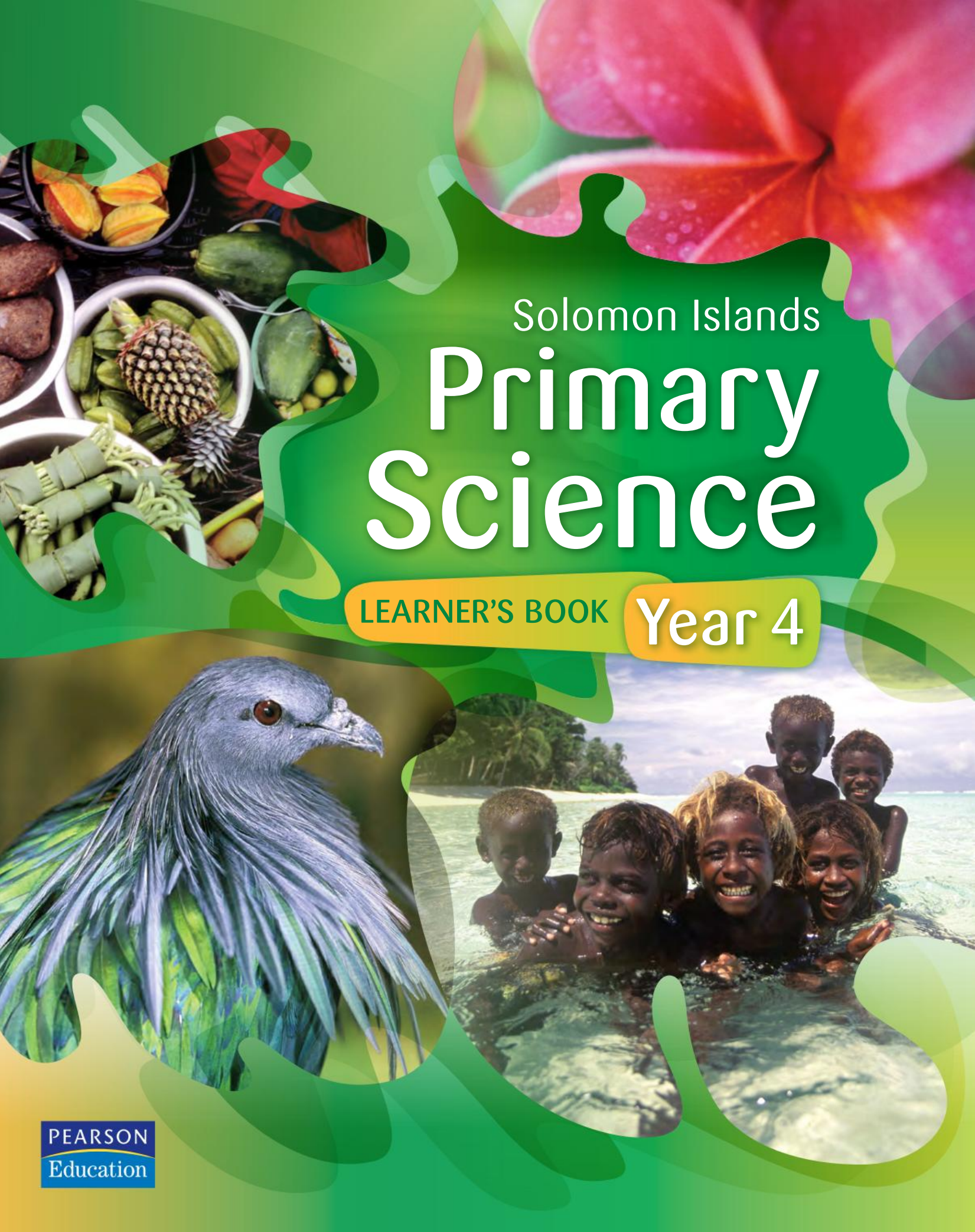

Solomon Islands

Primary Science

LEARNER'S BOOK Year 4

PEARSON Education

Solomon Islands

Primary Science

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Contents

Chapter 1

Organisms and their environment

In this chapter, you will:

- learn that the Sun is our primary source of light and heat energy
- observe the things in a local environment
- describe aspects of a local environment by drawing and writing
- collect and record information about things in a local environment
- identify the path that energy takes from the Sun through living things
- identify living things in a food chain
- appreciate the roles of different living things in a food chain
- understand the terms organism, population and community
- understand that different environments support different communities of living things
- identify examples of how human beings change the environment
- appreciate that science and technology affect the environment.

The environment

In this chapter, you will learn about living things in their **environments**. The environment is the area where a living thing lives. There are many different types of environments. An environment consists of:

- the temperature
- the air
- the amount of rainfall or the amount of water available
- the amount of sunlight
- the type of soil
- the living things that live there.

In science, we often use the word "**organism**" for a living thing. Organisms live in their own environments. The land surfaces of the Earth are environments. The rivers, **lakes** and **oceans** of the earth are environments. The air surrounding the Earth is an environment.

Activity 1

Fieldwork Activity

Find out more about your physical environment by observation. **Observe** one part of the local environment each day for five days.

- Record any physical changes you see.
- Keep your record in a daily diary.

At the end of the five days, record the differences you observed in the environment.

Observing the local environment

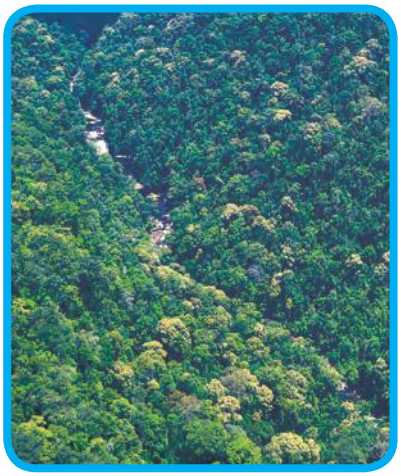
Then and now

Look at the photograph. This is what a tropical **rainforest** looks like. Was more of Solomon Islands like this in the past?

Solomon Islands is near the equator. It has a warm, tropical climate. It has heavy rainfall and high temperatures.

The temperature is over 30 degrees on most days. It is also very humid. In this environment, many plants and animals grow well. The tropical rainforest contains many different kinds of living things.

