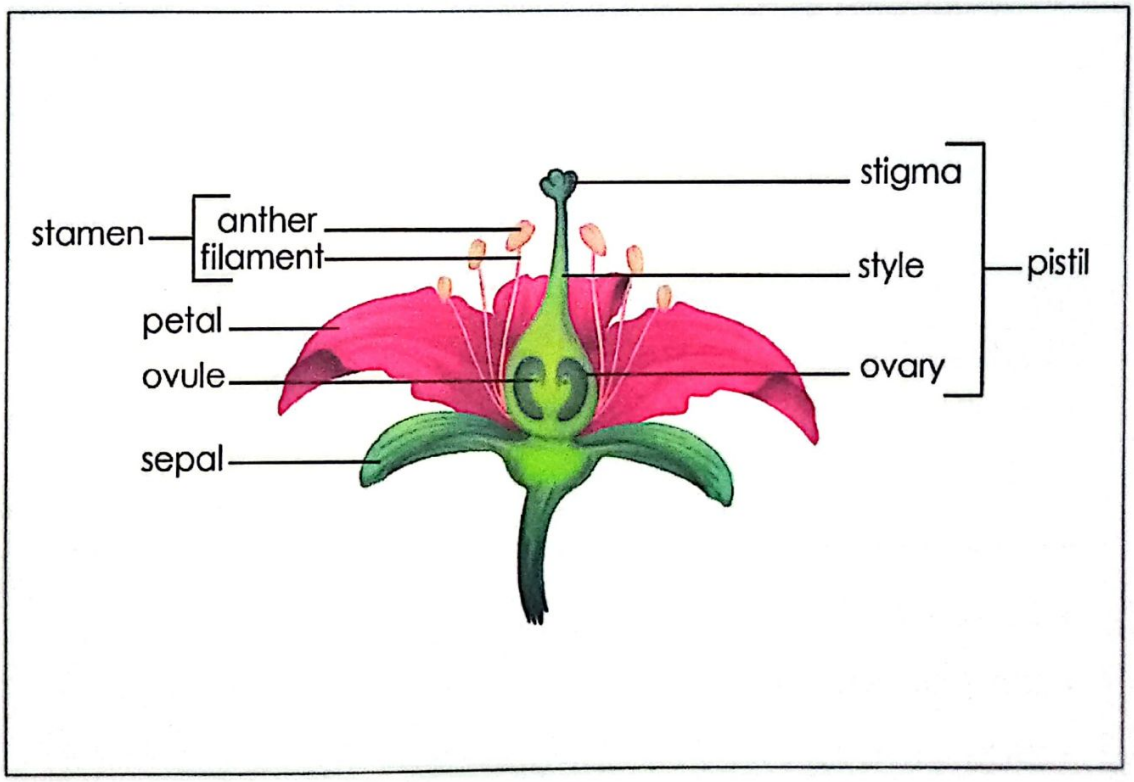
## What are the types of plant reproduction?

Plants reproduce and give offspring, either through sexual or asexual reproduction.

Flowering plants reproduce through a process called pollination.

## What are the parts of a complete flower?

A complete flower is made up of four basic parts: sepals, petals, stamens, and a pistil.





Sepals are the green parts, whereas petals are the colored parts.
The stamen is the male reproductive organ, consisting of anther and filament. The pistil is the female reproductive organ, composed of stigma, style, and ovary.

### What are self-pollination and cross-pollination?

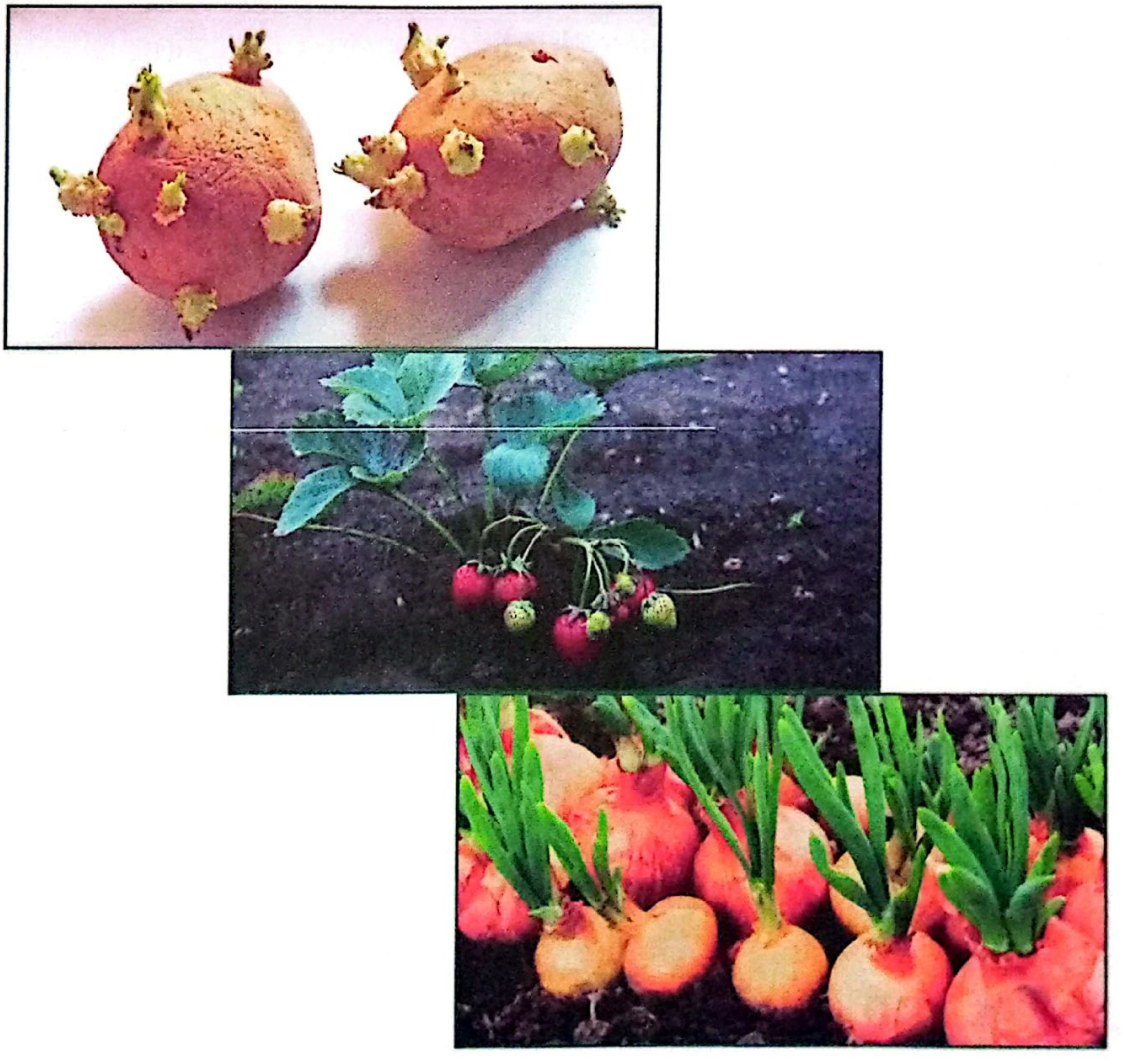
When a plant's own pollen fertilizes its own ovule, this is called self-pollination. When a plant's pollen fertilizes the ovule of another plant, this is called cross-pollination. It takes place through pollinators, such as bees and hummingbirds, as well as through the wind.



After pollination, fertilization takes place. The ovary develops into a fruit, and the ovule develops into a seed.

### What are some types of asexual reproduction?

Plants also reproduce through asexual reproduction. Potatoes reproduce using eye tubers, strawberries reproduce using stolons, whereas garlic and onions reproduce using bulbs.



**A Write true or false. Then correct the false statement(s).**

Plants can reproduce.

Self-pollination occurs when a plant's own pollen fertilizes the ovule of another plant.

The stamen is the female reproductive organ of a flower.

Wind is a pollinator.

**B Tick (✓) the correct answer.**

**1.** The stamen is made up of ..... .

- ◯ anther and filament
- ◯ stigma and ovary
- ◯ stigma, style, and ovary

**2.** Strawberries reproduce using ..... .

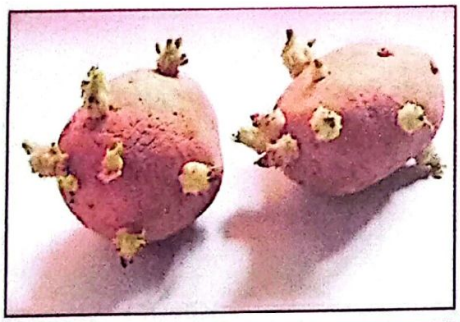
- ◯ bulbs
- ◯ eye tubers
- ◯ stolons

**C Arrange the following steps of pollination in chronological order.**

- ☐ The bee flies away from the first flower.
- ☐ Pollen from the bee's legs falls onto the second flower.
- ☐ Pollen from the first flower sticks to the bee's legs.
- ☐ The bee lands on the first flower.
- ☐ The bee lands on the second flower.



**D Indicate the type of asexual reproduction in each of the following plants.**



.....



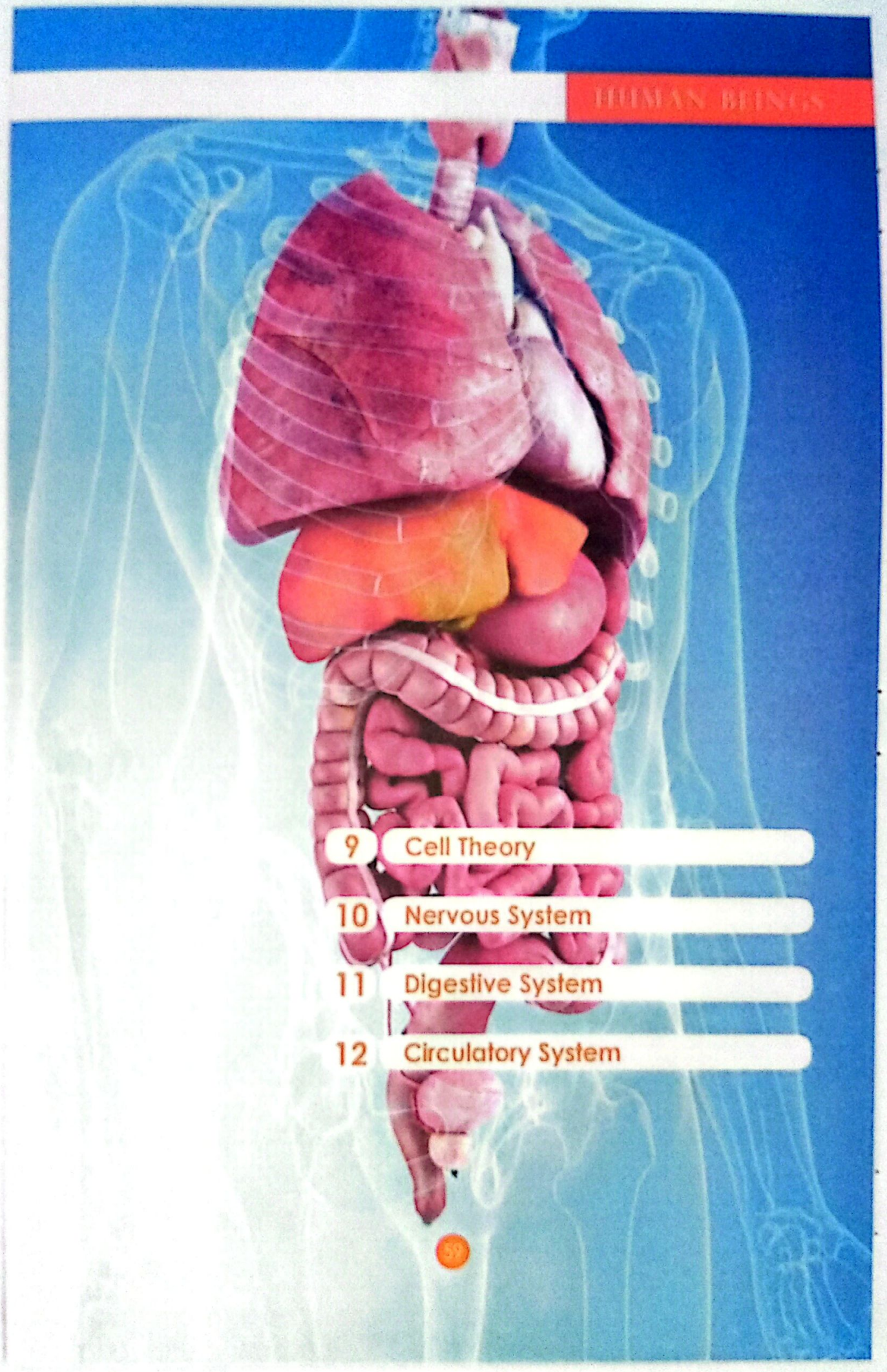
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WORLD'S KEY

UNIT 3

# HUMAN BEINGS



9 Cell Theory
10 Nervous System
11 Digestive System
12 Circulatory System

LESSON 9

# CELL THEORY

- What is the cell theory?
- What are cells made up of?
- What are the different types of cells in the human body?

## KEY TERMS

- cell theory
- cell membrane
- nucleus
- cytoplasm
- organelle
- nerve cells
- muscle cells
- cardiac cells
- red blood cells
- white blood cells

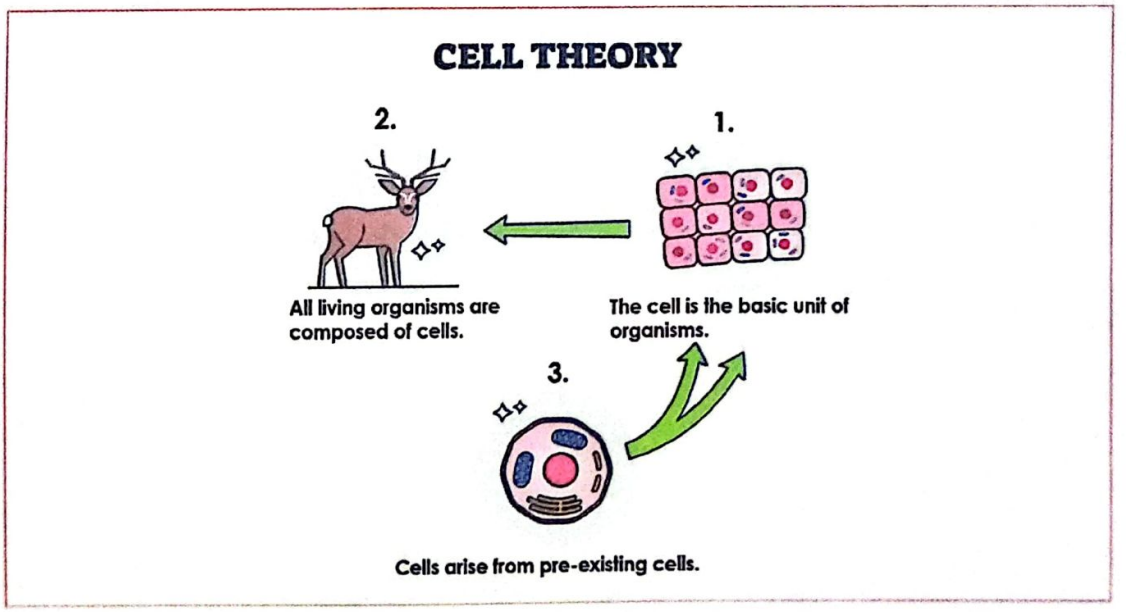
## What is the cell theory?

Cells are the basic functional units of life.

In 1838, Matthias Schleiden, the German biologist, proposed that cells are the building blocks of all plants.
Later, another German biologist, Theodor Schwann, stated that cells are the basic functional units of animals.
The combined efforts of Schleiden, Schwann, and other scientists led to the formulation of the cell theory.

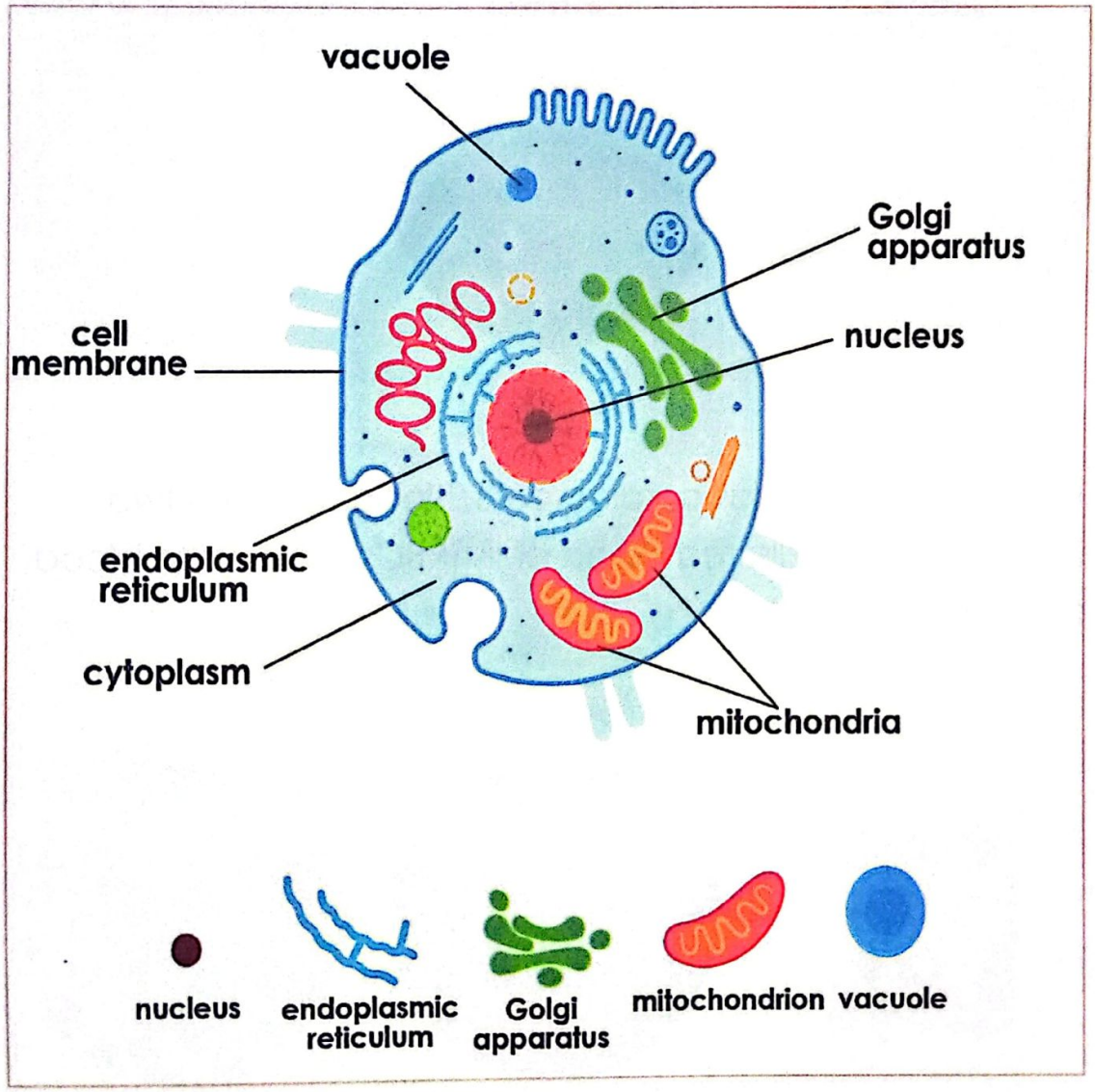
The cell theory proposes the following:

1. Cells are the basic units of life.
2. All living things are made up of cells.
3. All cells are derived from other pre-existing cells.



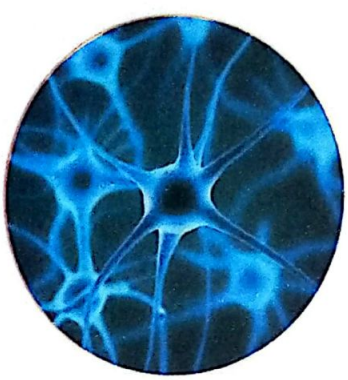
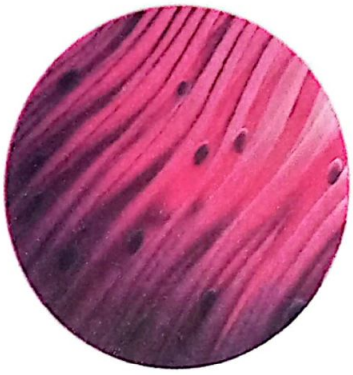
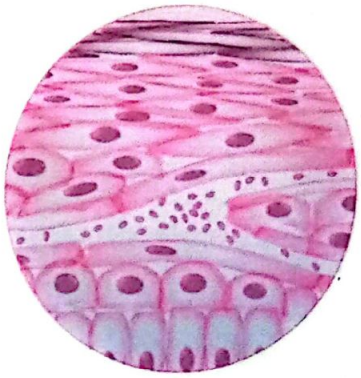
## What are cells made up of?

Cells are made up of three basic parts: cell membrane, nucleus, and cytoplasm. Within the cytoplasm, there are tiny structures called organelles, which perform various essential functions.

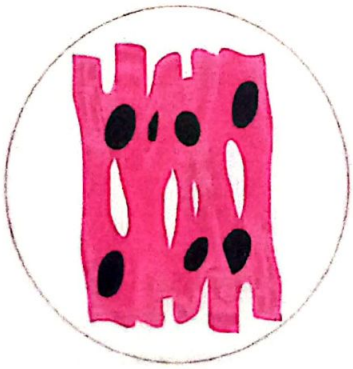
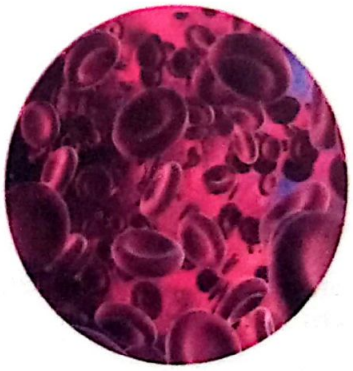
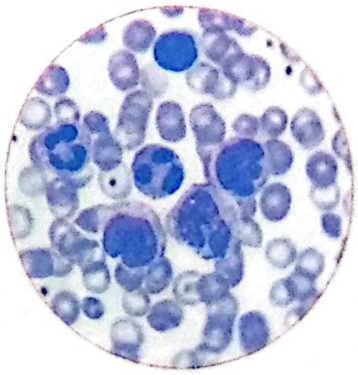


## What are the different types of cells in the human body?

The human body consists of trillions of different cells that work together to perform various functions.
Some cells are long and thin, like nerve cells, while others are bulged and striated, like muscle cells. Additionally, there are flat cells, such as skin cells.

The human heart has cardiac cells. Blood contains two basic types of cells: red blood cells (RBCs) and white blood cells (WBCs).

# LESSON 9 CELL THEORY

**A Write true or false. Then correct the false statement(s).**

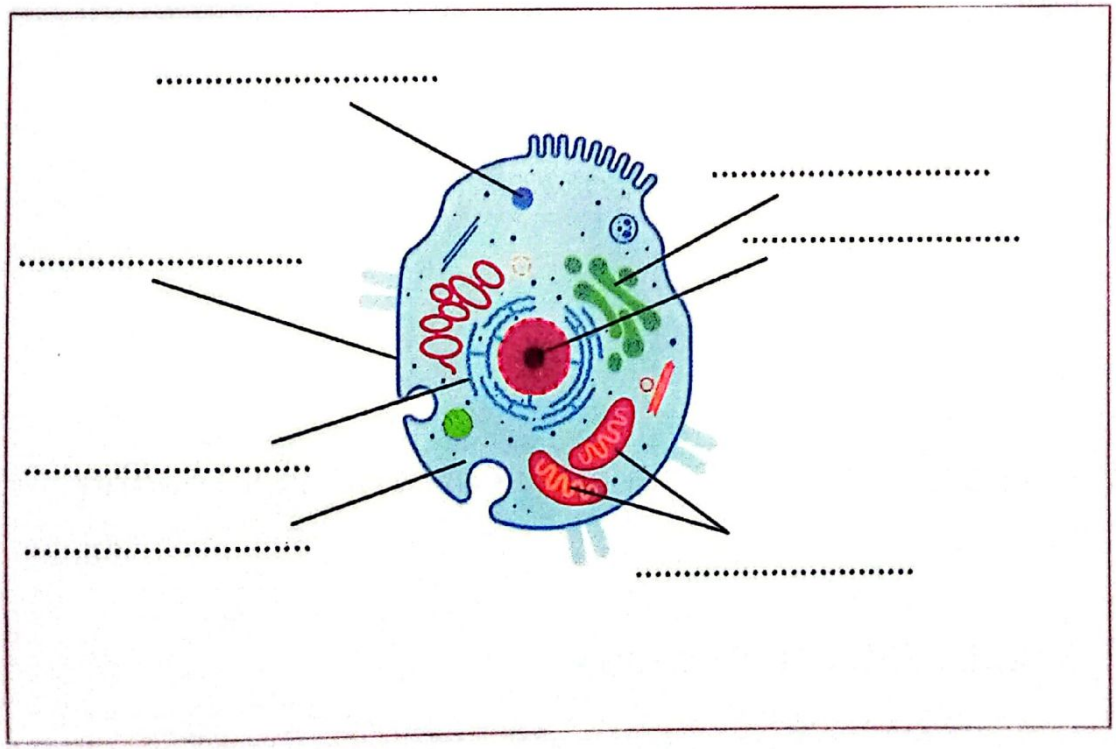
A tissue is the smallest unit of living things.

Cells come in various shapes and sizes.

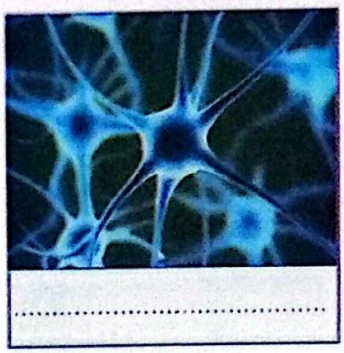
The heart is a cell.

All living things are made up of cells.

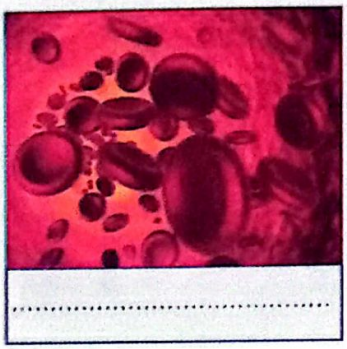
**B Label the following parts of the cell.**



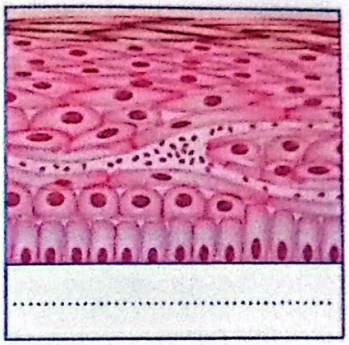
## C Name the following cells.



.....



.....

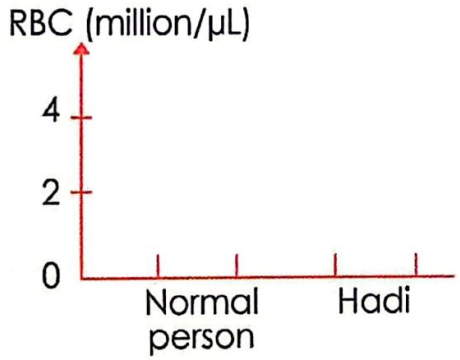


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## D Bar Graph

Red blood cells (RBCs) in a normal person should be 4 million cells per microliter. Hadi was tested to have a count of 2 million red blood cells per microliter.

