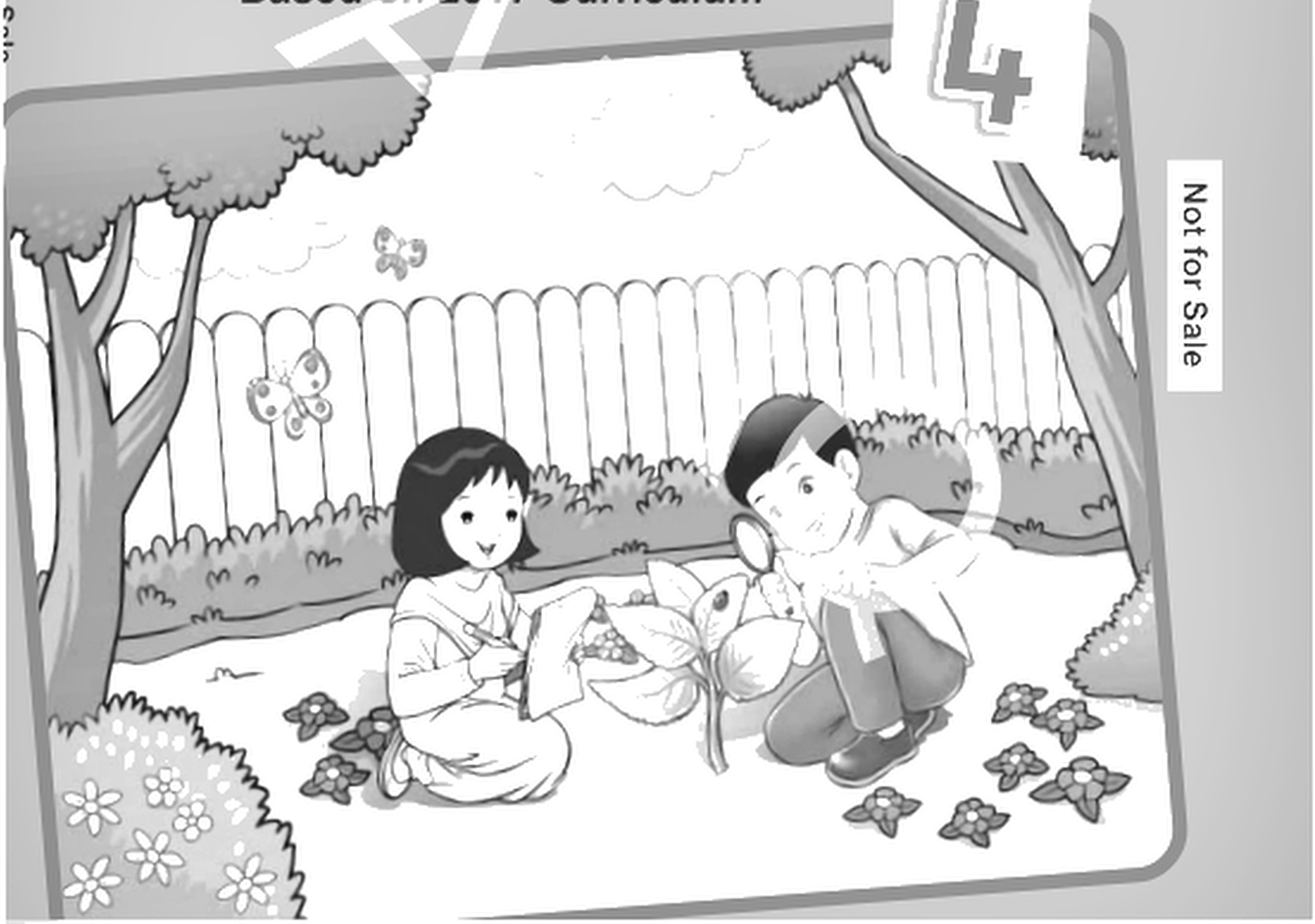
This book has been selected by National Curriculum Council,
Ministry of Federal Education & Professional Training, Government of Pakistan,
as the textbook for academic year 2020-21 and is being distributed free of cost in
schools under the Federal Directorate of Education, Islamabad.

General Science

Based on 2017 Curriculum

4



National Curriculum Council,

Textbook of

General Science

Grade 4

Approved by

Ministry of Federal Education and Professional Training

&

Federal Directorate of Education(FDE) Capital Administration and Development Division Government of Pakistan

Preface

General Science 4 has been developed according to the Curriculum 2017. It presents an opportunity to teach science in an interactive way, focusing on everyday observations. It is designed to help young learners grasp concepts related to science for understanding daily scenarios. It is written with the perspective of a student-centred approach and aids teachers in teaching students effectively.

This textbook has been developed in collaboration between the Ministry of Federal Education and Professional Training and the Federal Directorate of Education, Capital Administration and Development Division (CADD). It is aimed at providing quality textbooks according to the government's vision to make Islamabad Capital Territory (ICT) a model education city. It is the result of detailed deliberations between the curriculum developers and the authors who worked in close collaboration to translate the soul of the curriculum into textbook.

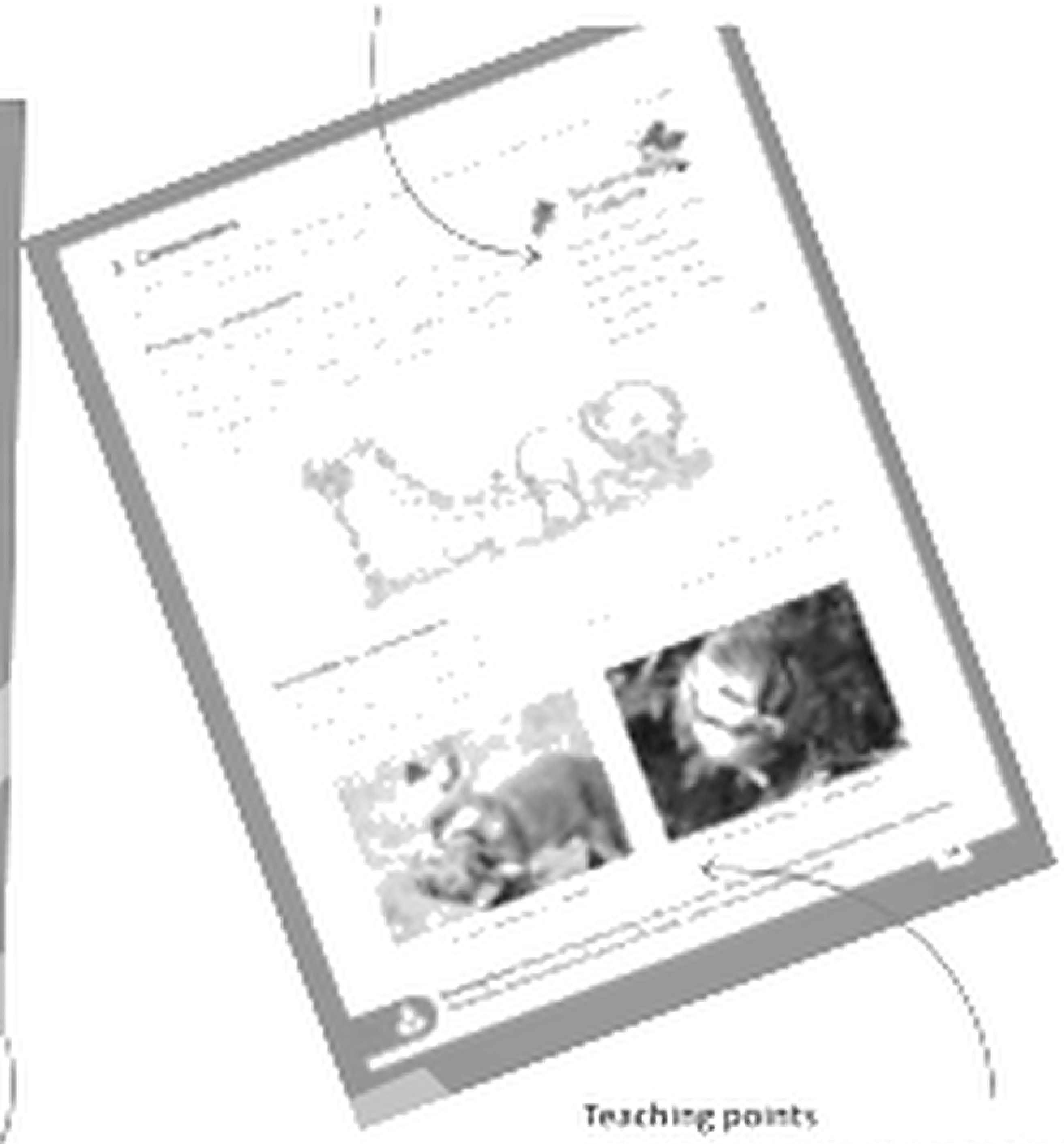
This textbook brings scientific phenomena closer to the interests of the students. It comprises a collection of materials, exercises and activities that target high-order thinking skills. The content has been enriched with the learning outcomes of the curriculum, which covers a wide range of topics such as life science, physical science, earth and space science with an adequate focus on science skills.

The textbook has been aligned with TIMSS (Trends in International Mathematics and Science Study) and review exercises have been added to practise its methodology. These exercises focus on the three main cognitive skills (knowledge, application and reasoning). This gradual stretch in the thinking order will certainly enhance students' critical thinking and reflective skills. We hope that this textbook will meet the desired learning outcomes.

About the Book

Learning Outcomes
Each unit starts with the target outcomes to be achieved in that specific unit.

Science Tidbits
It provides students with scientific details of the world around them.

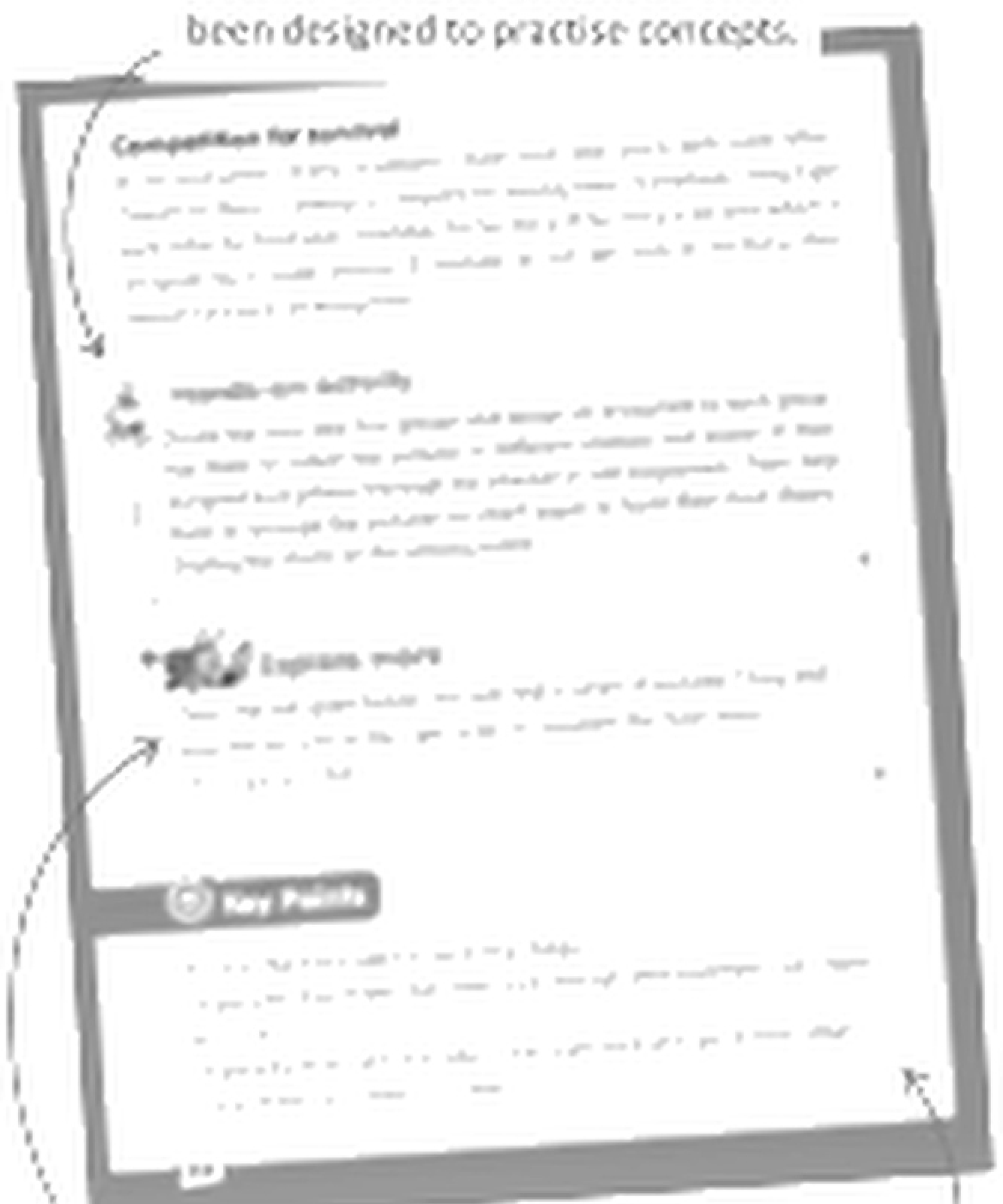


Key questions
Appropriate and intriguing questions were asked at the beginning of a unit to bridge the prior knowledge of students with the upcoming new concepts.

The Big Idea
At the beginning of each unit, there is an overall unit introduction to stimulate thinking.

Teaching points
Provide clear instructions to the teachers on how to deliver the concepts.

Hands-on activity
A variety of hands-on activities have been designed to practise concepts.



Explore more
This section encourages inquiry and independent learning among students.

Key Points
The key points summarise the whole unit and tell what students have learnt.

Project
Projects are given at the end of each unit to make science come alive.

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شروع اللہ کے نام سے جو بڑا مہربان نہایت رحم والا ہے۔

Contents

Animals

Unit 1

Learning Outcomes

- Distinguish groups of animals with backbones from groups of animals without backbones.
- Relate major structures in animals to their functions (e.g., chewing foods, bones support the body, lungs take in air, the heart circulates blood, the stomach digests food, muscles move the body).
- Compare and contrast physical and behavioural characteristics that distinguish major groups of living things (i.e. insects, fish, reptiles, birds and mammals.)
- Identify or provide examples of members of major groups of living things (i.e. insects, fish, reptiles, birds and mammals.)

Animals

Animals are different from each other in various ways. However, we can group them into two major classes: animals with backbones and animals without backbones. They are called vertebrates and invertebrates. Let us study them in detail.

Vertebrates

Vertebrates are animals with the vertebral column in the centre of their backs. The backbone is not a single bone; it is made up of small moveable bones You can feel your backbone by running your hand along the central portion of your back.

There are many other major features that distinguish vertebrates from invertebrates. These features help us to understand their characteristics.

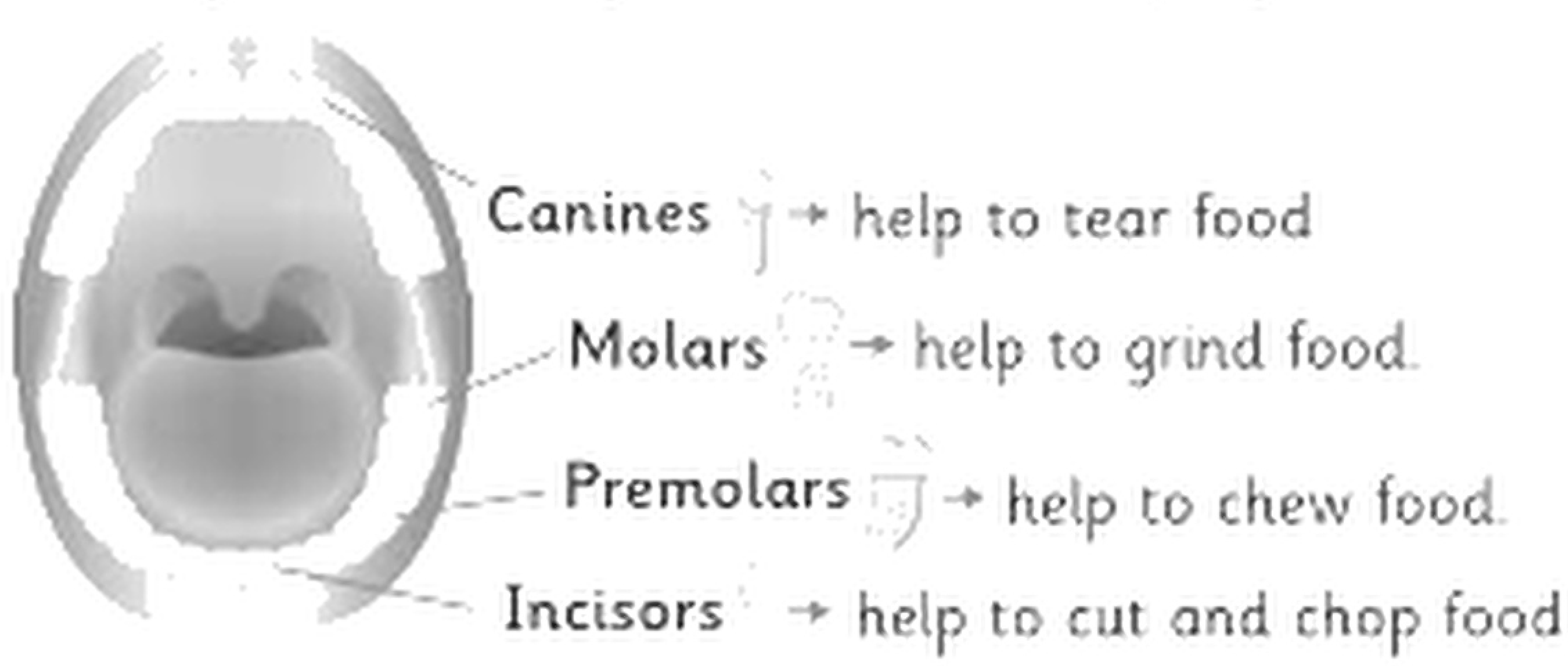
Structures in vertebrates

Bones: All vertebrates have bones that join together to make a skeleton. It gives shape to the body and protects its soft internal parts, for example the ribcage protects the heart and lungs.