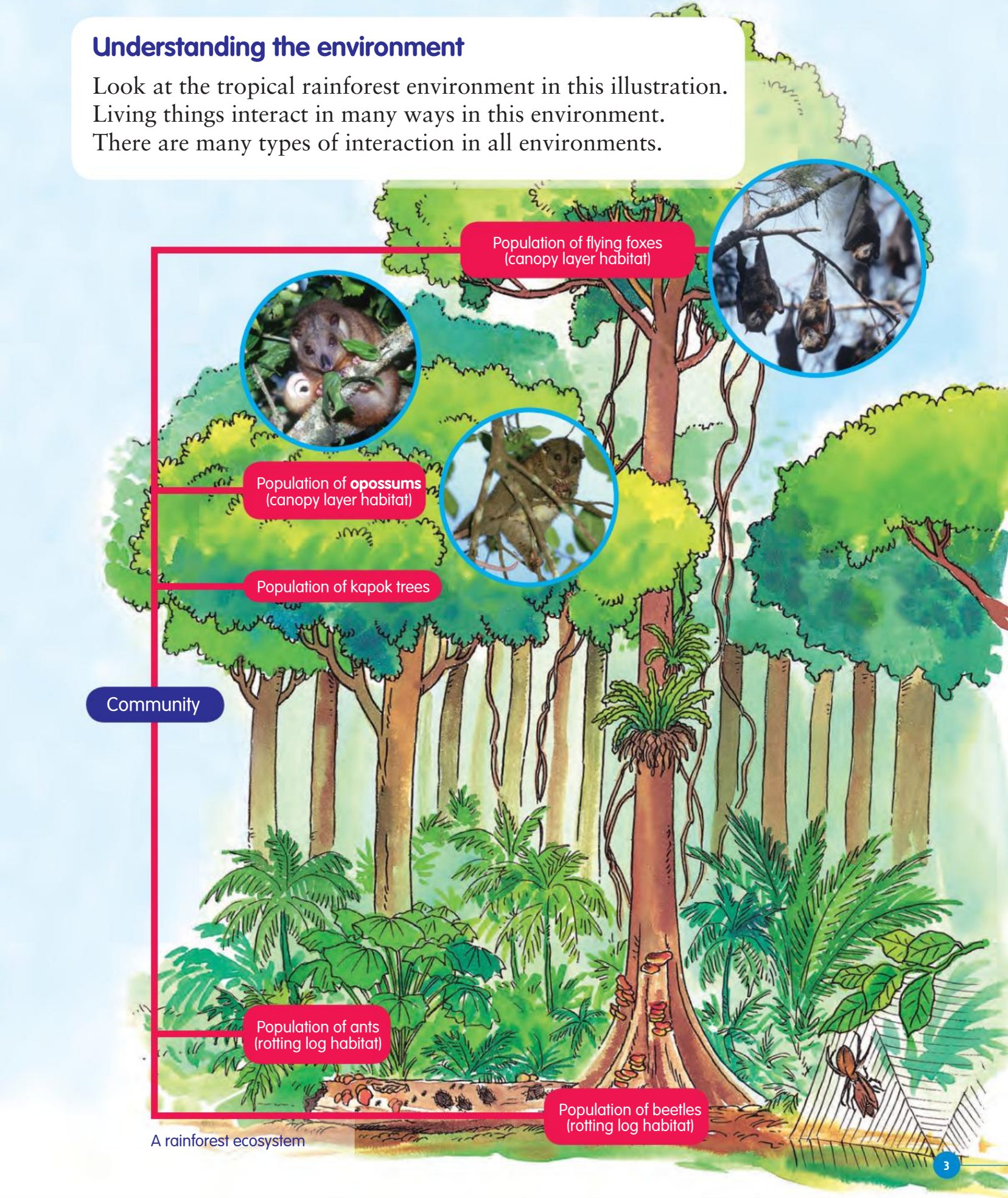
In Solomon Islands, logging companies cut down many trees. We are slowly losing our rainforest.



Tropical rainforest

Understanding the environment

Look at the tropical rainforest environment in this illustration. Living things interact in many ways in this environment. There are many types of interaction in all environments.



A rainforest ecosystem

Do you think you interact with your environment? Think about what you do during a day. Do you do different things on sunny days and rainy days ?

For instance, you may interact with friends. You may do your science work at school. You may interact with your pet dog. You may clean its house. You may feed it, and play with it.

Interacting with your environment

Ecosystems

"**Ecosystem**" is a word we use for a special kind of area on the Earth's surface. In an ecosystem, living things interact with each other. They also interact with the environment. An ecosystem can be large, like a rainforest. It can be small, like a rotting log. There are also non-living things in an ecosystem.

A **mangrove** ecosystem

Organisms

A plant is an organism. An animal is an organism. A fungus is an organism. Very small water animals, such as the didinium, are organisms. Organisms interact with one another in their environment. They also interact with parts of their environment. They change the environment. They affect the non-living things in the environment.

Activity 2

Think and Write

Look at the questions below.

1 Do plants compete for light, water and living space?

2 Do animals depend on plants for food? Do they eat other animals?

3 Do flowers depend on **insects**? How do flowers depend on insects?

4 Do some **insects** affect other organisms in their environment? Give some examples.

5 How do animals help plants? How do the seeds of plants move to other places? Give some examples.

Can you understand why all organisms in an environment affect one another? Answer the questions in your exercise book.

Activity 3

Fieldwork Activity

Look around you. Observe how the **temperature**, the air, the amount of sunlight, the amount of rainfall and the amount of water influence one another as well as the organisms living in the environment. Answer the questions below in your exercise book.

1 What happens after heavy rainfall? Are there puddles of water? Do the puddles form where the soil is clayey or where it is sandy? Is the temperature lower than on a warm, sunny day? Do you see snails and earthworms after rainfall?

The wet ground after a rainfall allows earthworms to move easily.

2 Look at tree trunks. Are some of them covered with **moss**? Look at the direction of the Sun. Does moss like damp, shady areas?

A mossy tree trunk

3 Look at the ground around a shady tree. Compare it to a place without trees. Is there more grass growing in the shade or on open ground?

Ground under a shady tree (a) and open ground (b)

4 Epiphytes are plants that live on the branches of host plants. In this way, they get sunlight. They do not harm the host plant.

Which kind of environment in Solomon Islands has epiphytes?

Which common plant in Solomon Islands is an epiphyte?

Staghorn fern

Activity 4

Think about the ways that human beings have changed the environment. Think about how they affect other living things in the environment. Answer the questions below in your exercise book.

1 Have we cut down trees? Do we destroy the homes of many organisms?

2 Sometimes, human beings destroy one kind of animal by hunting it down or by destroying its habitat. It ceases to exist. The leatherback turtle is an example. Can you think of others?

3 Have we caused **pollution** of our water and land? Can you think of an example?

4 Why do you think we have places where people are not allowed to garden, hunt, or build houses? Give some examples in Solomon Islands.

The climate, the landscape, and the soil are the non-living parts of the environment. Climate is an important part of an ecosystem. The temperature, sunlight, the rainfall, and the air make up the climate. Different types of animals and plants live in different climates.

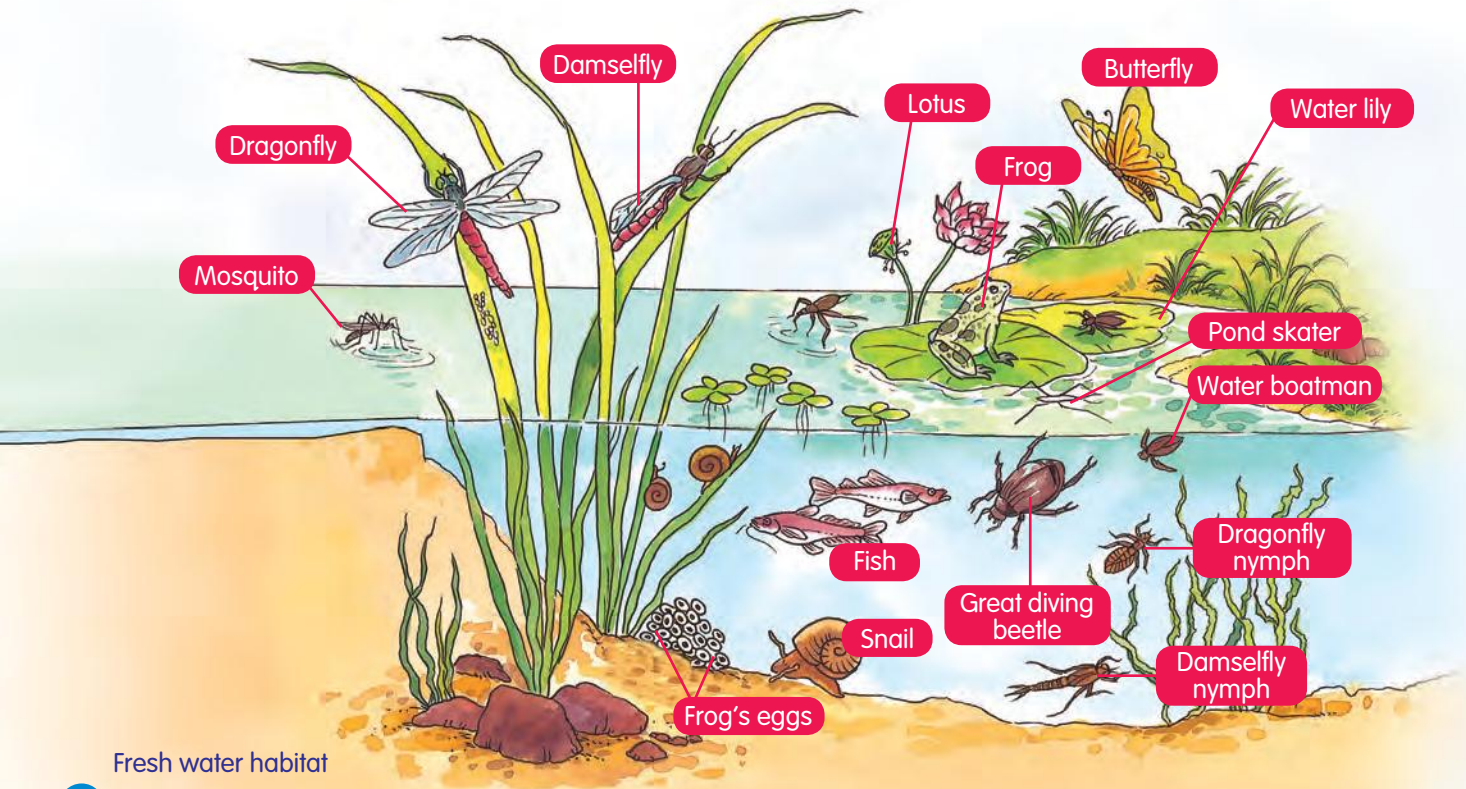
Landscape is important. The environment on the top of Mt Popomanaseu in Guadalcanal is different from the environment on the Guadalcanal plains.