1. Draw a bar graph showing the RBC count of a normal person and Hadi's RBC count.




2. Compare Hadi's RBC count to that of a normal person.

.....

.....

3. Is Hadi's RBC count normal?

.....

LESSON 10

# NERVOUS SYSTEM

- What is the role of the nervous system?
- What does the central nervous system include?
- What is the function of the peripheral nervous system?
- What is a neuron?

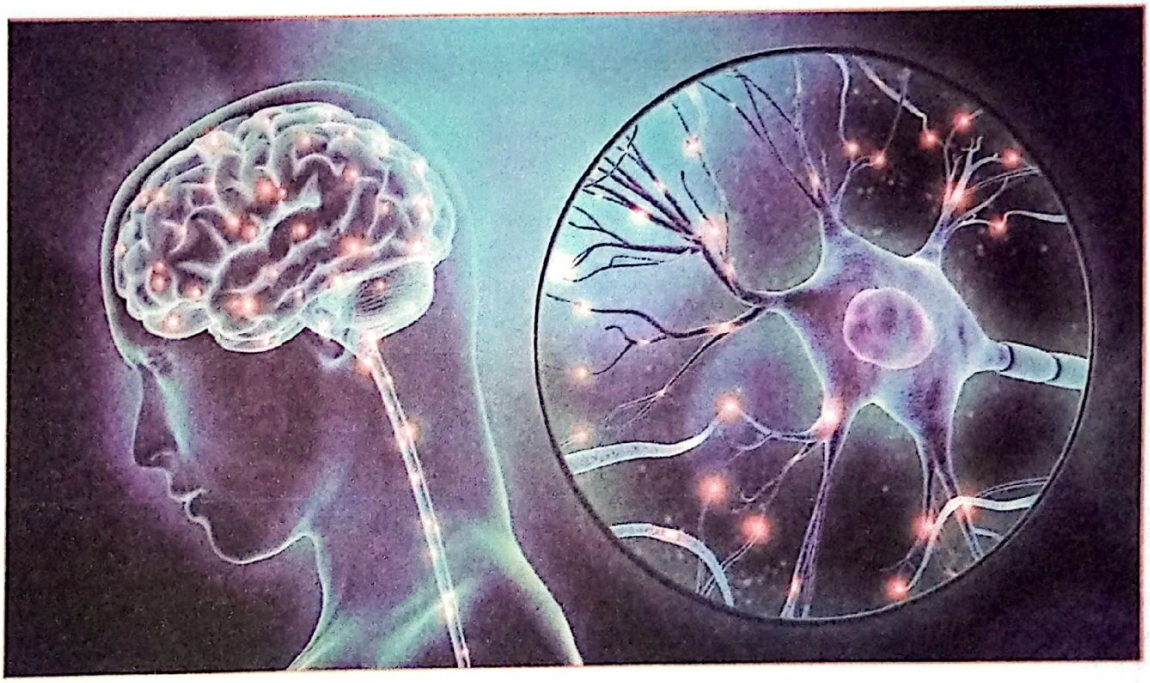
## KEY TERMS

- nervous system
- central nervous system
- peripheral nervous system
- brain
- spinal cord
- neuron

## What is the role of the nervous system?

Vertebrates, including humans and animals, have a well-adapted nervous system.

The nervous system provides communication among body organs and between the human body and its surroundings.



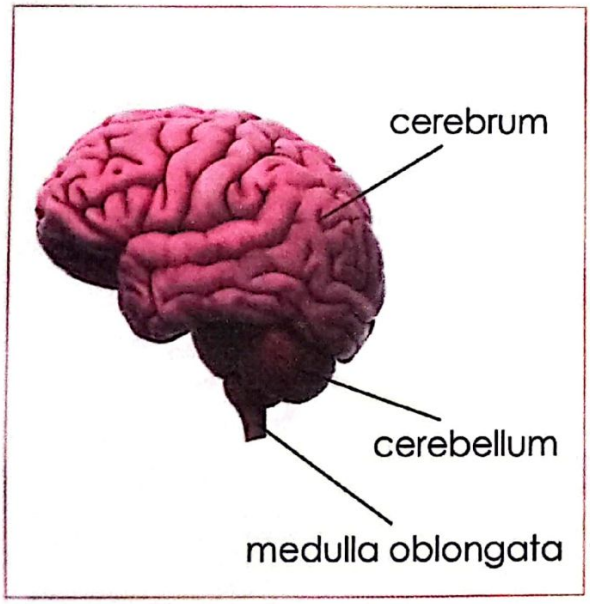
## What does the central nervous system include?

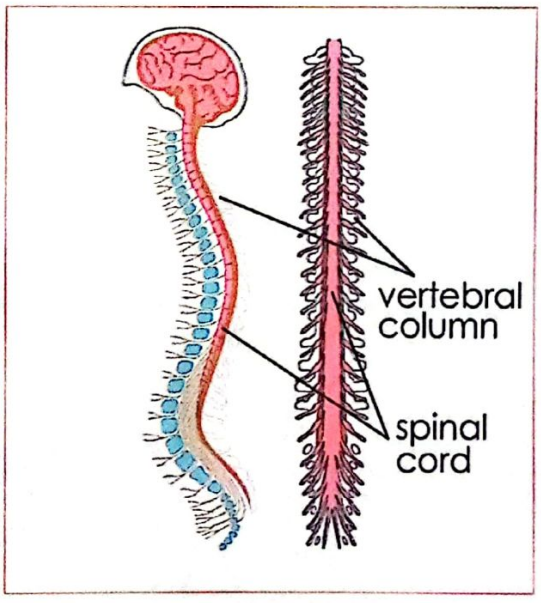
The nervous system is made up of two basic parts: the central nervous system and the peripheral nervous system.

The central nervous system includes the brain and the spinal cord. It controls the body through these organs.

The brain, located in the head, is divided into three main parts: the cerebrum, the cerebellum, and the medulla oblongata.

The spinal cord, located in the vertebral column, consists of 31 segments that extend from the neck to the lower back.



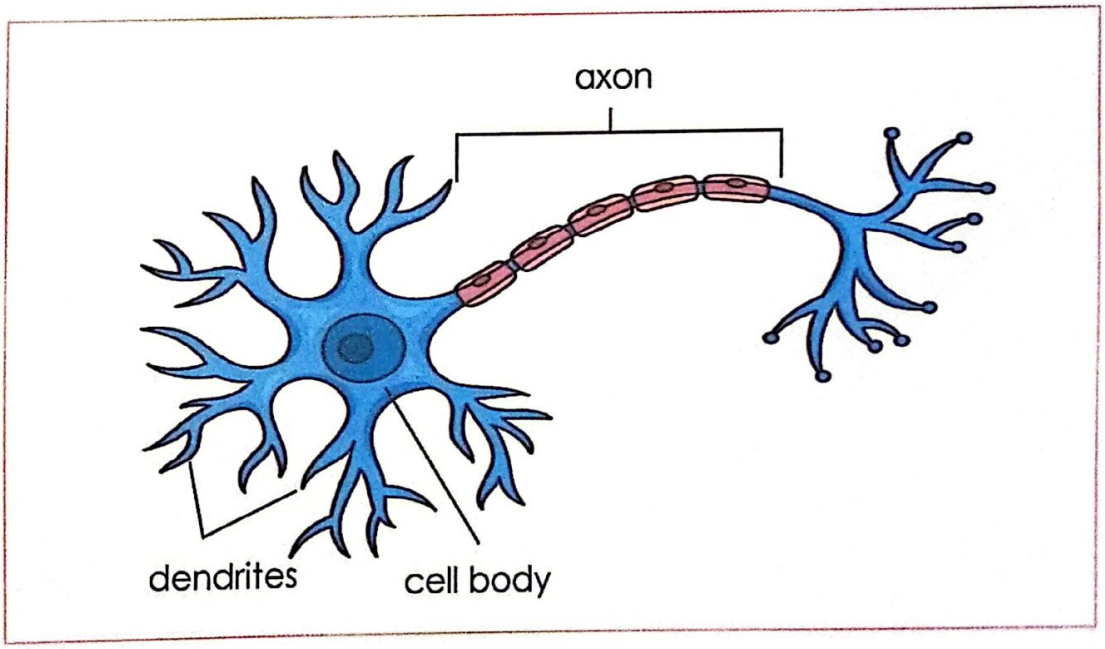
### What is the function of the peripheral nervous system?

The peripheral nervous system is responsible for sending nerve messages from various parts of the body to the central nervous system. It also sends commands, issued by the central nervous system, to different body parts.

### What is a neuron?

A neuron, also known as a nerve cell, is the structural and functional unit of the nervous system.

A neuron consists of three parts: the dendrites, the cell body, and the axon.



**A Write true or false. Then correct the false statement(s).**

The brain is protected by the vertebral column.

The peripheral nervous system is composed of the brain and the spinal cord.

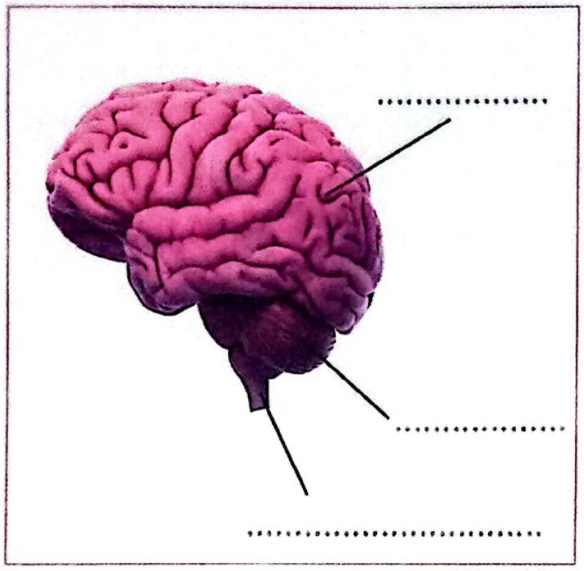
The nerve cells are called neurons.

The spinal cord is protected by the skull.

**B Match each of the following terms to the appropriate phrase.**

| | |
|---|---|
| brain | carries messages to and from the brain and the spinal cord |
| peripheral nervous system | controls the nervous system as the central command center |
| neurons | are nerve cells |

**Identify the organs in the figures below, write their names, and label their parts.**

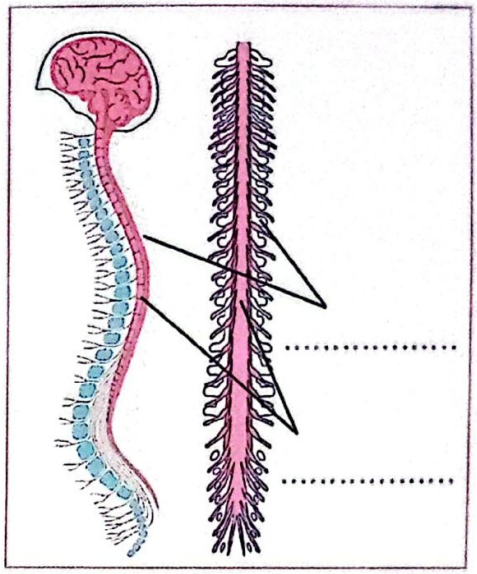


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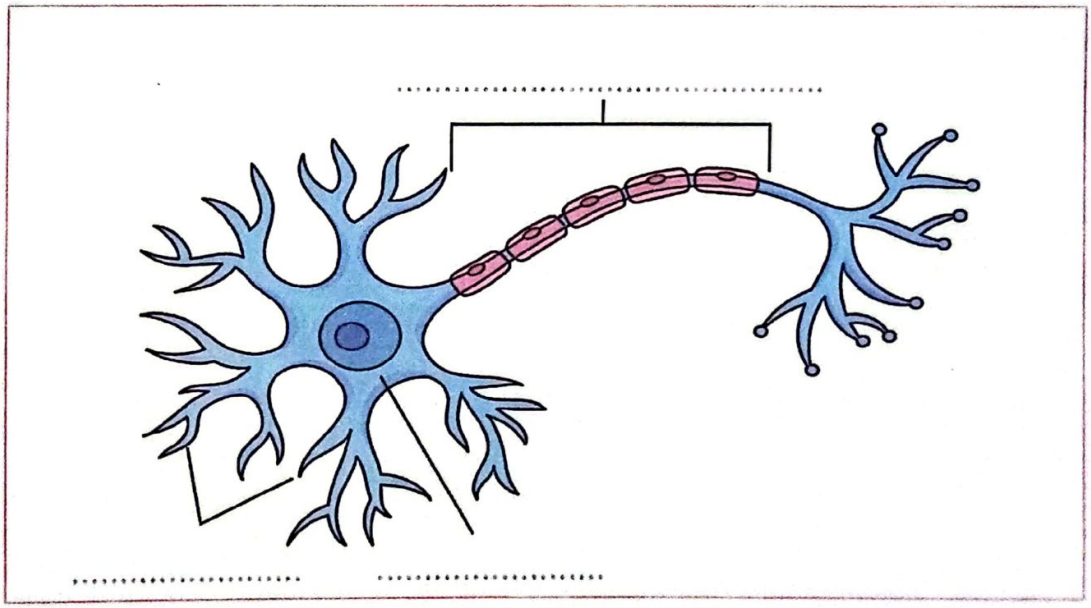
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LESSON 11

# DIGESTIVE SYSTEM

- Where does digestion take place?
- What are the parts of the digestive system?
- How does digestion take place?
- What are the end products of digestion?

## KEY TERMS

- digestion
- food
- digestive tube
- digestive glands
- stomach
- esophagus
- small intestine
- large intestine
- nutrients
- liver
- pancreas

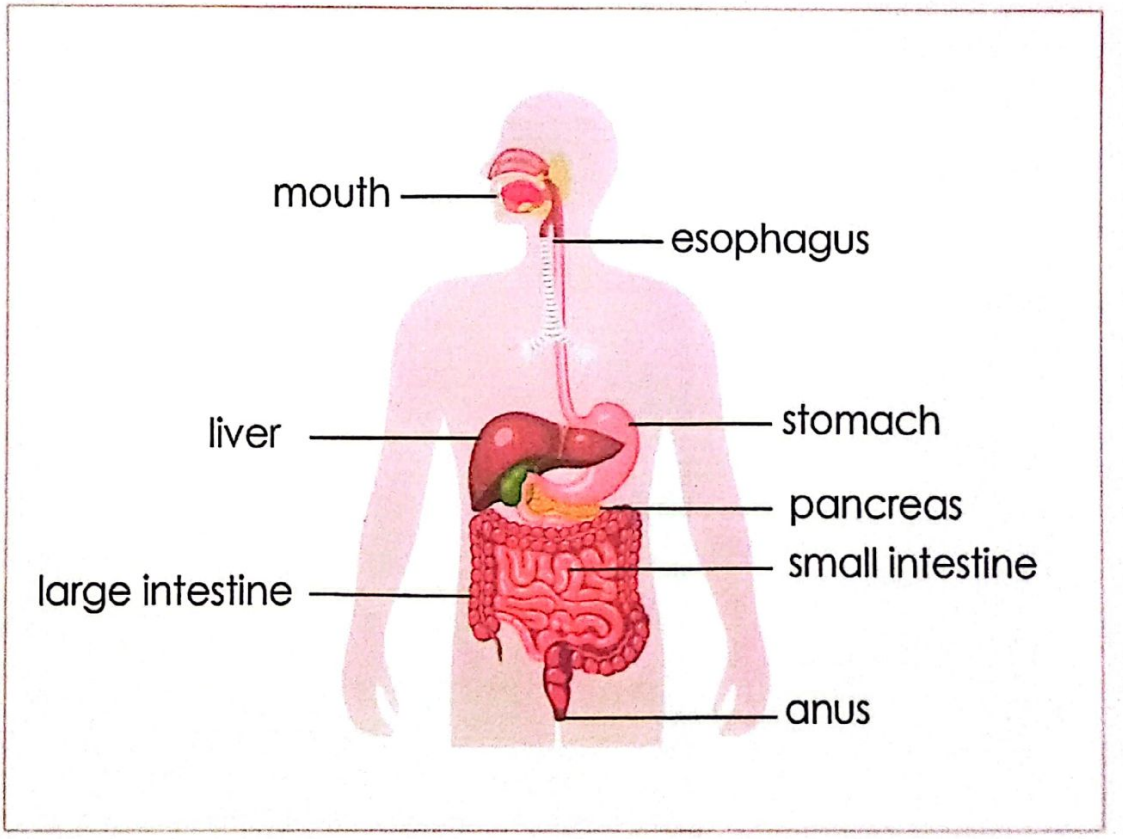


## Where does digestion take place?

Food consumed by humans and other mammals must be converted into nutrients to be used in different ways. This conversion takes place in the digestive system.

## What are the parts of the digestive system?

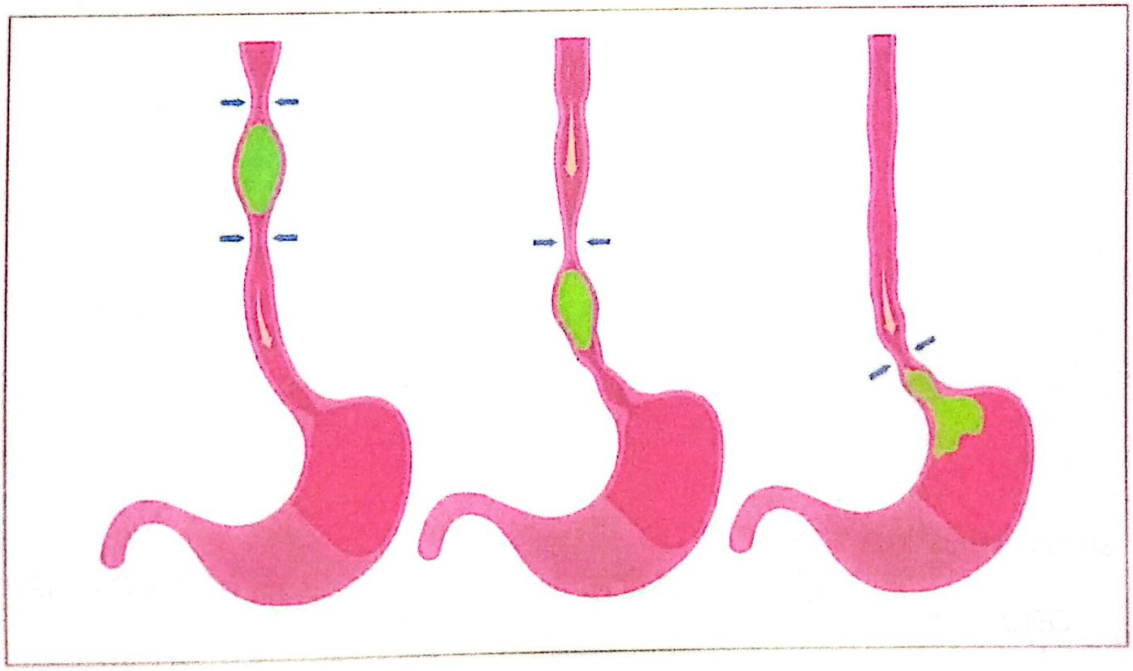
The digestive system consists of two basic parts: the digestive tube where the food passes and the digestive glands that facilitate digestion.



The digestive tube consists of the mouth, esophagus, stomach, small intestine, large intestine, and anus.

## How does digestion take place?

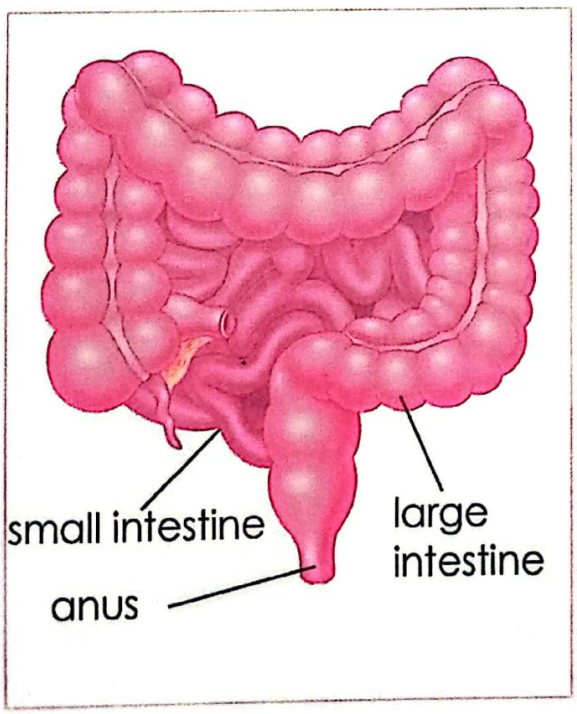
Digestion starts in the mouth, where food is chewed and swallowed with the help of the teeth and the tongue. The chewed food is softened in the esophagus through a phenomenon called peristaltic movement. In the stomach, food is further broken down with the help of gastric acid.

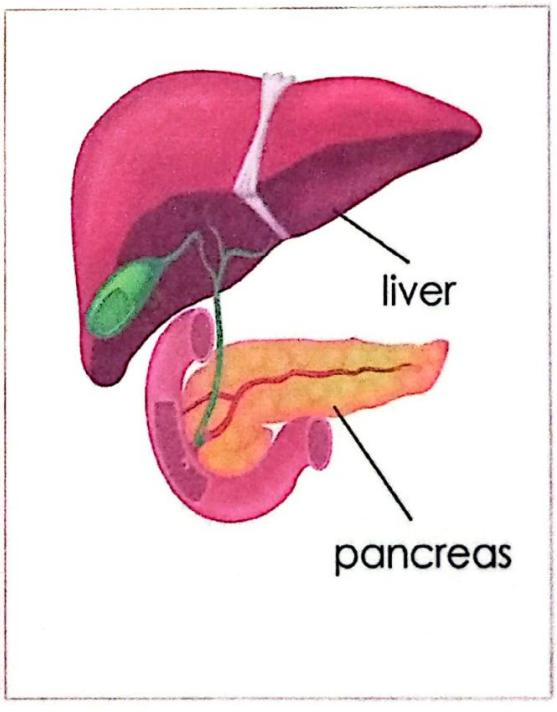


## What are the end products of digestion?

The small intestine, the longest part of the digestive system, measures about 7 meters. In the small intestine, food is broken down into nutrients and absorbed by the blood. The undigested food then moves to the large intestine, where it is eliminated from the body through the anus.

Other organs that are not located in the digestive tube, such as the pancreas, liver, and other digestive glands, also play an important role in digestion.



## A Write true or false. Then correct the false statement(s).

The digestive system consists only of the digestive tube.

_____

The pancreas is a part of the digestive tube.

_____

The stomach does not play an important role in digestion.

_____

The undigested food is eliminated from the body through the anus.

_____

## B Tick (✓) the correct answer.

1. Digestion begins in the ..... .

◯ esophagus ◯ stomach ◯ mouth

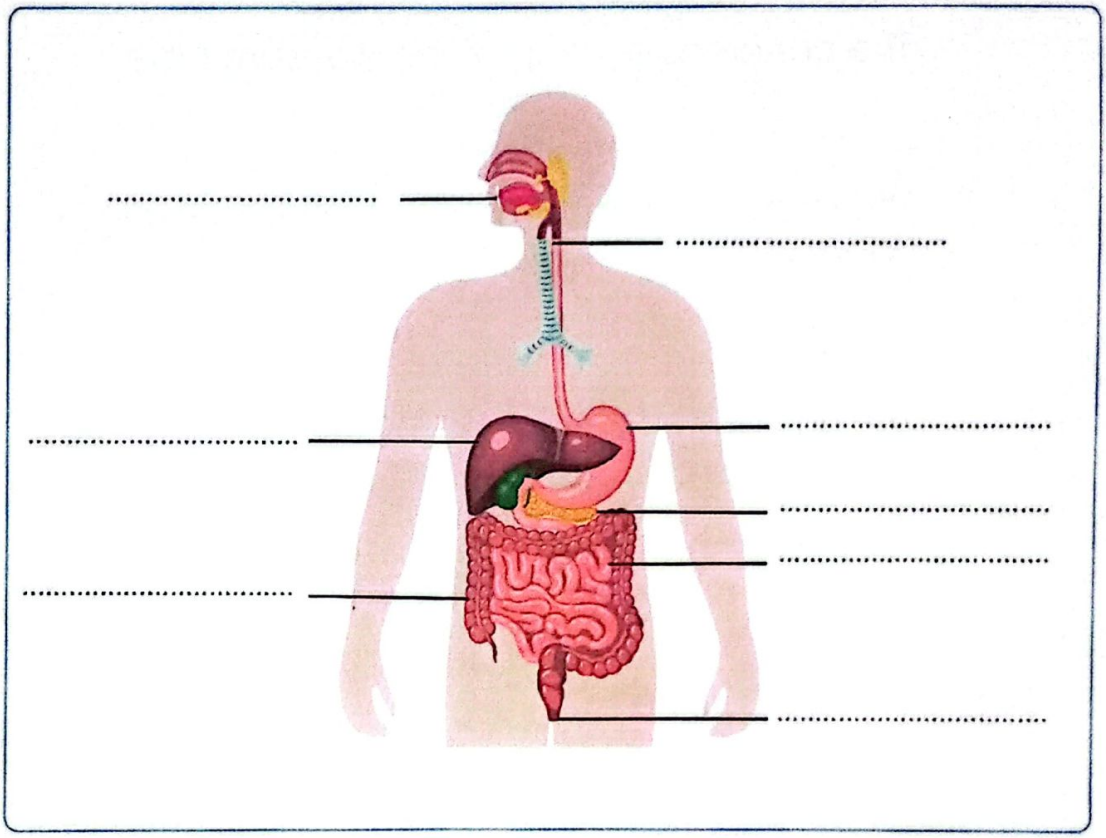
2. The ..... is responsible for breaking down food in the stomach.

◯ water ◯ acid ◯ pancreas

3. The length of the small intestine is about ..... .

◯ 3 meters ◯ 5 meters ◯ 7 meters

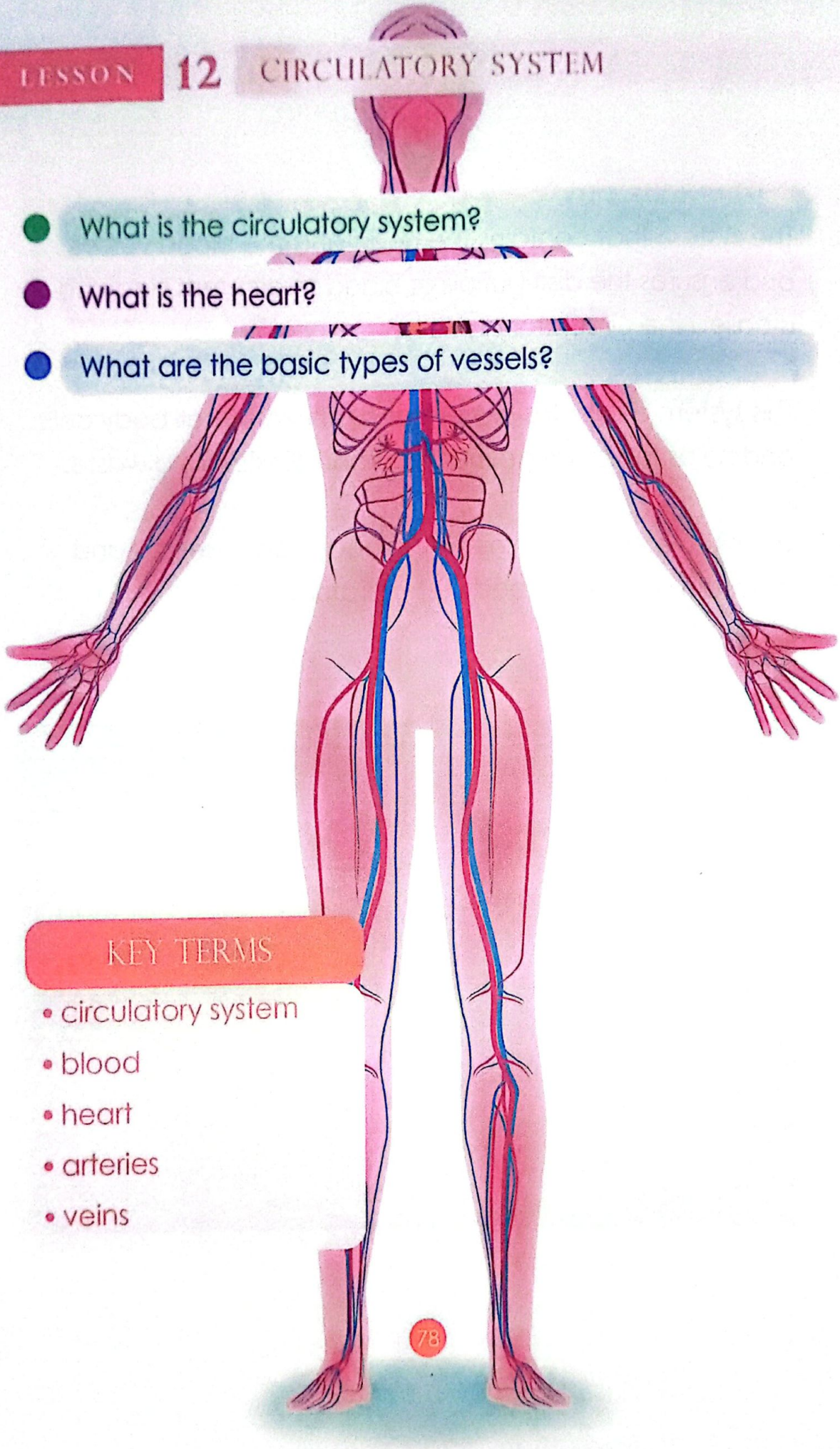
C Label the parts of the digestive system in the following diagram.