Muscles: Muscles are attached to bones and support the body in its movement.


Arm

Teeth: Animals having different diets have different structures of their teeth. Animals that eat plants have flat and wide teeth to chew and grind leaves. Meat-eating animals have sharp and painted teeth that are mainly used for tearing and chewing the flesh of their prey.



Human teeth


Teeth of plant-eating animals


Teeth of meat-eating animals

Teaching point: For effective teaching and learning, feel free to use 'Urdu' as a medium of instruction to explain the concepts.

Vertebrates also have important internal organs that have their own functions

The **stomach** is like a bag. It digests the food chewed by teeth.

Do You Know?

The black part of the eye is called the pupil. It dilates in dim light and shrinks in bright light.

In dim light

In bright light

The **brain** is the most important organ of the body. Animals follow instructions from the brain to perform all their activities, such as thinking and speaking.

The **heart** is a pumping organ that circulates the blood to all parts of the body.

Lungs are the organs that exchange gases. They help an animal to take air in and out.

Hands-on activity

Visit the zoo or safari park with an elder. Choose an animal and list its structural features. Then conclude your observations by categorising the animal into the group it belongs to.

Teaching point: Discuss the human body before discussing other groups of vertebrates.

Major groups of vertebrates

Along with these similarities, vertebrates also have many dissimilarities. Therefore, they can be divided further into five sub groups.

Physical and behavioural characteristics in vertebrates

Vertebrates	Physical Features	Behavioural Features
Mammals 	• Give birth to their young ones • Feed their young ones • Fur/Hair on the body	Hibernation (deep sleep): Period of inactivity and low body temperature in winters, e.g. squirrels hibernate in burrows.
Birds 	• Hollow bones • Wings for flying • Feathers on the body	Migration: Birds such as geese have regular seasonal movements twice a year.
Reptiles 	• Dry scaly skin • Skin protects them from hot and cold.	Hide by blending: Reptiles such as chameleons change colour to blend with their surroundings
Amphibians 	• Tadpoles live in water and have gills. • Adult frogs can live on land and have lungs. • Moist skin	Active at night: Amphibians, such as frogs, rest in cool, moist places during day. So, they do not have much water loss from their skin.
Fish 	• Live in water • Swim with fins and a tail • Breathe through gills • Slimy scales on the body	Fish School: A large number of fish swimming together is called a school. Swimming in schools protects them from predators.

Teaching point: Tell students that the physical and behavioural features of animals are their adaptations that help them to survive in their environment, such as adaptation of wings and claws in birds.

Invertebrates

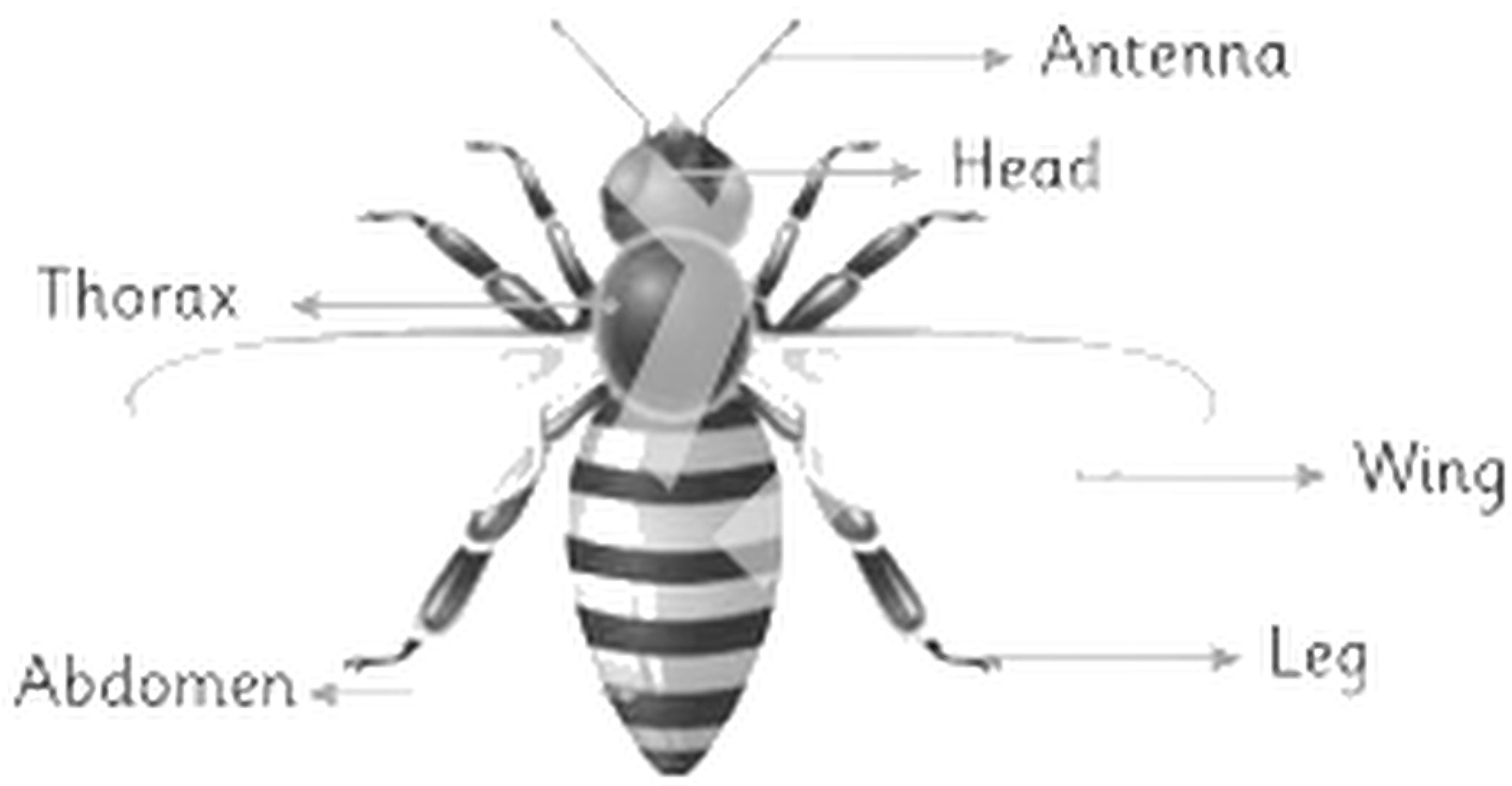
Invertebrates are animals without a backbone. Some of them have skeletons outside their bodies. Such skeletons are called exoskeletons. All insects are invertebrates.

Do You Know?

Birds sit on their eggs to keep them warm until they hatch.

Structures in insects

Have you ever observed creepy crawlies in your home? Most of them are insects. They are small animals with six legs. Their bodies are divided into three segments, i.e. head, thorax and abdomen. Most insects fly. They have two or four wings.



Science Tidbits

Many mammals such as whales, seals and polar bears have a special layer of fats under their skin that keeps them warm in a cold environment.

Physical and behavioural characteristics in insects

Insects have many different organs to feed themselves, like jaws and feeding tubes. Examples are given below.

A caterpillar

has jaws for chewing leaves.

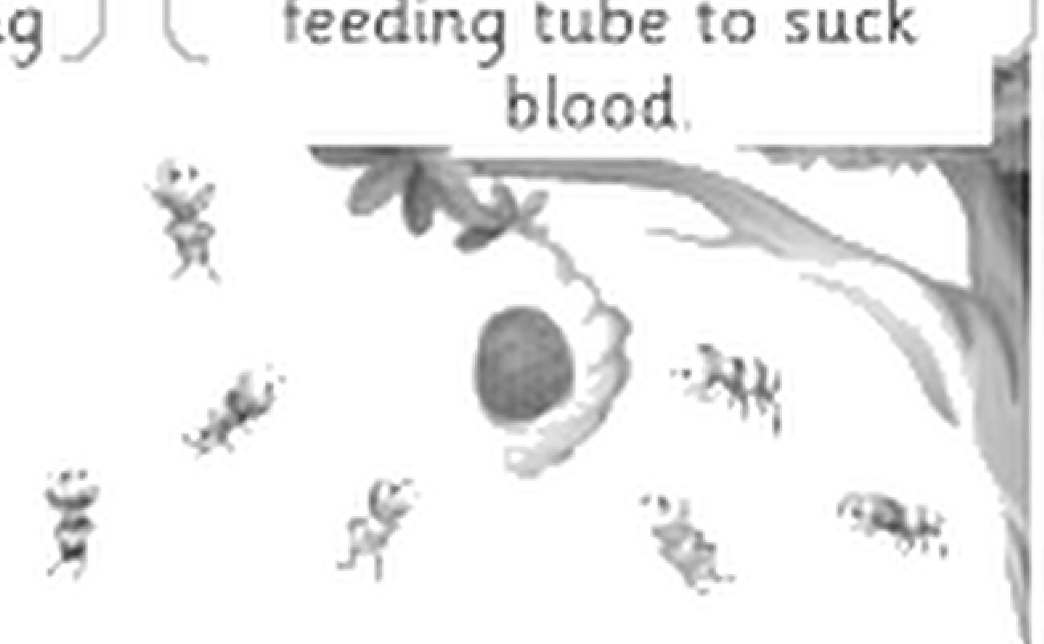
A butterfly

has a long, flexible feeding tube for sipping nectar.

A mosquito

has a long, needle-like feeding tube to suck blood.

Some insects, such as ants and honeybees, live in colonies and help each other in different tasks.



Explore more

Go to the following link and learn more about insects.
https://goo.gl/U54xyH
What is your favourite insect? Gather some information about it. Draw it in your notebook and add some of its structural and behavioural features to share with your class fellows.

Key Points

- Animals can be grouped into two main groups: the ones with backbones and the ones without backbones.
- Animals with backbones are called vertebrates.
- Mammals give birth and feed their young ones.
- Birds have feathers and wings that help them in flying.
- Reptiles have dry scaly skin.
- Fish have fins and a tail to swim in water.
- Frogs have moist skin and lungs.
- Animals without backbones are called invertebrates, e.g. insects.

Exercise

A Answer the following questions briefly.

1. What is a backbone?
2. Why is the brain so important to an animal's body?
3. How do fish breathe in water?
4. How do different mouth parts help insects to get their food?
5. Which type of skeleton is present in insects?

B Answer the following questions in detail.

1. How are vertebrates categorised? Give an example of each group of vertebrates.
2. Compare the features of fish and reptiles.

C Tick (✓) the correct answer.

1. Which of the following body organs pump blood?
   a. Lung   b. Heart   c. Stomach   d. Brain
2. Below is set of two types of teeth: flat and sharp.

   Which group of animals has both types of teeth?
   a. Elephant and cow   b. Whale and shark
   c. Horse and bear   d. Goat and lion
3. Fish are the vertebrates that can swim in water. Which of the following statements supports this fact?
   a. They have fur or hair on their body.
   b. They have feathers and tail.
   c. They have four legs.
   d. They have fins and a tail.
4. How many body segments are there in insects?
   a. one   b. two   c. three   d. four
5. Which of the following statements is true about frogs?
   a. They do not have lungs.
   b. A baby frog can live on land.
   c. An adult frog cannot swim in water.
   d. A tadpole lives only in water.

D Label each organ and write its function.

Think Tank!

1. Which group of animals do bats belong to?
2. How does migration help birds to survive?

Project Animal Encyclopaedia

Materials

- A notebook
- Scissors
- Glue
- Some old animal magazines with animal pictures and information

Procedure

1. Take a notebook or a scrapbook.
2. Now cut pictures of different animals from old magazines (take at least one picture of each group).
3. Paste these pictures and give some information about each.
4. Your animal encyclopaedia is ready.

Teaching point: Get students into groups and have them complete the given project. Assign a different role to each group member. Then ask them to present their group work in collaboration.

Unit 2

Plants

Learning Outcomes

- Relate major structures in plants to their functions (i.e., roots absorb water and nutrients and anchor the plants; leaves make food; the stem transports water and food; petals attract pollinators; flowers produce seeds, and seeds produce new plants).
- Compare and contrast physical and behavioural characteristics that distinguish major groups of plants.
- Identify or provide examples of members from major groups of plants.

What is the function of a cotyledon in a seed?

The BIG Idea

Like animals, plants are living things having unique structures that perform specific functions. For example, leaves prepare food for the plant. Plants can be grouped into flowering and non-flowering plants

Can you name some parts of a plant?

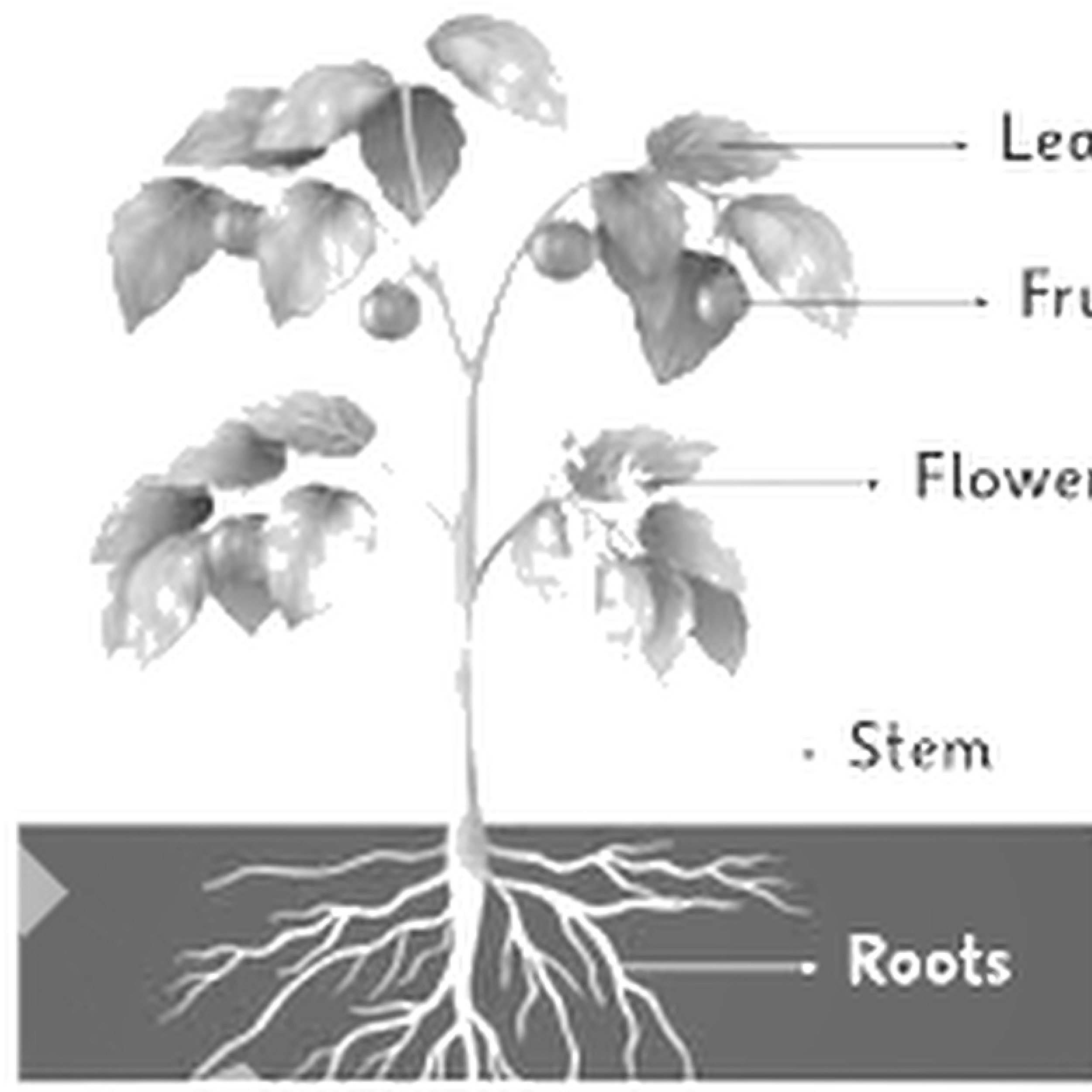
What is the function of a seed?

Plants

Just like animals, plants also have different parts. For example, roots, stems and leaves are some parts of a plant. Let us study them in detail:

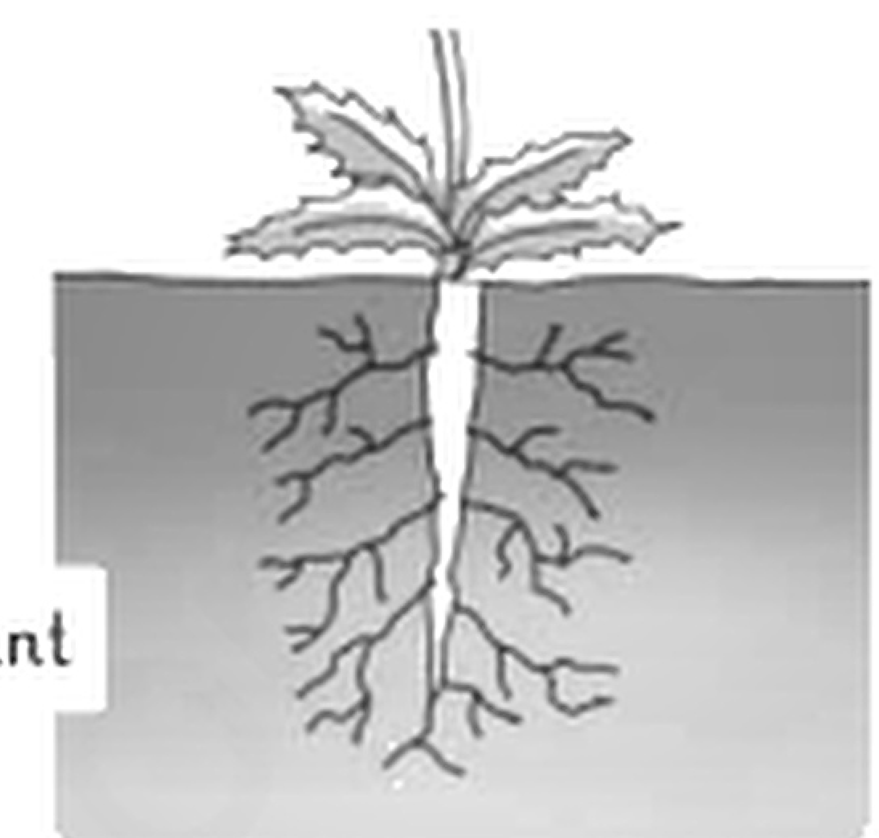
Parts of a plant

All plants have roots, leaves and stems. Some plants also have flowers and fruit.