The soil is the third non-living part of the environment. The type of soil affects which plants grow in an environment. For example, some plants like sandy soil. Others like clayey soil.

Coconut trees grow well in sandy soil (left). Mangrove trees like clayey soil (right).

Habitats

Some organisms live in fresh water, in creeks or in ponds. Fish, tadpoles (which are the young of frogs), water insects, and water snails are some of the organisms that live in fresh water. It is their **habitat**. Other living things, such as frogs, live near the water. Frogs need to keep their skin wet. They lay their eggs in fresh water.



Fresh water habitat

The word **population** means a group of living things of the same kind living in an area. They **reproduce** in their own area.

The different populations of plants and animals in the same area form a **community**. They live and interact with one another in the community.

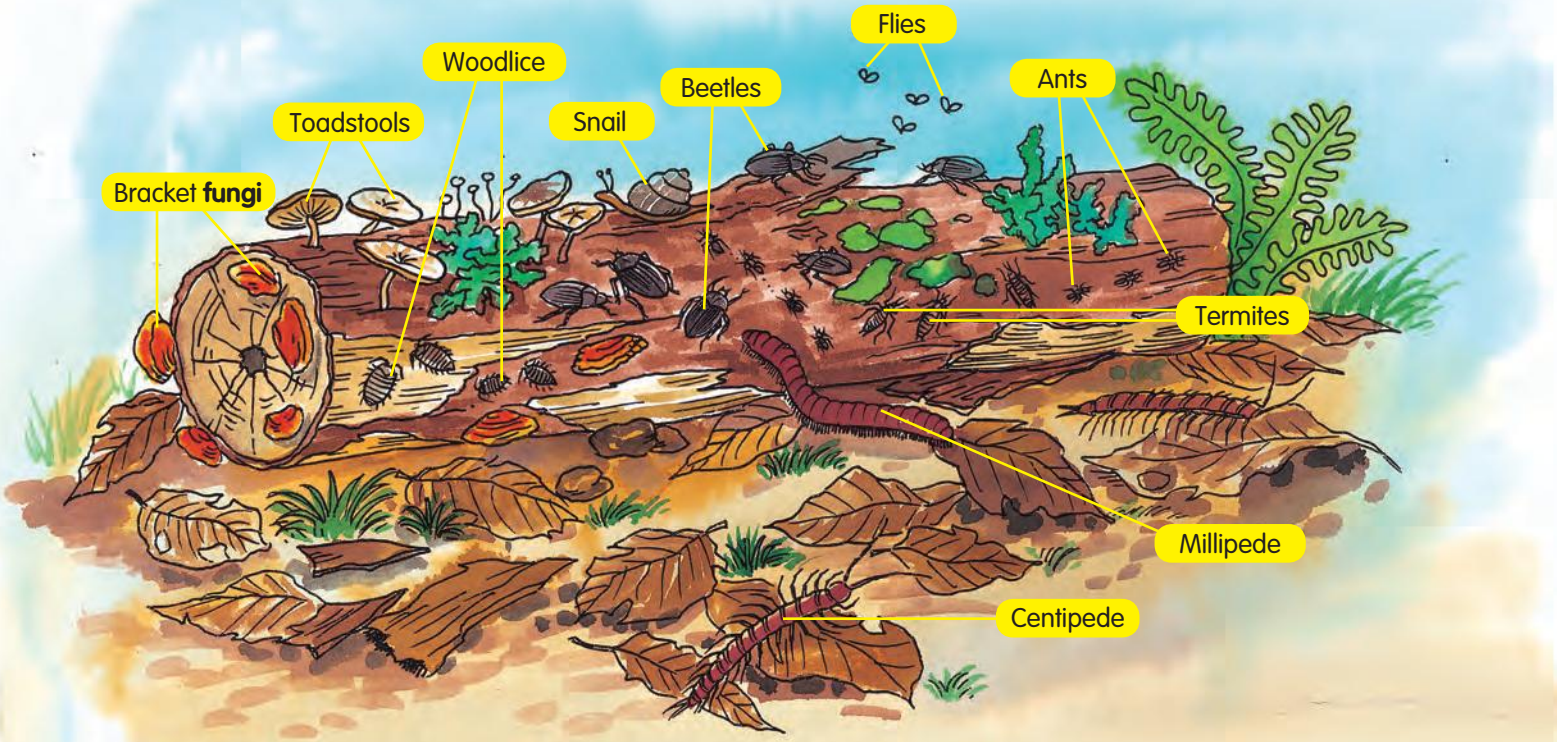
The place or home where organisms live is their habitat. For example, the habitat of the opossum population is trees in the rainforest.

Some habitats are **natural**, some are human made. An example of a human made habitat is a farm. Another example is Dolphin Island in the Nggela Islands, Central Province. These habitats must be well looked after so that living things stay healthy.