LESSON 12

# CIRCULATORY SYSTEM

- What is the circulatory system?
- What is the heart?
- What are the basic types of vessels?



## KEY TERMS

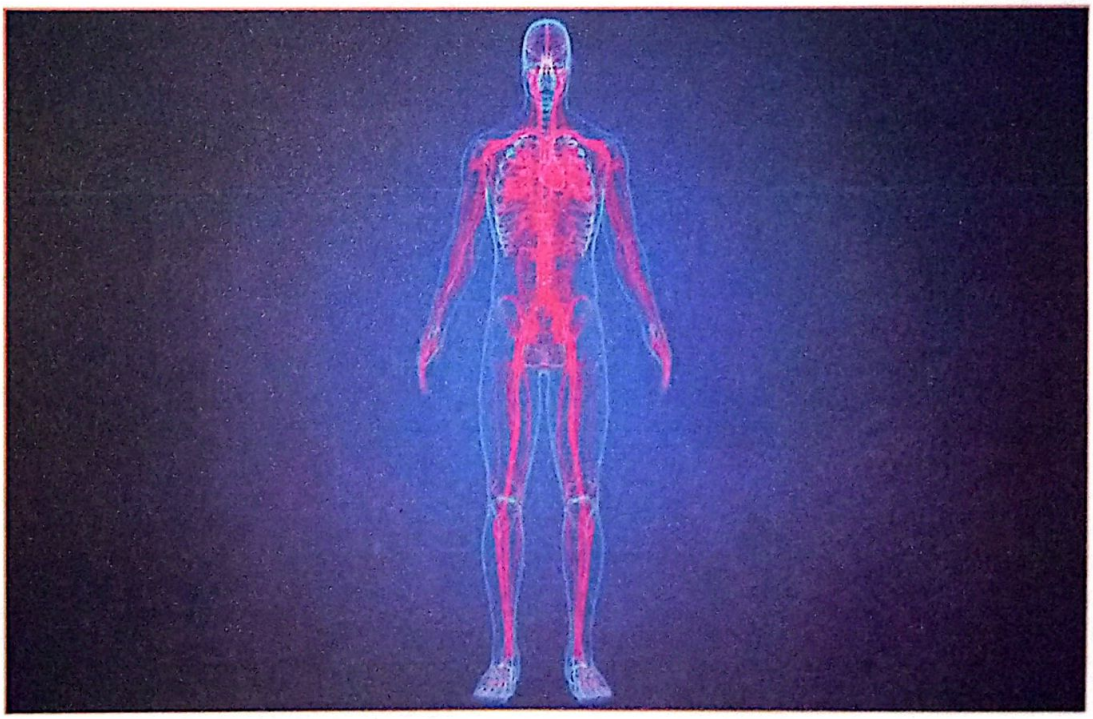
- circulatory system
- blood
- heart
- arteries
- veins

## What is the circulatory system?

The system that contains the heart and the blood vessels and ensures the distribution of blood to different body parts is called the circulatory system.

This system distributes oxygen and nutrients to all body cells and helps the body get rid of carbon dioxide and waste.

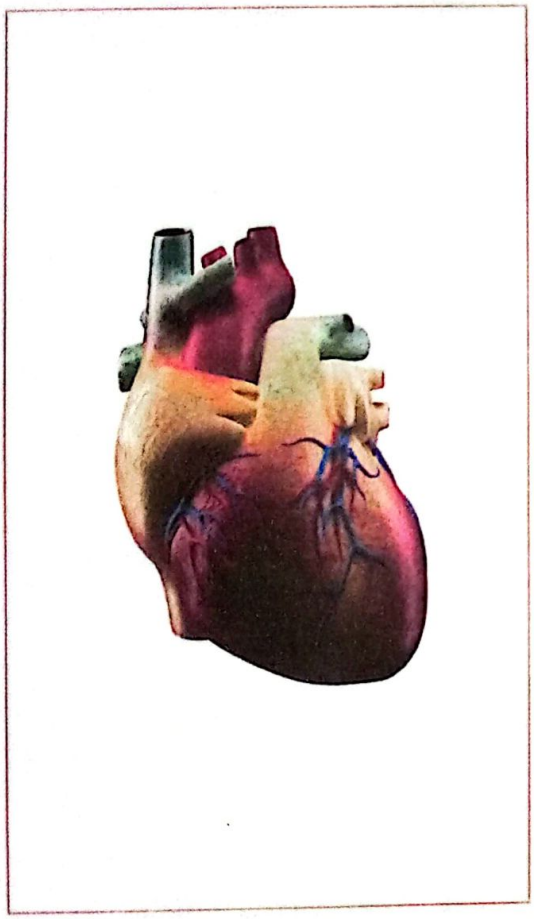
The circulatory system helps the body fight diseases and maintain a constant body temperature.

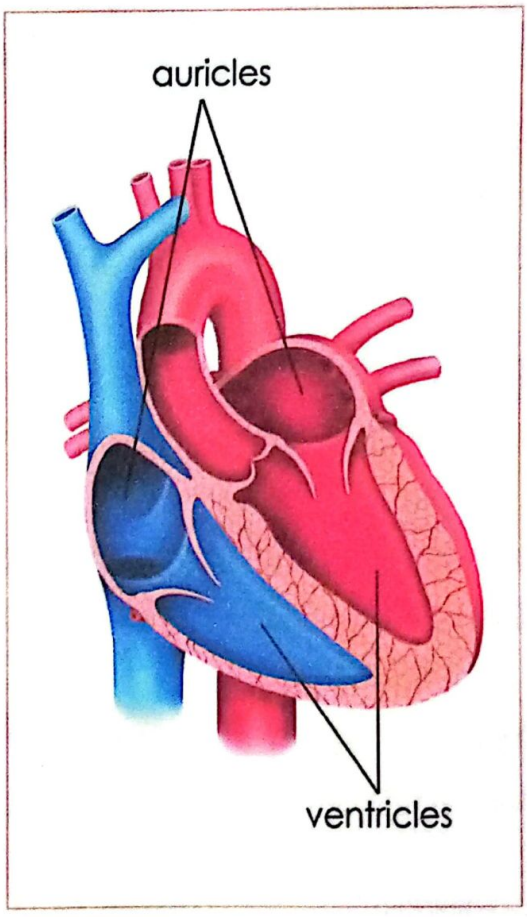


## What is the heart?

The heart is the central organ of the circulatory system. It is a muscular, hollow organ that keeps beating and pumping blood to various parts of the body.

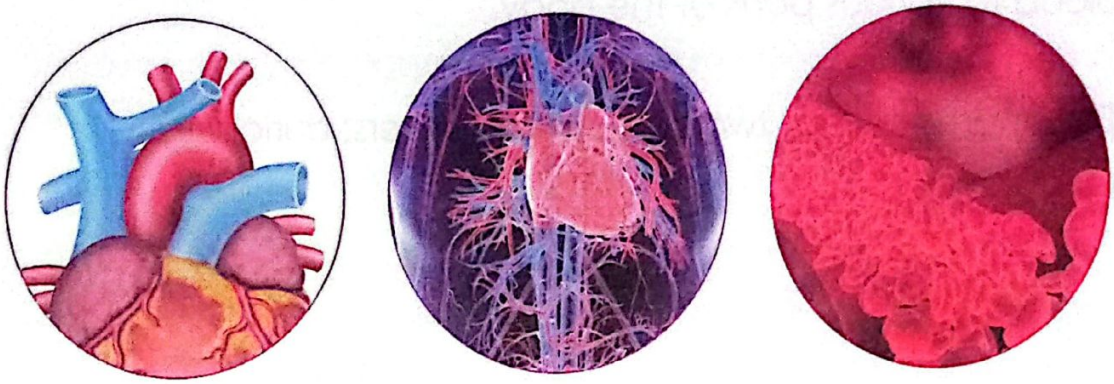
The heart contains two types of chambers: auricles and ventricles.





## What are the basic types of vessels?

The circulatory system has two main types of vessels: arteries and veins.



The arteries are blood vessels that carry blood from the heart to various body organs.

The basic types of arteries in the body are the aorta and the pulmonary arteries.

The veins are blood vessels that carry blood from various body organs back to the heart.

The basic types of veins are the vena cava and the pulmonary veins.

Capillaries are tiny vessels that ensure communication between the arteries and veins.

## A Write true or false. Then correct the false statement(s).

The heart is a hollow organ.

---

The arteries carry blood from various body parts to the heart.

---

Blood capillaries ensure communication between the arteries and veins.

---

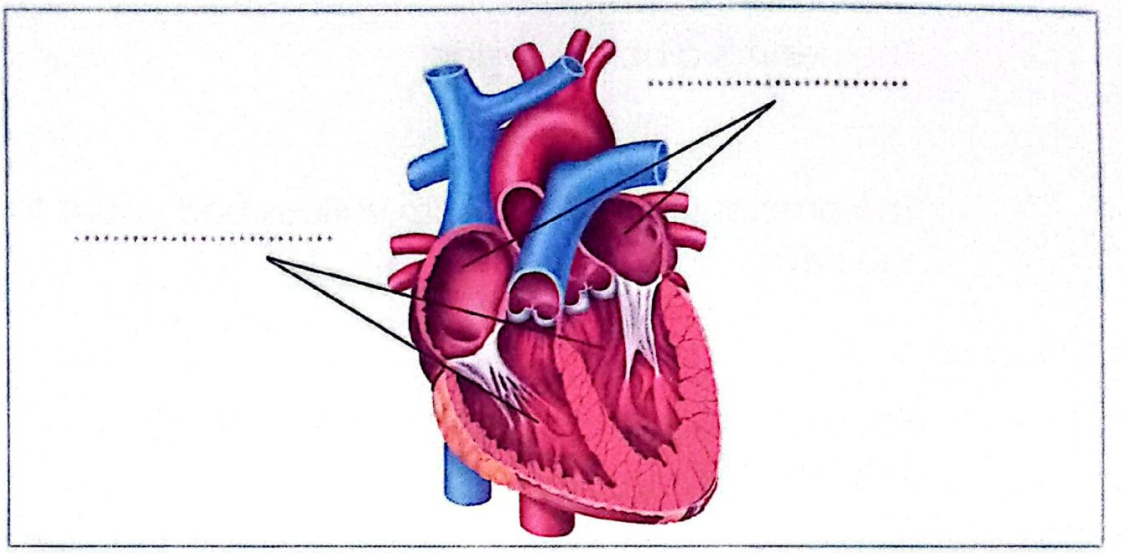
The circulatory system helps maintain body temperature.

---

## B Match each component to its function.

| | | |
|---|---|---|
| arteries | • | • pumps blood |
| heart | • | • carry blood to the heart |
| veins | • | • ensure communication between vessels |
| capillaries | • | • carry blood from the heart |

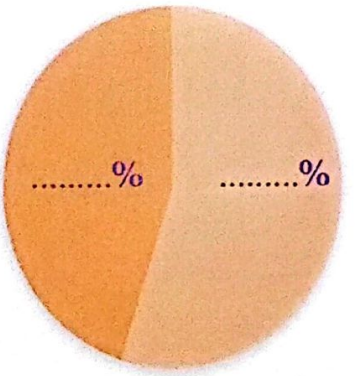
## C Label the parts of the heart in the following diagram.



## D Circle Graph

In the human body, blood is made up of 55% plasma and 45% cells.

1. Represent the given information in the circle graph below.




2. What is the biggest constituent of blood?

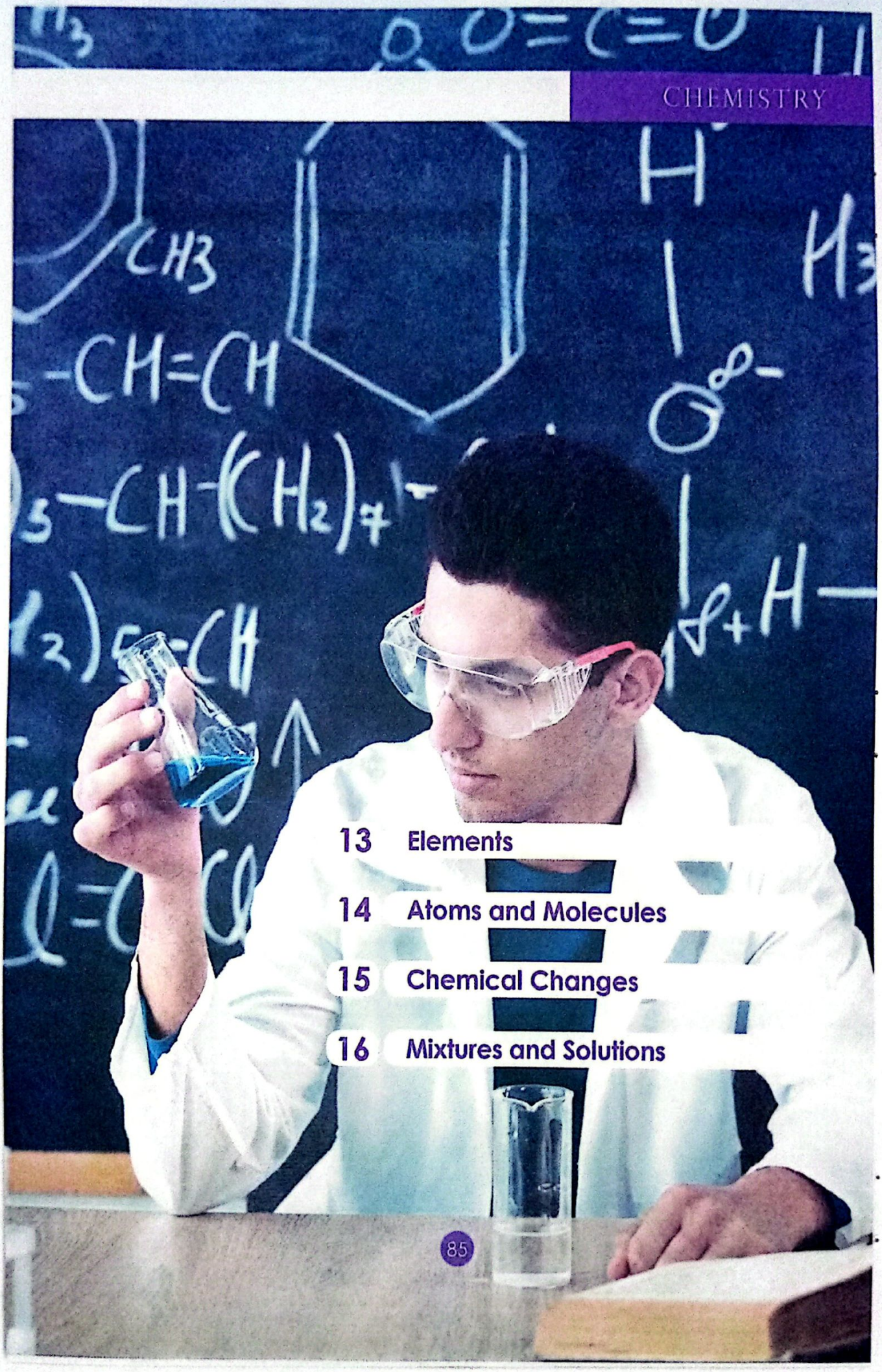
.....



WORLD'S KEY

UNIT 4

# CHEMISTRY



13 Elements

14 Atoms and Molecules

15 Chemical Changes

16 Mixtures and Solutions

LESSON 13 ELEMENTS

- What are elements?
- What are the differences between metals and nonmetals?
- What are the symbols of elements?



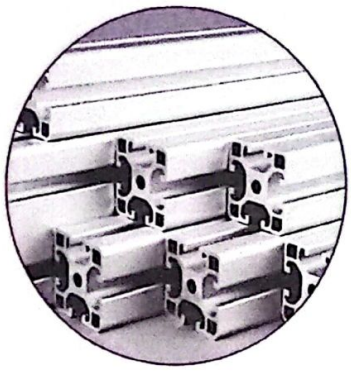
## KEY TERMS

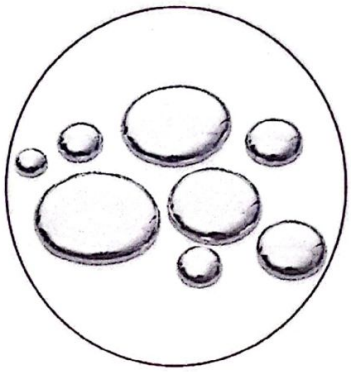
- elements
- metal
- nonmetal
- symbol

## What are elements?

All matter is made up of elements. Elements are substances that are made up of one type of matter.

There are 118 known elements; 92 of them occur naturally on Earth, and the remaining 26 are artificially created in laboratories.

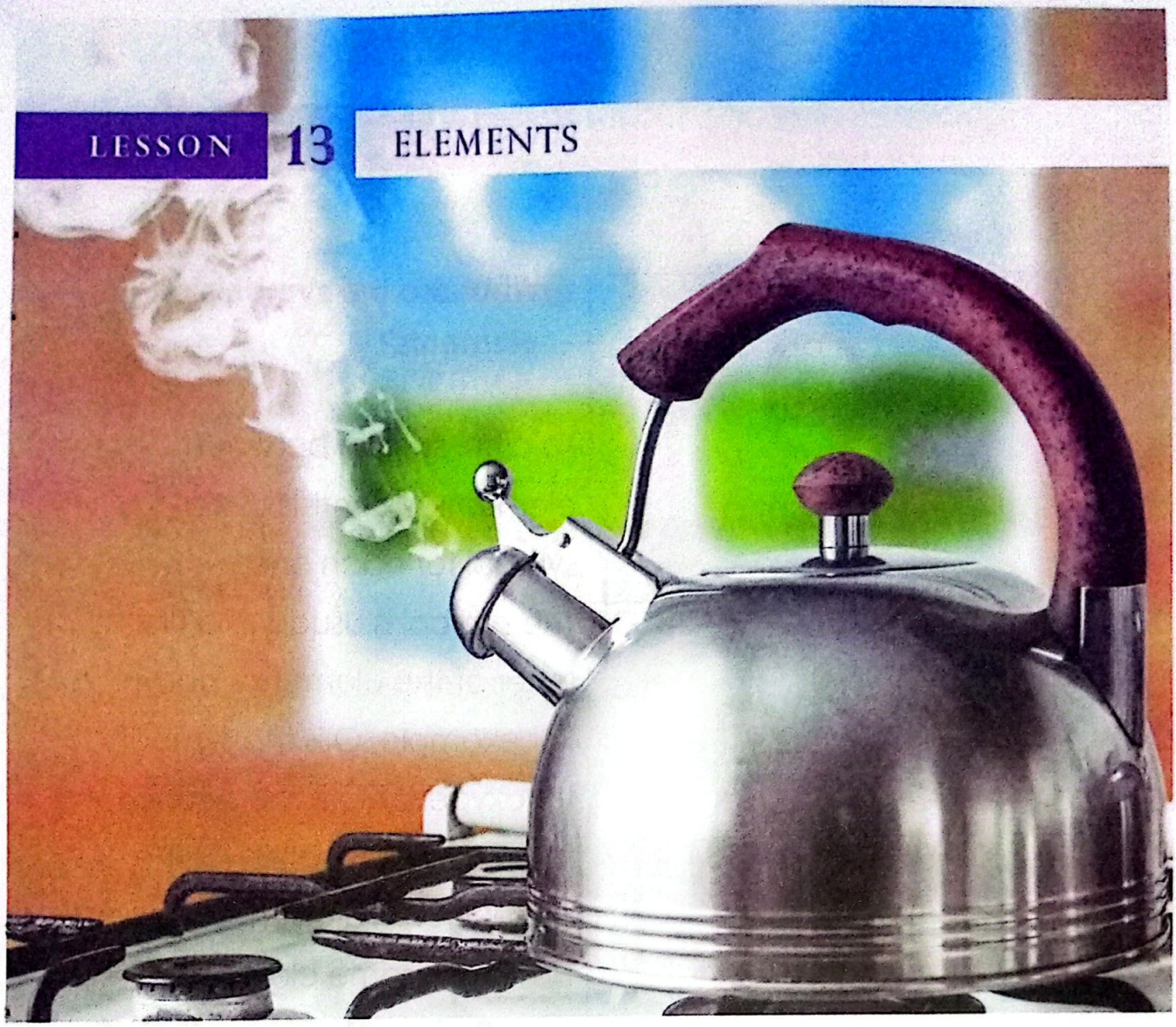







Elements can be solids, liquids, or gases.
Solid elements include copper, zinc, and aluminum, whereas mercury and bromine are the only elements that are liquids.
Gas elements include helium, nitrogen, and neon.

LESSON 13 ELEMENTS

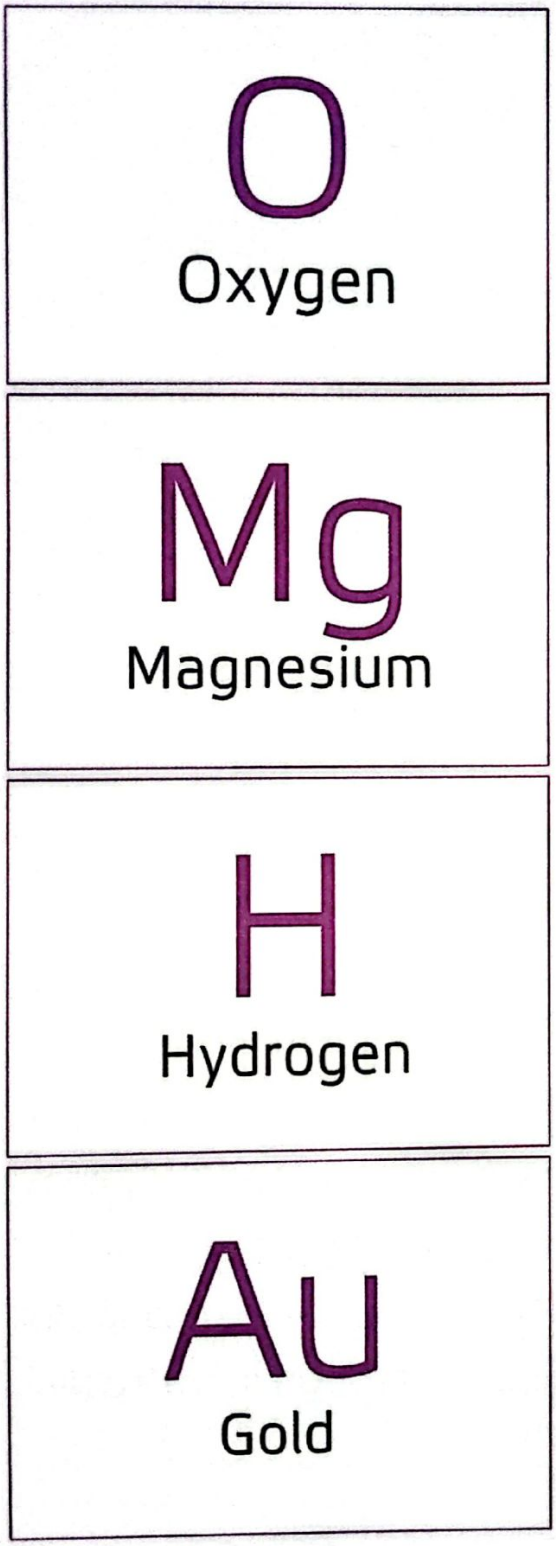


## What are the differences between metals and nonmetals?

Elements can be classified as metals or nonmetals.

Metals, such as aluminum, iron, and copper, are shiny and can be bent or hammered into different shapes. They allow heat and electricity to pass through them easily.

Nonmetals, such as neon and iodine, are not shiny and do not allow heat and electricity to pass through them easily.




## What are the symbols of elements?

To differentiate between elements, scientists use a symbol for each one.
The symbol is usually the first letter of the element's name. For example, O is the symbol for oxygen, Mg is the symbol for magnesium, and H is the symbol for hydrogen.
However, some elements take their symbols from their Latin names. For example, gold's symbol is Au, and its Latin name is 'aurum'.
The first letter of a chemical symbol is always capitalized.

**A Write true or false. Then correct the false statement(s).**

All matter is made up of elements.

Elements can be solids or gases only.

Metals conduct electricity.

Nonmetals are shiny.