Roots

The roots of a plant usually grow from a seed under the ground. They help to hold the plant in the soil. They also take in water and nutrients for the plant. Different plants have different types of roots



Radish plant

Rice plant

Stem

A stem holds the plant above the ground. It has tiny tubes inside, called xylem and phloem. These tubes transport water and nutrients to all parts of the plant.

Teaching point: For effective teaching and learning, feel free to use 'Urdu' as a medium of instruction to explain the concepts.

In the given picture the arrows show how water is collected by roots and carried throughout the plant by the stem.

Transfer of water from roots to the plants

Transportation of food

Leaves

Leaves are known as the food factory of a plant. They make food for the plant using sunlight and distribute it to the different parts of the plant.

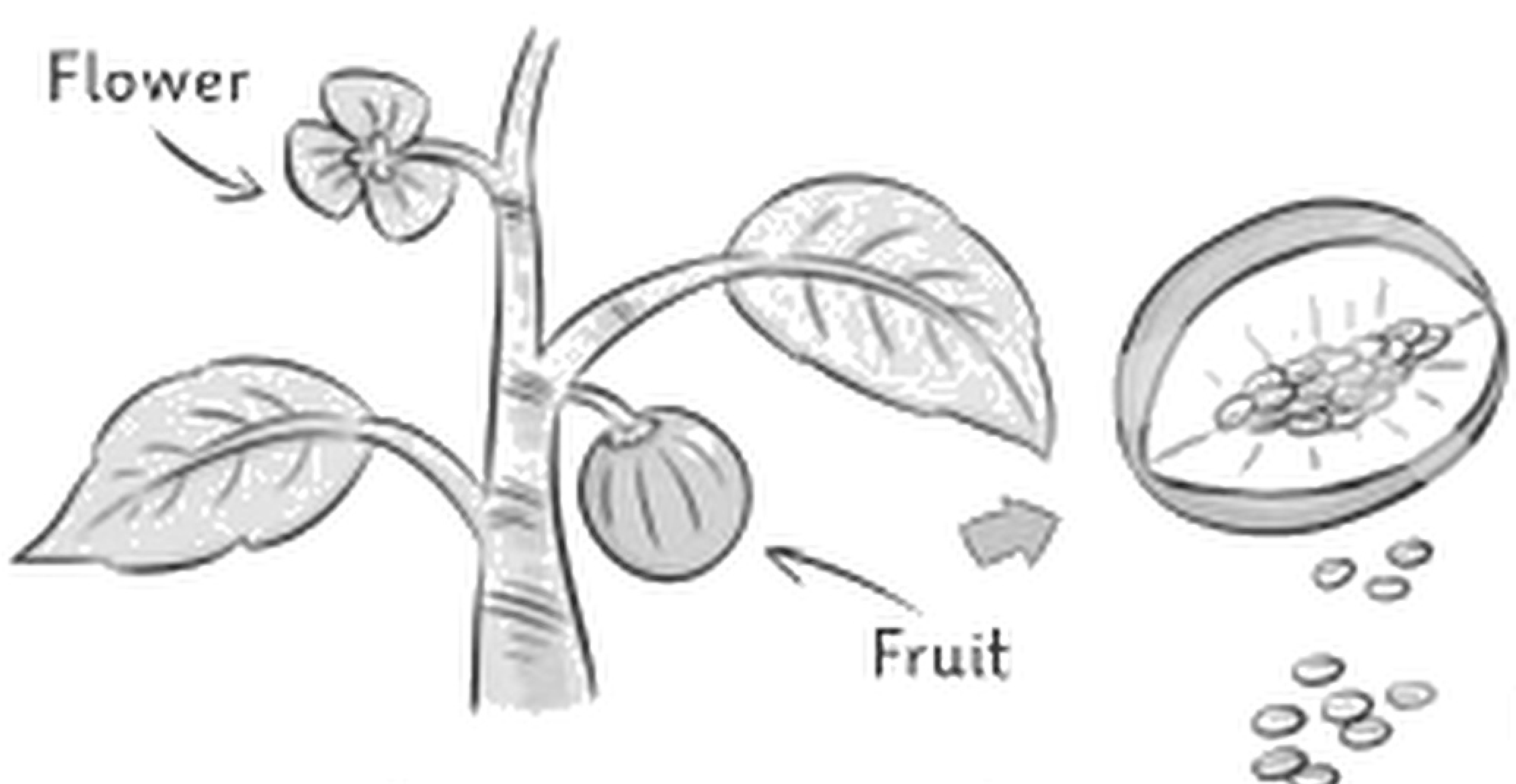
Flowers

Some plants have flowers which make seeds and fruit to produce new plants.

Science Tidbits

Rafflesia is the largest flower in the world. It is about 3 ft 6 inches in diameter and 11 kilograms in weight.

Seeds are produced inside flowers.



A flower turns into a fruit.

Fruit seeds can grow into new plants.

Plants are classified into two major groups: flowering and non-flowering plants.

- Plants
  - Flowering
  - Non-flowering

Flowering plants

Flowering plants are also called angiosperms meaning 'covered seeds'. They are produced inside flowers. Examples are rose, jasmine, apple, mango and tomato seeds.

Distinctive features

There is a vast variety of flowering plants such as herbs, shrubs and trees. They have many distinctive features such as flowers and leaf structure.

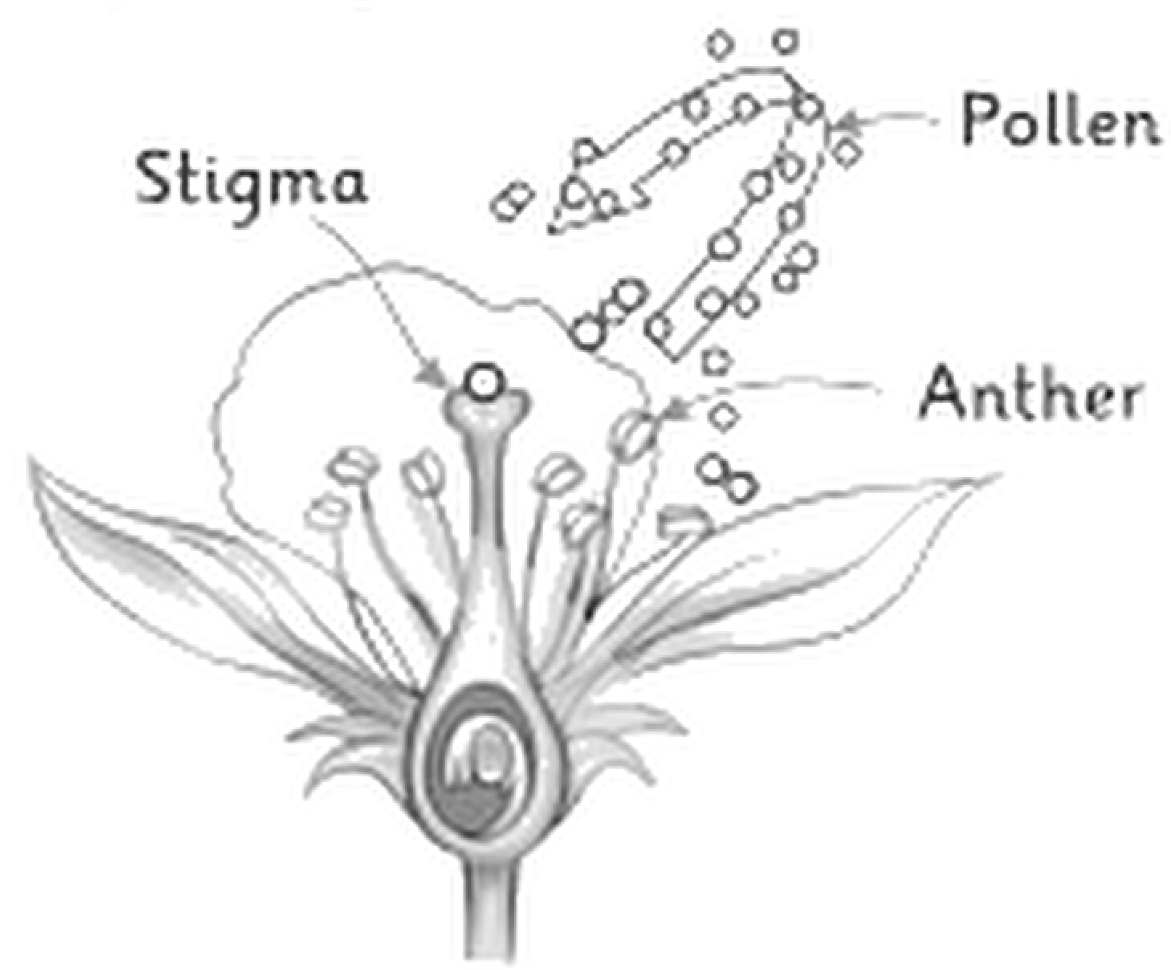
Flower

Flowering plants reproduce through their seeds. These seeds are formed after pollination of flowers. Do you know what pollination is? To understand the process of pollination, we must know the structure of a flower.


A flowering plant

1. **Petals** are brightly coloured. They are present around the stigma and the anther.
2. **Anther** is part of the flower that has pollen. Pollen contains yellow dust-like grains formed inside the anther.
3. **Stigma** is the part of a flower that receives pollen grains.

The transfer of pollen from the anther to the stigma is called **pollination**. However, pollination in flowering plants mostly takes place through pollinators such as insects and birds or by wind and water.



Leaves

Flowering plants usually have broad leaves. These leaves come in many shapes and sizes.


Banana Leaf


Rose Leaf

Teaching point: Explain to students that pollen gets attached to birds or insects when they come into contact with a flower. These birds and insects flutter from flower to flower and drop the pollen everywhere. Thus, many pollen grains drop on the stigma and cause pollination.

Behaviour through the seasons

Many flowering plants sense seasonal changes and respond to them accordingly. For example, some plants shed their leaves seasonally in autumn to conserve water or to better survive in dry conditions. During spring and summer, there is plenty of sunlight and water vapour in the air. Therefore, angiosperms grow new leaves and flowers in spring and summer.

Non-flowering plants

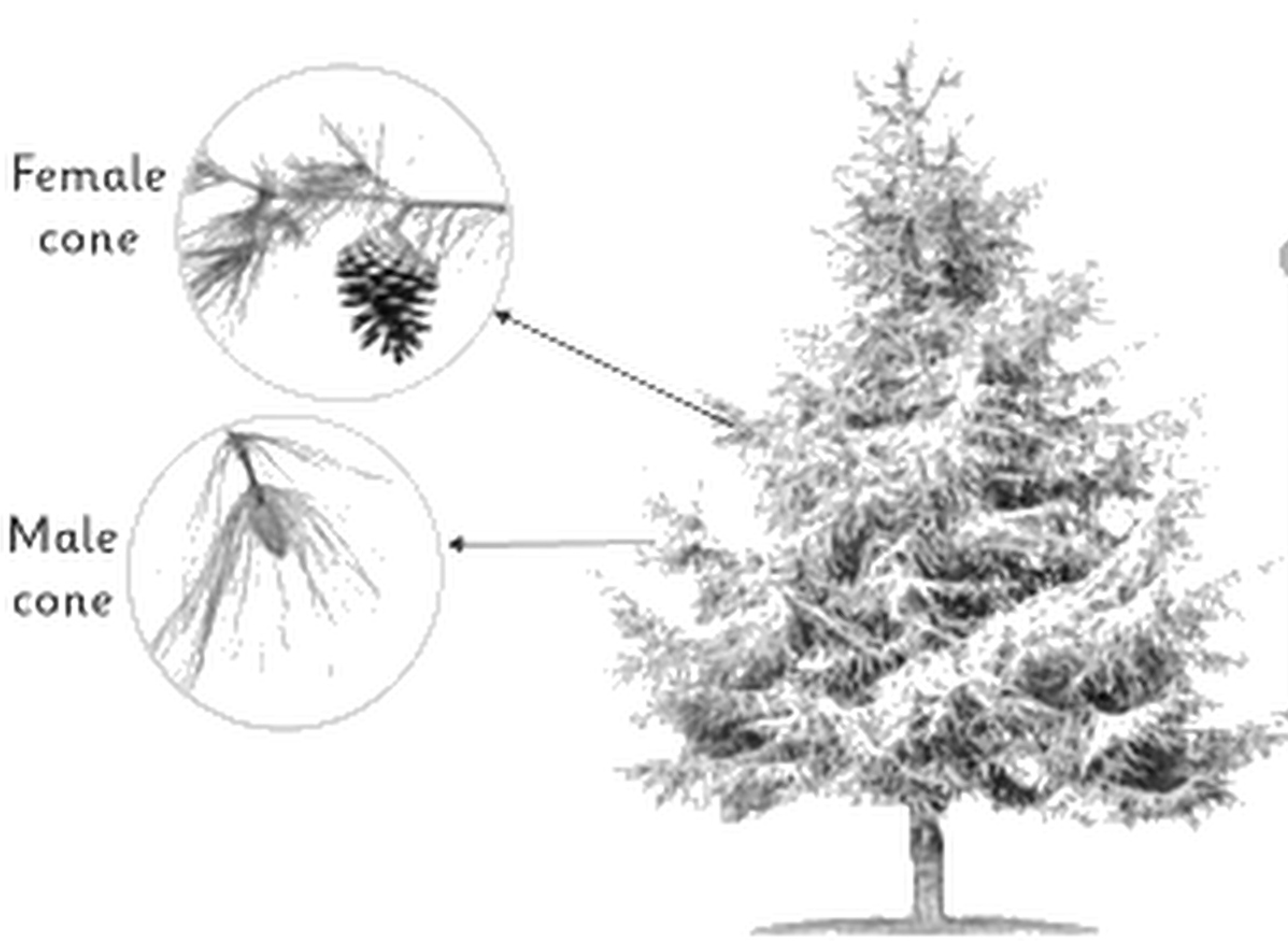
Plants that do not have flowers are called gymnosperms. Their seeds are not enclosed in flowers. Examples of non-flowering plants are pine and cedar.

Distinctive features

Non-flowering plants are generally large trees. They have woody cones instead of flowers.

Cones

A pine tree has two different types of cones on the same tree. Male cones make pollen while female cones produce seeds. Pollination occurs when pollen grains reach the female cones.



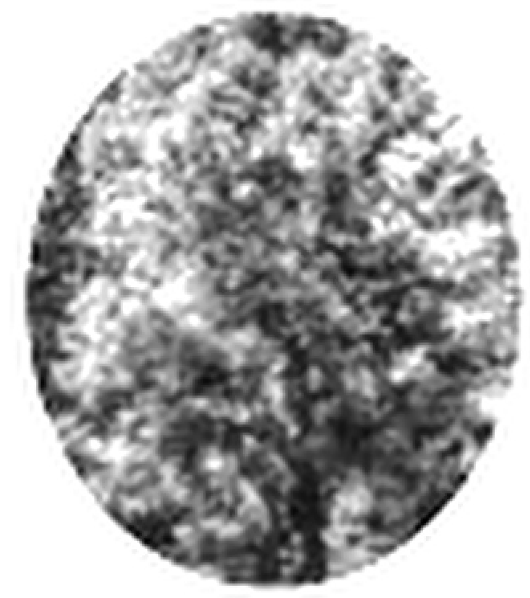
Do You Know?

There are some non-flowering plants that do not produce seeds. They have spores to reproduce.

Pollination in non-flowering plants mostly takes place through wind.

Behaviour through the seasons

These are evergreen plants. However, the colour of some non-flowering plants is affected by the temperature. For example, the Japanese cedar is green in summer and red in winter.



In summer

In winter

Explore more

Visit the following link to learn more about plants. Make a presentation and present it in your class. https://goo.gl/VwraBF

Key Points

- All plants have roots, leaves and stems. Some plants also have flowers and fruit.
- Roots help to hold the plant and take in water and nutrients from the soil.
- Leaves prepare food for the plant using sunlight.
- Flowers make seeds and fruit to produce new plants.
- Flower-bearing plants are called flowering plants or angiosperms.
- Plants that do not have flowers are called non-flowering plants.
- Non-flowering plants are evergreen. They have male and female cones that rely on wind for pollination.

Exercise

A Answer the following questions briefly.

1. Define pollination
2. Briefly explain the function of cones in a non-flowering plant.
3. What is the function of leaves?
4. How do plants transport water and nutrients to all of their parts?

B **Answer the following questions in detail.**

1. Compare flowering and non-flowering plants.
2. Describe the structure of a plant.
3. Explain how plants get food, water and support. How do they become able to reproduce and grow?