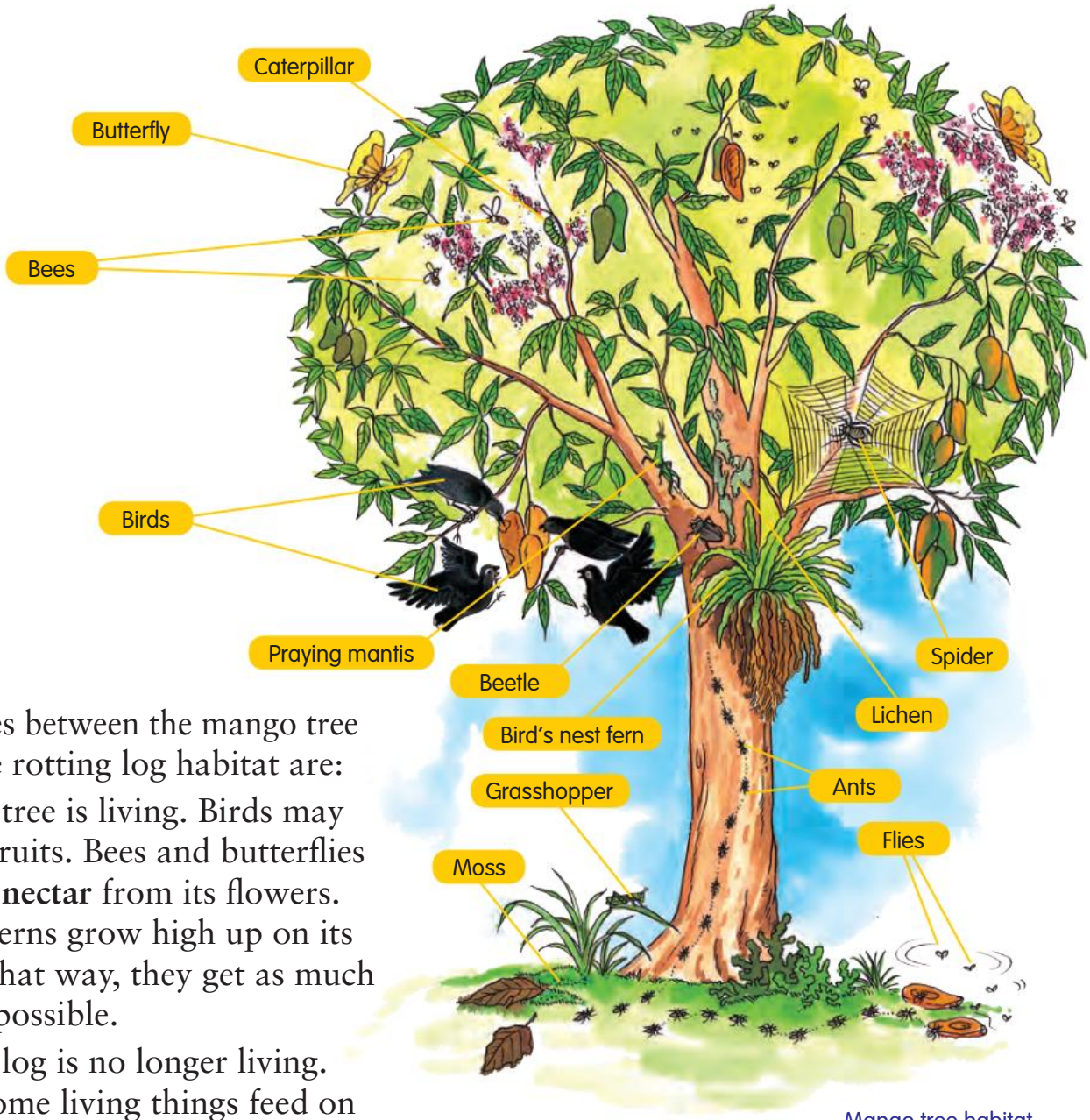
School grounds

Your school grounds may have a field, some trees, a pond, or a rotting log. There may be a **forest** nearby. Animals in your school ground habitat are different from those in a rainforest habitat.

Look at the drawings of the rotting log habitat and the mango tree habitat on these pages. Notice some of the living things you see in each habitat. The populations of each of these living things make up the community in the habitat.



Rotting log habitat



Mango tree habitat

Some differences between the mango tree habitat and the rotting log habitat are:

- The mango tree is living. Birds may feed on its fruits. Bees and butterflies may collect **nectar** from its flowers. Bird's nest ferns grow high up on its branches. That way, they get as much sunlight as possible.
- The rotting log is no longer living. However, some living things feed on the dead material. They live on it. It is their habitat.

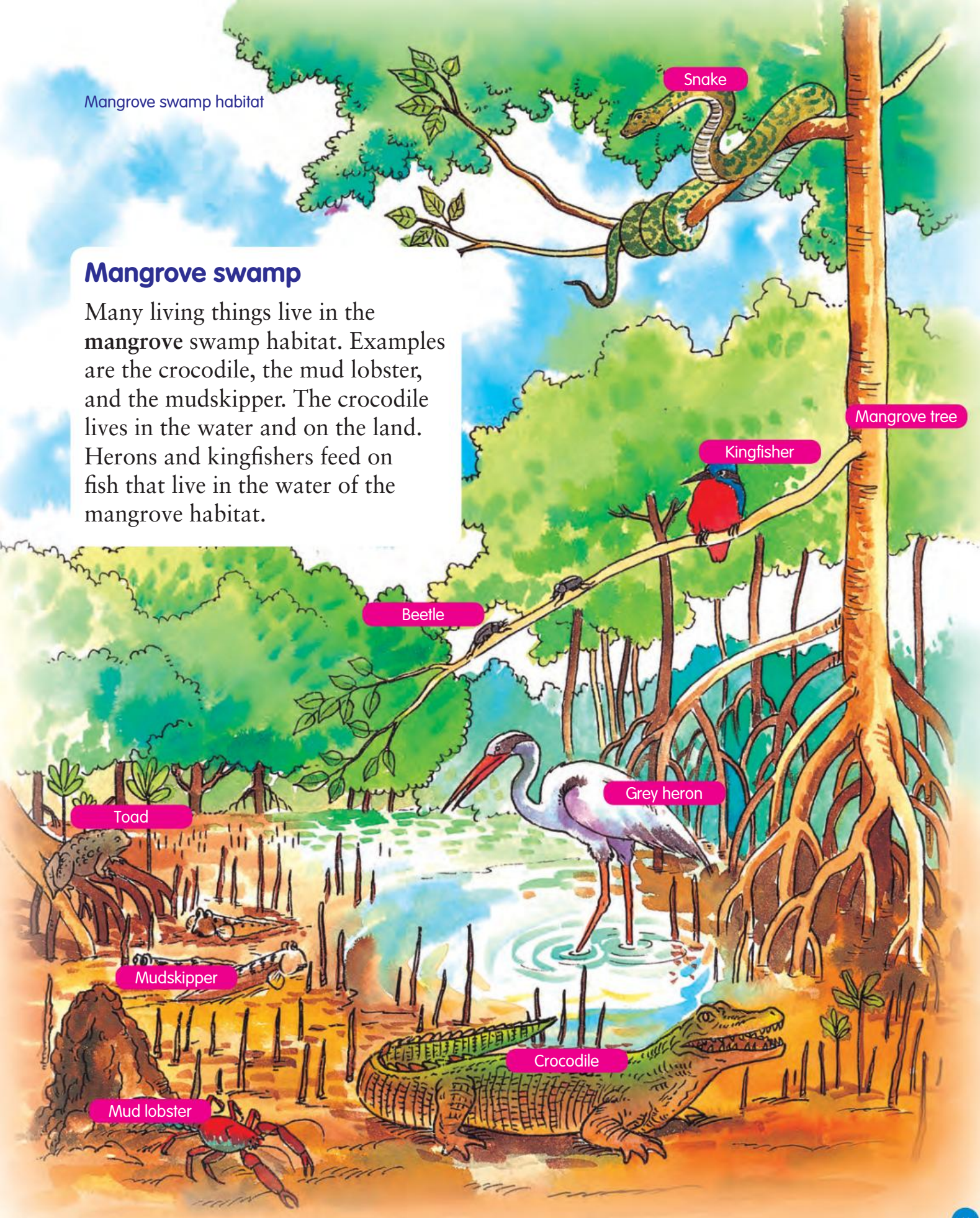
Think and Write

Activity 5

Draw a table in your exercise book like the one shown here but larger, with plenty of room to write in. Compare the rotting log habitat and the mango tree habitat. List the animals in the two habitats. Do they have different communities?