**B Match each element to its symbol.**

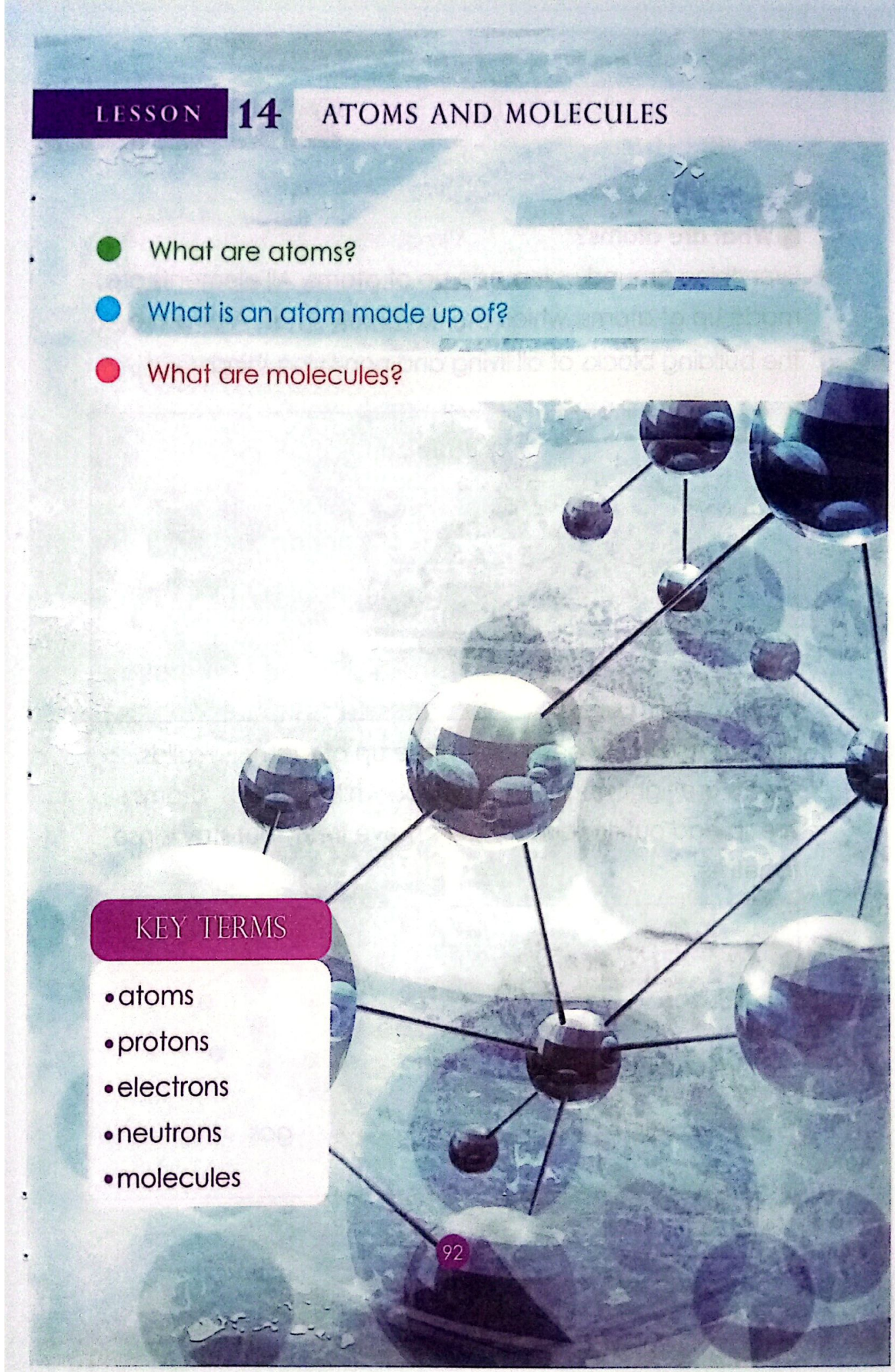
| | | | |
|---|---|---|---|
| Gold | • | • | O |
| Magnesium | • | • | H |
| Oxygen | • | • | Au |
| Hydrogen | • | • | Mg |

**C Differentiate between copper and neon in the table below.**

| Element | Properties |
| --- | --- |
| Copper | • .....<br>• .....<br>• ..... |
| Neon | • .....<br>• .....<br>• ..... |

# LESSON 14 ATOMS AND MOLECULES

- What are atoms?
- What is an atom made up of?
- What are molecules?

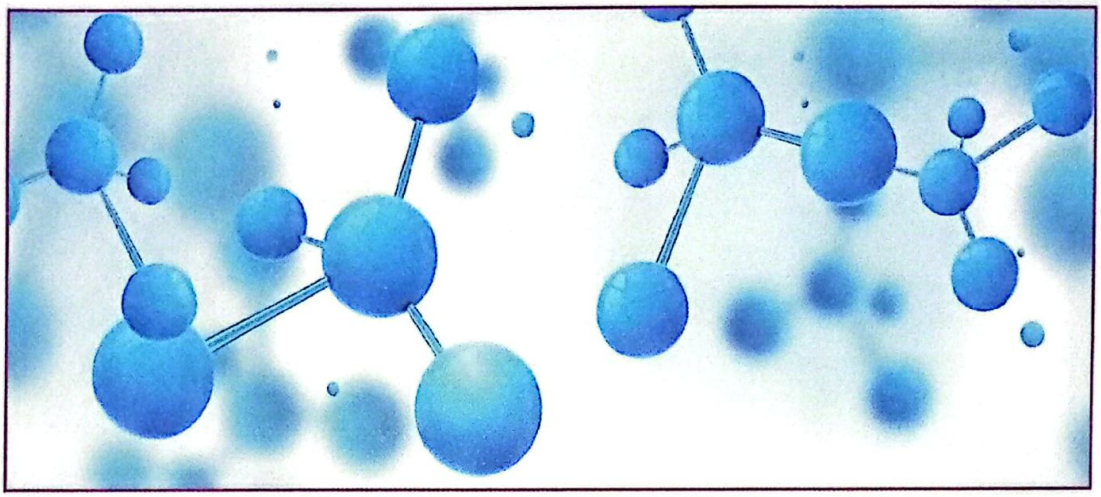


## KEY TERMS

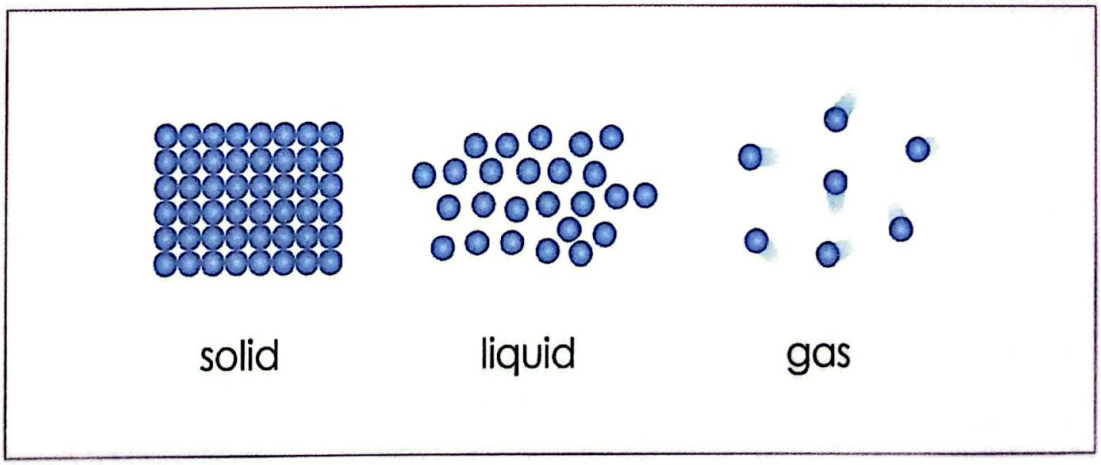
- atoms
- protons
- electrons
- neutrons
- molecules

## What are atoms?

Everything around us is made up of atoms. All elements are made up of atoms, which are extremely small. Atoms are the building blocks of all living and non-living things.



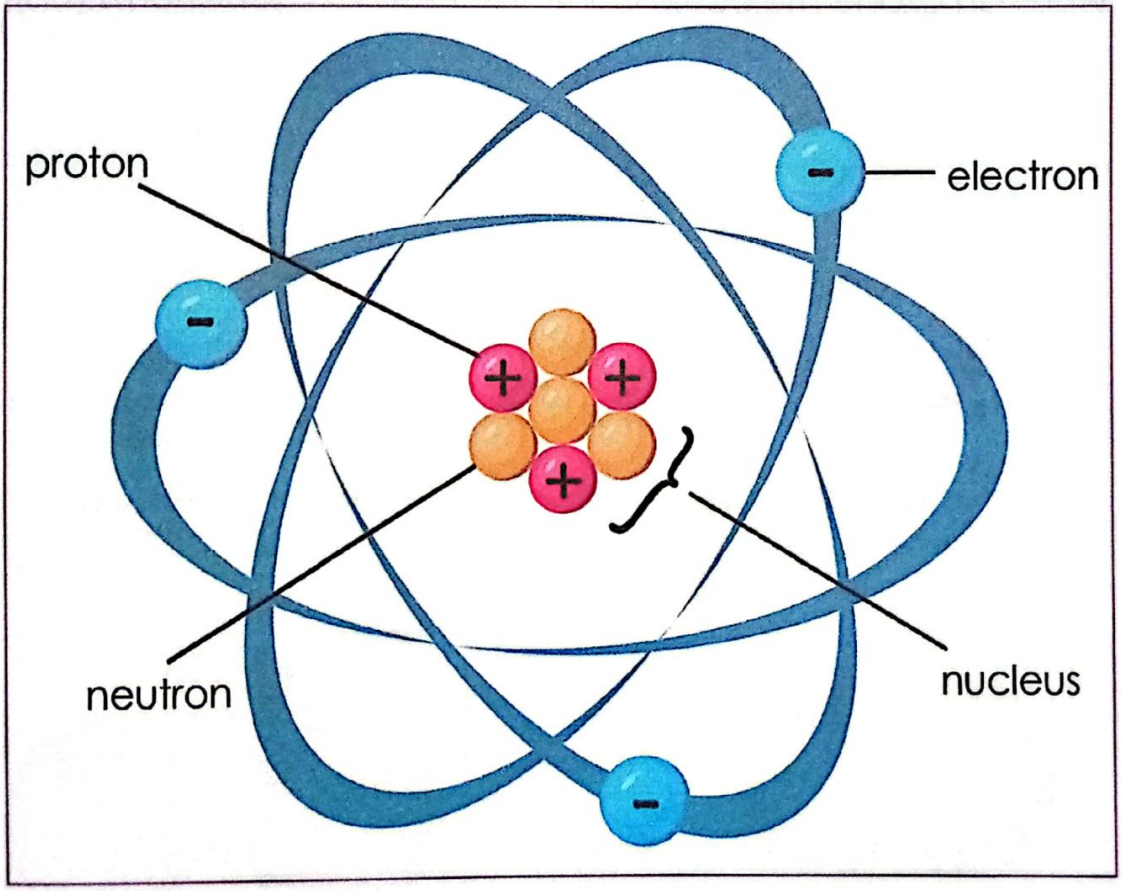
Solids, liquids, and gases are made up of atoms. In solids, atoms are tightly packed together, while in gases, atoms are spread out. In liquids, atoms move freely but stay close together.



## What is an atom made up of?

An atom is made up of two basic parts: a nucleus, which holds the protons and neutrons, and a surrounding shell, which holds the electrons.

Protons are positively charged, electrons are negatively charged, and neutrons are neutral.



## What are molecules?

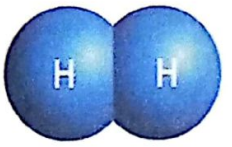
Atoms combine to form molecules.

A molecule consists of two or more atoms.

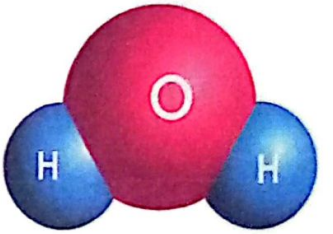
For example, a hydrogen molecule is made up of two hydrogen atoms ($H_2$).

Water is made up of two hydrogen atoms and one oxygen atom ($H_2O$).

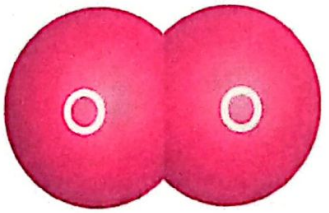
An oxygen molecule is made up of two oxygen atoms ($O_2$), while an ozone molecule contains three oxygen atoms ($O_3$).



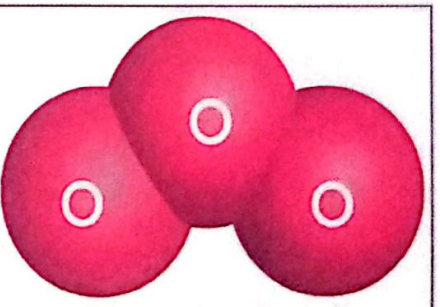

hydrogen molecule




water molecule




oxygen molecule




ozone molecule

**A Write true or false. Then correct the false statement(s).**

Some elements are made up of atoms.

A molecule can be made up of two or more atoms.

Protons are negatively charged.

Protons and neutrons are found in the nucleus of an atom.

**B Tick (✓) the correct answer.**

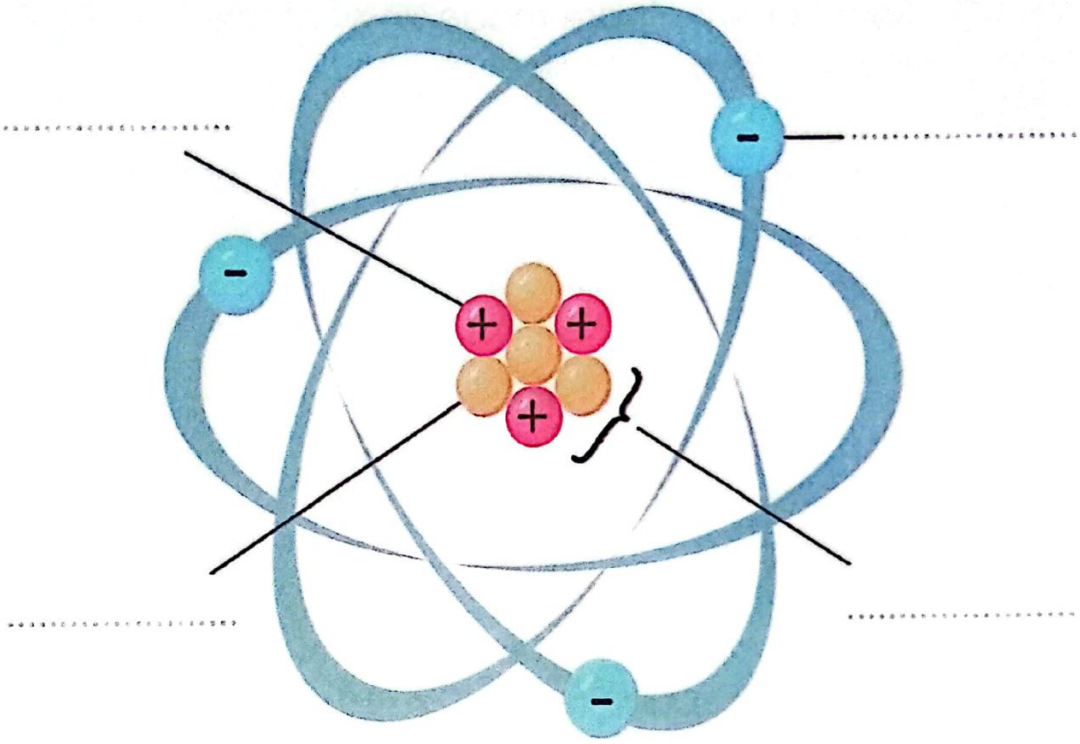
**1.** Atoms of different elements are .....

◯ similar ◯ different

**2.** Atoms combine to form .....

◯ protons ◯ molecules

1. Label the structure of the atom in the figure below.



2. Fill in the correct number of electrons, protons, and neutrons for the atom, as shown in the figure above.

| Atom's Constituents | Number |
|---|---|
| electrons | |
| protons | |
| neutrons | |

**A Write true or false. Then correct the false statement(s).**

Some elements are made up of atoms.

A molecule can be made up of two or more atoms.

Protons are negatively charged.

Protons and neutrons are found in the nucleus of an atom.

**B Tick (✓) the correct answer.**

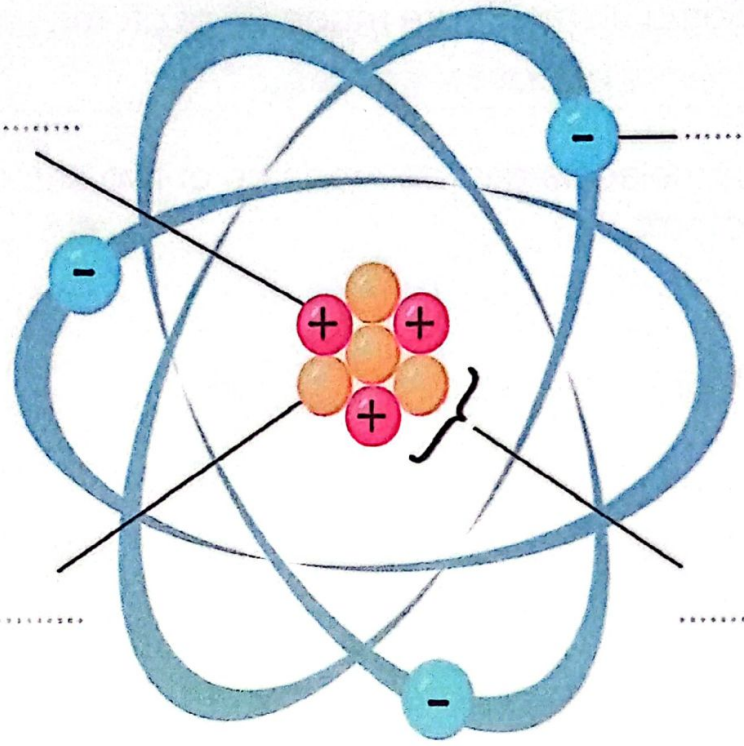
**1.** Atoms of different elements are .....

◯ similar ◯ different

**2.** Atoms combine to form .....

◯ protons ◯ molecules

**1. Label the structure of the atom in the figure below.**

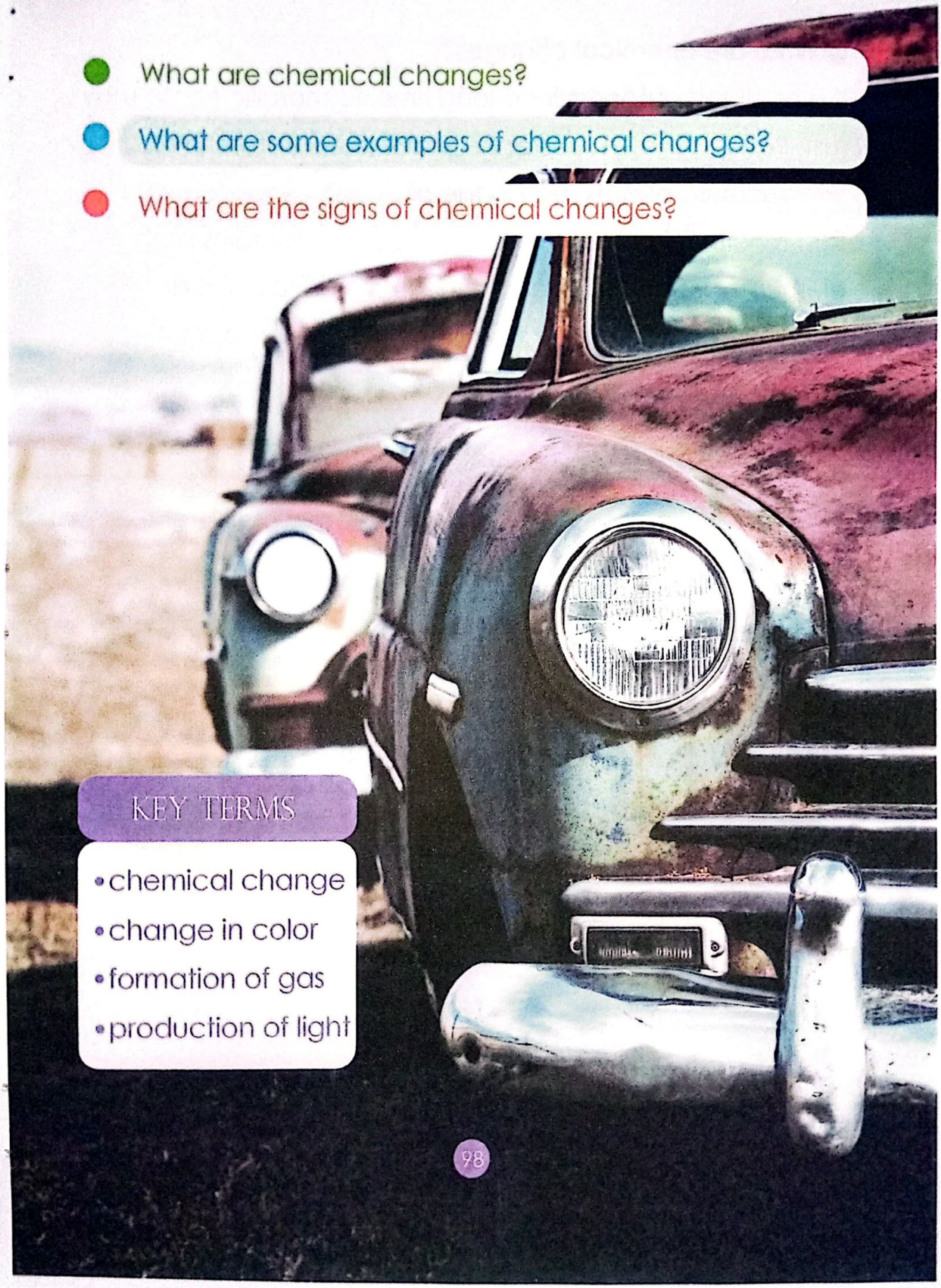


**2. Fill in the correct number of electrons, protons, and neutrons for the atom, as shown in the figure above.**

| Atom's Constituents | Number |
|---|---|
| electrons | |
| protons | |
| neutrons | |

# LESSON 15 CHEMICAL CHANGES

- What are chemical changes?
- What are some examples of chemical changes?
- What are the signs of chemical changes?



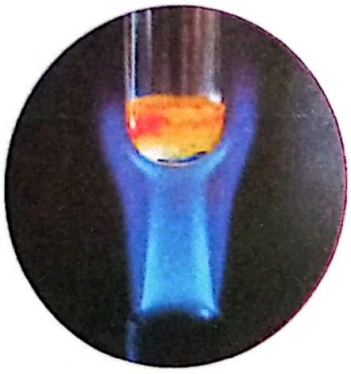
## KEY TERMS

- chemical change
- change in color
- formation of gas
- production of light

## What are chemical changes?

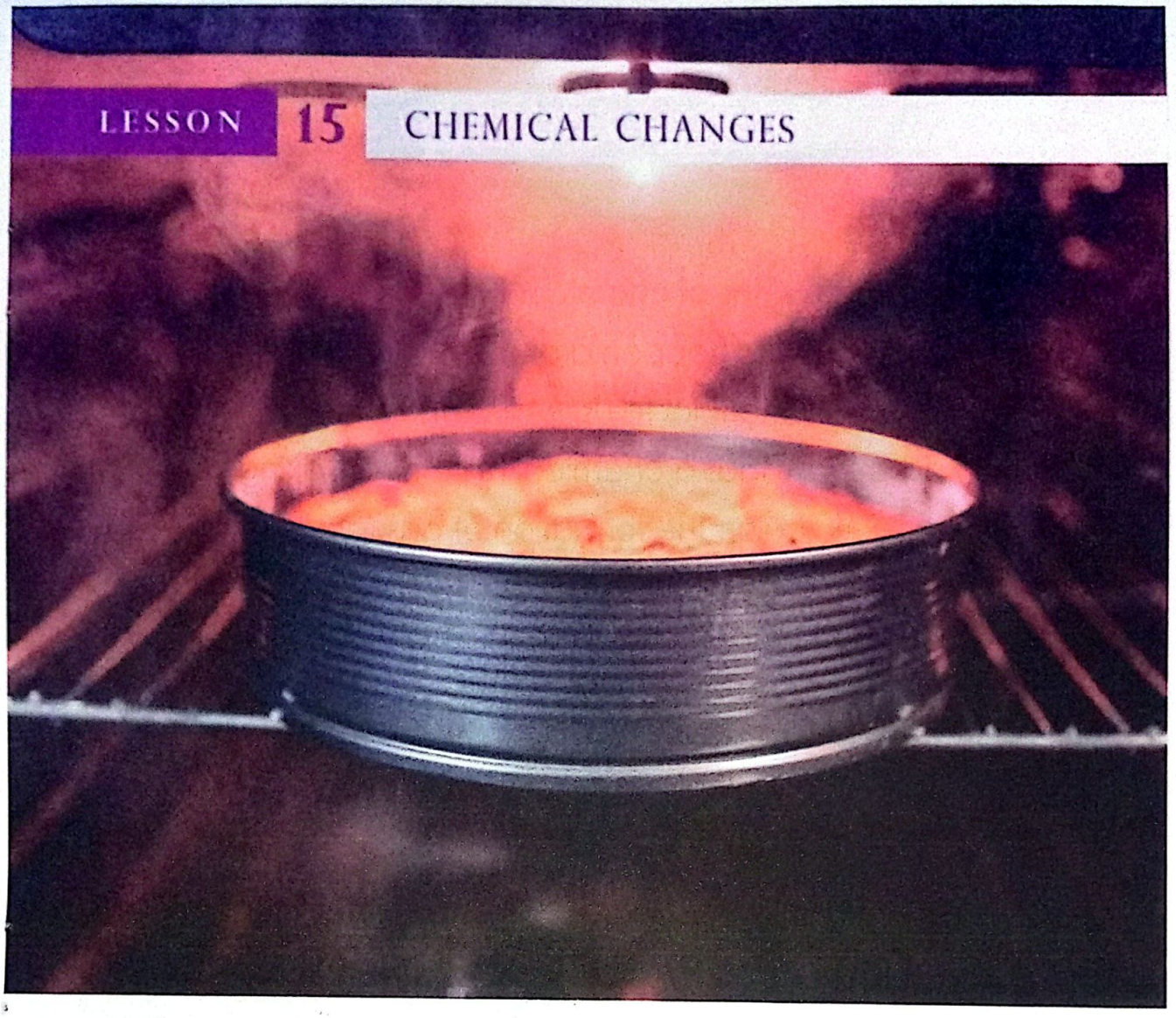
If a car is left outdoors for a long time, its metallic frame may rust. Rust is a brown substance that forms when iron reacts with moisture and oxygen in the air.

Rust is neither iron nor oxygen; however, it contains both elements combined. The change from iron to rust is a chemical change, also known as a chemical reaction.









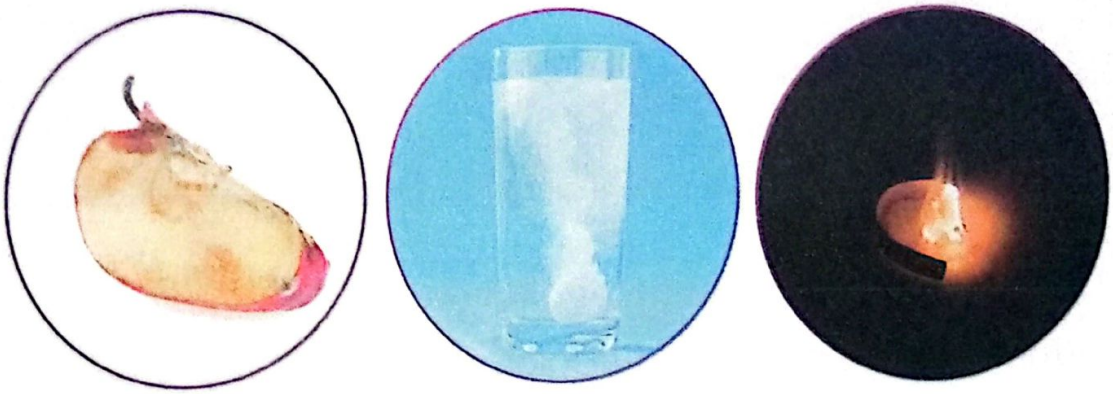
LESSON 15 CHEMICAL CHANGES

## What are some examples of chemical changes?

When we bake a cake, its color, taste, and texture change. Cooking causes chemical changes in food. Similarly, silver darkens and turns black over time due to a chemical reaction with sulfur-containing gases in the air, resulting in black spots called tarnish. This is also a chemical change.

## What are the signs of chemical changes?

Chemical changes happen around us. Some chemical reactions are beneficial to us, while others are harmful. Many signs show that a chemical reaction is taking place. The change in color, the formation of gas, and the production of light are signs of chemical changes.