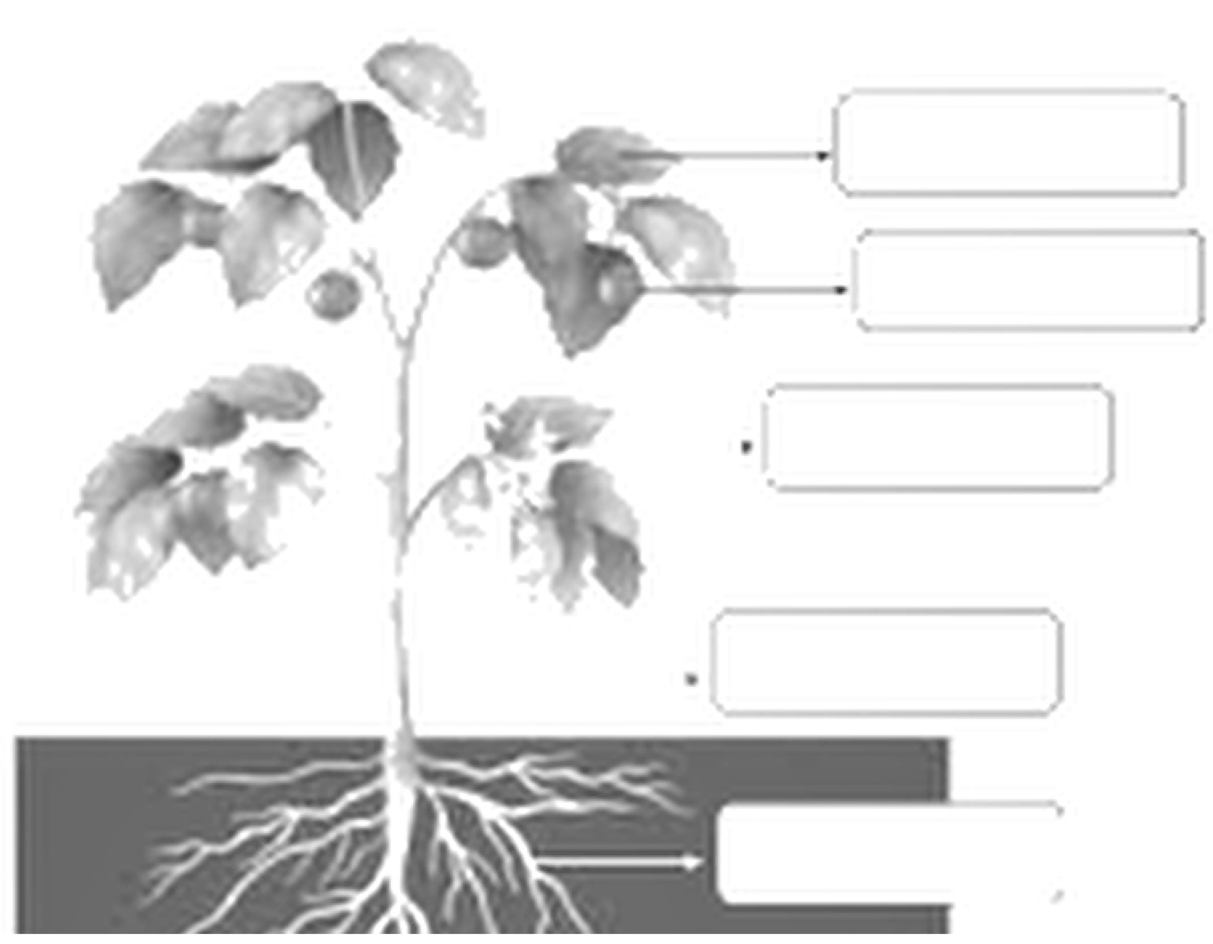
C **Tick (✓) the correct answer.**

1. The picture below shows a plant. Which of following statements is true about it?

a. It is a gymnosperm because it has seeds.
b. It is an angiosperm because it has green leaves.
c. It is an angiosperm because it has flowers.
d. It is a gymnosperm because it has branches.

2. What is the main source of pollination in flowering plants?
a. Insects b. Reptiles c. Water d. Mammals
3. Which of the following is an example of a non-flowering plant?
a. Apple b. Sunflower c. Rose d. Spruce
4. Which of the following parts of gymnosperms produces pollen?
a. Male cone b. Leaf c. Female cone d. Flower
5. Which of the following characteristics distinguishes flowering plants from non-flowering plants?
a. Root b. Flower c. Leaf d. Stem

D **Label the parts of the plant.**



Think Tank!

1. How can plants prepare food without sunlight?
2. What would happen if there were no pollinators?

Project

Let us investigate how a plant grows from a tiny seed in this simple project.

Materials

- Glass jar
- Paper towels or tissue
- Seeds of French bean (or any other)

Procedure

1. Fill the jar with paper towels or tissues.
2. Now put a few seeds in the jar.
3. Add some water just to make them wet.
4. Keep the jar in a warm place.
5. Observe the seeds daily and note the changes in your notebook.

As the seeds germinate, you can either take the jar to your school or invite your classmates to see it.

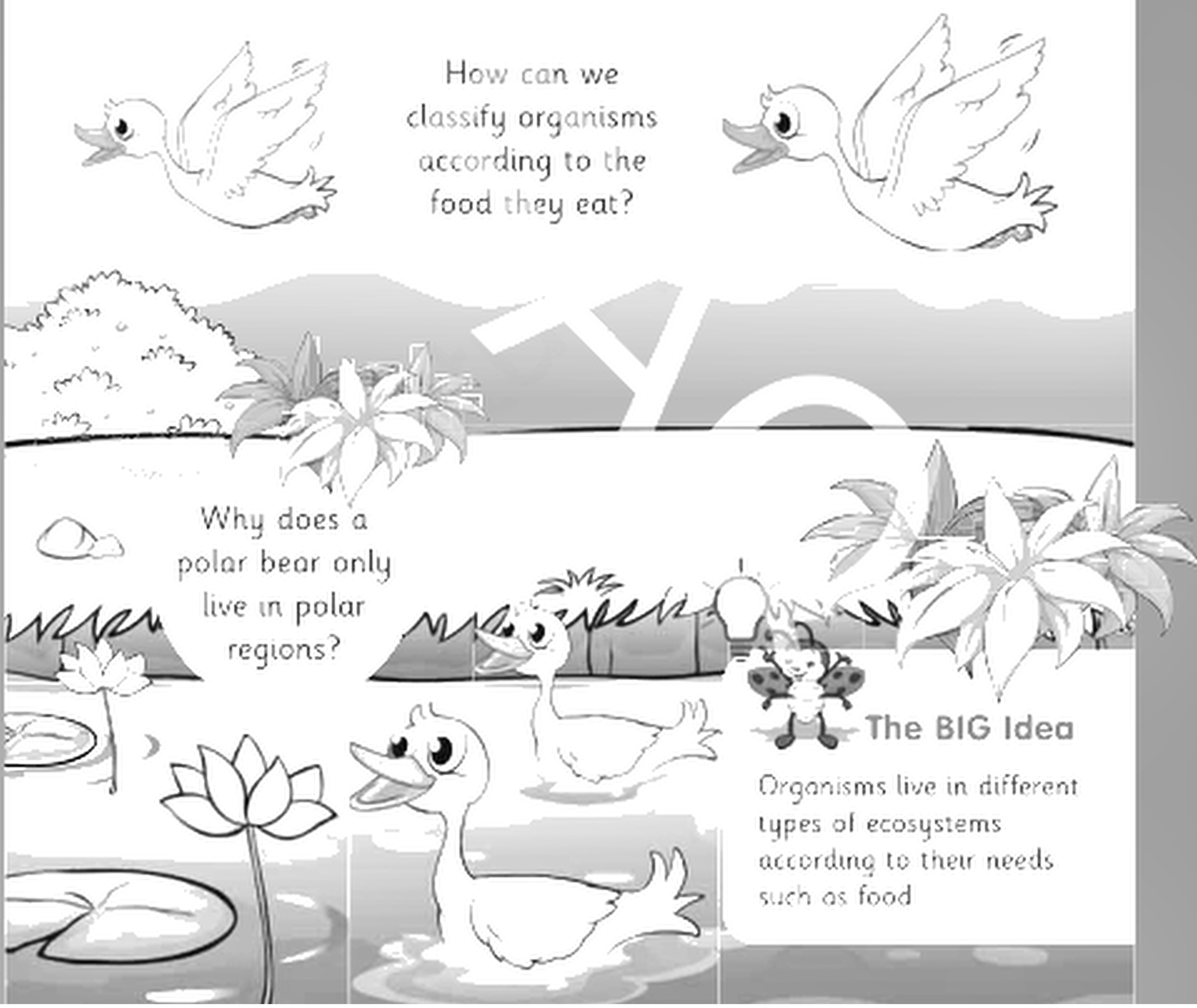
Teaching point: Get students into groups and have them complete the given project. Assign a different role to each group member. Then ask them to present their group work in collaboration.

Ecosystem

Unit 3

Learning Outcomes

- Recognise that all plants and animals need food to provide energy for activity and need raw materials for growth and repair.
- Explain that plants need sunlight to make their food, while animals eat plants or other animals to get their food.
- Complete a model of a simple food chain using common plants and animals from familiar ecosystems, such as a forest or a desert.
- Describe the roles of living things at each link in a simple food chain (e.g. plants produce their own food; some animals eat plants, while other animals eat the animals that eat plants).
- Identify and describe common predators and their prey.
- Relate common plants and animals (e.g. evergreen trees, frogs, lions) to common ecosystems (e.g. forests, ponds, grasslands)
- Recognise and explain that some living things in an ecosystem compete with others for food or space.



Ecosystem

Food is the basic need of all living things. It provides energy to organisms to sustain life. It also provides raw materials for growth and to repair body parts.

Some organisms make their own food but some cannot. We can classify organisms into two major groups on the basis of the way they get their food.

1. Producers

Have you ever seen plants eating some fruit or vegetable? No, plants do not eat. They prepare their own food. The Sun is the main source of energy for plants and helps to make their food in the presence of carbon dioxide and water.

This process is called **photosynthesis**. 'Photosynthesis' is a combination of two words. 'photo' meaning 'light' and 'synthesis' meaning 'to put together'. It is the process by which green plants produce food (sugar) and oxygen inside their leaves. Therefore, plants are called producers.

Teaching point: For effective teaching and learning, feel free to use 'Urdu' as a medium of instruction to explain the concepts.

2. Consumers

Organisms that cannot produce their own food are called consumers. They get their food from other living things.

Primary consumers

Animals that eat only plants to get energy are known as primary consumers or herbivores. Caterpillars, deer, sheep, cows, rabbits, giraffes and elephants are a few examples of primary consumers.

Science Tidbits

Animals that eat only meat are called carnivores. Animals that eat both meat and plants are called omnivores.

Secondary consumers

Consumers that obtain their food by eating primary consumers, or animals that eat plants are called secondary consumers. For example, a fox eats rabbits and a sparrow eats caterpillars

A fox eating a rabbit

A bird eating a caterpillar

Teaching Point: Observe Plantation Day with your class. Take students to the school garden. Get them into groups and provide each group with seeds, water canes and garden tools.

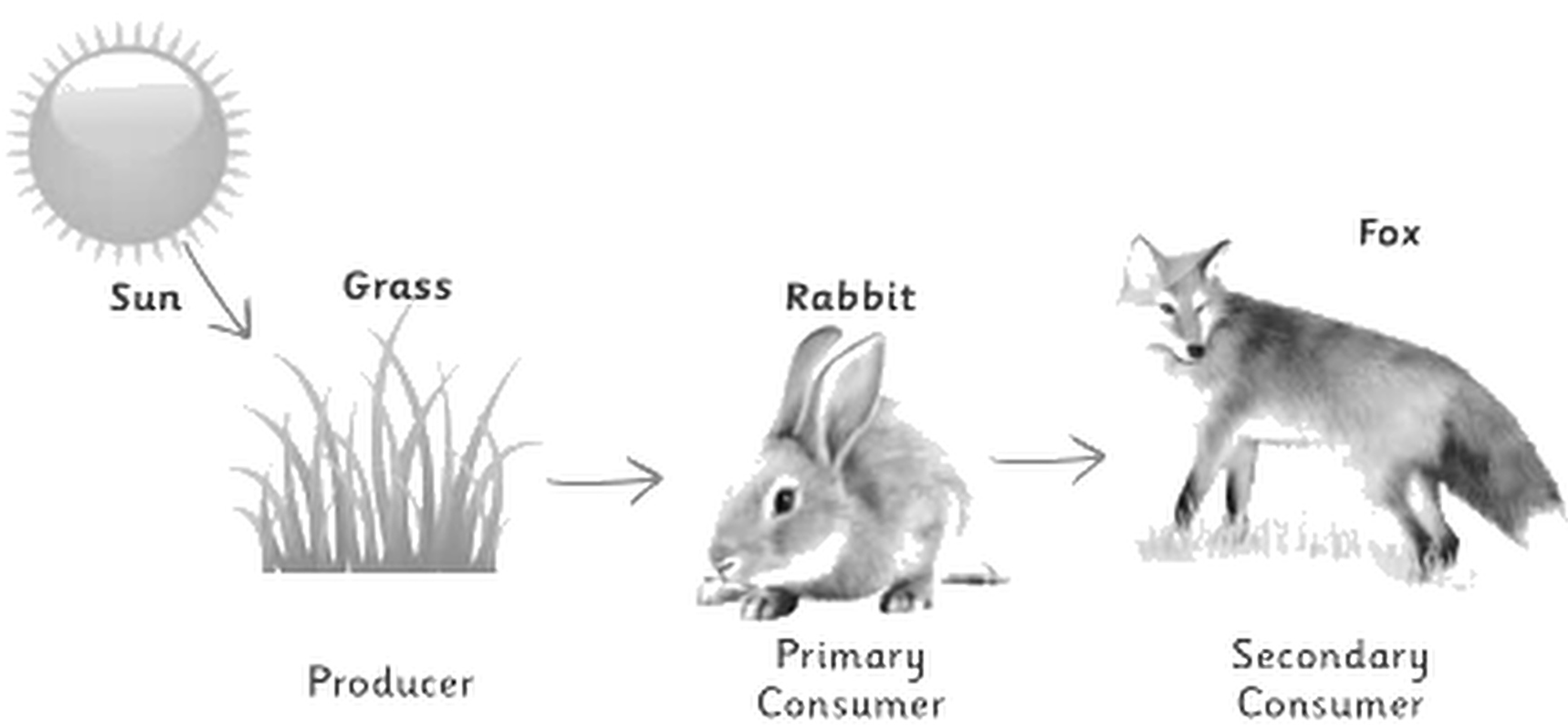
Tertiary consumers

Animals that eat secondary consumers for getting energy are called tertiary consumers. For example, a fox may be eaten by a lion and a sparrow by a sparrow hawk. Thus, the lion and the sparrow hawk are tertiary consumers.

If we put primary, secondary and tertiary consumers together, they make a food chain showing the feeding relationship among them.

Food chain

A food chain is the path of energy transfer from one living thing to another in the form of food.



Teaching Point: Download the worksheet from the link below:
https://instantworksheets.net/herbivore_carnivore_omnivore/

The 'arrow' ⟶ in the food chain means 'is eaten by' and the 'head of the arrow' shows the transfer of energy. The food chain above can be read as: a plant is eaten by a rabbit and the rabbit is eaten by a fox.

A food chain always begins with energy from the Sun, which is utilised by a producer. It goes in one direction and ends up with secondary or tertiary consumers. A food chain must consist of minimum three links (organisms).

Roles of organisms in a food chain

In a food chain, each organism has a specific role. The animal that eats or kills other animals is called a predator, while the animal which is killed or hunted by others is called prey. For example, a lion eats a deer or cow. So, the lion is a predator and the deer or cow is the prey. In a simple food chain, primary consumers become prey for secondary consumers (predators).

This is how organisms of an area interact with each other for food and energy. Similarly, living things also interact with non-living things such as sunlight, air, water, etc.

Ecosystem

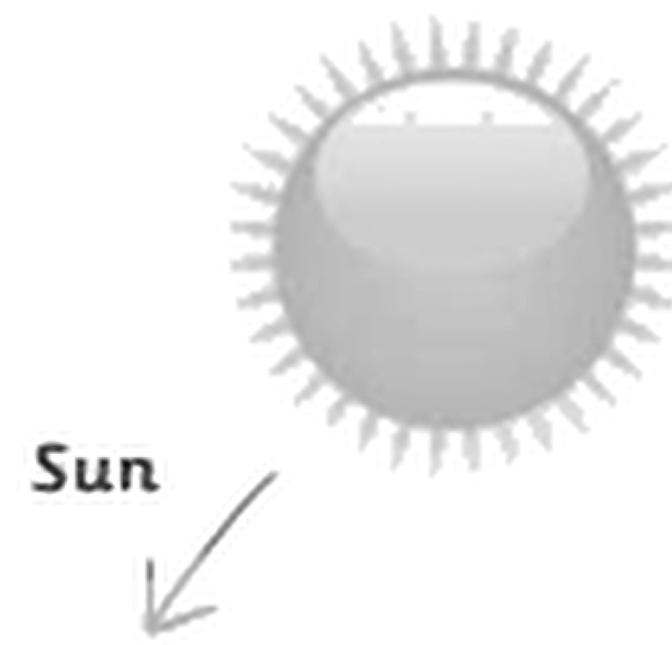
All living and non-living things in a particular place that interact with each other make up an ecosystem.

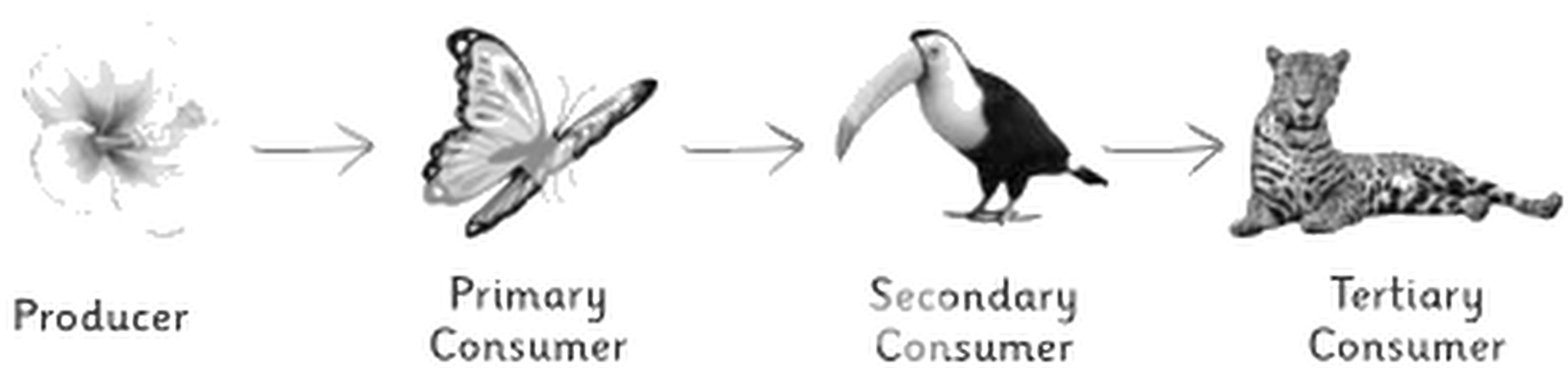
"An ecosystem includes all the organisms interacting with each other and with their non-living environment (air, water and soil)."