Rotting log habitat	Mango tree habitat

Mangrove swamp habitat

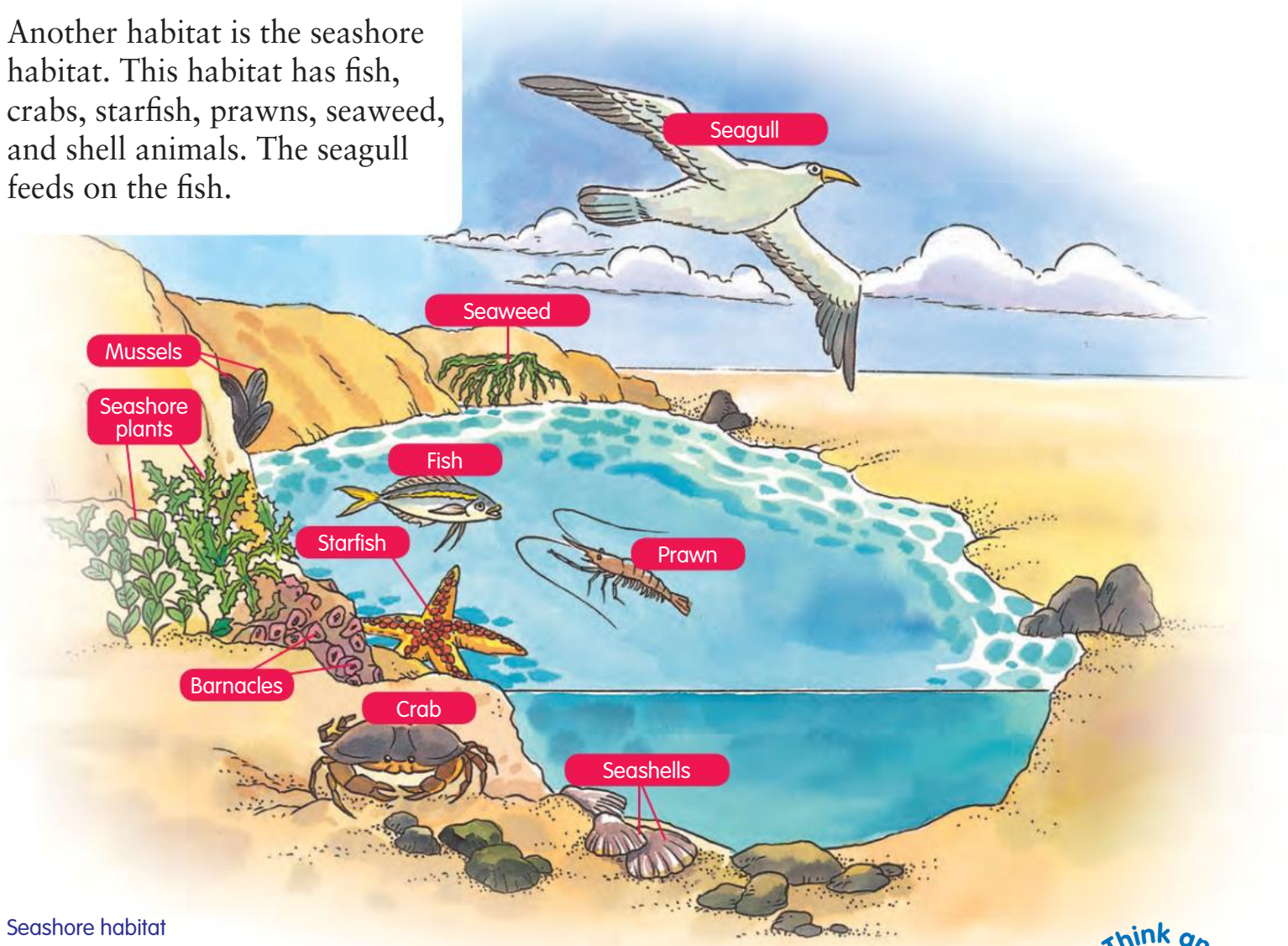


Mangrove swamp

Many living things live in the **mangrove** swamp habitat. Examples are the crocodile, the mud lobster, and the mudskipper. The crocodile lives in the water and on the land. Herons and kingfishers feed on fish that live in the water of the mangrove habitat.

Seashore

Another habitat is the seashore habitat. This habitat has fish, crabs, starfish, prawns, seaweed, and shell animals. The seagull feeds on the fish.



Seashore habitat

Think and Write

Activity 6

In your exercise book, give some reasons why particular organisms live in some habitats.

Use the drawings of different habitats on pages 8–12 to help you. Note that different organisms live in different habitats.

Name some organisms that live in more than one habitat.

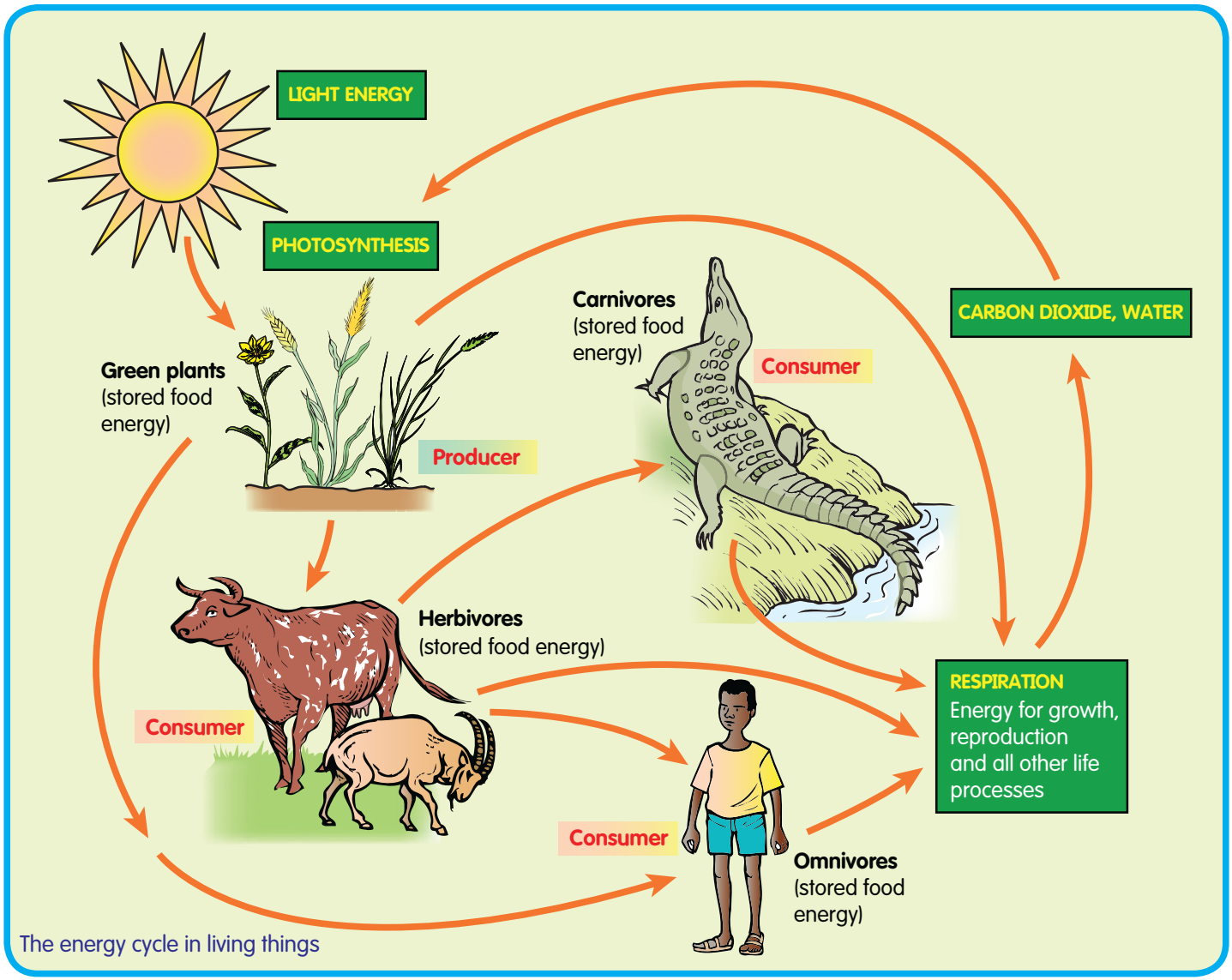
Why do you think this is?

Energy from the Sun

Green plants capture **light energy** from the Sun. Plants use the Sun's **energy** to make food. Plants then use this stored energy for growth and movement.

When animals eat plants, they get the energy stored in the plants. The plants are food for the animals.