# LESSON 15 CHEMICAL CHANGES

## A Choose the correct answer.

1. Rust contains ..... .

◯ only oxygen ◯ only iron ◯ oxygen and iron

2. A chemical change begins with one kind of matter and ends with ..... of matter.

◯ a different state ◯ the same kind ◯ a different kind

3. When silver tarnishes, a/an ..... change occurs.

◯ electrical ◯ physical ◯ chemical

## B Tick (✓) the signs of the chemical reaction shown in the figure.

◯ change in shape

◯ formation of gas

◯ production of light



**1. Fill in the blanks using the words in the box.**

rust - fresh milk - fried egg - ash

| Example | Before a Chemical Change | After a Chemical Change |
|---|---|---|
| Rusting of iron | iron | ..... |
| Souring of milk | ..... | sour milk |
| Frying an egg | raw egg | ..... |
| Burning firewood | firewood | ..... |

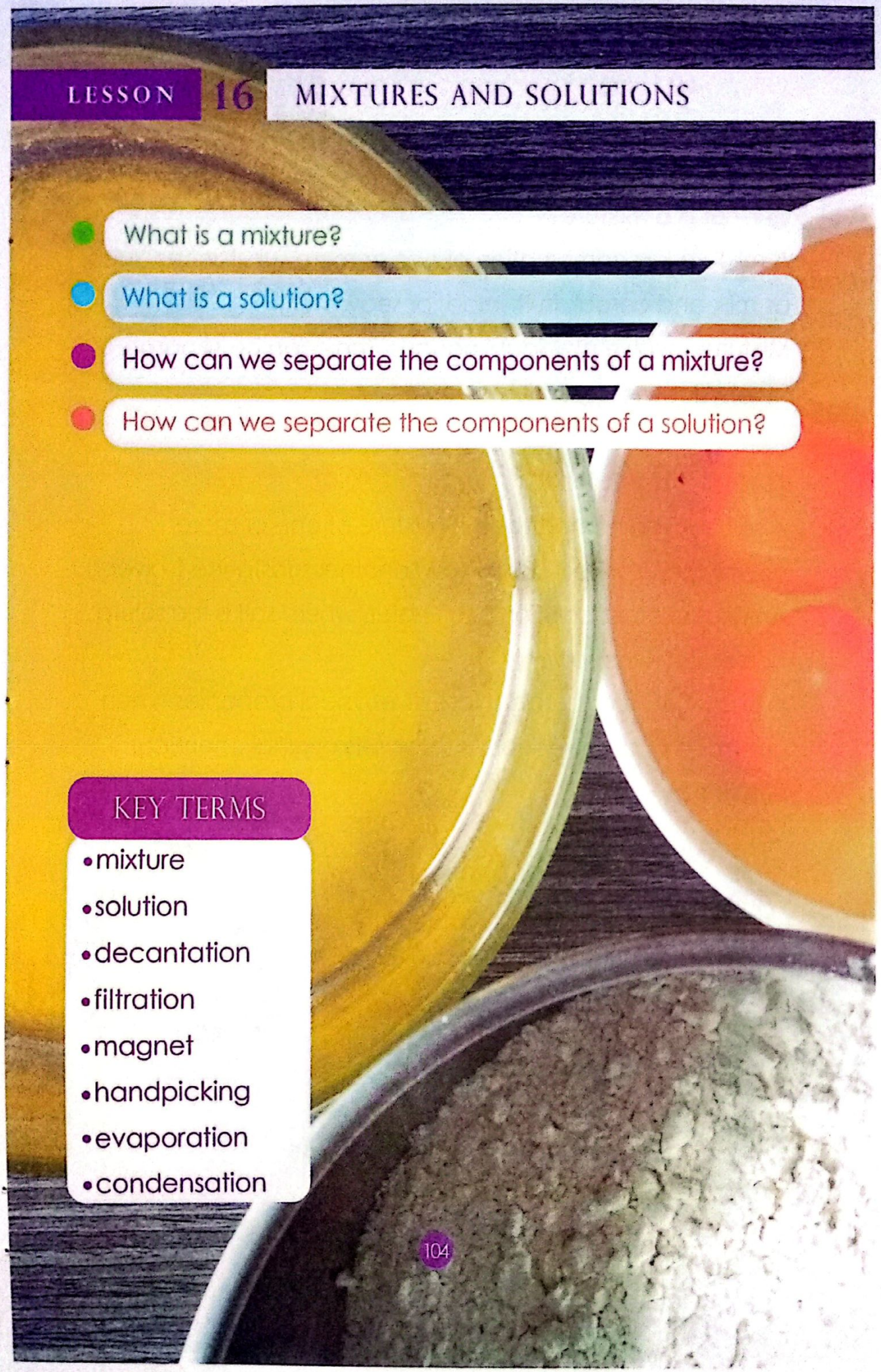
**2. Does the kind of matter remain the same before and after a chemical change?**

.....

LESSON 16

# MIXTURES AND SOLUTIONS

- What is a mixture?
- What is a solution?
- How can we separate the components of a mixture?
- How can we separate the components of a solution?



## KEY TERMS

- mixture
- solution
- decantation
- filtration
- magnet
- handpicking
- evaporation
- condensation

## What is a mixture?

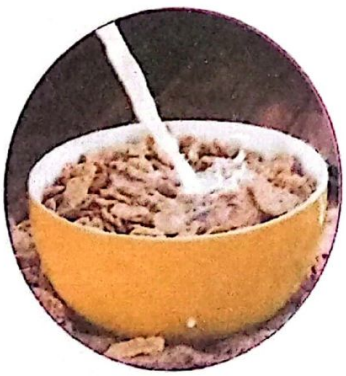
A mixture is a combination of two or more substances, such as milk and cereal, fruit salad, or seawater.

Mixtures involve physical changes. They can be separated by physical means.

## What is a solution?

A solution is a homogeneous mixture of one or more substances (solutes) dissolved in another substance (solvent). An example of a solution is saltwater, where salt is the solute and water is the solvent.

In a mixture, matter might lose its physical properties when chopped or dissolved, but it retains its original chemical properties.







## How can we separate the components of a mixture?

We can use physical properties to separate mixtures. For example, to separate coins from pebbles, we can pick the materials based on their shapes, colors, or even sizes.

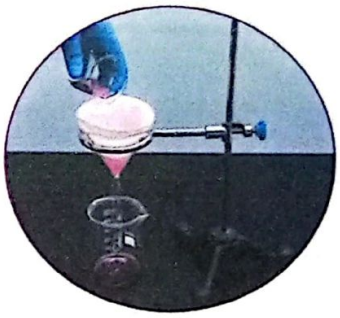
**Decantation:**

When muddy water is left undisturbed for a long time, the soil settles down at the bottom, while the water stays on top.



**Filtration:**

A filter acts as a net that allows small particles, such as water, to pass through its pores while trapping large particles.



**Magnet:**

A magnet can be used to separate iron filings from sand. The magnet attracts only the iron filings.



**Handpicking:**

Handpicking involves separating the components of a mixture by hand.



## How can we separate the components of a solution?

Tiny particles of solutions, like salt, cannot be separated by decantation or filtration. Instead, they can be separated by evaporation followed by condensation to collect the solvent. For example, when seawater evaporates, it turns into water vapor, leaving behind solids, such as salt.



As water vapor rises into the sky, it accumulates to form clouds. Later, in colder weather, the water vapor in the clouds condenses and turns into liquid water. This is an example of condensation.



# LESSON 16 MIXTURES AND SOLUTIONS

**A Tick (✓) the correct answer.**

**1.** In a sugar-water solution, sugar is the ..... .

○ solvent ○ solute ○ solution

**2.** A/an ..... is a combination of two or more substances.

○ mixture ○ element ○ atom

**3.** The process of changing water vapor into liquid water is called ..... .

○ evaporation ○ filtration ○ condensation

**B Name the most appropriate separation technique for separating the components of each of the following mixtures.**

soil + water .....

sand + iron filings .....

rice + marbles .....

salt + water .....

**C Classify each mixture under the correct heading.**

oil and water - salt and water - sand and water - sugar and water - alcohol and water - fruit salad

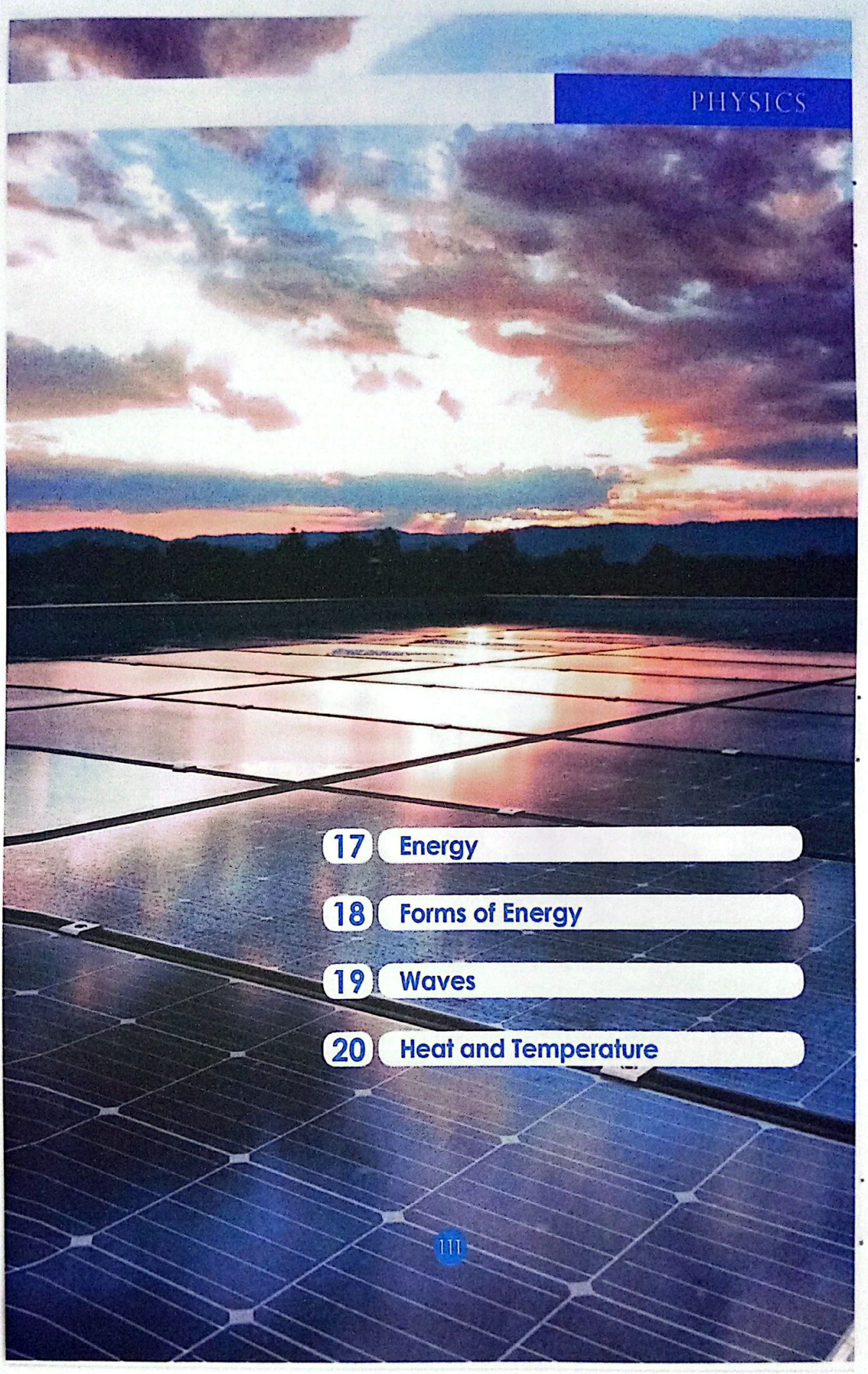
| Solution | Not a Solution |
| --- | --- |
| ..... | ..... |
| ..... | ..... |
| ..... | ..... |



WORLD'S KEY

UNIT 5

# PHYSICS



17 Energy

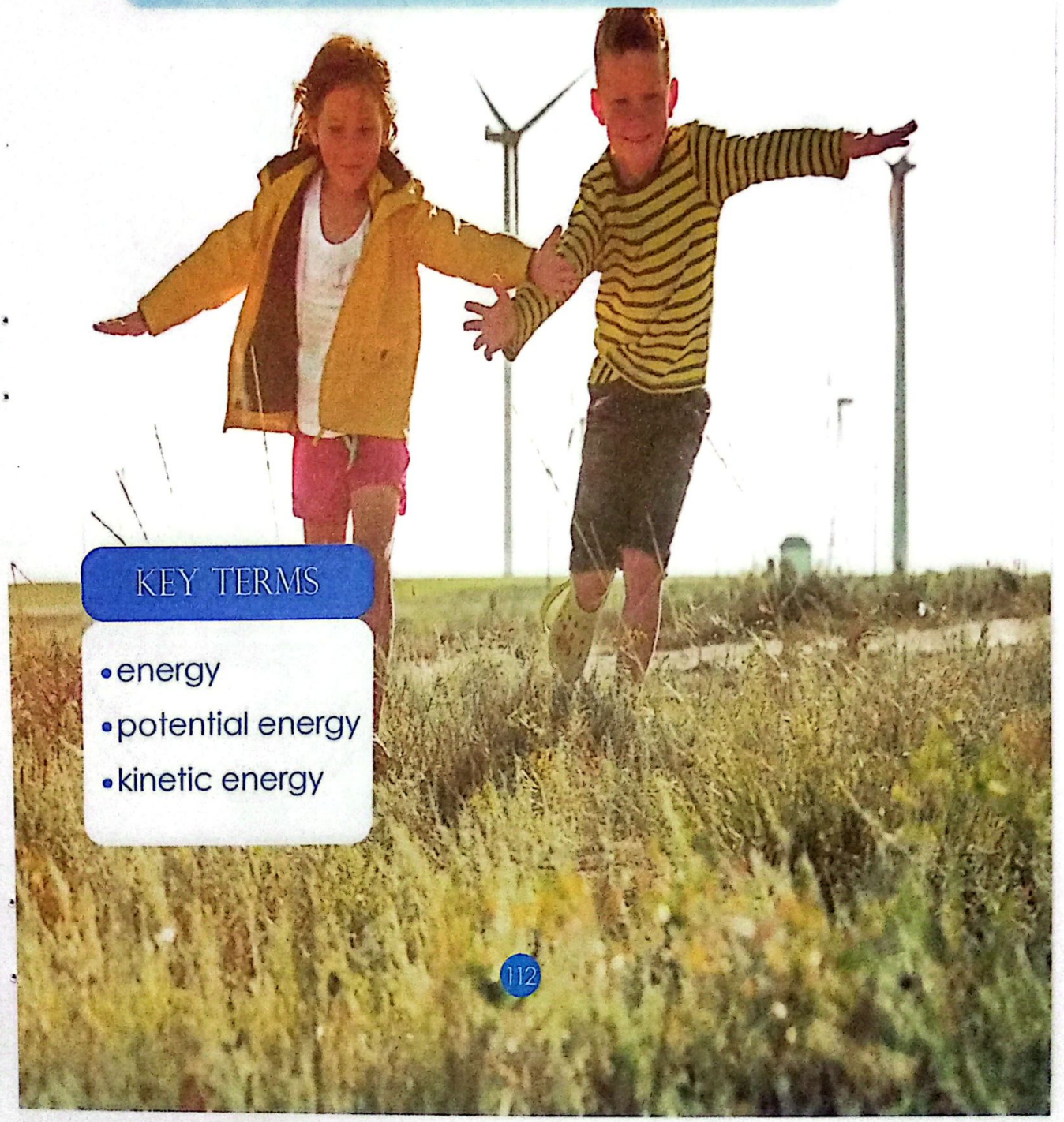
18 Forms of Energy

19 Waves

20 Heat and Temperature

# LESSON 17 ENERGY

- What is energy?
- What is potential energy?
- What is kinetic energy?
- Can energy move from one place to another?



## KEY TERMS

- energy
- potential energy
- kinetic energy

## What is energy?

Everything we do in life has a physical value called energy. Energy is the ability to do work, like moving objects to perform tasks. We need energy for everyday activities, like walking, riding bikes, and lifting weights.





## What is potential energy?

Potential energy is stored energy due to an object's position. For example, in a crossbow, the form of energy present in the bow before shooting is called potential energy.

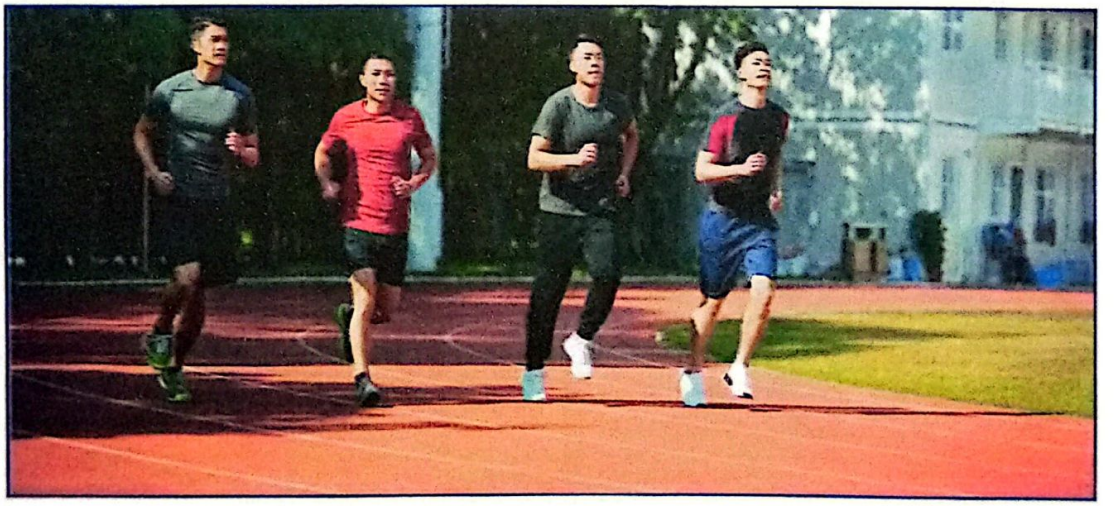




## What is kinetic energy?

Kinetic energy depends on the speed of an object. As the speed increases, the kinetic energy also increases.

For instance, when a crossbow is released, its bow moves and generates kinetic energy.



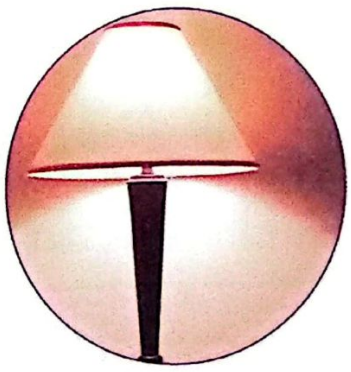
## Can energy move from one place to another?

Energy can move from one place to another. When two objects collide, they transfer energy to each other. For example, during a car crash, energy transfers from one vehicle to another.



Energy transfers from one place to another in the form of heat, light, or sound.







**A Write true or false. Then correct the false statement(s).**

Energy is the ability to do work.

Stored energy is called potential energy.

As the speed of an object increases, its kinetic energy decreases.

Energy never transfers from one place to another.

**B Match each form of energy to its definition.**

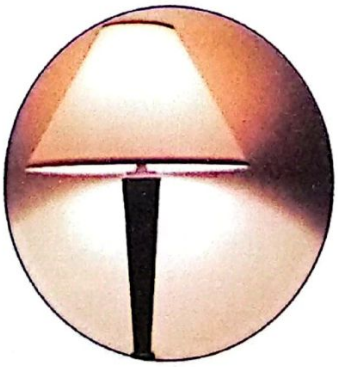
| | |
|---|---|
| potential energy | energy that an object has when it moves |
| kinetic energy | energy that an object stores |

**C** Tick (✓) the object performing kinetic energy.

| Object | Kinetic Energy |
|---|---|
| A car moving downhill | |
| A book placed on a shelf | |
| A ball rolling on the ground | |
| A stretched rubber band | |

**D** Indicate one type of energy involved in each figure below.





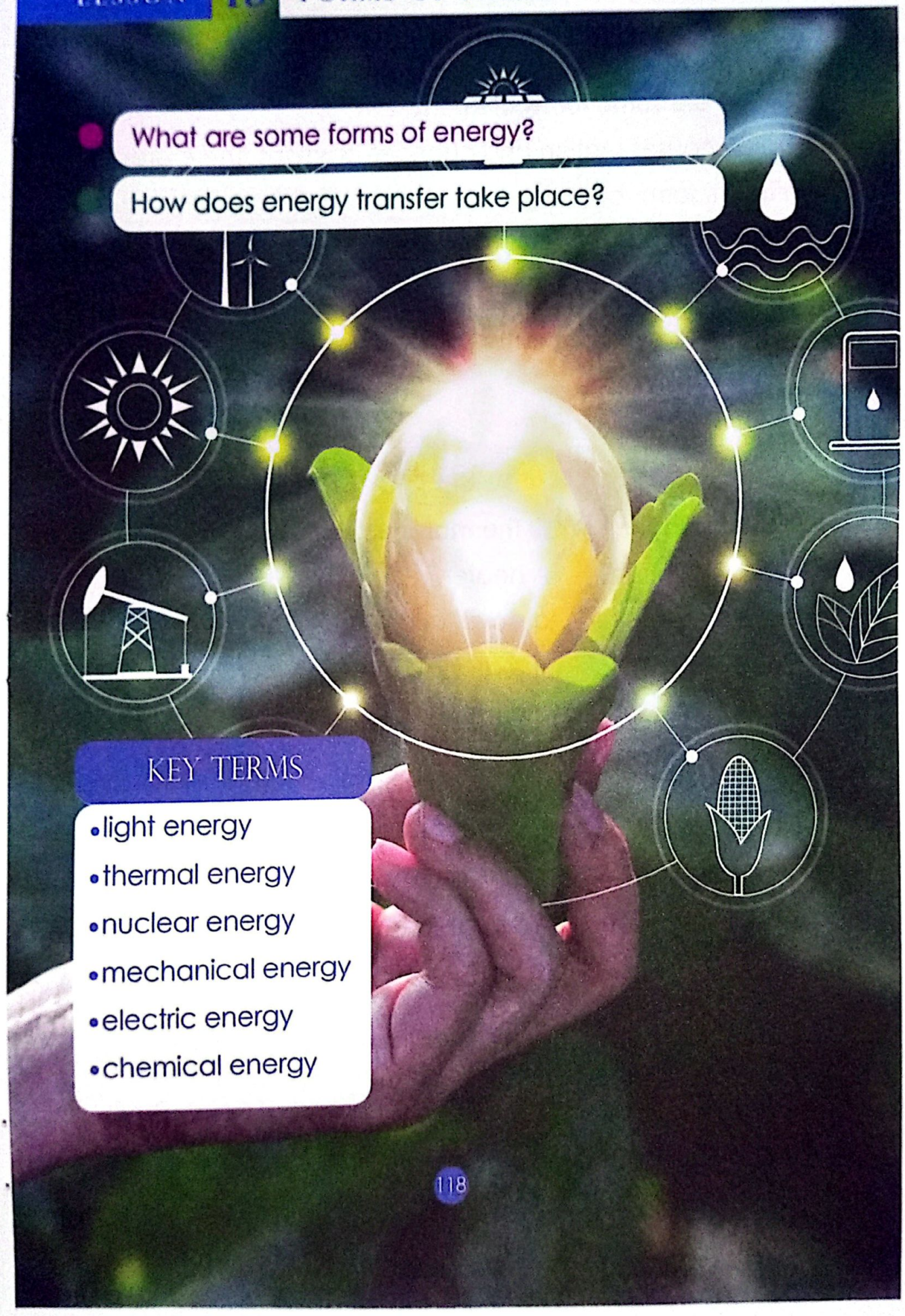


..... ..... .....

LESSON 18

# FORMS OF ENERGY

- What are some forms of energy?
- How does energy transfer take place?



## KEY TERMS

- light energy
- thermal energy
- nuclear energy
- mechanical energy
- electric energy
- chemical energy

## What are some forms of energy?

Energy causes motion and changes positions. There are different forms of energy.



### Light Energy

Energy from the Sun is light energy. It is essential for life on Earth, and it is the origin of all other types of energy.



### Thermal Energy

A heater, a boiler, a stove, and even a match have thermal energy. Substances with thermal energy produce heat.



### Nuclear Energy

When tiny particles inside the atoms of matter split apart or join together, nuclear energy is released.



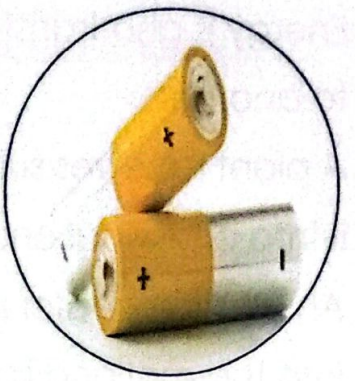
### Mechanical Energy

All moving objects have mechanical energy.
For example, machines require mechanical energy to function.



### Electric Energy

The flow of charged particles causes electric energy.
Examples include energy produced by lightning and lamps.



### Chemical Energy

Energy resulting from chemical reactions is called chemical energy.
Examples include energy produced by batteries and coal.

### How does energy transfer take place?

Energy transfer takes place when energy moves from one object to another. For example, when you throw a volleyball, energy transfers from your hand to the ball.

Energy is also transformed when it changes from one form to another.

A plant receives sunlight, which is light energy, and converts it into chemical energy.

An electric heater receives electric energy and converts it into thermal and light energy.

A photocell converts sunlight energy into electric energy.

In a car, the chemical energy stored in fuel is converted into mechanical energy to power movement.









**A Write true or false. Then correct the false statement(s).**

Energy transfer takes place when energy moves from one object to another.

---

A photocell converts sunlight energy into electric energy.

---

Substances with thermal energy produce heat.

---

The Sun is the basic source of light energy on Earth.

---

**B Fill in the blanks with the correct forms of energy using the types of energy listed in the word box. One word may be used more than once.**

light - electric - thermal

1. The Sun provides ..... energy, which is converted into ..... energy by solar panels.

2. When you turn on a light bulb, electric energy is converted into ..... energy and ..... energy.

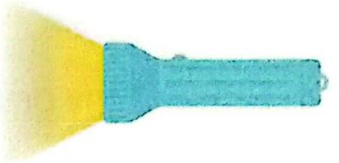
## Identify the energy transformation in each of the following cases.



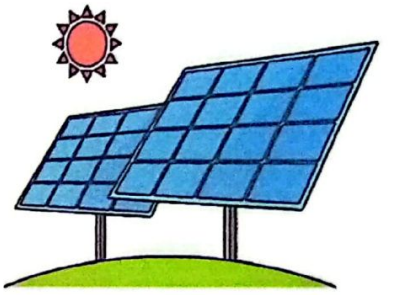
Electric energy is transformed into ..... energy.



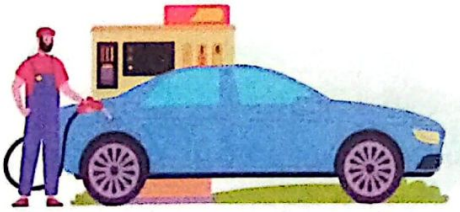
Mechanical energy is transformed into ..... energy.



Chemical energy is transformed into ..... energy.



Light energy is transformed into ..... energy.