An ecosystem could be as small as an area under a tree log, or as large as a forest. All organisms have their own ecosystems. For example, frogs live in a pond ecosystem, lions live in a grassland ecosystem and evergreen trees live in a forest ecosystem.

Rainforest ecosystem

A rainforest ecosystem gets a huge amount of rainfall and mild sunlight. Therefore, it is home to a huge variety of animals and plants. The following food chain shows the relationship among different organisms of a rainforest ecosystem.



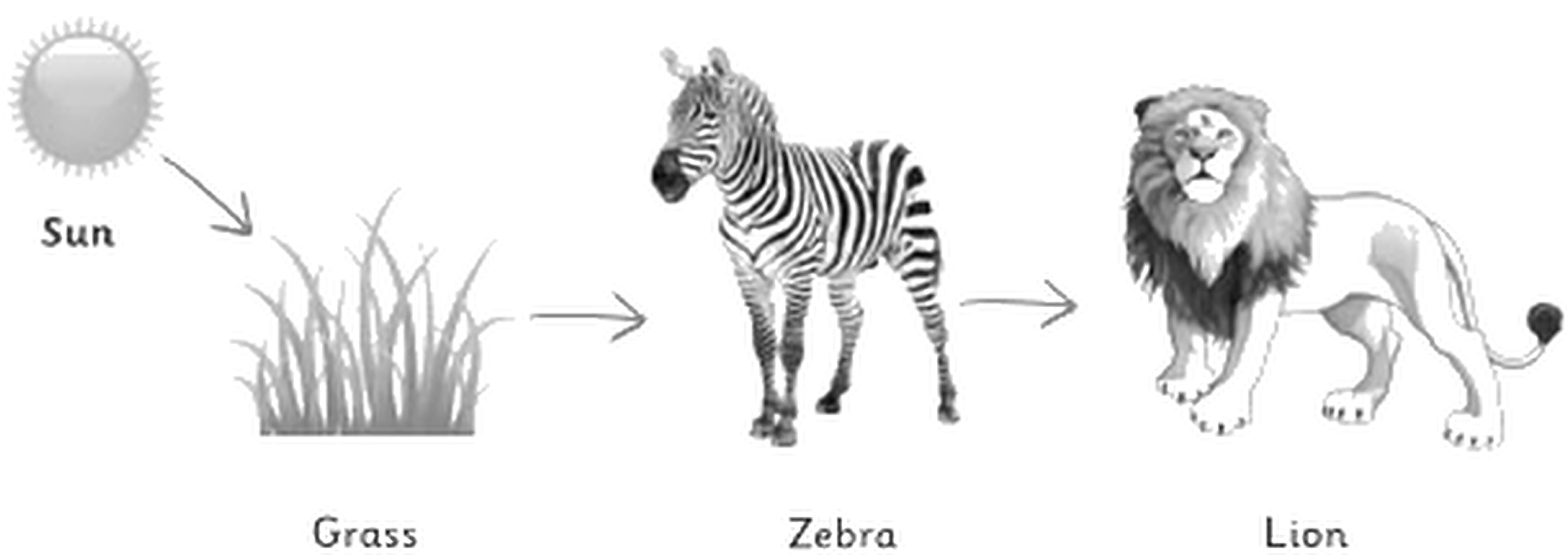


Do You Know?

Birds also eat plants. Therefore, sometimes birds become primary consumers and the food chain becomes shorter.

Grassland ecosystem

A grassland ecosystem is a large ecosystem. It gets less rainfall than a forest ecosystem. However, it supports small trees and shrubs as well as many animals such as elephants, giraffes, lions and zebras. A simple food chain of a grassland ecosystem can be shown as below:

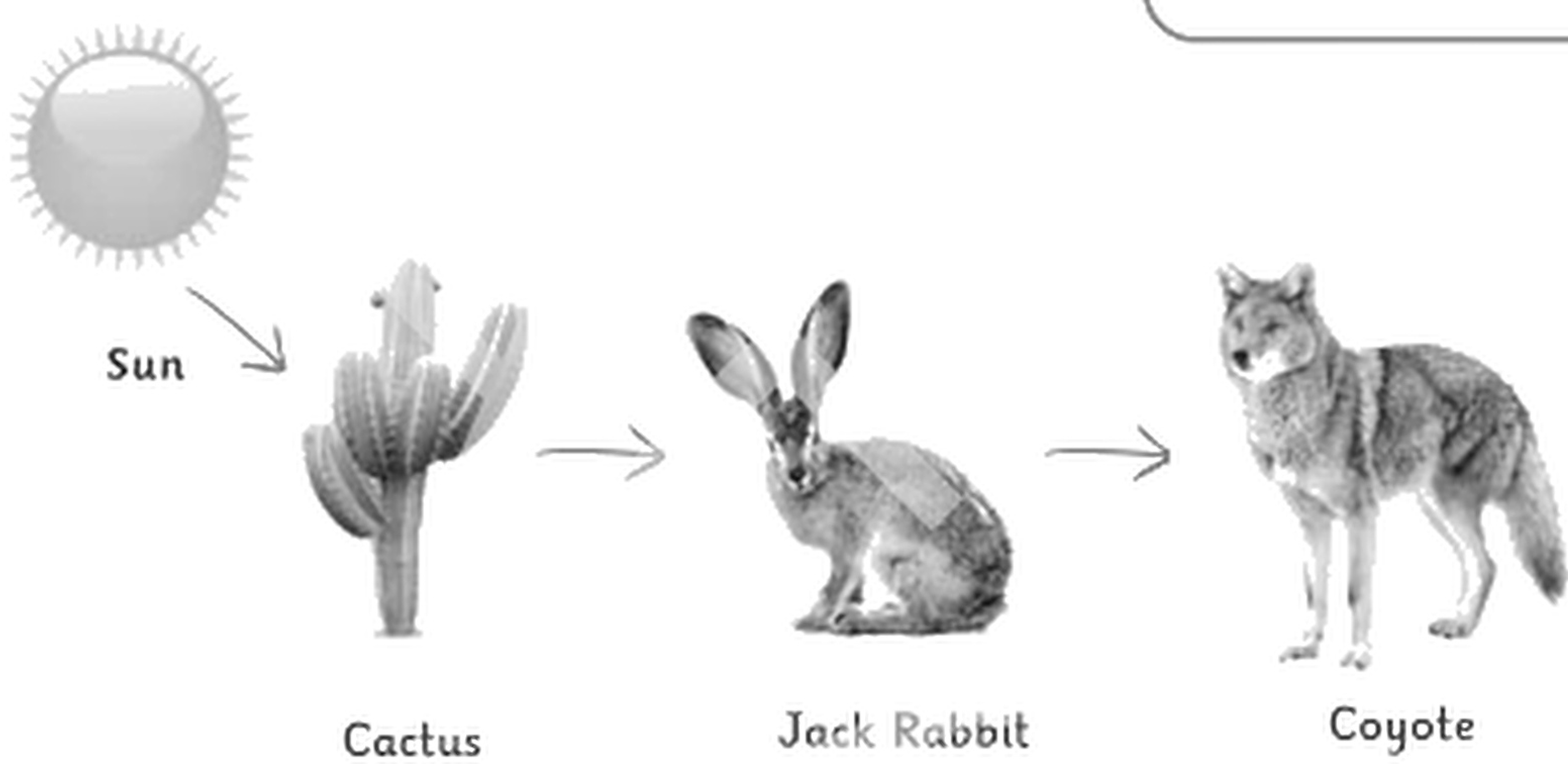


Desert ecosystem

A desert ecosystem gets little rainfall but a high amount of sunlight. Therefore, only those plants and animals that are well-adapted to this environment can live there. Examples of living organisms are cactuses, snakes, camels, lizards, etc.

Do You Know?

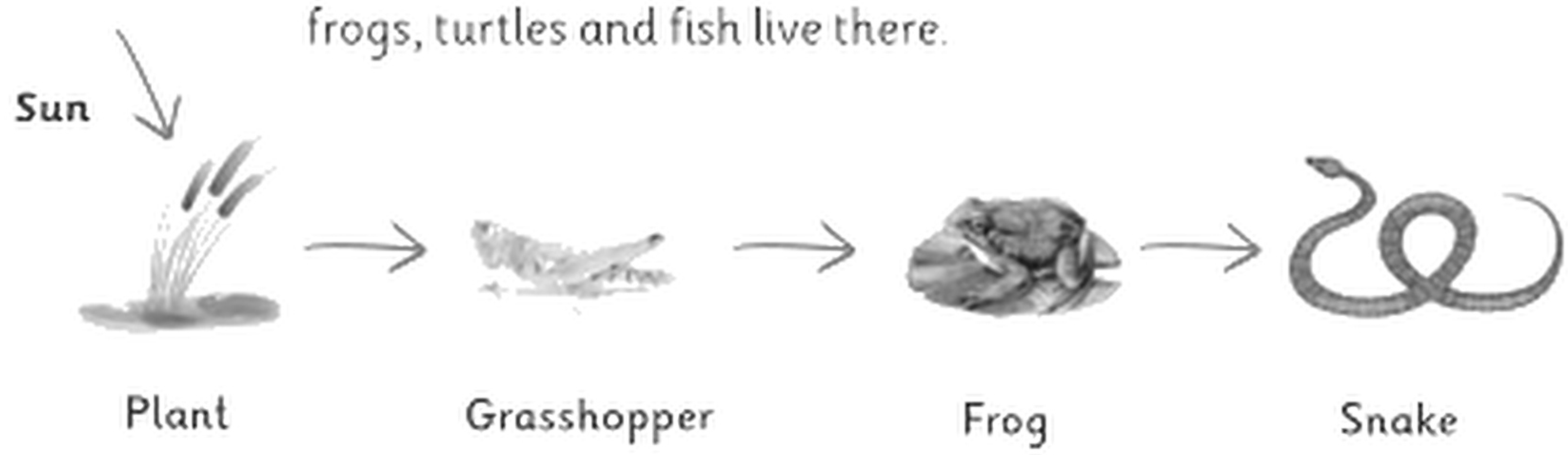
Deserts are very hot. Therefore, most of the desert animals are active only at night.



Pond ecosystem

A pond ecosystem is a smaller ecosystem having fresh water and a variety of organisms.

Pond weeds and water lilies are some of the common pond plants. Many small animals and insects such as shrimps frogs, turtles and fish live there.



Competition for survival

In an ecosystem, many organisms share food and space with each other. Therefore, there is always a competition among them. Sometimes, they fight each other for food and sometimes for territory. A territory is an area which is occupied by a single animal. If animals do not get food or territory, they cannot survive in an ecosystem.

Hands-on activity

Divide the class into four groups and assign an ecosystem to each group. Ask them to collect the pictures of different animals and plants of their assigned ecosystems (through the internet or old magazines). Then, help them to arrange the pictures on chart paper to build their food chains. Display the charts on the activity board.

Explore more

Open the link given below. You will find a series of pictures. Drag and drop the pictures in the right order to complete the food chain.
https://goo.gl/xTfhKj

Key Points

- Food is the basic need of all living things.
- Organisms that make their own food through photosynthesis are called producers.
- Organisms that cannot produce their own food and get it from other living things are called consumers.

- Animals that eat only plants to get energy are known as primary consumers or herbivores.
- Consumers that obtain their food by eating primary consumers, or animals that eat plants are called secondary consumers.
- Animals that eat secondary consumers for getting energy are called tertiary consumers.
- A food chain is the path of energy going from one living thing to another in the form of food.
- An animal that eats or kills other animals is called a predator.
- An animal which is killed or hunted by others is called prey.
- An ecosystem includes all the organisms interacting with each other and with their non-living environment (air, water and soil).
- Forests, grasslands, deserts and pond ecosystems are some of the common ecosystems.

Exercise

A **Answer the following questions briefly.**

1. Are seeds producers? What kind of consumers attract them?
2. What is an ecosystem?
3. Write down a food chain in which humans are secondary consumers.
4. How do tertiary consumers get their food? Write any two examples.

B **Answer the following questions in detail.**

1. What are consumers? Describe their three types.
2. Explain a pond ecosystem in your own words. Give an example of its food chain.
3. Describe the process of photosynthesis.

C Tick (✓) the correct answer.

1. What do you think a sunflower is?
   a. Producer b. Herbivore
   c. Carnivore d. Omnivore
2. Which of the groups below contains only consumers?
   a Frog, rabbit, grass b. Lion, fox, grasshopper
   c. Fish, cactus, coyote d. Mouse, sun, zebra

3. Which of the following statements is correct about the food chain below?

   a. The fox and the rabbit are primary consumers.
   b. The lion and the fox are tertiary consumers.
   c. The rabbit and the lion are secondary consumers.
   d. The lion is a tertiary consumer.

4. An animal that eats or kills other animals is called a predator. Which of these is a predator?
   a. Caterpillar b. Deer
   c. Lion d. Sunflower
5. A simple food chain is given below.

(1) (2) (3)

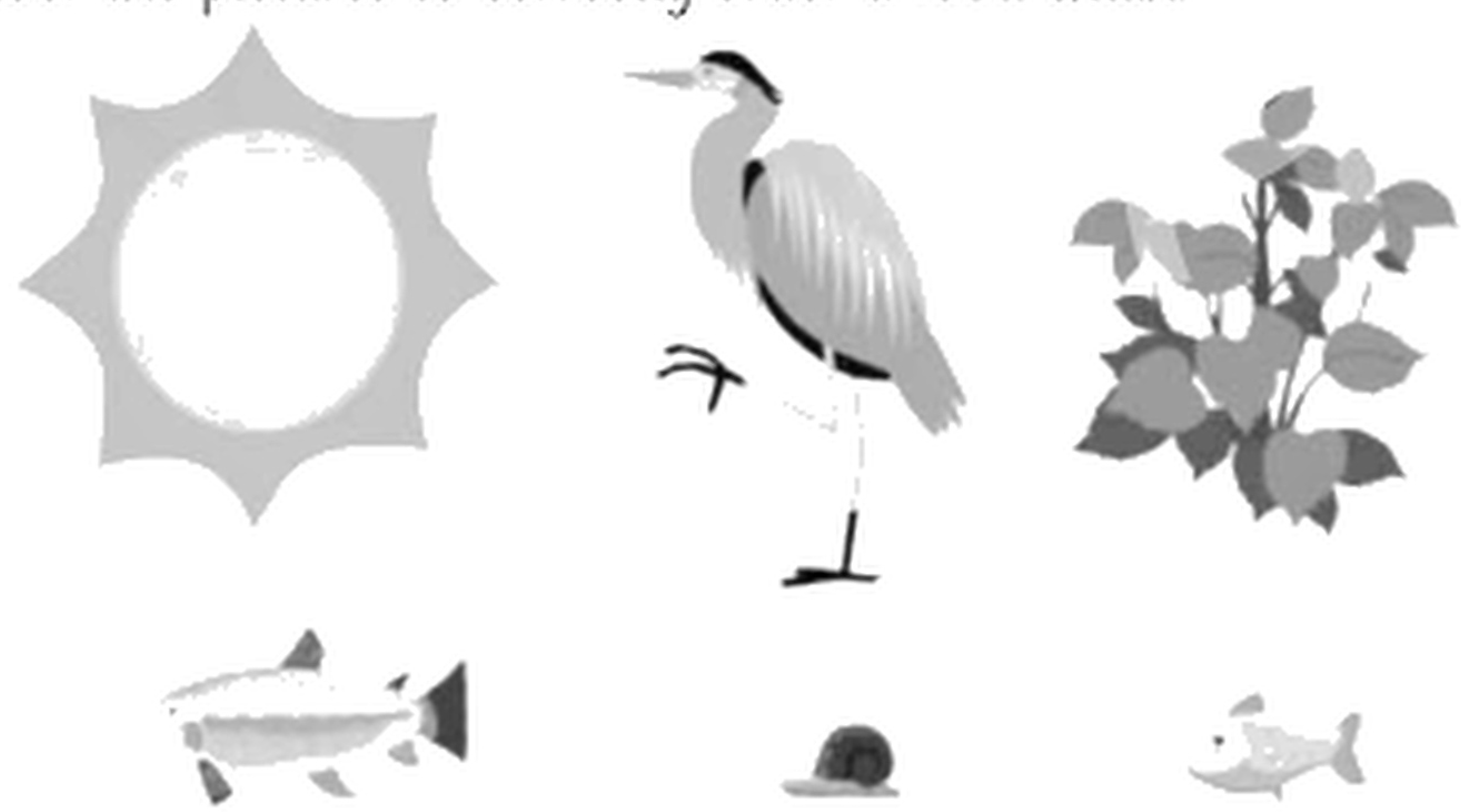
6. Which of the following is a predator in the food chain above?
   a. 1 b. 2
   c. 3 d. both 2 and 3

D Match each term with its correct description.

Producers	living and non-living things of an area
Primary consumers	organisms that make their own food
Secondary consumers	animals that eat secondary consumers
Tertiary consumers	animals that eat only plants
Ecosystem	animals that eat primary consumers

Think Tank!

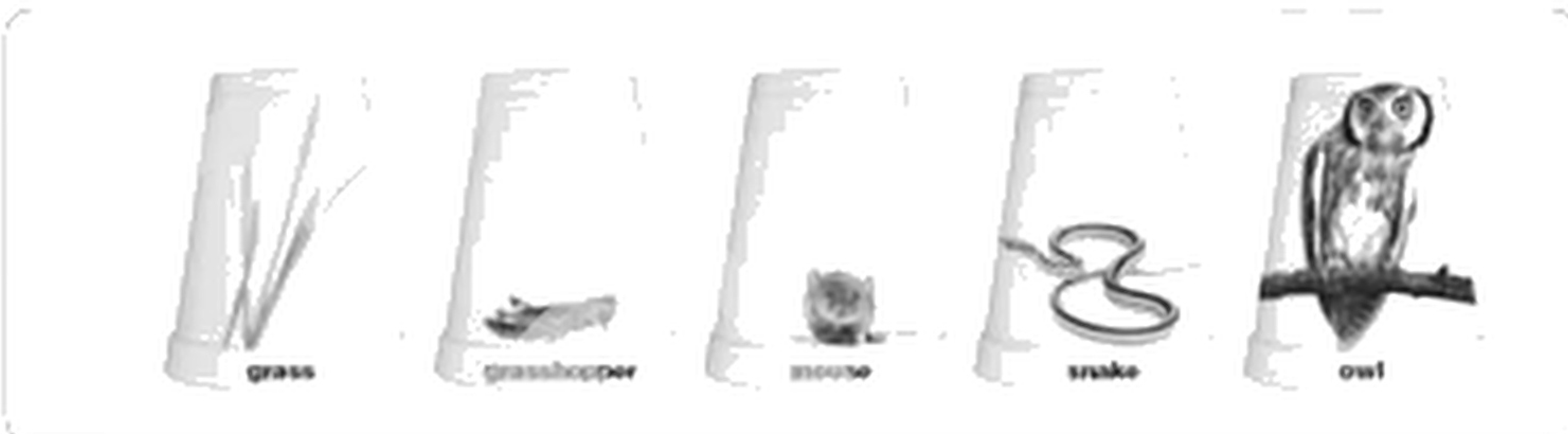
Number the pictures to correctly order a food chain.