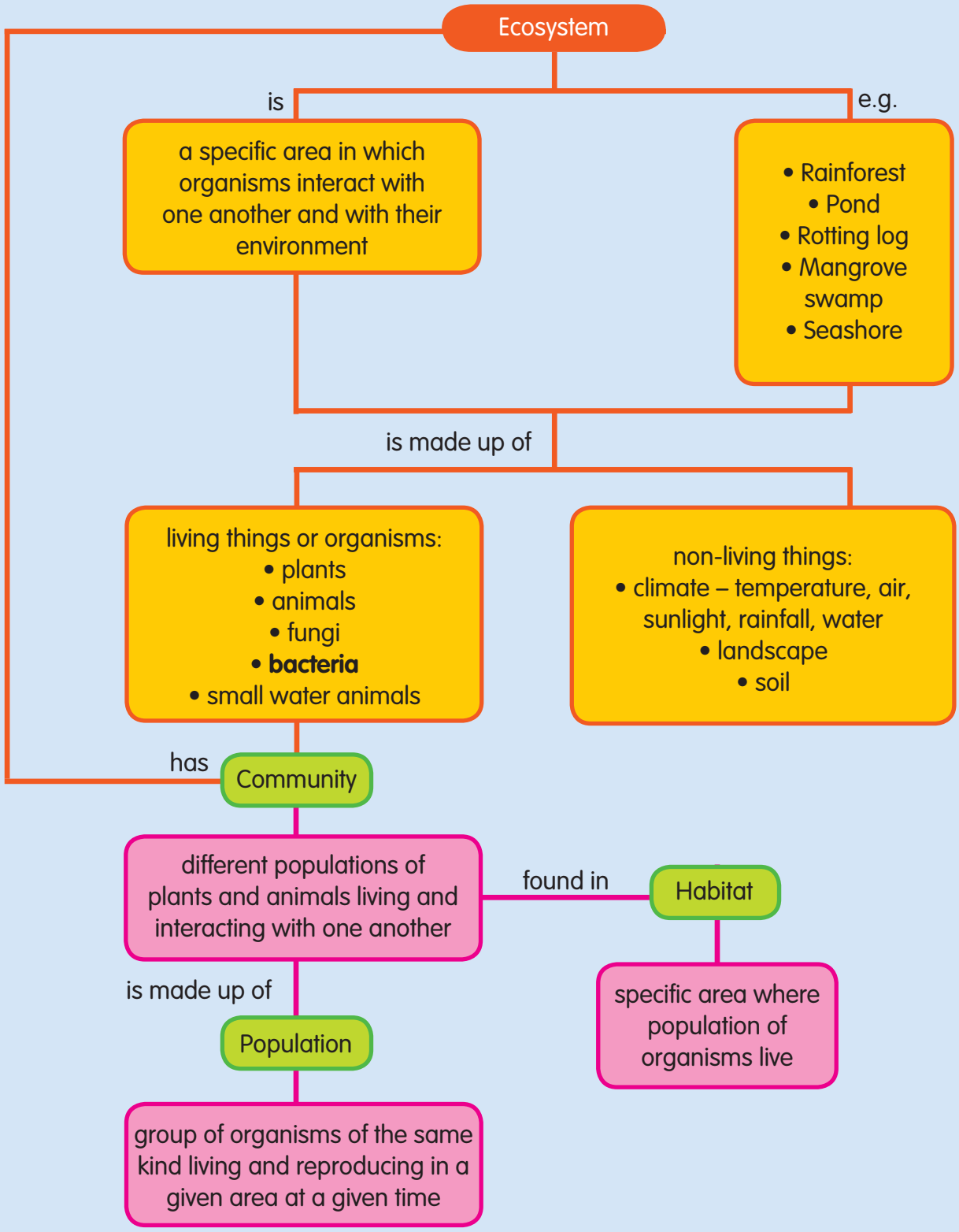
Look at this diagram. It shows the Sun, green plants, and animals. Food and energy link them together.



The energy cycle in living things

Animals do not make their own food. They get their food by eating other living things.

Green plants are food **producers**. Animals depend on plants and other animals for food. Animals are food **consumers**.



This concept map shows how ecosystems, communities, populations, and habitats are connected.

Humans and the environment

Most of our landscape in Solomon Islands is natural. But the landscape in our towns is human made.

Humans have both a bad and a good impact on the environment.

There are many examples of bad human impacts on the environment. For example, humans have cleared more than half of the world's rainforest. We build houses and factories. We plant crops in **plantations**.

Humans cut down trees and clear away other plants. We destroy the homes of animals and destroy plants. Plants keep the earth's **atmosphere** healthy.

The human population is increasing. People need more homes. We need more things for living. We must think carefully before we clear rainforests. Clearing rainforests has a big impact on our environment.

Ministry of Finance building, Honiara

SolBrew factory, Honiara

Rice growing has a major impact on the environment.

Deforestation

Deforestation is the destruction of natural forests by people. Heavy logging causes deforestation. It has a bad impact on the forest environment. It causes soil **erosion**. It also affects the Earth's atmosphere.

Will this baby's children be able to enjoy a better life on the Earth if we harm our environment?

Fieldwork Activity

Activity 7

Look at an area on your island where rainforest has been cleared. What will happen if we continue to clear the rainforest? Will the organisms in the rainforest habitat survive?

Rainforest cleared by logging

Research Activity

Activity 8

These photos show organisms that are in danger. The rainforests were cleared and their habitat was destroyed. Do you know of any living things that are in danger?

Nicobar pigeon

Fruit dove on its nest

Pollution

Humans add materials to the environment. Some of these cannot be broken down naturally and remain in the environment for a very long time. Examples include plastic bottles and food boxes.

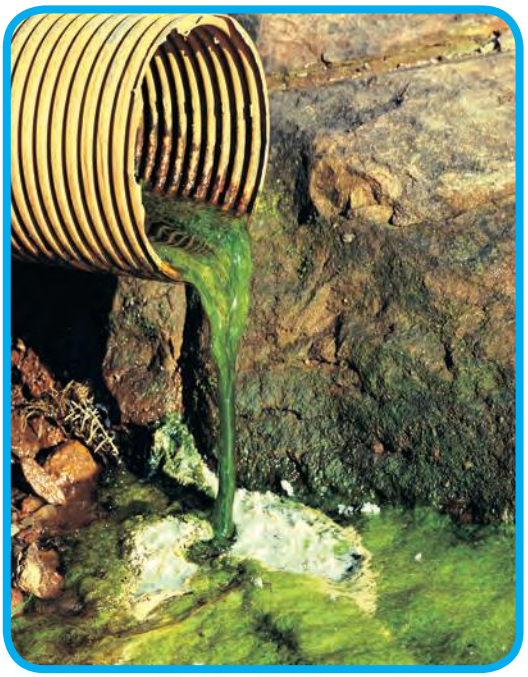
People throw plastics on the beach. Sometimes the plastics end up in the sea. Animals can die from eating the plastics. For example, birds, turtles and whales mistakenly eat plastic bags **floating** in the ocean. Perhaps they think the bags are jellyfish.

Plastic bottles do not rot.

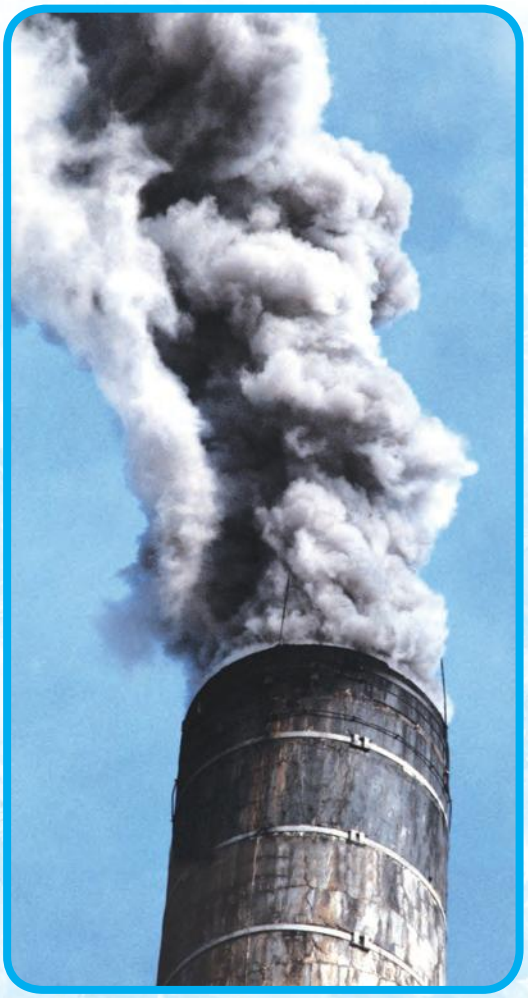
Turtles can die from eating plastic rubbish.

Overuse of land

Another bad impact of humans is the overuse of land. People clear **vegetation.** They put too many cattle on the land to eat grass and other plants. Too much farming or grazing on the same land can lead to the land gradually becoming **desert.**



Water pollution



Air pollution from industrial activities. Industries sometimes produce smoke that contains harmful **gases** and **particles**.

Overfishing

Sharks are disappearing from the oceans for two main reasons. Firstly, humans are hunting sharks for their fins and for their meat. Secondly, humans are the main animals eating fish. The powerful **technology** humans use for catching fish also catches and kills many sharks. Populations of both fish and sharks are decreasing as a result. What would happen if humans—like the sharks in the film ***Finding Nemo***—began to say, 'Fish are friends, not food'?