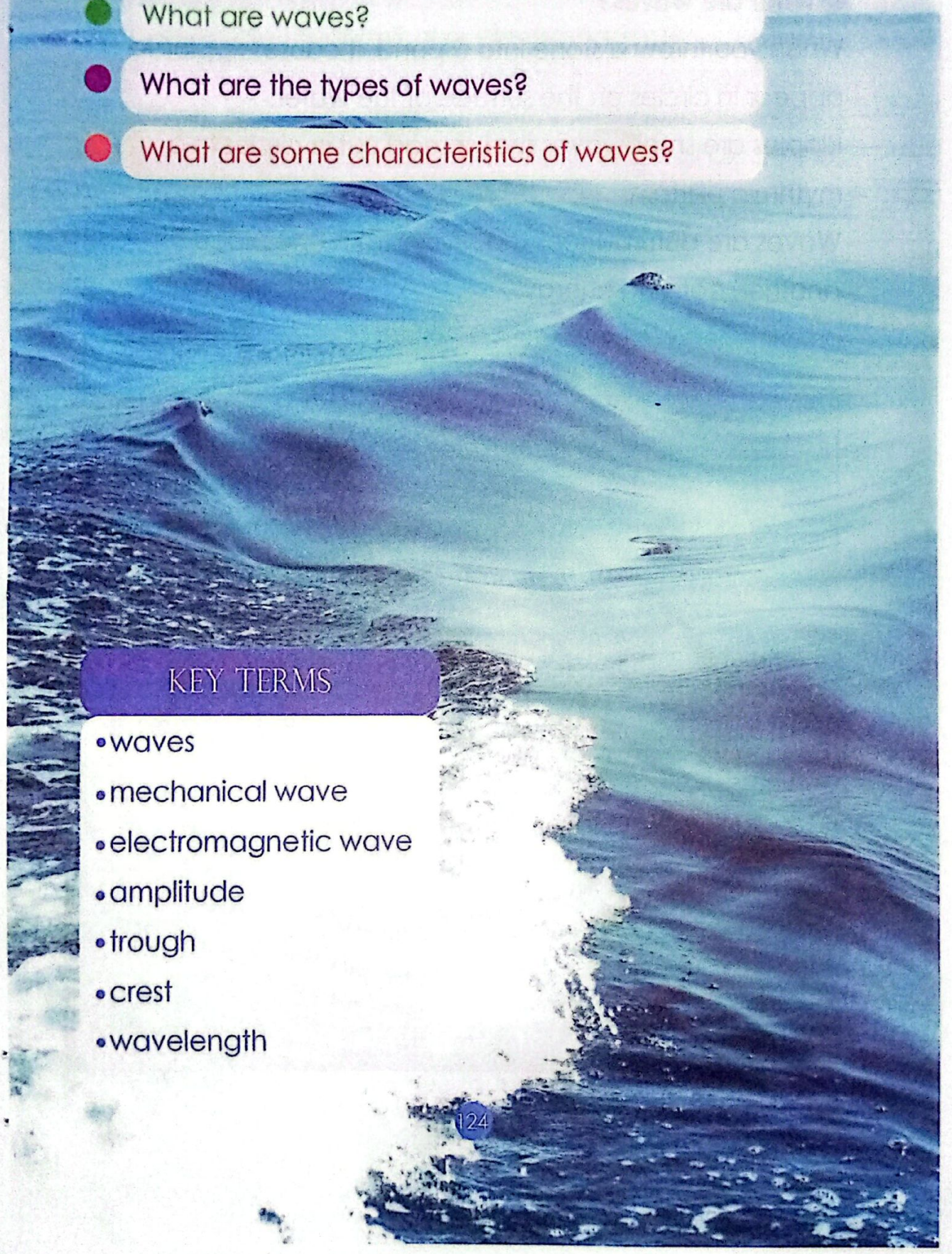
Chemical energy is transformed into ..... energy.



Electric energy is transformed into ..... energy.

# LESSON 19 WAVES

- What are waves?
- What are the types of waves?
- What are some characteristics of waves?



## KEY TERMS

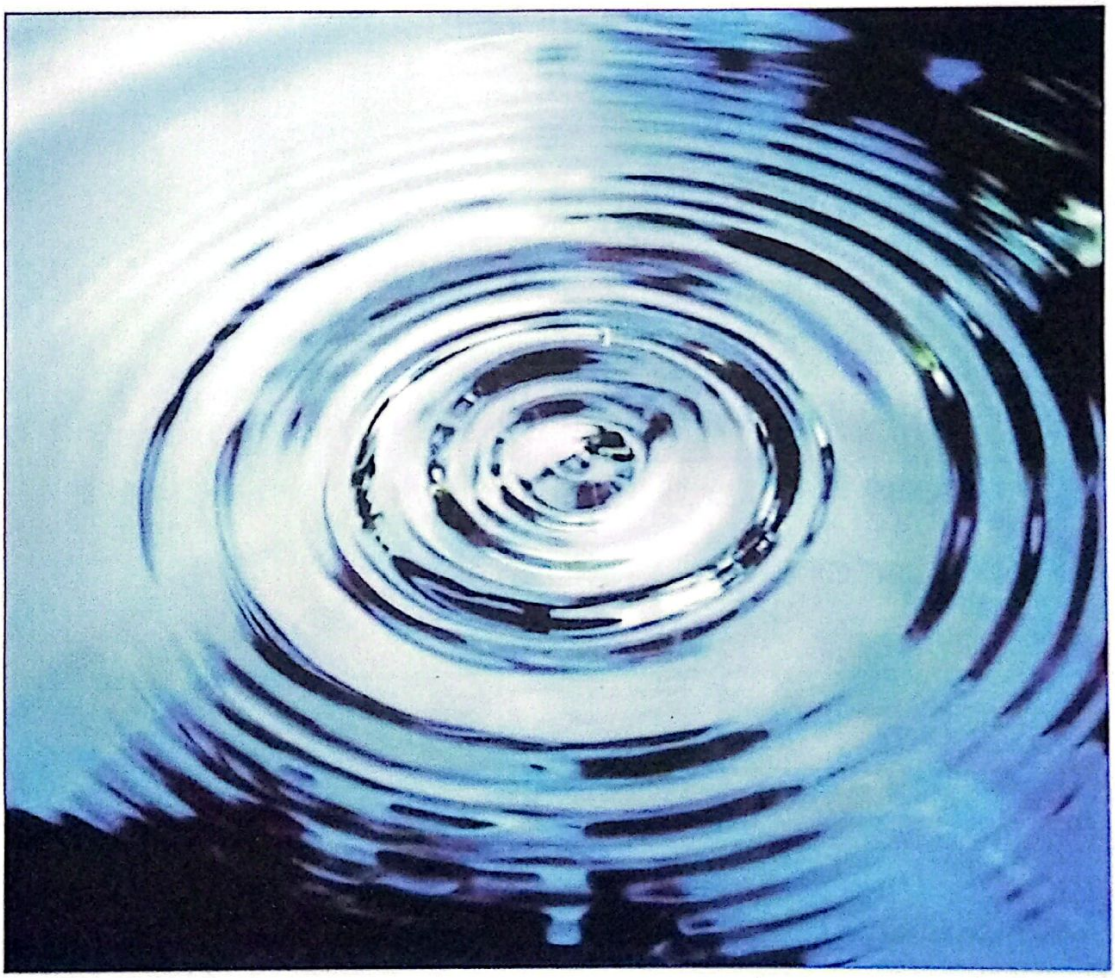
- waves
- mechanical wave
- electromagnetic wave
- amplitude
- trough
- crest
- wavelength

## What are waves?

When you throw a stone into a pond, it causes ripples to appear in circles on the surface of the water.

Ripples are small waves that spread out in circles in a rhythmic pattern.

Waves are disturbances that travel from one place to another, carrying energy.



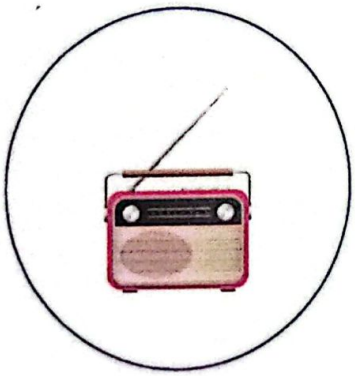
## What are the types of waves?

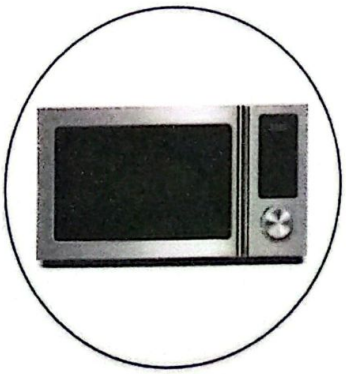
Most waves are mechanical or electromagnetic.
For instance, when we play the guitar, the string moves up and down, producing sound. The vertical motion between two points is called a mechanical wave. In a wall clock, the pendulum moves back and forth between two points; this movement is also called a mechanical wave.

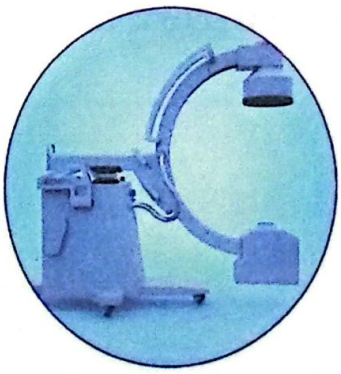




Waves can also be produced by radios, microwaves, and X-ray machines. These are called electromagnetic waves.



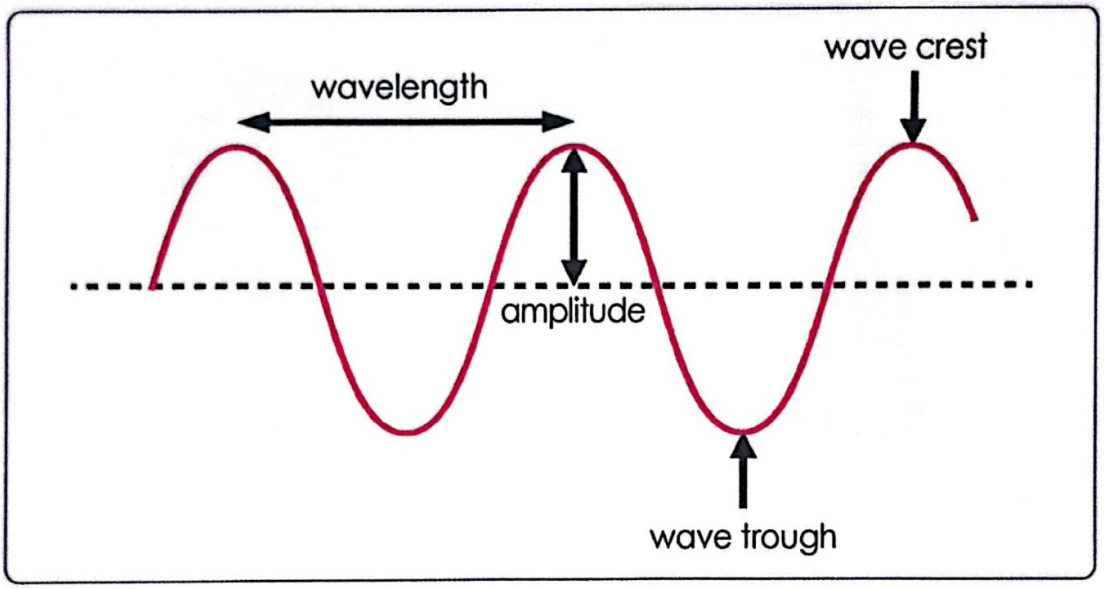




## What are some characteristics of waves?

There are some characteristics of waves:

- **Amplitude:** It refers to the maximum or minimum height of a wave with respect to its equilibrium position.
- **Crest:** It is the highest point of the wave.
- **Trough:** It is the lowest point of the wave.




The distance between two successive crests or two troughs of a wave is called wavelength.

## A Choose the correct answer.

**1.** The wave produced by ..... is mechanical.

- ○ an X-ray machine
- ○ a guitar string
- ○ a radio

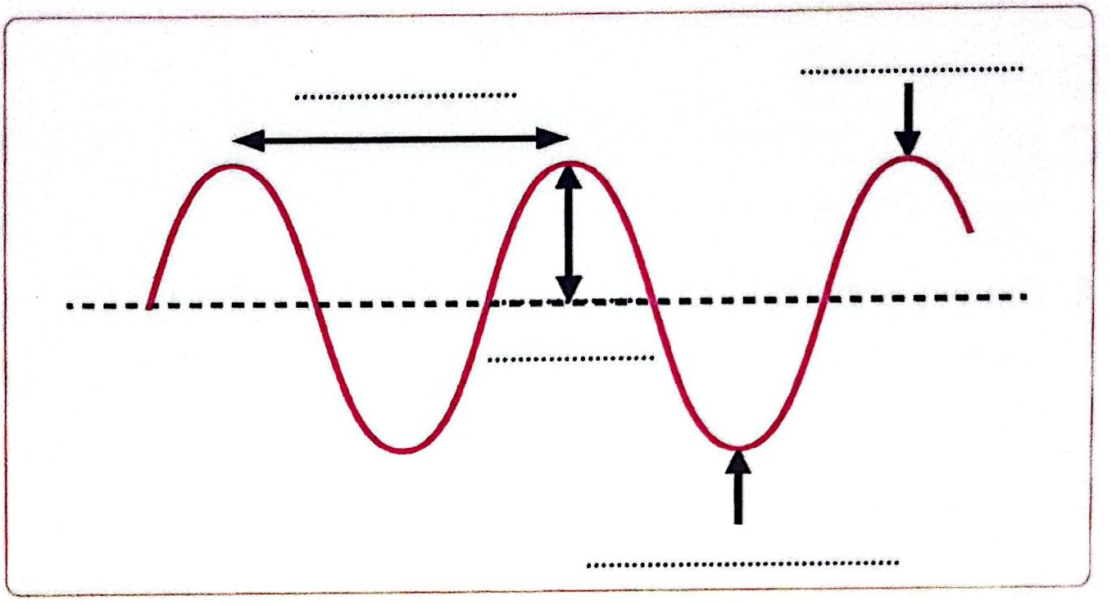
**2.** The wave produced by a ..... is electromagnetic.

- ○ guitar string
- ○ microwave
- ○ pendulum clock

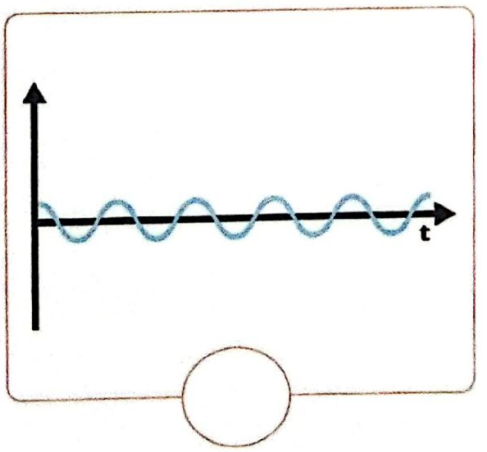
## B Match the terms to their definitions.

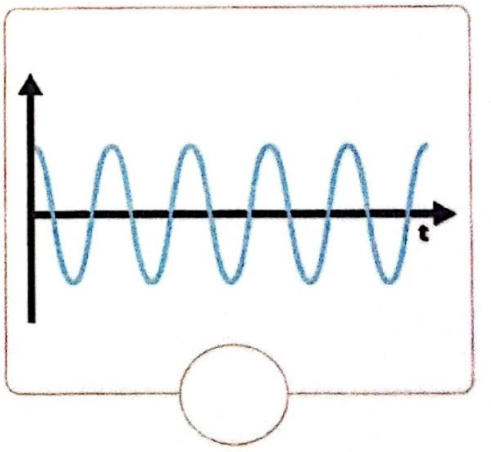
| | |
|---|---|
| amplitude • | • the distance between two successive crests |
| wavelength • | • the height of a wave |

**C** Observe the following wave diagram and label the crest, trough, wavelength, and amplitude.

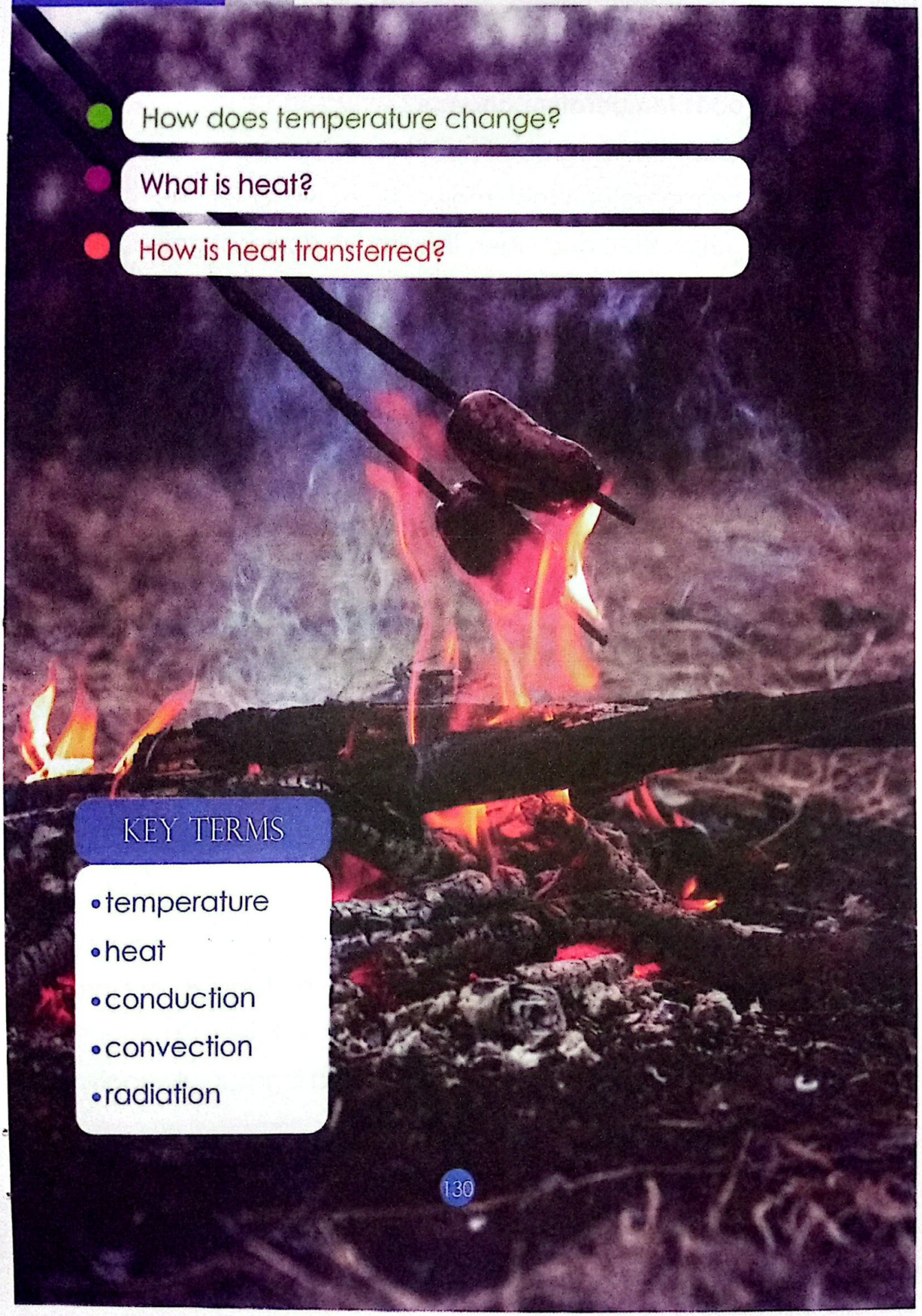


**D** Tick (✓) the wave with the higher amplitude.



# LESSON 20 HEAT AND TEMPERATURE



- How does temperature change?
- What is heat?
- How is heat transferred?

## KEY TERMS

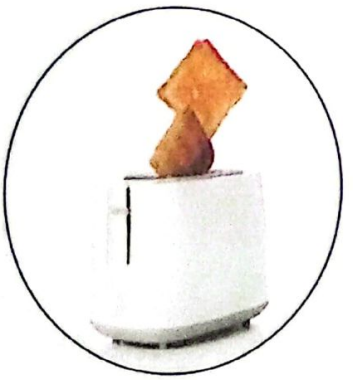
- temperature
- heat
- conduction
- convection
- radiation

## How does temperature change?

Temperature, the degree of heat in an object, is measured with a thermometer. When molecules move faster, the object gets hotter, and when they move slower, it gets colder.

## What is heat?

Heat is the flow of thermal energy from one object to another. Heat always moves from a warmer object to a cooler one.





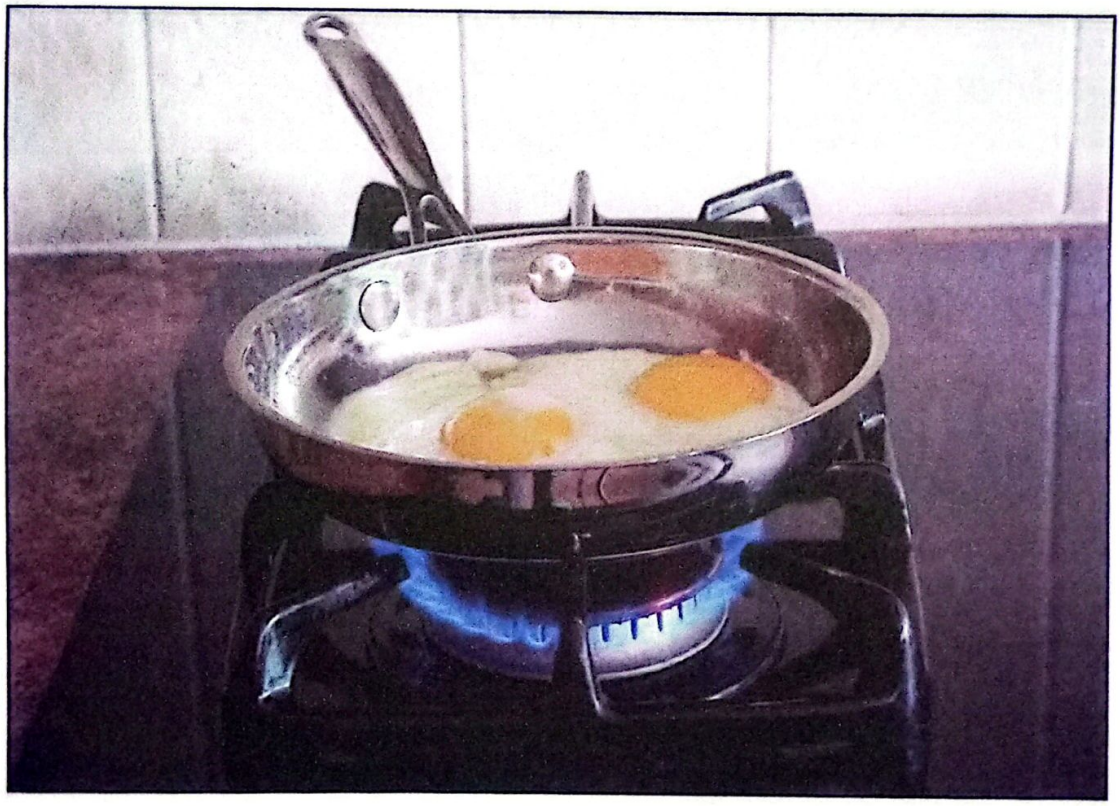


## How is heat transferred?

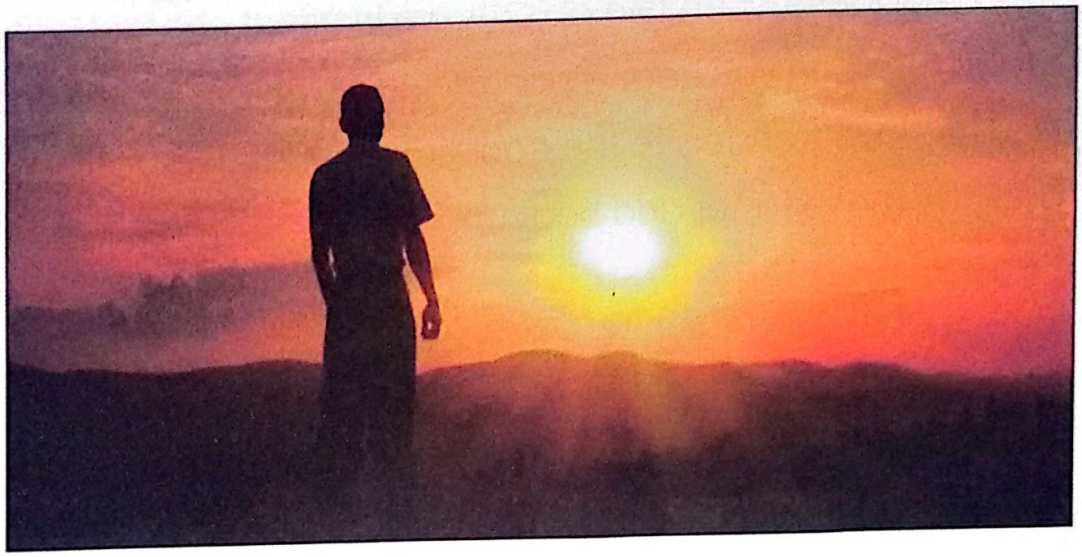
When you heat bread in a toaster, both the toaster and the air around it warm up. Once you touch the bread, its thermal energy moves to your hand, and it gradually cools down.

Heat transfers in different ways:

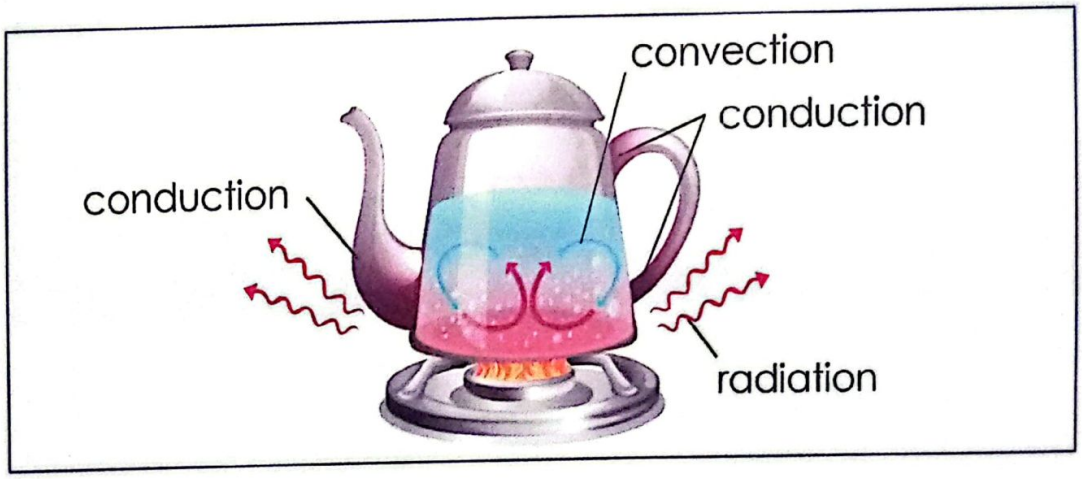
**Conduction:** Solids are heated mainly through conduction, which happens when two objects are in direct contact. For example, when you heat a pan on the stove, energy from the hot stove transfers to the cool pan, making the pan's particles move faster and heat up.



**Radiation:** It is a way of transferring heat. Radiation can travel through different mediums, including air and space. The energy of the Sun reaches Earth through radiation.



**Convection:** Another way of transferring heat is convection. Convection transfers heat through liquids or gases. When you heat water in a kettle, the kettle transfers energy to the water, and heat spreads through the water.



**A Write true or false. Then correct the false statement(s).**

Convection transfers heat through liquids or gases.

_____

The energy of the Sun reaches Earth through conduction.

_____

Temperature is the degree of heat in an object.

_____

As the molecules of an object move faster, its temperature decreases.