Project

Materials

- Styrofoam cups
- Stickers of grass, grasshopper, mouse, snake and owl
- Cut-outs of arrows



Procedure

1. Take styrofoam cups and paste stickers of all the components of a food chain on them.
2. Propose a possible food chain based on who eats who.
3. Show the energy transfer by using cut-outs of arrows.

Inquiry Question!

How do plants and animals depend on each other in a food chain?

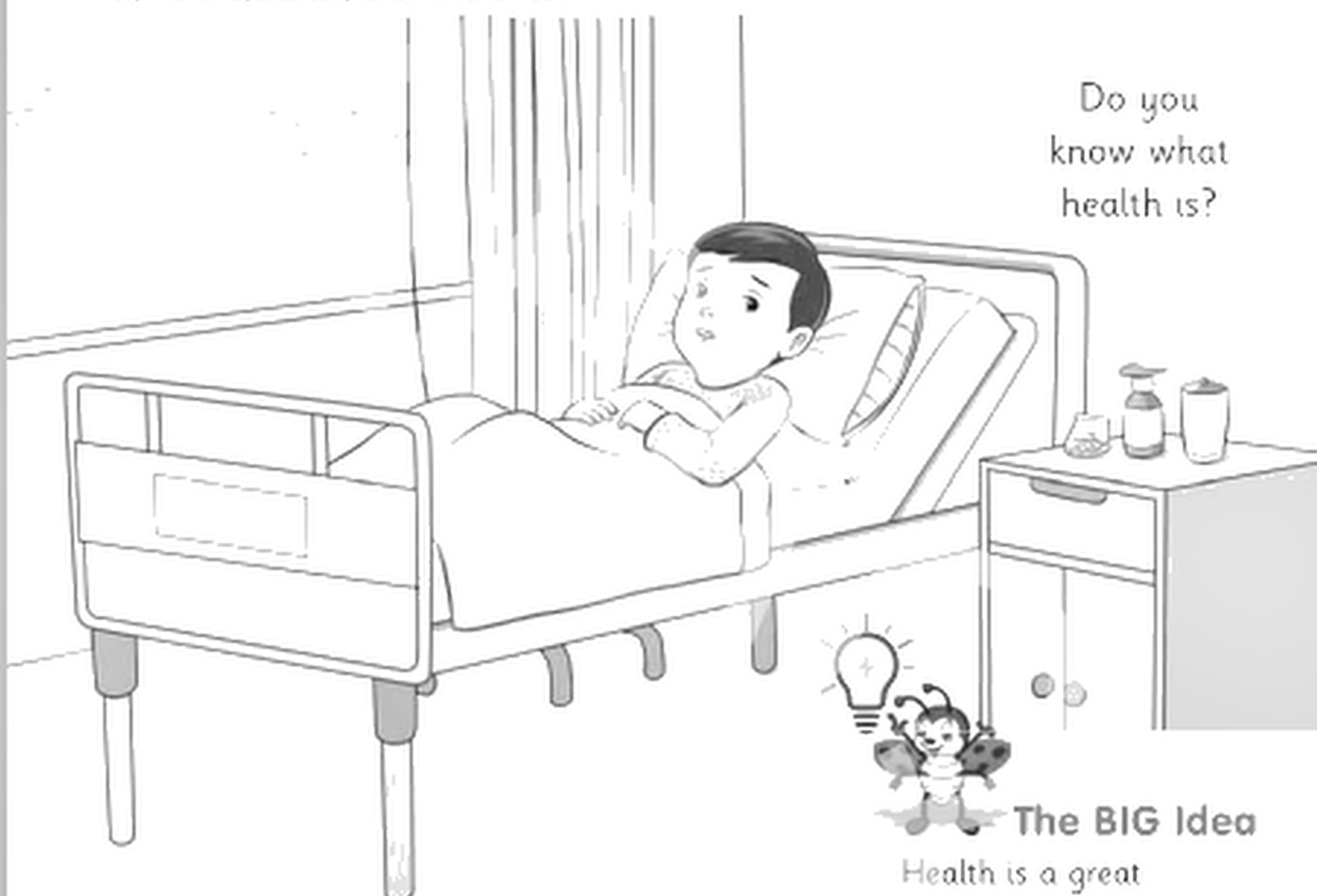
Teaching point: Get students into groups and have them complete the given project. Assign a different role to each group member. Then ask them to present their group work in collaboration.

Human Health

Unit 4

Learning Outcomes

- Recognise common signs of illness (e.g. high body temperature, coughing and stomach ache).
- Relate the transmission of common communicable diseases through human contact (e.g. touching, sneezing and coughing).
- Identify or describe some methods of preventing disease transmission (e.g. vaccination, washing hands and avoiding germs).
- Describe everyday behaviours that promote good health (e.g. a balanced diet, exercising regularly, brushing teeth, getting enough sleep and wearing sunscreen). Identify common food sources included in a balanced diet (e.g. fruits, vegetables, grains, milk and meat).



Do you know what health is?

How do we know that a person is ill or healthy?

What kind of food is good for us?

The BIG Idea

Health is a great blessing. There are many things that can affect our health and make us ill. The study of common signs and causes of illness can help us to maintain a healthy life

Human Health

Being ill means you are not healthy. Tiny living organisms called germs are the main cause of any illness. There are some signs that help us to tell if a person is ill or not. These signs are given below:


Fever


Stomach ache


Cough


Flu

Let us study how diseases are transmitted.


Direct contact

Transmission of Diseases

The transmission of diseases can happen in several ways as discussed below.

1. Direct contact

Many diseases spread from person to person through direct contact. For example, when any part of a healthy person's body comes into contact with the skin of a diseased person, the germs are transmitted from the diseased person to the healthy person.

2. Indirect contact

Germs can transfer from a diseased person to the objects around. For example, if a person with a cold sneezes into his hand and touches the doorknob, the germs will be transferred to the doorknob. These germs are transmitted to someone who touches the doorknob afterwards.


Germs on a doorknob

Teaching point: Encourage students to wash their hands with soap before and after eating every meal. For effective teaching and learning, feel free to use 'Urdu' as a medium of instruction to

Release of germs by sneezing

3. Air

Germs can spread in the air when somebody coughs, spits or sneezes. These germs float in the air for a long time and travel long distances. Any healthy person who breathes in the air in which these germs are present can become infected.

4. Water

Germs may be found in drinking water. Waterborne diseases are common in areas that have poor sewage and clean water systems.

Germs inside water

5. Food

Germs attack food when left uncovered or not properly cooked. When a healthy person eats this food, he or she becomes infected.

6. Animals or insects

When a mosquito bites a diseased person, some germs enter the body of that mosquito. Now, when this mosquito with germs inside its body bites a healthy human, he or she becomes infected.

Science Tidbits

The lifespan of E. coli bacteria in water is 100 days.

Hands-on activity

Prepare a chart of precautions we should take to save ourselves and family members from diseases caused by germs. Get it checked by your class teacher and share this information with your classmates and family.

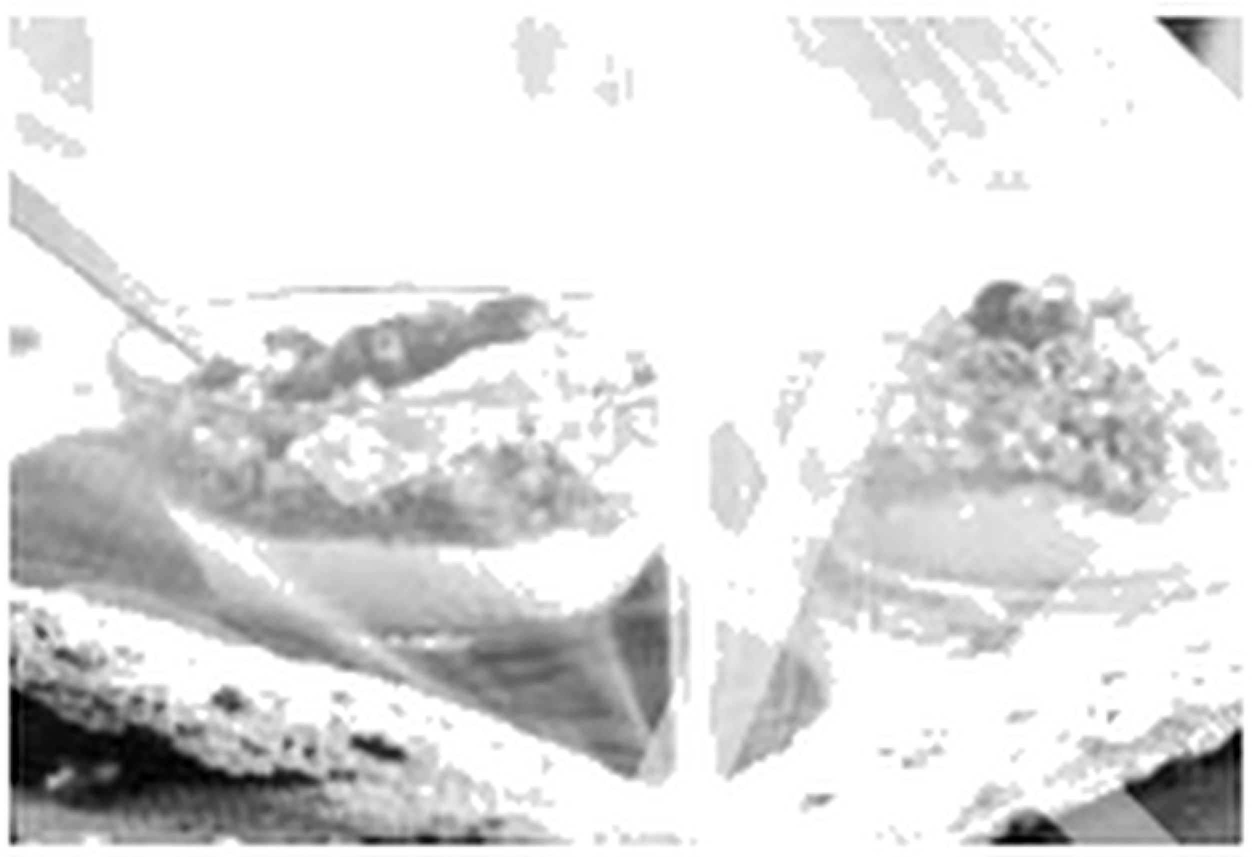
Teaching point: Discuss that mosquitoes are involved in the spread of malaria and dengue fever. Tell them the difference between waterborne and airborne diseases.

Preventing disease transmission

We can prevent disease transmission by taking the following precautions:

1. Washing hands

Make a habit to wash your hands before eating anything and after using the toilet. Use soap to wash your hands.



2. Keeping food covered

Since germs can be present in the dust or in the air, it is important to keep food and utensils covered.

3. Using boiled or filtered water

Always use boiled or filtered water as the germs present in water can make you ill. Boiling and filtration remove germs from water or kill them.

Boiling water

Water filter

4. Avoid germs from diseased people

People having flu can transmit influenza germs to a healthy person when they sneeze and cough. So, use a mask to avoid catching influenza.

5. Careful with cuts and scratches

Wounds or cuts on the skin can provide germs with a pathway to the body. Always use bandages to cover wounds.

6. Vaccination

Vaccines increase the ability of our body to fight germs. It is important to make sure that children get vaccinated at an early age to protect them from diseases such as polio, TB, etc.

Healthy habits

Healthy habits result in good health. Let us study some healthy habits.

Do You Know?

Germs can grow into millions and trillions. So, we should wash our hands with soap regularly to avoid catching germs.

Cleaning

Cleaning saves us from germs that transmit diseases. Therefore, we should keep our bodies and surroundings clean, brush our teeth after every meal and cover food.

Proper sleep

Proper sleep is essential for good health. Children are required to have at least 8-10 hours of sound sleep. Always sleep on time and rise early.

Exercise

Regular exercise is good for health. Playing outdoor sports is good for our bodies.

Teaching point: Tell students that certain diseases are not curable. However, they are preventable.

Our health is also affected by what we eat. So, we must take a balanced diet and eat homemade food Let us see what a balanced diet is

Balanced diet

A balanced diet has all the important food items we need to stay healthy and active. Some common food sources included in a balanced diet are as follows:

Food pyramid

Fruits and vegetables

Fresh fruits and vegetables are an important source of minerals and vitamins. Their regular use protects the body from different diseases.

Grains

Grains are seeds of different plants like wheat, corn, beans, rice, etc. Whole grains are a good source of nutrients such as fibre.

Milk

Milk and dairy products are rich sources of calcium. They are essential for proper growth and development of our bones.

Meat

Meat is an important source of proteins and fats. It gives strength to our body and also protects us from many diseases. Fish meat is also called white meat. It is also the best source of proteins and fats.

Teaching point: Tell students about unhealthy food (e.g. carbonated drinks and fast food) and its effects. Explain to them the nutritional requirements of a healthy body.

Explore more

Visit the following link and learn more about germs. Take notes of different diseases and show them to your class teacher.

https://goo.gl/X6EjoZ

Key Points

- Microscopic living organisms that cause different diseases are called germs.
- By observing the signs of illness (e.g. fever, cough, stomach ache), we can tell if a person is ill or not.
- Germs can spread in the air when somebody coughs, spits or sneezes.
- We can prevent disease transmission by taking some precautions like washing our hands and getting vaccinated.
- Cleaning oneself and surroundings, taking proper sleep, doing exercise and eating a balanced diet are healthy habits.
- A balanced diet has all the important food items we need to stay healthy and active.

Exercise

A Answer the following questions briefly.

1. List three signs of an illness.
2. What kind of food should we eat to stay healthy?
3. What are healthy habits? Write any two.
4. What are the harmful effects of fast food and carbonated drinks?
5. Why is meat good for health?

B. Answer the following questions in detail.

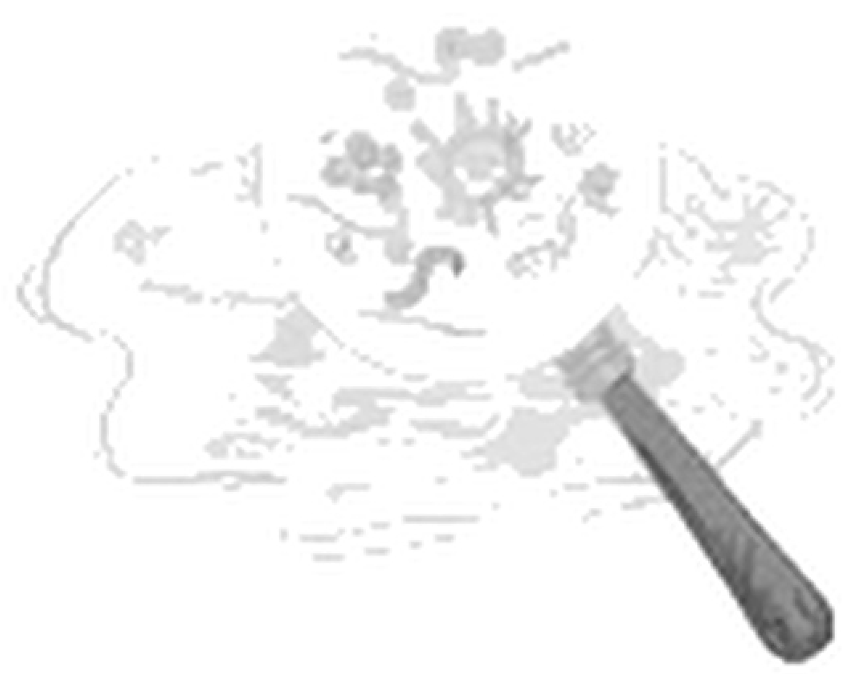
1. Describe any five ways of disease transmission.
2. Write a detailed note on the methods of preventing disease transmission.
3. Discuss the main groups of a balanced diet.

C. Tick (✓) the correct answer.

1. Which of the following cause diseases?

   a. Animals b. Germs c. Plants d. Birds

2. What are the sources of disease transmission in the pictures shown below?



   a. Cuts and wounds b. Dirty water and rotten food
   c. Mosquitoes and sneezing d. Air and animals

3. Which sign of illness is shown below?

   a. Stomach ache b. Cough
   c. Fever d. Headache

4. Which two of the following are methods of disease prevention?
   i. Vaccination
   ii. Using things used by a diseased person
   iii. Washing hands

   a. i and ii b. i and iii
   c. ii and iii d. i, ii and iii

5. Which ones of the following are not part of a balanced diet?
   a. Fruits and vegetables b. Milk and meat
   c. Soft drinks d. Grains

D Fill in the blanks.

1. The normal body temperature of humans is _______ °C.
2. Tiny living organisms that can cause illness are called ___________.
3. Always use boiled or _______________ water.
4. Proper sleep and exercise are good for _____________.
5. Fish meat is a source of ____________ and __________.

E Write T for a true statement and F for a false statement in the box.

1. Fruits and vegetables are important sources of minerals and vitamins. ☐
2. Grains are seeds of different plants such as wheat, corn, beans, etc. ☐
3. Our health is affected by what we eat. ☐
4. Diseases like influenza, etc. can spread from healthy persons. ☐
5. Germs can be present in the dust or in the air. ☐

Think Tank!