A shark swimming free

Introducing organisms

Humans bring non-native organisms to the country. They put native organisms in danger. Humans brought cats and dogs to Choiseul, where the Kuvojo bird lived. It lived on the ground and did not fly. What do you think happened to the Kuvojo bird? Most countries set aside areas where people are not allowed to garden, fish, and build houses. Solomon Islands also does this. Why are these areas set aside?

Positive human impacts

The Arnavon Island Community Marine Conservation Area is a nature conservation area. It is between Choiseul and Isabel. Lake Tenggano area in East Rennell is an area of primary forest that has never been cut down. We need to care for areas like these so that the native plants and animals will survive.

Arnavon Island

Creative Activity

Activity 9

Identify an example of how humans pollute the environment in your area.

Draw a picture to show how they are doing this.

In 2004 the Honiara beautification campaign began to plant trees and shrubs in and around the town. They have planted almost one thousand trees and shrubs. This is another example of good human impact on the environment.

The streets of Honiara

Research Activity

Activity 10

Look at the photographs on the right. These birds still exist. They live in East Rennell protected area.

What can you do to **conserve** these birds?

Forty-seven per cent of birds in the East Rennell area are found only in that area.

White ibis

Rennell shrikebill

White-collared kingfisher

Chapter Review

1. An organism is a living thing.
2. A population is a group of organisms of the same kind, living and reproducing in their own area.
3. Different populations of plants and animals living together form a community.
4. The specific area or place where an organism lives is called its habitat.
5. Different habitats support different organisms.
6. Green plants are food producers.
7. Animals depend on plants for food. Therefore animals are food consumers.
8. An ecosystem is an area in which organisms interact. They also interact with their environment.
9. The non-living parts of an ecosystem are the climate, the landscape and the soil.
10. Food energy is passed from one organism to another in a food chain. The organisms in a food chain depend on each other.
11. Humans remove and destroy the natural forest. This is called deforestation. They use up some of the natural resources. Humans spoil the environment by causing pollution. They pollute the water, air and land. This has a bad impact on the environment. Many living things cease to exist.
12. Humans overuse the land. They clear vegetation. They do too much farming on the same land. In some countries the land turns into desert.
13. Non-native animals often kill native animals in their environment. This happens when the non-native animals move in to new environments.
14. Planting new trees in Honiara is an example of how humans can have a good impact on the environment.
15. Energy enters living things on the Earth when green plants capture light energy from the Sun.

Revision

Answer the following questions in your exercise book.

1 Which of these statements are true?

a An ecosystem is a specific area in which organisms interact with one another and with their environment.

b A population is defined as a group of organisms of the same kind living and reproducing in their own area.

c The specific area or place that an organism lives is called its habitat.

d A community forms when different populations of plants and animals live and interact with one another in the same area.

A A, B and C only

B B, C and D only

C A, C and D only

D All of the above

2 Organism X in the food chain below could be a(n):

A moss

B owl

C butterfly

D caterpillar

Lime plant → Organism X → Small bird → Bird of prey

3 In a pond habitat, what happens if there is a sudden increase in the number of frogs?

4 What are the non-living parts of the environment? Say how the non-living parts affect animals.

5 Deforestation has which of the following effects?

A affects the survival of organisms

B leads to the erosion of soil

C causes floods

D all of the above

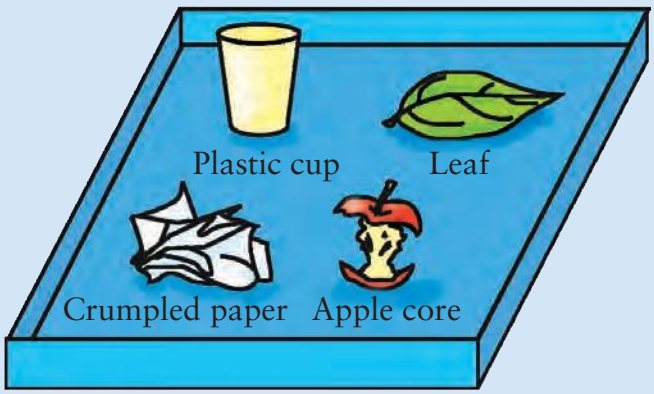
6 Look at the drawing. The things in the tray are standing for a long time. After six months, what can we say about the object that is likely to still be there?

A plastic does not rot

B plastic is strong

C plastic is a good material for a cup

D all of the above



7 Why do you think land should be set aside for nature reserves?

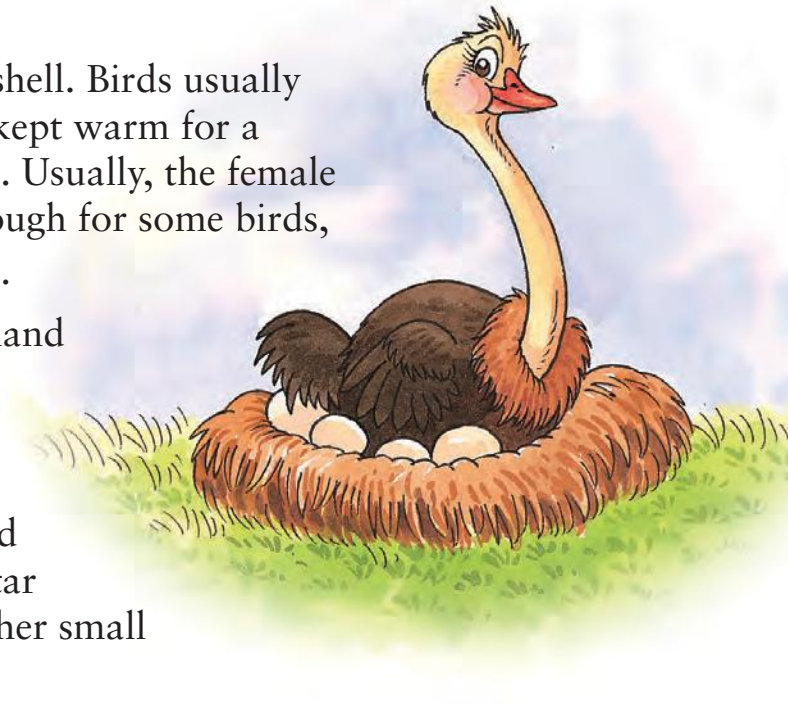
Chapter 2

Cycle of life

In this chapter, you will:

- learn that living things reproduce to ensure that their own kind continues to exist
- investigate and compare the various ways in which plants reproduce
- describe the process of pollination, seed dispersal and germination in the sexual reproduction of plants
- identify the similarities in the sexual reproduction of flowering plants and animals.

Birds



All female birds lay eggs with a hard, **brittle** shell. Birds usually build a nest for their eggs. The eggs must be kept warm for a certain number of days before they can **hatch**. Usually, the female bird looks after the eggs and the young, although for some birds, such as the ostrich, the male looks after them.

Most birds live on land. Seabirds live on the land near the sea.

Birds have **beaks** for feeding. Beaks are modified for the food that they eat. Some birds feed on seeds and fruits. Some birds feed on insects and caterpillars. Some feed on nectar of flowers. Some birds feed on worms and other small animals, while others feed on dead animals.

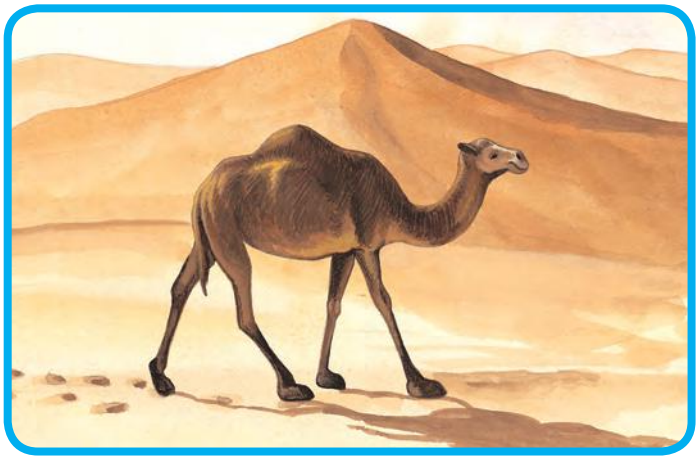
Some birds swim and dive to find most of their food, which is in the water.