_____

_____

**B Tick (✓) the correct answer.**

**1.** The transfer of heat through space is called ..... .

◯ conduction ◯ convection ◯ radiation

**2.** Metals in pans and kettles are good ..... .

◯ conductors ◯ insulators ◯ radiators

**3.** The flow of thermal energy between objects is ..... .

◯ heat ◯ power ◯ space

**C Indicate the way of heat transfer (conduction, convection, or radiation) in each of the following cases.**

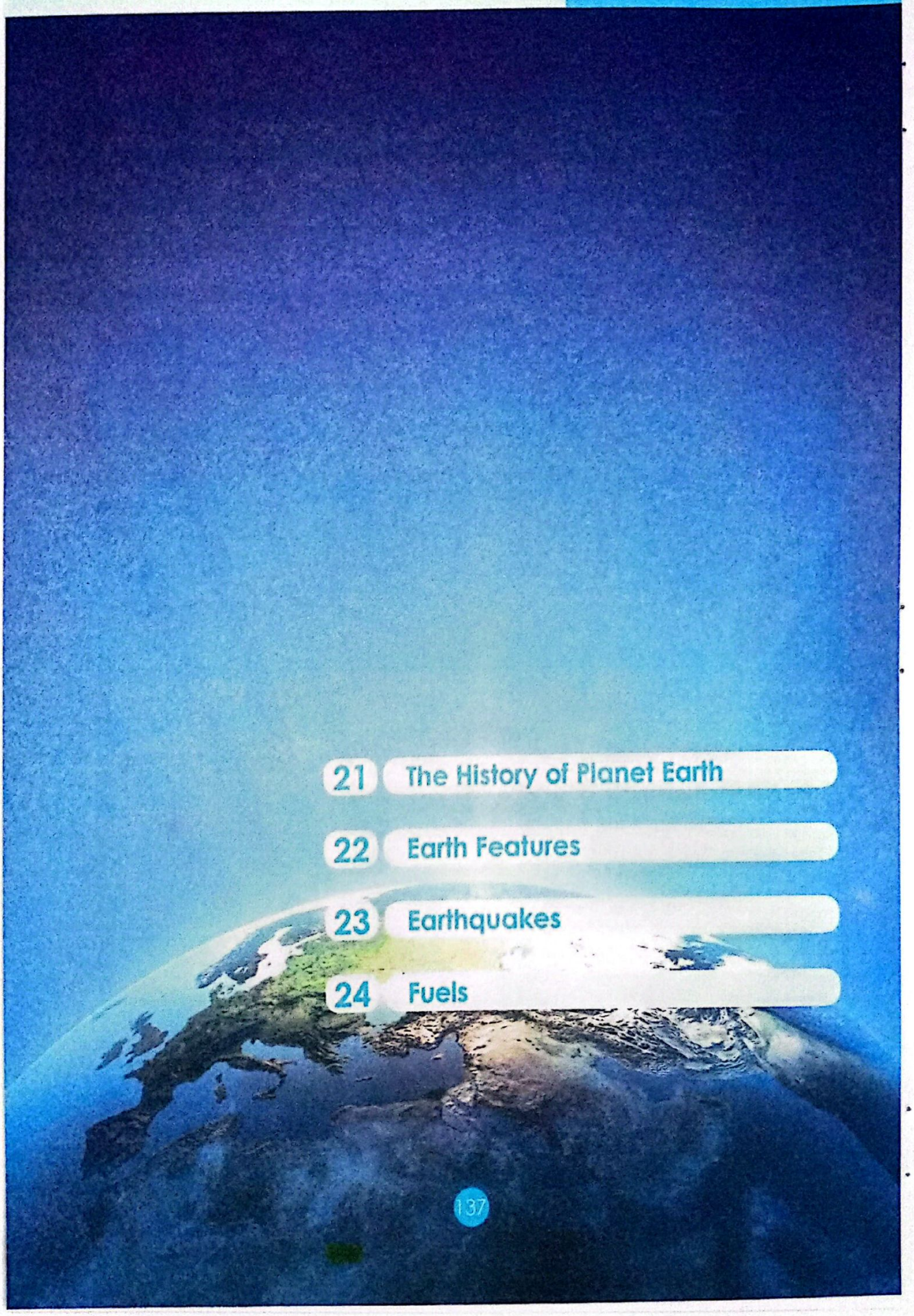
| Case | Way of Heat Transfer |
| --- | --- |
| Soup is stirred with a spoon, and the spoon gets hot. | ..... |
| The Sun warms your skin in cold weather. | ..... |
| Mom irons some clothes. | ..... |
| Hot air lifts a balloon. | ..... |



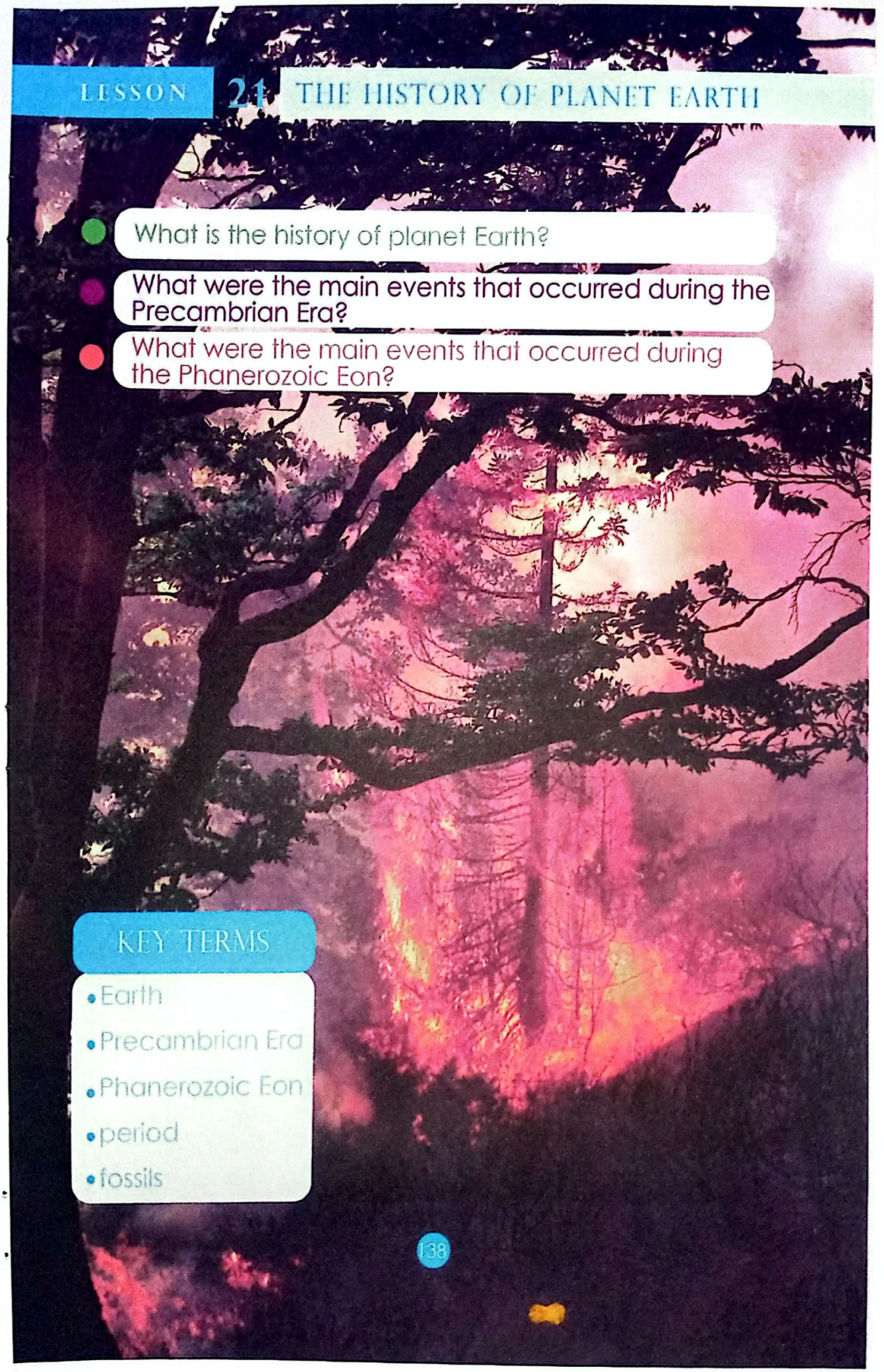
WORLD'S KEY

UNIT 6

# EARTH



21 The History of Planet Earth
22 Earth Features
23 Earthquakes
24 Fuels



# LESSON 21 THE HISTORY OF PLANET EARTH

- What is the history of planet Earth?
- What were the main events that occurred during the Precambrian Era?
- What were the main events that occurred during the Phanerozoic Eon?

## KEY TERMS

- Earth
- Precambrian Era
- Phanerozoic Eon
- period
- fossils

## What is the history of planet Earth?

Earth is a planet in the solar system. Among all the other planets of the solar system, it is the only planet that supports life.

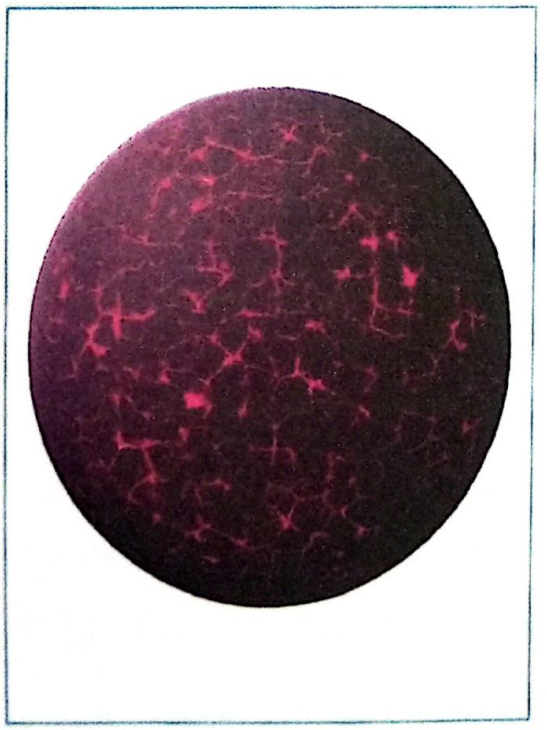
The study of Earth is called geology. Geologists estimate that Earth is about 4.6 billion years old.

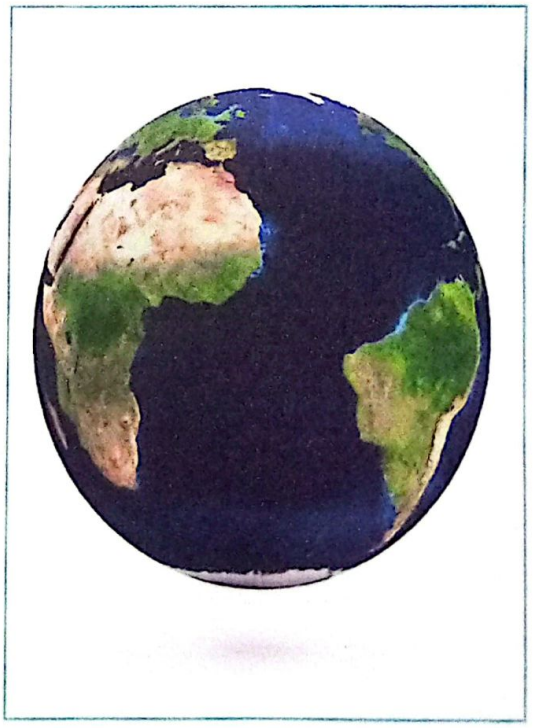
Over time, Earth has changed dramatically to reach its current landscape.



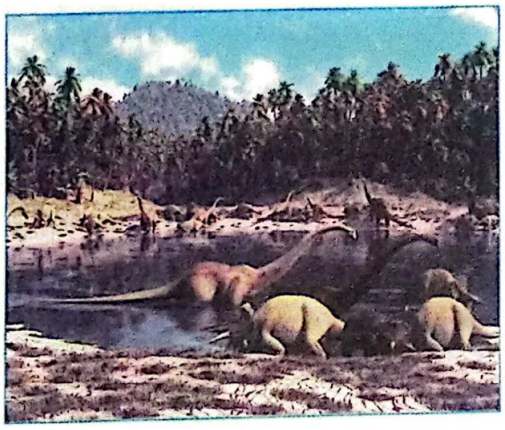
## What were the main events that occurred during the Precambrian Era?

The Precambrian Era started about 4.6 billion years ago with the formation of Earth as one large mass and the emergence of very primitive life. The period was characterized by intense volcanic eruptions and by Earth's coverage with molten lava. Over time, Earth cooled down, giving rise to large masses of rock, eventually identified as continents, surrounded by massive areas of water, known as oceans.











## What were the main events that occurred during the Phanerozoic Eon?

The Phanerozoic Eon began 540 million years ago. At the beginning of the eon, known as the Cambrian Period, complex organisms, such as arthropods, whose fossils are still found today, appeared. In the middle of the eon, dinosaurs appeared and ruled Earth for around 150 million years. Their fossils were first discovered in 1819, providing evidence of their presence. After the extinction of dinosaurs, the Age of Mammals started with the discovery of teeth from small, rat-like creatures and early human species, ending with the known mammals and other organisms.

## A Write true or false. Then correct the false statement(s).

Geologists estimate that Earth is about 4.6 million years old.

Dinosaurs lived during the Precambrian Era.

Earth is the only planet in the solar system that supports life.

The Precambrian Era started with the formation of Earth as one large mass.

## B Tick (✓) the correct answer.

1. The study of Earth is called .....

◯ biology ◯ geology ◯ astronomy

2. The first life formed on Earth appeared during the .....

◯ Precambrian Era ◯ Phanerozoic Eon

3. Earth was once covered with .....

◯ molten lava ◯ water ◯ ice

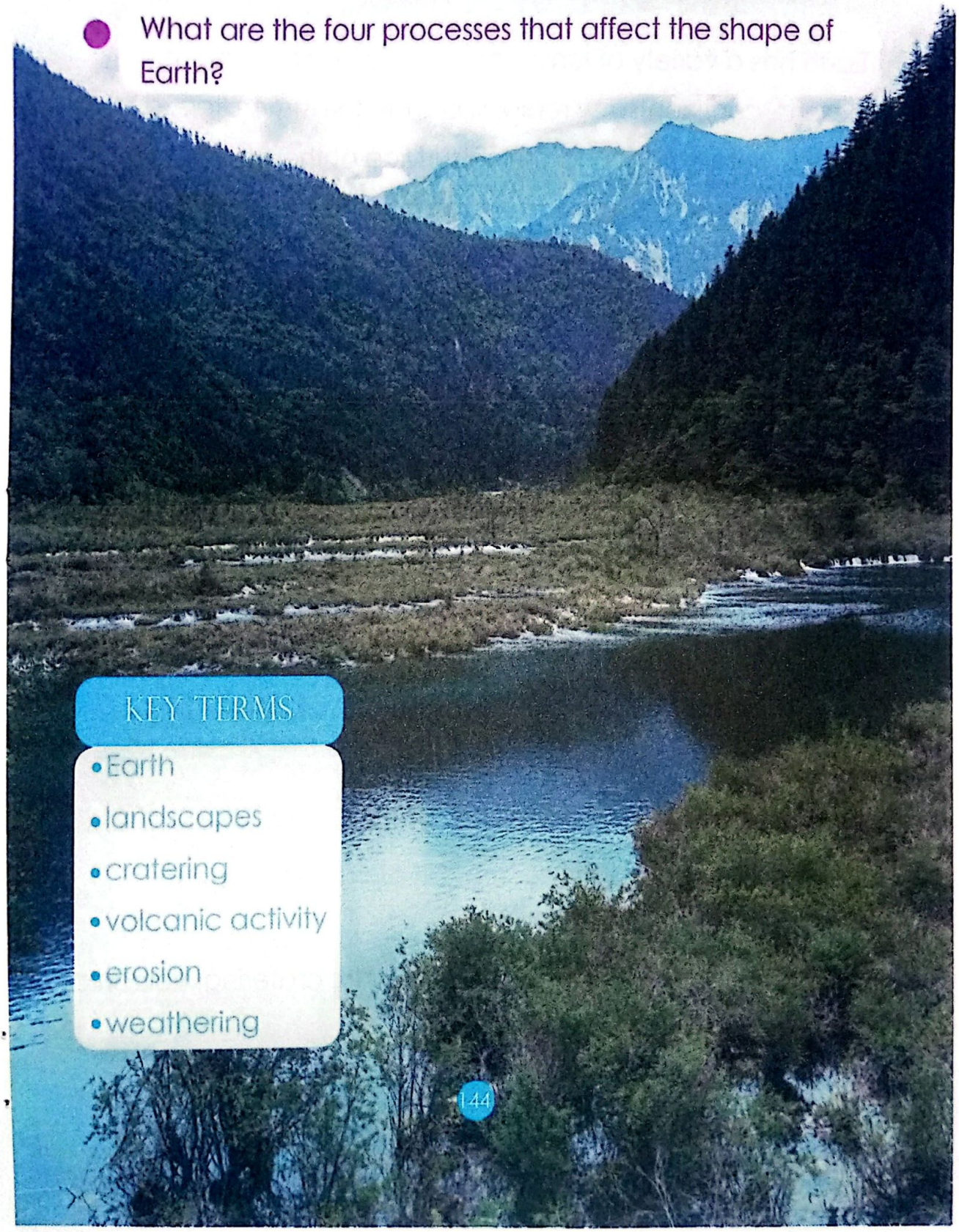
**Choose from the box the appropriate characteristics of each period in Earth's history.**

started 540 million years ago - started 4.6 billion years ago - presence of primitive life - appearance of the first complex organisms

| Period | Characteristics |
| --- | --- |
| Precambrian Era | ..... |
| Phanerozoic Eon | ..... |

# LESSON 22 EARTH FEATURES

- What are the landscapes of Earth?
- What are the four processes that affect the shape of Earth?



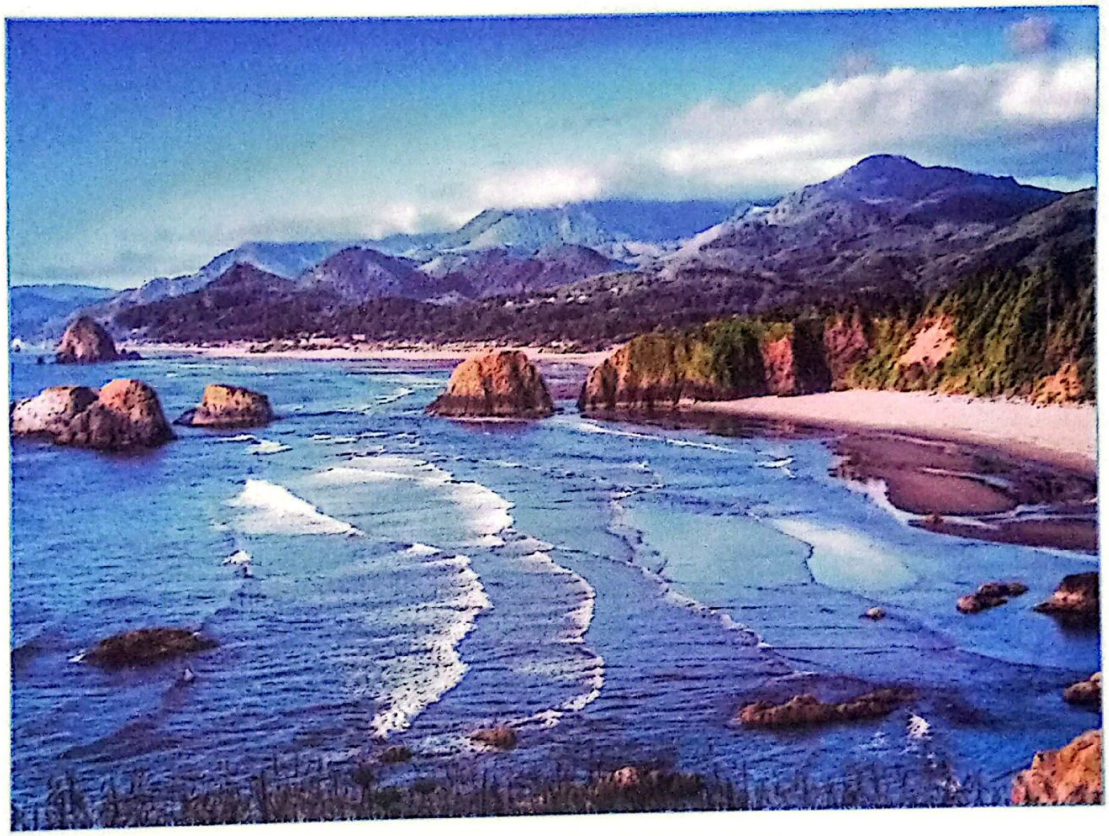
## KEY TERMS

- Earth
- landscapes
- cratering
- volcanic activity
- erosion
- weathering

Earth is made up of continents and oceans.

## What are the landscapes of Earth?

Earth has a variety of landscapes, including mountains, deserts, continents, icy regions, islands, forests, craters, and valleys. Some are found on the surface of the continents, while others are submerged in the oceans.



## What are the four processes that affect the shape of Earth?

Four processes affect the shape of Earth: cratering, volcanic activity, erosion, and weathering.

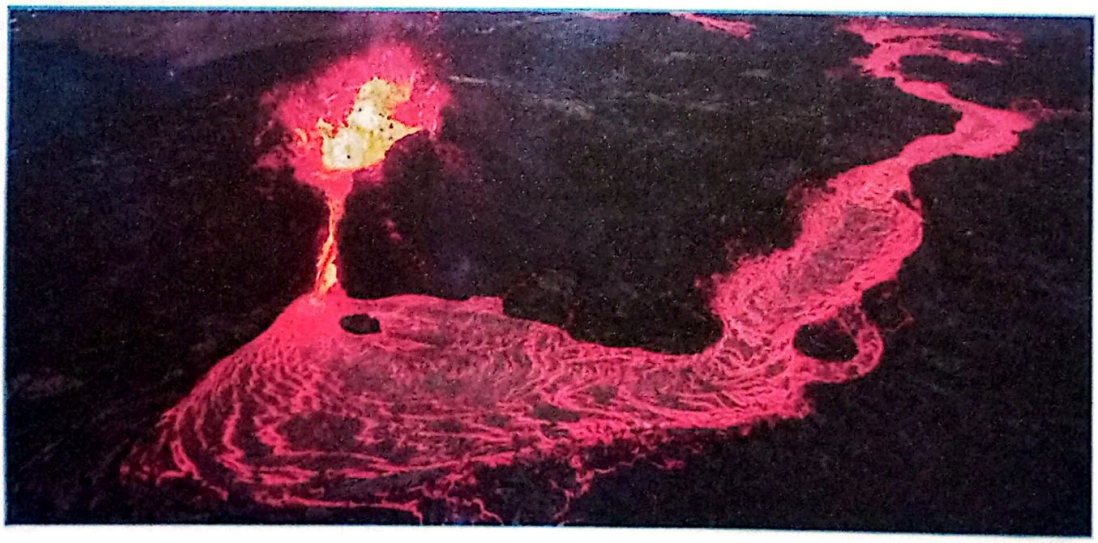
## What is cratering?

Cratering is the formation of craters, which are hollow areas on the Earth's surface. This process is caused by the effect of collision of meteorites with the Earth's surface or by volcanic eruptions.



## What is volcanic activity?

Volcanic activity is the action of volcanoes. Volcanic eruptions can destroy the landscapes around a volcano and create new ones, such as islands and mountains.



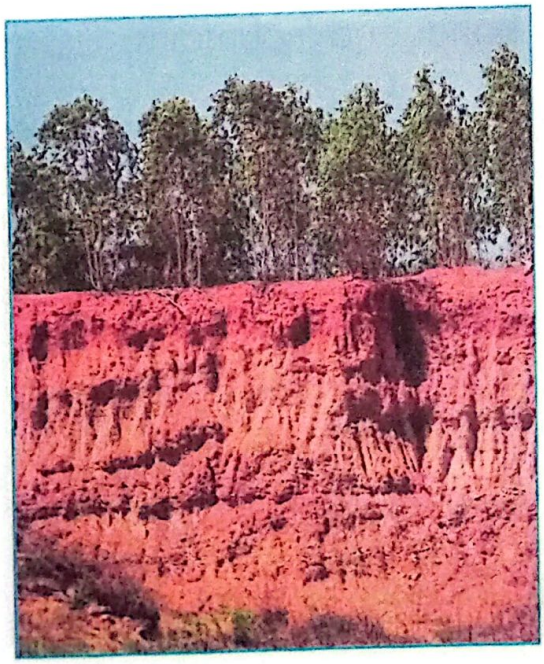
## What is erosion?

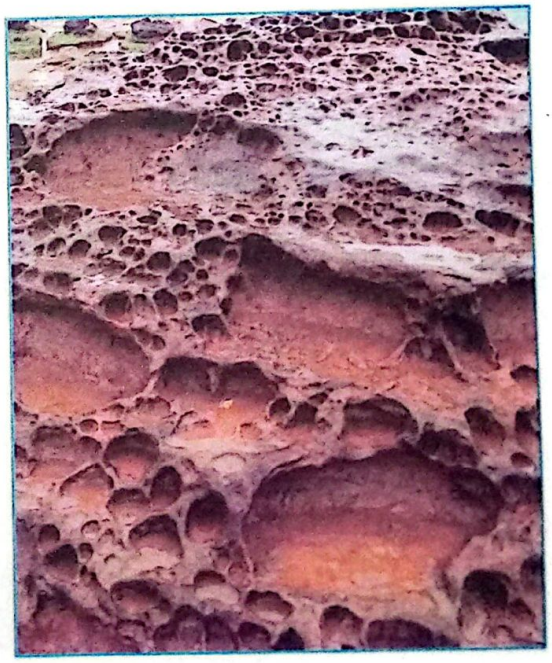
Erosion is the displacement of solid particles through the actions of wind, water, and ice. It involves breaking down materials on the Earth's surface and moving them to another place, where they can cause changes in the landscape.

## What is weathering?

Weathering is the decomposition of rocks and soil due to physical and chemical processes.

All these processes affect the pattern of the Earth's features.





## A Write true or false. Then correct the false statement(s).

Earth is made up of only continents.

_____

Cratering is caused by the collision of meteorites with the Earth's surface.

_____

Erosion can only create valleys.

_____

Weathering is the decomposition of rocks and soil.

_____

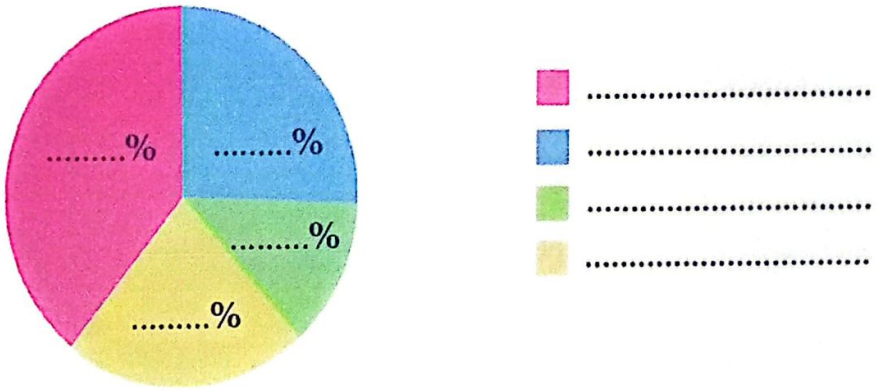
## B Match each process to its definition.

| | |
|---|---|
| cratering | the displacement of solid particles by wind |
| erosion | the action of volcanoes |
| volcanic activity | the formation of craters on the Earth's surface |
| weathering | the decomposition of rocks and soil |

## Circle Graph

In a study of the landscape of an island in the Pacific Ocean, the following four changes were observed.
30% of the land was changed by erosion.
10% of the land was influenced by cratering.
40% of the land was affected by volcanic eruptions.
20% of the land was impacted by weathering.