1. What will happen if wounds and cuts are not properly taken care of?
2. Why is it important to eat a balanced diet?

Project Diet Diary

Materials required

- Diary or Scrapbook
- Pencil
- Glue
- Some old magazines and newspapers

Procedure

- Take a diary or scrapbook.
- Cut pictures of different food items you eat from the old magazines or newspapers. You can also use stickers if easily available.
- Write the date and day at the top left corner of your diary. Make three columns: breakfast, lunch and dinner.
- Now paste the stickers or pictures of the food items you eat.
- Maintain the diet diary for about a week and get it checked by your class teacher.
- After one week, observe if your diet is balanced or not.

Teaching point: Get students into groups and have them complete the given project. Assign a different role to each group member. Then ask them to present their group work in collaboration.

Review Exercise

Tick (✓) the correct answer.

1. In the picture below, what is structure X used for?

a. For chewing leaves b. For sipping nectar
c. For sucking blood d. For injecting poison

2. How are animals classified into the following categories?

a. On the basis of structure of the heart.
b. On the basis of composition of blood.
c. On the basis of presence and absence of lungs.
d. On the basis of presence and absence of the backbone.

3. Fish live and swim together in groups called:
a. Colonies b. Flocks c. Schools d. Batches

4. We can classify a crocodile as a reptile because it has:

a. Feathers b. Moist skin
c. Dry scaly skin d. Hair

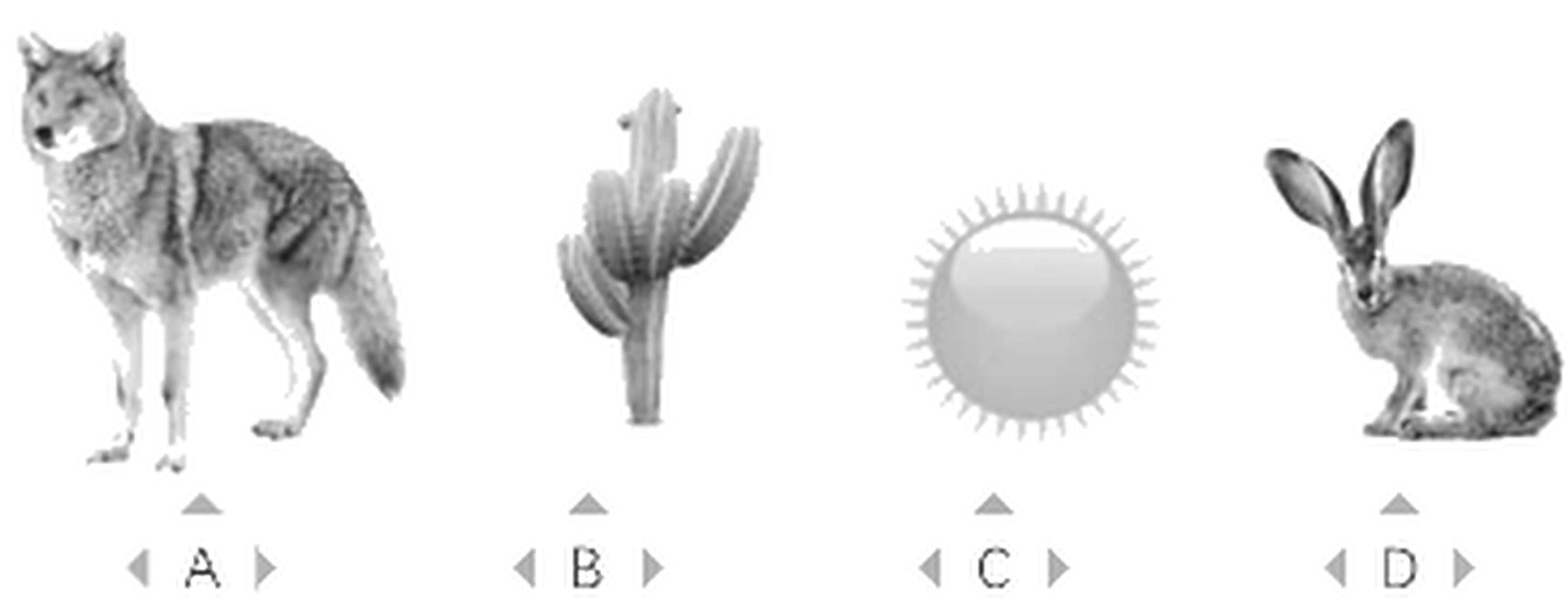
5. A pair of lungs is given in the picture. Select its function from the options below.

a. Give shape and protection b. Help in tearing and chewing
c. Help in digestion d. Help in breathing

6. Pollen is produced in the male cones of gymnosperms and flowers of angiosperms. What is true about their means of pollination?
   a. By wind only.
   b. Through insects and birds.
   c. Flowers rely on birds and cones rely on animals.
   d. Cones rely on wind, whereas flowers rely on birds and insects.
7. Plants that do not have flowers are called:
   a. Angiosperms b. Monocots
   c. Gymnosperms d. Dicots
8. The classification of plants below is on the basis of presence and absence of:

   a. Leaves b. Roots c. Stems d. Flowers
9. The diagram of a plant below shows a part labelled as Z. The role of this part is to:

   a. Make seeds b. Collect water c. Make food d. Make fruit
10. The part of a flower that receives pollen is called:
   a. Carpel b. Petals c. Anther d. Stigma
11. Study the four organisms below. A possible food chain would be:



a. A → B → C → D
b. C → B → D → A
c. C → D → A → B
d. D → A → B → C

12. Which of the following sets contains only consumers?

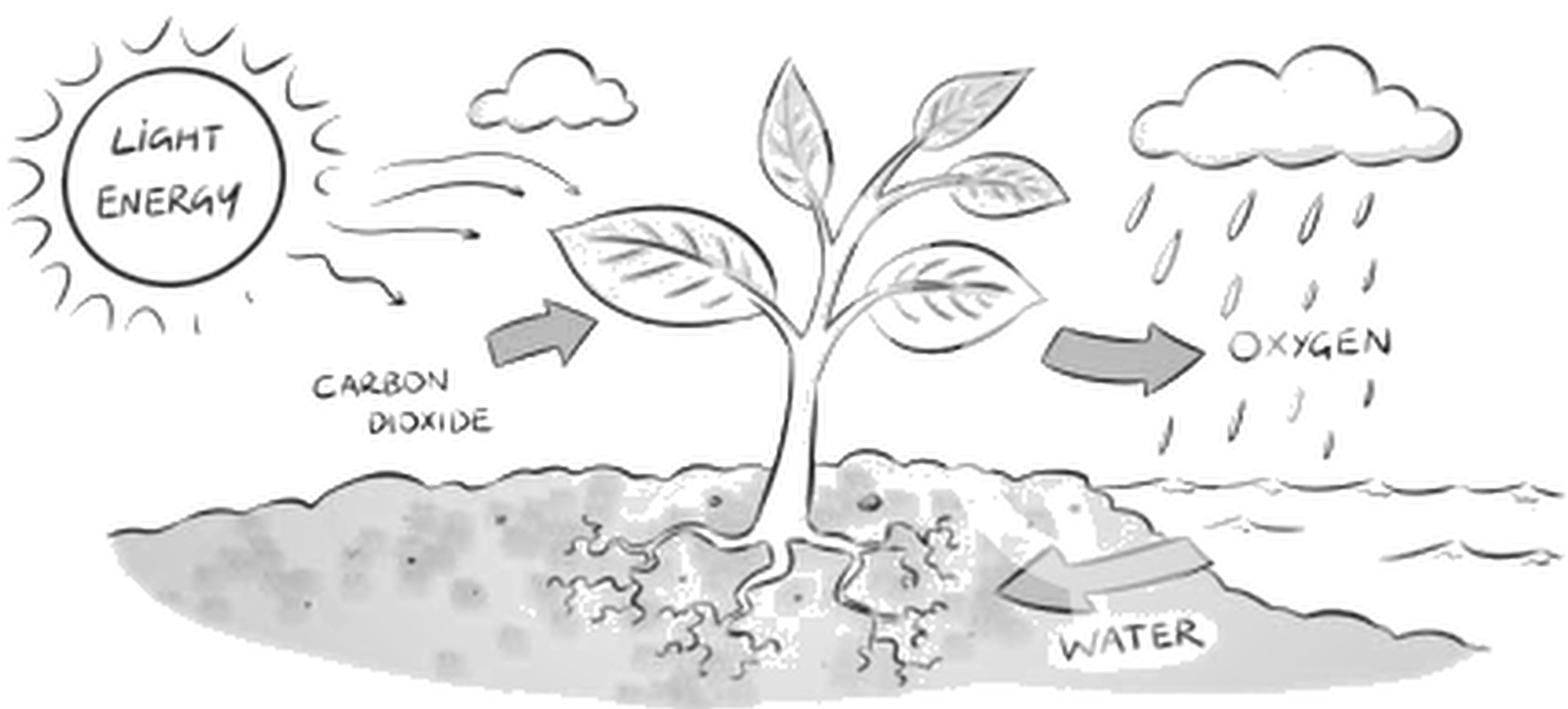
a. Sun, grass, rabbit, fox
b. Grasshopper, mouse, snake
c. Sun, grass, zebra, lion
d. Sun, cactus, rabbit, coyote

13. Complete the food chain by selecting the most appropriate organism.

Plant → grasshopper → $\boxed{}$ → Snake

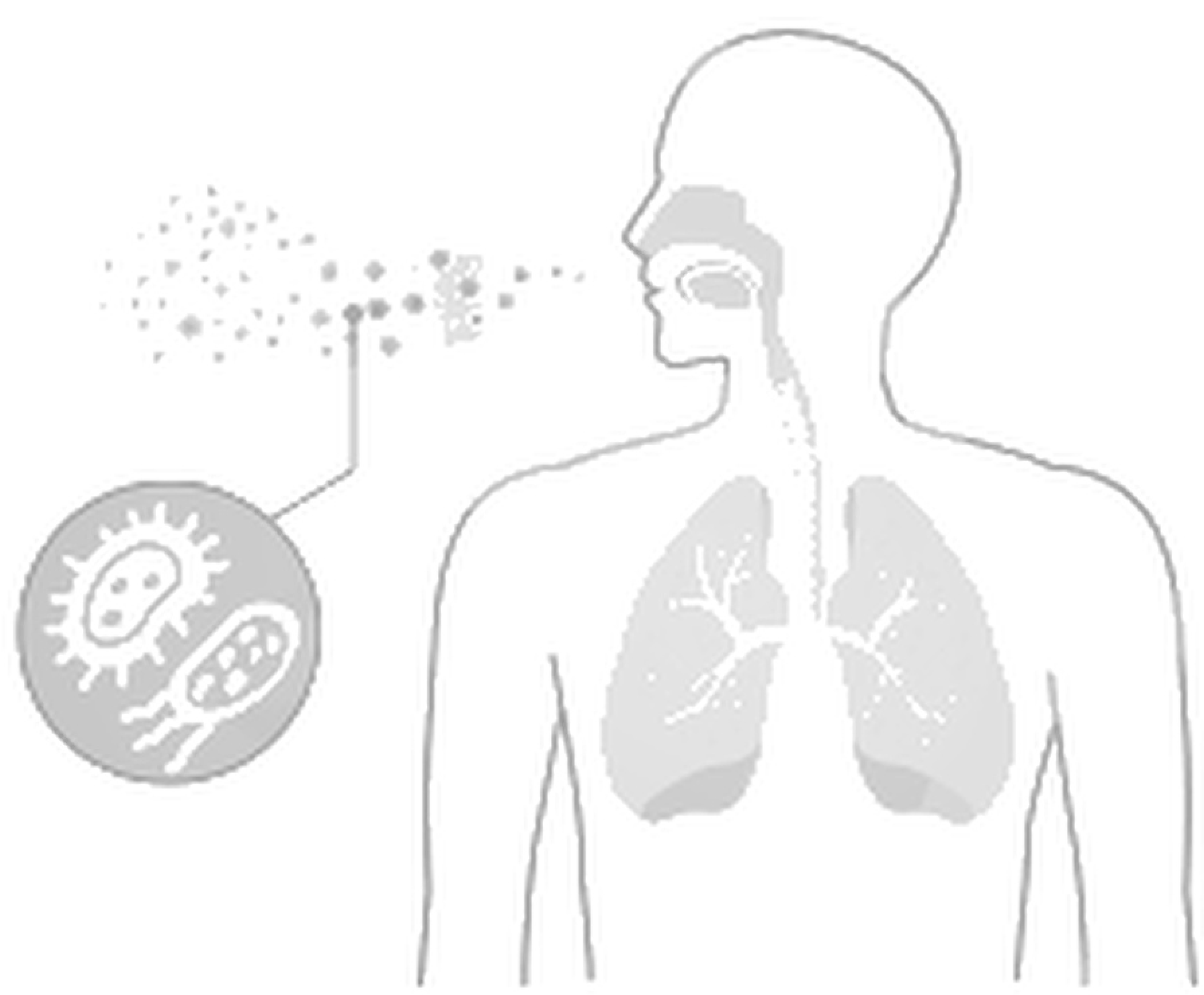
a. Caterpillar b. Lion c. Frog d. Cactus

14. Which of the following is true about the process of photosynthesis?



a. Plants take in oxygen and give out carbon dioxide.
b. Plants take in food and give out carbon dioxide.
c. Plants take in carbon dioxide and give out oxygen.
d. Plants take in sunlight and give out carbon dioxide.

15. Which of the following is a primary consumer?
    a. Green plants b. Caterpillar
    c. Sun d. Lion
16. Which of the following is the method of preventing disease transmission?
    a. Sneezing b. Coughing
    c. Fever d. Vaccination
17. Children are required to have at least:
    a. 5-10 hours sleep b. 10-12 hours sleep
    c. 4-10 hours sleep d. 8-10 hours sleep
18. The diagram below shows transmission of disease by:



    a. Water b. Food
    c. Air d. Insects
19. Which of the following is not a healthy habit?
    a. Cleaning b. Proper sleep
    c. Exercise d. Eating fast food
20. Which of the following is a rich source of calcium?
    a. Grains b. Fruits
    c. Milk d. Vegetables

Unit 5

Changes in Matter

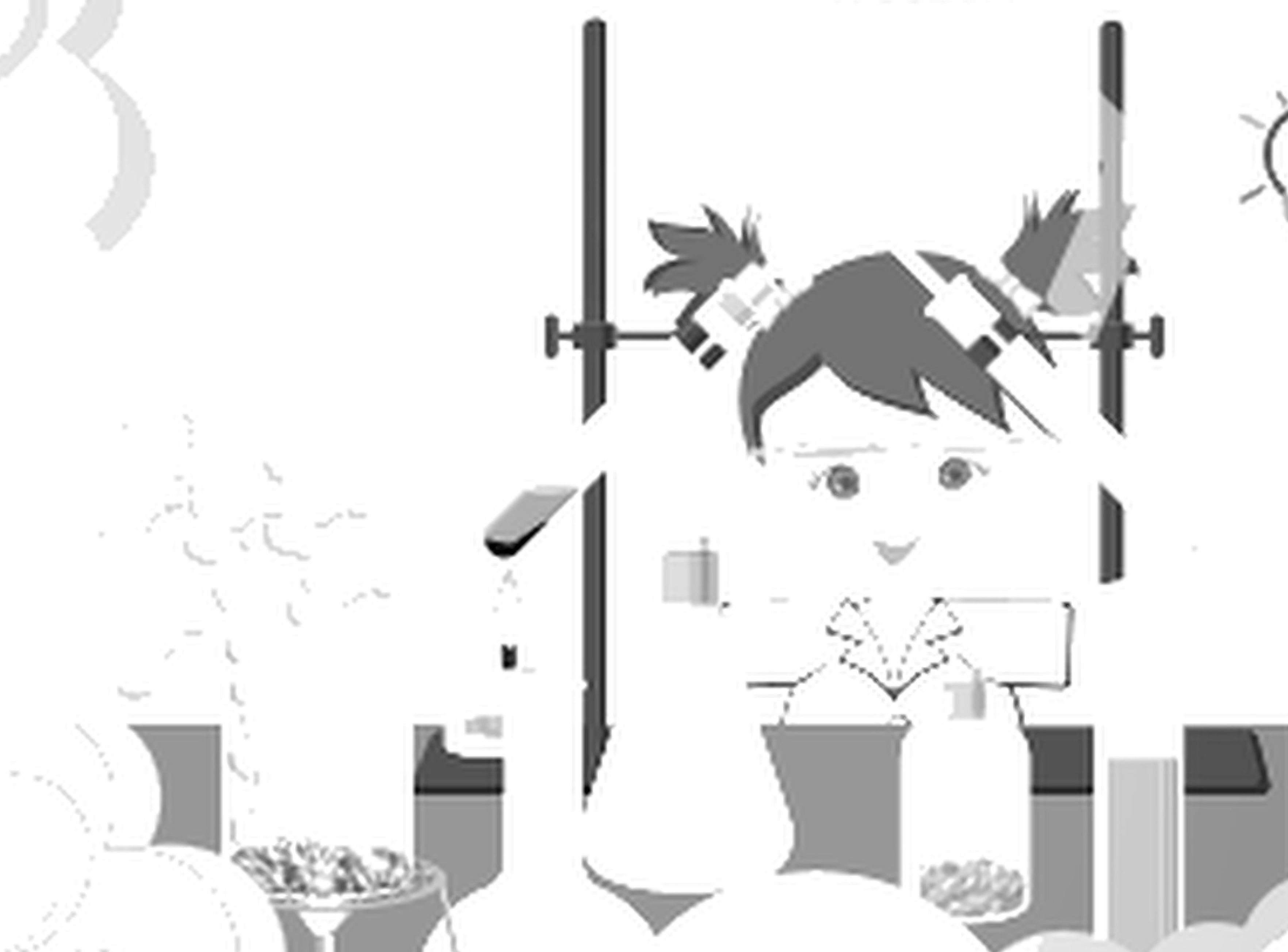
Learning Outcomes

- Identify three states of matter
- Describe characteristics of each state of matter.
- Compare and sort objects and materials on the basis of physical properties (mass, volume and state of matter).
- Recognise that matter can be changed from one state to another by heating or cooling (candle wax).
- Describe changes in the states of water (i.e. melting, freezing, boiling, evaporation and condensation).
- Identify observable changes in materials that do not result in new materials with different properties (e.g. dissolving, crushing an aluminium can)
- Identify observable changes in materials that make new materials with different properties, e.g. decaying
- (such as food spoiling), burning, rusting.