**1.** Label the circle graph based on the above data.

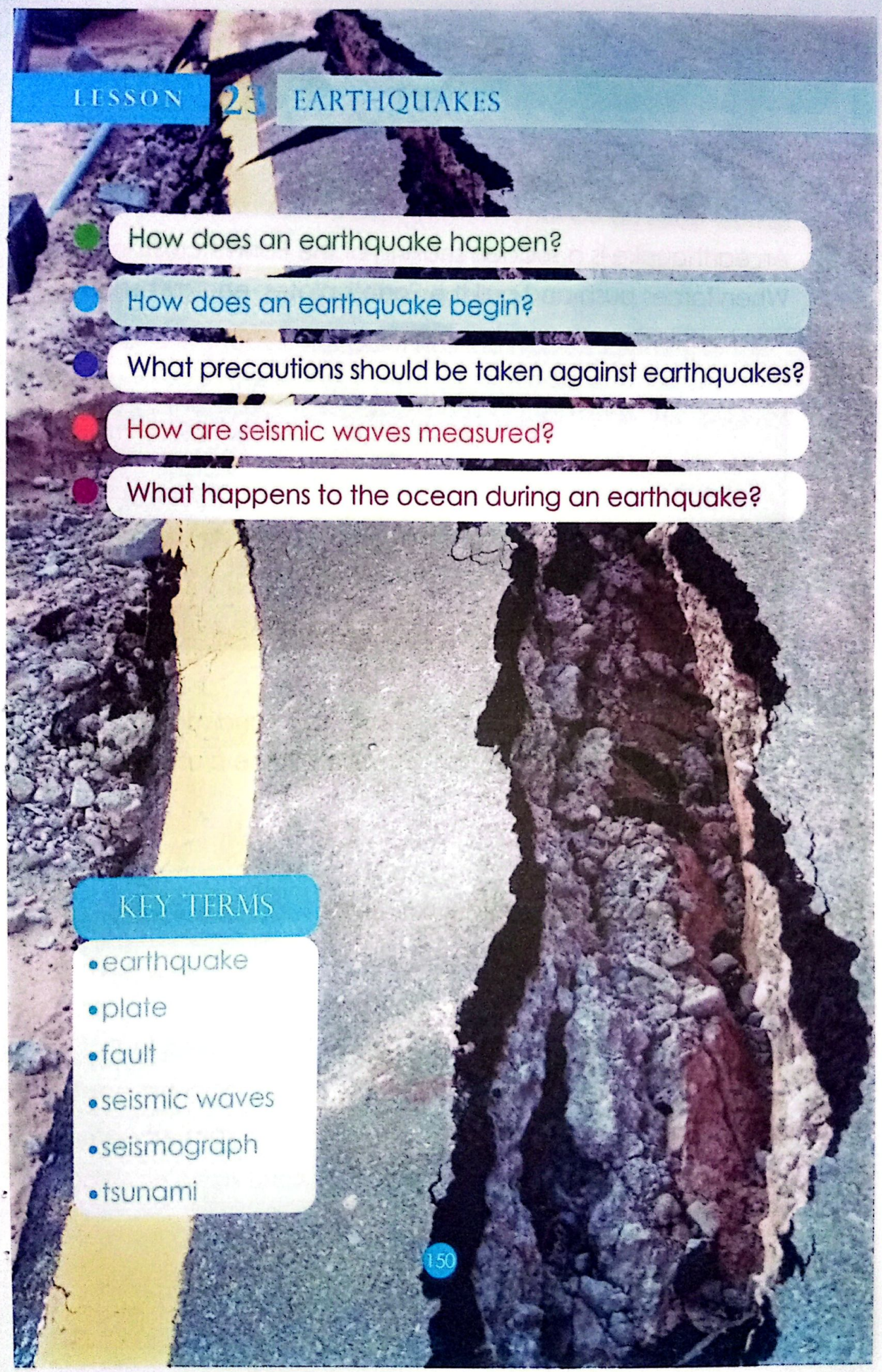



**2.** Indicate the process that has the highest percentage.

.....

**3.** Indicate the process that has the lowest percentage.

.....



# LESSON 23 EARTHQUAKES

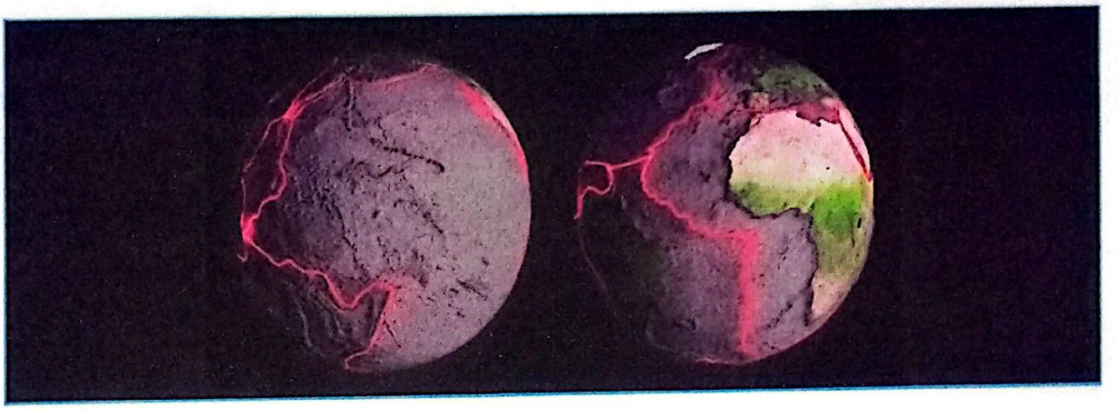
- How does an earthquake happen?
- How does an earthquake begin?
- What precautions should be taken against earthquakes?
- How are seismic waves measured?
- What happens to the ocean during an earthquake?

## KEY TERMS

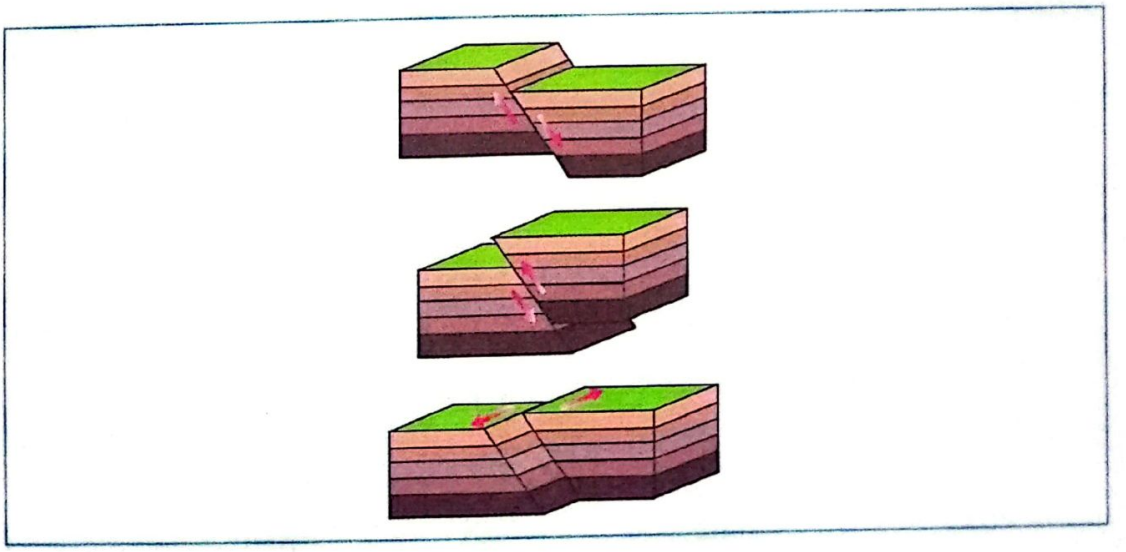
- earthquake
- plate
- fault
- seismic waves
- seismograph
- tsunami

## How does an earthquake happen?

An earthquake is a sudden shaking of the Earth's crust. When forces push and pull the Earth's plates, energy builds up.

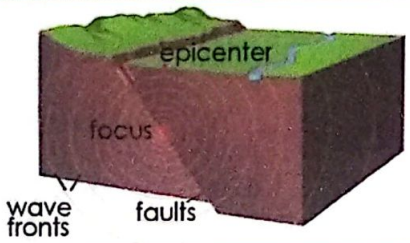


This energy causes the rocks to break apart and move along the Earth's faults. A fault is a crack in the crust where the Earth's movement takes place.



## How does an earthquake begin?

An earthquake begins below the ground, causing vibrations in all directions. The point where the earthquake originates is called the focus. This point has the highest intensity of the earthquake. The shortest distance from the focus to the Earth's surface is called the epicenter.




Most earthquakes are too weak to be noticed, while others are so strong that they damage buildings and rocks.







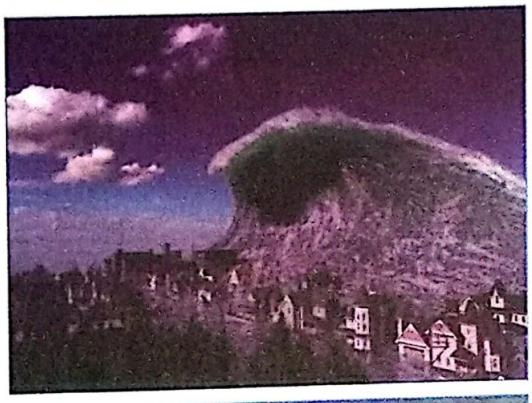
## What precautions should be taken against earthquakes?

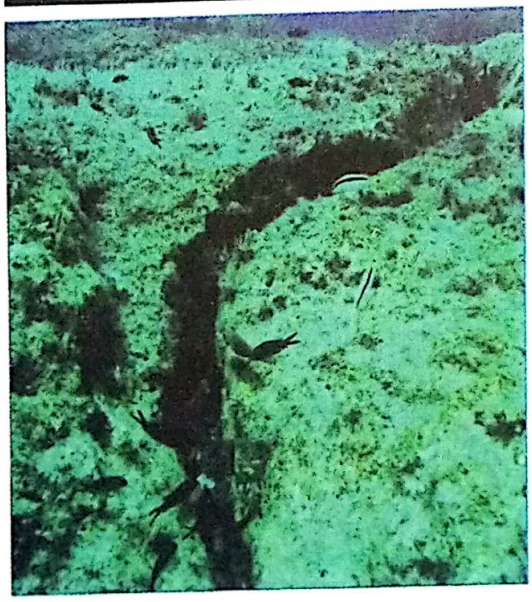
If you are indoors, stay under a desk or table. If you are outdoors, move away from buildings, trees, and towers and go to an open area.



## How are seismic waves measured?

Seismic waves are the vibrations caused by earthquakes.
Scientists measure seismic waves with an instrument called a seismograph, which records earthquakes and shows how the ground shakes.





## What happens to the ocean during an earthquake?

Some earthquakes occur below the ocean. If an earthquake is strong, the ocean's crust will be uplifted. When this happens, a giant wave, called a tsunami, may hit the shore and destroy everything in its path.

## A Write true or false. Then correct the false statement(s).

An earthquake is a sudden shaking of the Earth's crust.

---

A fault is a crack in the core of Earth.

---

A focus is the point where the earthquake originates.

---

To take precautions against earthquakes, move away from buildings if you are outdoors.

---

## B Tick (✓) the correct answer.

1. The instrument that measures earthquakes is the ..... .

◯ seismic wave ◯ seismograph ◯ seismology

2. A crack in the Earth's crust along a sudden movement is called a/an ..... .

◯ earthquake ◯ plate ◯ fault

3. A crack in the crust where the Earth's movement takes place is a ..... .

◯ fault ◯ tsunami ◯ wave

## Track the formation of a tsunami.

1. .....

.....

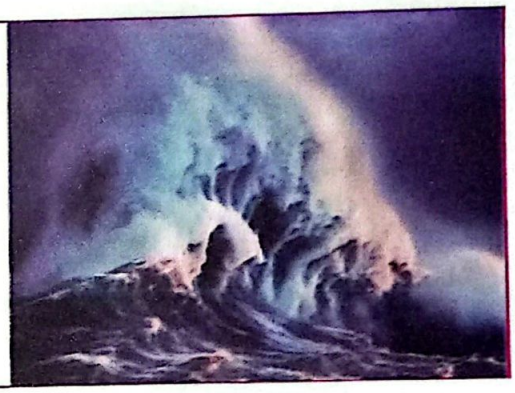
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2. .....

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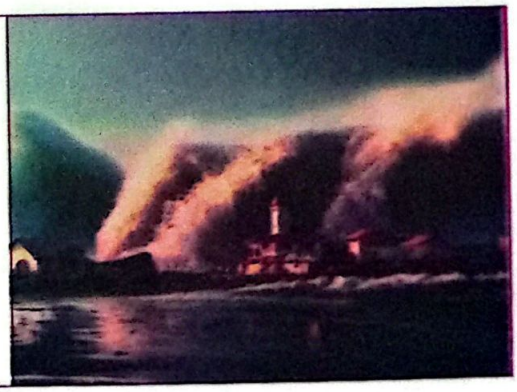
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3. .....

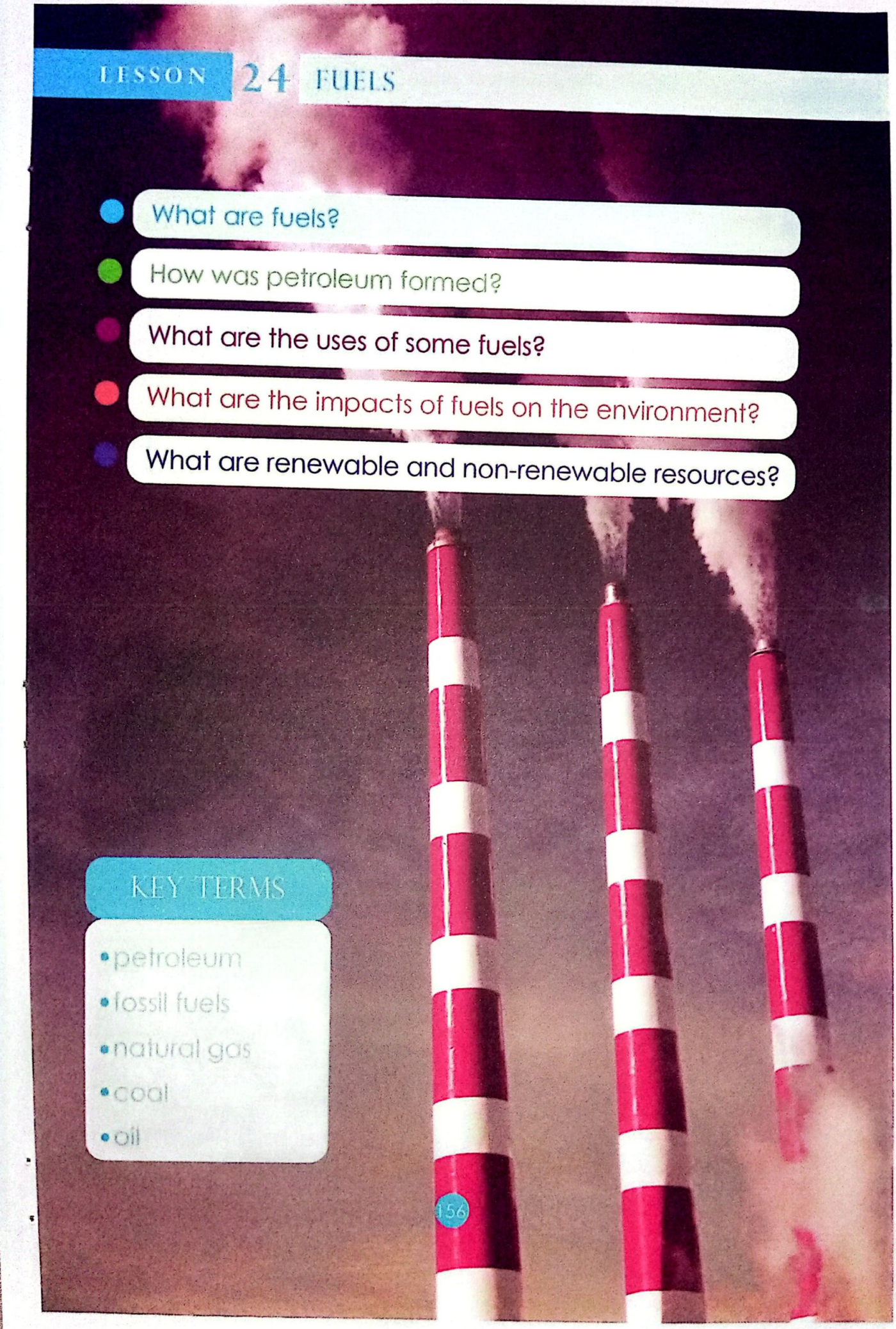
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# LESSON 24 FUELS

- What are fuels?
- How was petroleum formed?
- What are the uses of some fuels?
- What are the impacts of fuels on the environment?
- What are renewable and non-renewable resources?



## KEY TERMS

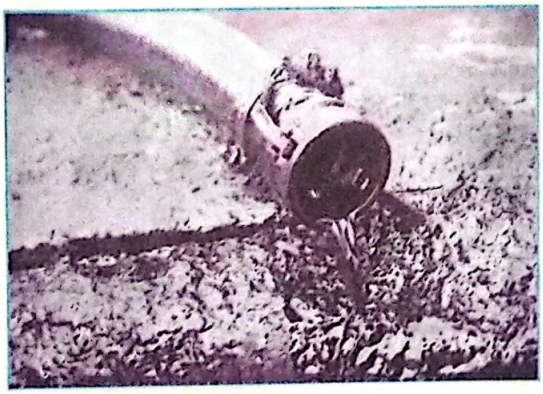
- petroleum
- fossil fuels
- natural gas
- coal
- oil

## What are fuels?

Fuels, such as petroleum, natural gas, and coal, are fossil natural resources found underground.

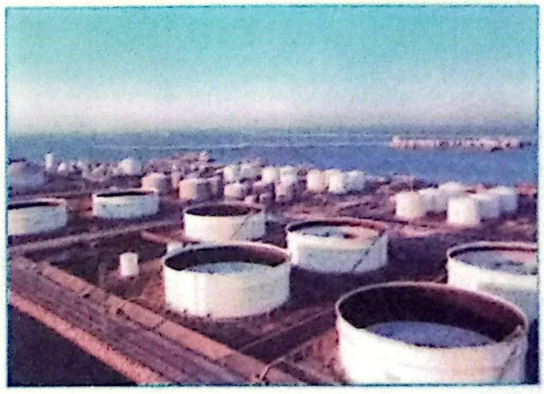
## How was petroleum formed?

Petroleum is a type of liquid fossil fuel formed from the remains of plants and animals that lived millions of years ago. After their death, their remains were mixed with mud and rock. Due to high pressure, these remains formed layers within Earth. Over time, heat and pressure have transformed them into fossil fuels.









## What are the uses of some fuels?

Fuels provide the energy needed for various activities. Gasoline and diesel provide power to cars and other means of transportation.

Natural gas, coal, and oil are used for heating houses and cooking food. Moreover, they are burned to generate electricity. In the chemical industry, some fuels are used to produce plastics, synthetic fibers, detergents, and fabrics.





## What are the impacts of fuels on the environment?

The use of fuels has negative impacts on the environment. Burning fuel releases harmful gases into the air. Their emissions can cause air pollution, which harms health. Extracting and transporting fuels may also lead to environmental damage, such as oil spills and habitat destruction.

## What are renewable and non-renewable resources?

Fuels are non-renewable; they take millions of years to form. Once depleted, they cannot be easily replaced.

Exploring and investing in renewable resources, such as solar and wind energy, can reduce dependence on fuels and their harmful effects on the environment.



## A Write true or false. Then correct the false statement(s).

Fuels are derived from the remains of plants and animals that were buried millions of years ago.

_____

Fuels are renewable resources.

_____

Non-renewable resources are easily replaced once depleted.

_____

Fuels are used to produce various products, like plastics.

_____

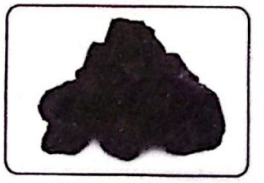
## B Match each type of fuel to its image.

Gasoline •

Oil •

Coal •

• 

• 

• 

## C Classify the following resources as renewable or non-renewable.

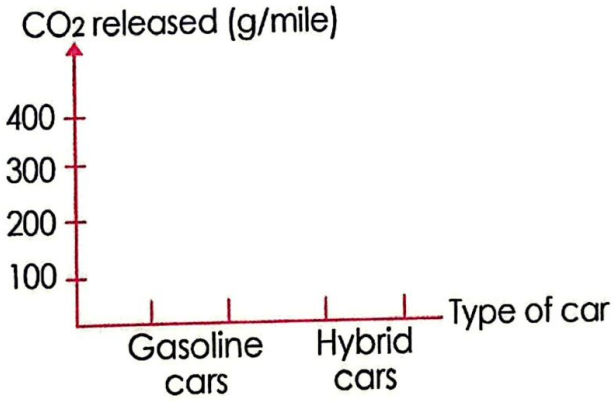
natural gas - coal - solar energy - fuel - wind energy

| Renewable Resources | Non-renewable Resources |
|---|---|
| | |
| | |
| | |

## D Bar Graph

Gasoline cars release 400 g/mile of $CO_2$, while hybrid cars generally release around 200 g/mile of $CO_2$.

1. Represent the given data on the bar graph below.




2. Compare the amount of $CO_2$ released into the air by gasoline cars to that released by hybrid cars.

.....

.....

3. Which type of car is more eco-friendly? Justify.

.....

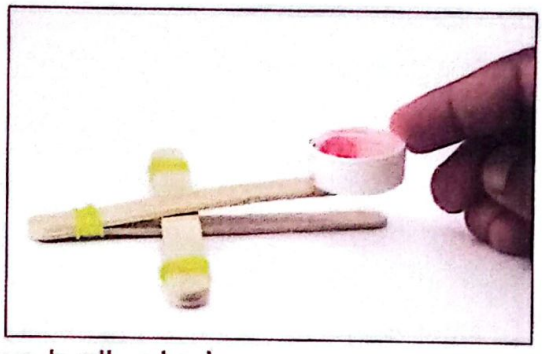
## Project 1

### Catapult

In a catapult project, potential energy is transformed into kinetic energy. When you push down the arm of the catapult, you store potential energy in the rubber band due to its stretched position. Upon releasing the arm, this stored energy is converted into kinetic energy, propelling the object forward with force.

#### Materials

- 4 popsicle sticks
- 1 bottle cap
- Rubber bands
- Glue
- A small, lightweight object (e.g., a marshmallow, a cotton ball, etc.)



#### Procedure

1. Arrange 2 popsicle sticks in a V-shape and secure the ends together with rubber bands.
2. Stack 2 popsicle sticks perpendicularly to the base. Secure these sticks to the base with rubber bands.
3. Glue the bottle cap to the end of the popsicle stick.
4. Put the small object in the bottle cap.
5. Push down the arm of the catapult and release.

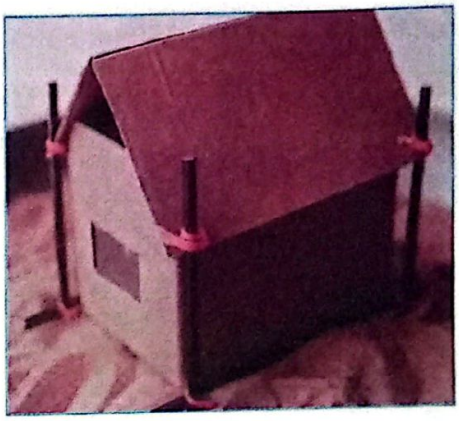
Project 2

## An Earthquake-Resistant House Model

Earthquakes range from minor, causing no harm, to strong, which may cause significant damage. To prevent this, certain earthquake-resistant features can be added.

### Materials

- A cardboard box
- Wooden sticks
- Rubber bands
- A pan
- Sand



### Procedure

1. Make a cardboard box house model.
2. Use wooden sticks as connectors. Add extra sticks for support, especially in the corners, to ensure structural reinforcement.
3. Attach rubber bands to the sides and the bottom of the house to isolate the base from shaking.
4. Fill the pan with sand.
5. Put the house on the pan and gently shake it to simulate vibrations.
6. Observe how the house responds.

## Project 3

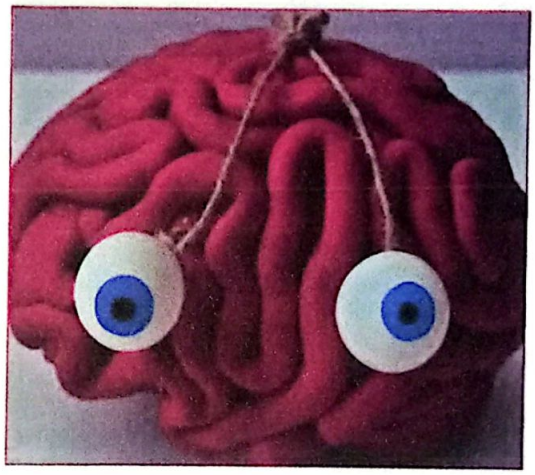
### Sensory Perception Model

Organs, like the eyes, the ears, and the tongue have specialized sense receptors that transmit specific types of information to the brain through nerves, enabling us to perceive the world around us.

Construct a model illustrating how sensory information is transmitted from our eyes to the brain, allowing us to see.

#### Materials

- Play dough
- Two ping pong balls
- Paint
- Paintbrushes
- A string
- Toothpicks



#### Procedure

**To make the brain model:**

1. Shape a large ball of play dough to represent the brain.
2. Use toothpicks to make grooves on the surface of the play dough.

**To make the eye model:**

1. Paint a black pupil in the center of each ball, and then color an iris around it.
2. Attach strings from the brain model to the eye model.

## Project 4

### A Periscope Model

A periscope is a tool that allows you to see objects that are not directly in your line of sight through the reflection of light.

#### Materials

- Four identical cardboard tubes
- Two mirrors
- Tape
- Glue



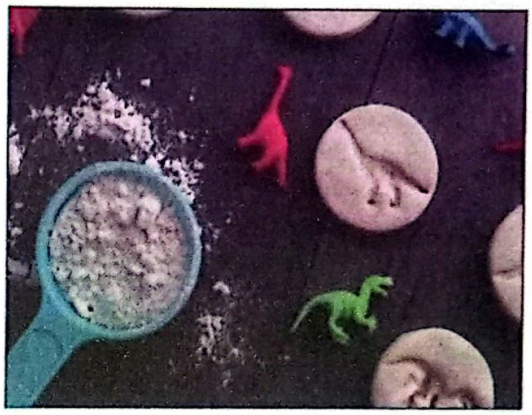

#### Procedure

1. Connect two cardboard tubes together into one piece.
2. Place one mirror at each edge in a slanted position using glue.
3. Place one cardboard tube at each edge in a perpendicular way, and then tape them together.

Project 5

## Dinosaurs and Fossils

Dinosaurs were ancient reptiles that roamed Earth millions of years ago. They left behind fossilized remains, which provide valuable clues about their lives and the planet's history. In this project, you will create your own fossil bed and discover your own dinosaur fossils.



### Materials

- Play dough
- Dinosaur toys
- Paint
- Paintbrushes

### Procedure

1. Roll out a large slab of play dough on a flat surface. This will be your dinosaur fossil bed.
2. Gently press the dinosaur toys into the play dough, creating prints.
3. Carefully remove the dinosaur toys, leaving behind dinosaur-shaped prints.
4. Let the play dough dry completely.
5. Paint the prints to make them look realistic. Use brown, gray, or other earthy colors.

Project 6

## Weathering and Erosion: A Model of a Sandhill

Weathering breaks down the Earth's crust into smaller pieces that move away by erosion. Rainfall is one type of weathering that reshapes the landscape, creating new environmental conditions to which living organisms must adapt.



### Materials

- A tray
- Sand
- Stones
- Small gravel
- Plastic plants
- A stick
- A water bottle

### Procedure

1. Make a sloped landscape of sand in one half of the tray.
2. Use the stick to make a riverbed starting from the top.
3. Distribute the stones, the gravel, and the plants around your landscape.
4. Use the water bottle to sprinkle water at the top of your landscape.

Observe what happens to the stones, gravel, sand, and plants.