Which state of matter do we breathe in?

Why do ice cubes melt when they are placed out of the freezer?

How do your wet clothes dry when you put them on a clothesline?



How can we turn water to ice?

The BIG Idea

Matter exists in three states: solid, liquid and gas. These states can be changed into each other by changing the temperature of matter. Water can be changed to all three states of matter by melting, freezing, boiling, evaporation and condensation.

Changes in Matter

Anything that has mass and volume is called matter. Just look around; there are rooms, tables, chairs, windows, etc. Have you ever wondered what these things are made up of? All materials, whether they are solids, liquids or gases, are made up of tiny invisible particles of matter.

Matter around us

States of Matter

Matter exists in three states: solid, liquid and gas. All these states are different from each other and have different properties. These properties are shape, mass and volume.

Mass is the amount of matter in an object. The amount of space occupied by an object is called its **volume**. Let us study the properties of states of matter.

Science Tidbits

There is a fourth state of matter also, called plasma. The Sun is mostly made up of plasma.

Teaching point: For effective teaching and learning, feel free to use 'Urdu' as a medium of instruction to explain the concepts.

Properties of different states of matter

Properties	Solids	Liquids	Gases
Shape and volume	Have a fixed shape and volume.	Have no fixed shape but have a fixed volume.	Have no fixed shape or volume.
Arrangement of particles	Very tightly packed.	Less tightly packed as compared to solids.	Loosely packed and can move freely.
Fluidity	Cannot flow.	Flow from a higher to a lower surface.	Flow in all directions.
Example	 Wooden blocks	 Juice in a glass	 Air in balloons

Hands-on activity

Observe different objects in your surroundings. Then write the names of three objects, one from each state of matter. Make a table in your notebook and compare all objects, their states of matter and their properties.

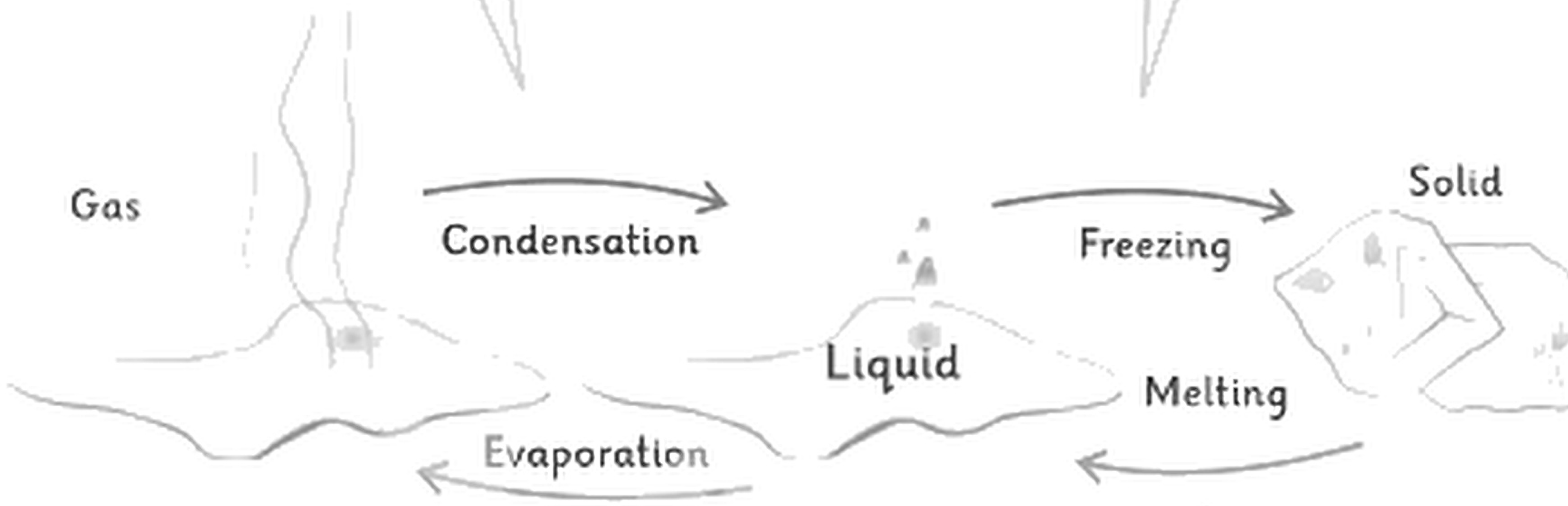
Changes in states of water

Water exists in all three states of matter. It changes its state with the change in the temperature of its surroundings. The processes involved in changing states of water are melting, freezing, boiling, evaporation and condensation.

Teaching point: Demonstrate the arrangement of particles in a solid, liquid and gas by arranging a group of students differently in the classroom.

The process in which water vapour turns to liquid water upon cooling is called condensation.

The process in which liquid water turns to solid ice upon cooling is called freezing.



The process in which liquid water turns to water vapour from the surface of water is called evaporation.

The process in which solid water (ice) turns to liquid water due to heating is called melting

Boiling

The process in which water turns to vapour by heating is called boiling. When water is heated, it starts to boil on reaching 100°C and turns to vapour.

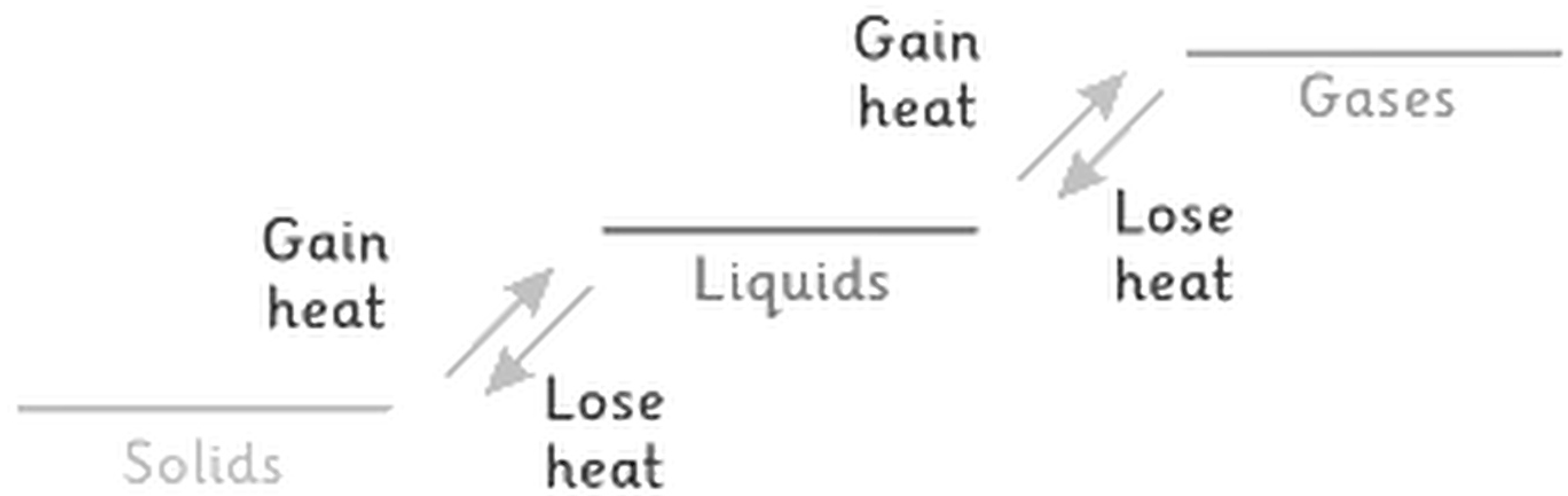
Boiling of water

Do You Know?

A solid can sometimes be directly converted into vapour without passing through a liquid state. This process is called sublimation. Conversion of a gas directly into a solid is called deposition

Teaching point: Explain to students that matter changes its state with the change in the temperature of the surroundings. Discuss the change in states of matter, for example butter and candle when they

Effects of heat on different states of matter



Hands-on activity

1. Place a piece of cloth under a tap to make it wet. Then wring it to remove the excess water.
2. Put the cloth in a plastic bag. Trap some air inside the bag and seal it.
3. Leave the bag in a warm place, like near a radiator or in direct sunlight, for an hour.
4. Water droplets will form on the inside surface of the bag.

Observe the water droplets and explain the process which caused the formation of water droplets.

Changes in matter

Matter around us is changing at all times. These changes are categorised as:

1. Physical change
2. Chemical change

Physical change

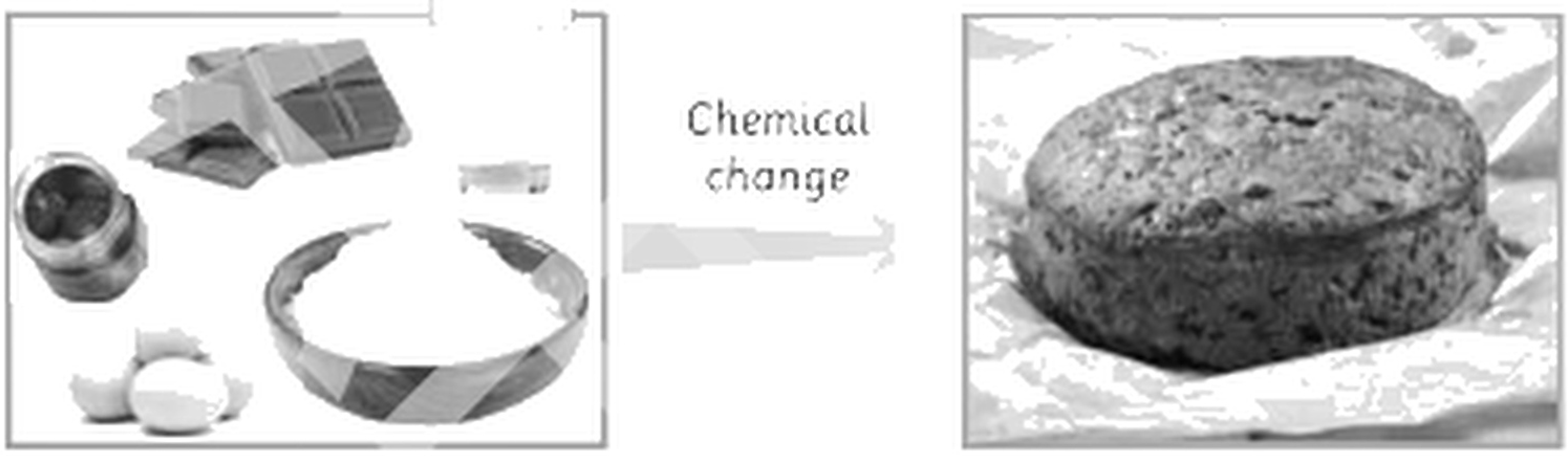
A physical change does not form a new substance. It only changes shape, size or state of a substance. A physical change is reversible. For example, the formation of ice and melting of ice into water are physical changes because they can be reversed. All the processes such as freezing, melting, boiling, evaporation and condensation that involve a change in states of matter are examples of physical changes.

Teaching point: Ask students, "Do you think dissolving sugar in water is a physical change?" Tell them , "Yes, it is a physical change because you can get the sugar back when water evaporates."

Chemical Change

A chemical change occurs when one kind of matter is changed into a different kind of matter. Matter cannot be turned into its previous state as result of a chemical change.

For example, baking a cake is a chemical change. Butter, eggs, sugar and flour are mixed and then baked in an oven. We get a completely new thing in the form of cake. The cake can never be turned back into butter, eggs, sugar and flour. Therefore, baking a cake is a chemical change.



Similarly, spoiling of food, burning of wood, burning of paper and rusting of iron are all chemical changes.

Burning of wood

Rusting of iron

Explore more

Visit the following link and apply your knowledge to explore different forms of matter. Note the key points and share with your teacher and class fellows.
http://goo.gl/P2sY58

Key Points

- Anything that has mass and volume is called matter.
- Matter exists in three states: solid, liquid and gas.
- Matter can change its state by heating or cooling.
- Water can change into all three states by melting, freezing, boiling, evaporation and condensation.
- Matter can have two types of changes: physical change and chemical change.
- A physical change does not form a new substance. A physical change is reversible.
- In a chemical change, one kind of matter changes to a different kind of matter. It is an irreversible change.

Exercise

A Answer the following questions briefly.

1. Explain why melting is different from freezing.
2. Differentiate between boiling and evaporation.
3. How is melting of ice into liquid water a physical change?
4. What would happen if you leave a glass full of water in the open air for some days?
5. Does burning a piece of wood involve a change in states of matter?

B Answer the following questions in detail.

1. Explain the states of matter with examples.
2. Describe how water changes from a solid to a liquid and then to a gas.
3. What is the difference between a physical change and a chemical change? Give two examples of each

C **Tick (✓) the correct answer.**

1. The amount of matter in an object is called:
   a. Mass b. Volume
   c. Fluidity d. Shape
2. Which change can be reversed easily?
   a. Burning of coal b. Spoiling of food
   c. Melting of ice d. Rusting of nail
3. Which of the following processes does the given picture represent?

   a. Condensation b. Cooling c. Evaporation d. Melting
4. Usman put cold water in a glass. After some time, he observed water droplets on the outside of the glass. The droplets were formed because:
   a. The glass was wet from outside.
   b. The glass had small pores in it.
   c. The vapour in air condensed to water droplets.
   d. The glass attracted the water droplets in the air.
5. A fried egg represents which type of change?
   a. Chemical b. Physical c. Artificial d. Natural

D **Fill in the blanks.**

1. Water boils at _______°C .
2. When a gas changes to a liquid, it is called __________.
3. Gas particles do not have _________ shape.
4. Spoiling of food is _________ change.
5. Burning of wood is a __________ change.

E Match the terms with their description.

Freezing	One kind of matter changes into another kind of matter
Evaporation	The change of a liquid into a solid
Chemical change	Melting of chocolate
Liquids	Takes place at any temperature
Physical Change	Do not have a definite shape but have a definite volume

Think Tank!

1. If you have an empty bottle, what state of matter does it have?
2. Adding food colour to water causes a change in colour. Is it a chemical change or a physical change?

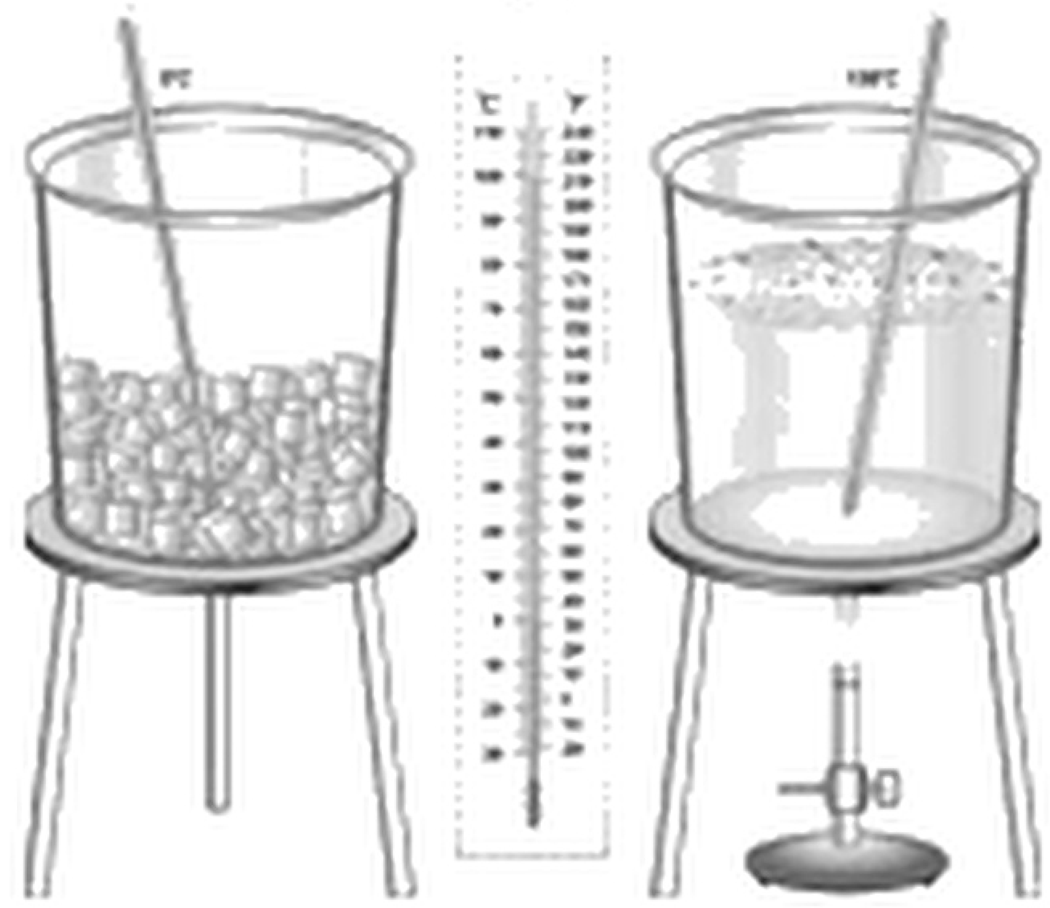
Let's Practise

Look around yourself and identify physical and chemical changes. Write three examples of each below.

Physical Change	Chemical Change

Project

Investigate the melting of ice and measure the boiling point of water.



Materials required

- A container of crushed ice
- A thermometer
- A burner
- A stopwatch

Procedure

- Pour crushed ice in a container and put the thermometer in it and note its temperature
- Now place the container on the burner and heat the ice.
- Note the temperature of the melting ice every minute.
- Record the temperature until all the ice melts into water.
- Now heat the water heat up until it starts to boil.
- Record the temperature of water when it starts to boil.
- Write your observations below.

Temperature of the ice is ____________ °C.

Time (minutes)									
Temperature (°C)									

The melting point of ice is ______________ °C.

The boiling point of water is _____________ °C.

Teaching point: Get students into groups and have them complete the given project. Assign a different role to each group member. Then ask them to present their group work in collaboration.

**Approved by National Curriculum Council,
Ministry of Federal Education & Professional Training,
Government of Pakistan vide Letter No. F. No 1(1) 17-NCC,
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