Mammals

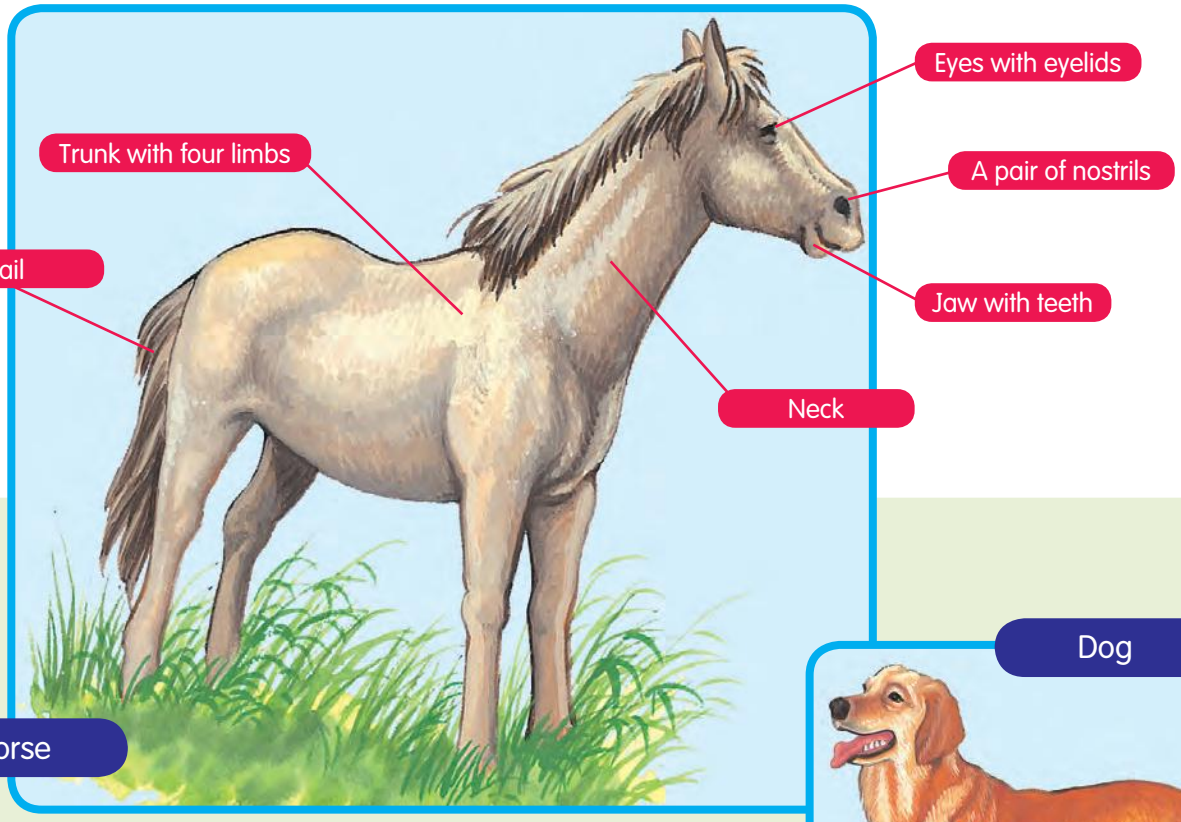
Mammals are the most advanced group of animals because of their highly developed brains. Besides birds, mammals are the only other group of organisms that are warm-blooded.

Mammals have a body that is covered with hair. They also have a layer of fat beneath the skin that protects them against the cold. Mammals are warm-blooded and they are able to live in very hot or cold places. Polar bears can live in polar areas and camels can travel in the desert at noon.

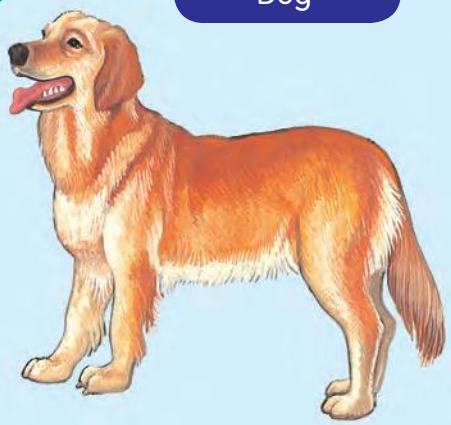
Polar bears can live in polar regions.



Camels can travel in the desert at noon.

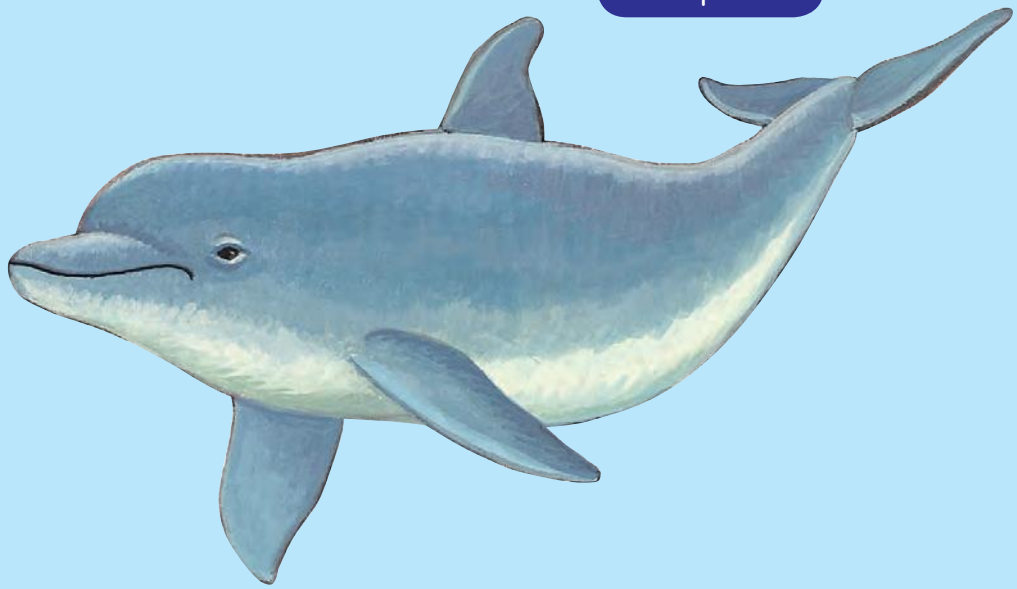


Dog



Mammals typically have a head, neck, trunk, and tail. They have a pair of eyes with eyelids, a mouth with teeth, two nostrils, and two ears located at the head region. The trunk has four limbs and ends with a tail, although in some animals, such as humans, the tail may be very reduced.

Dolphin

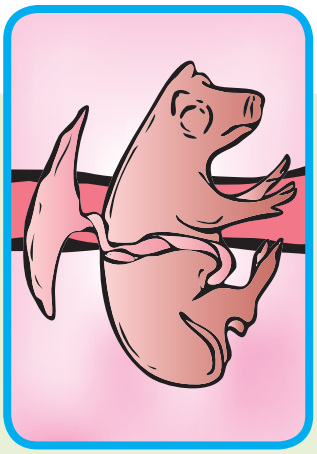


The young of some mammals develop inside an egg.

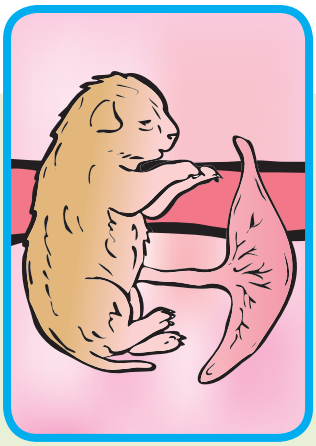
Egg of spiny anteater

Most young mammals develop inside the mother's womb. They are born live in a mature state.

Young of human



Young pig



Young dog

The young of mammals feed on milk produced by the mother.

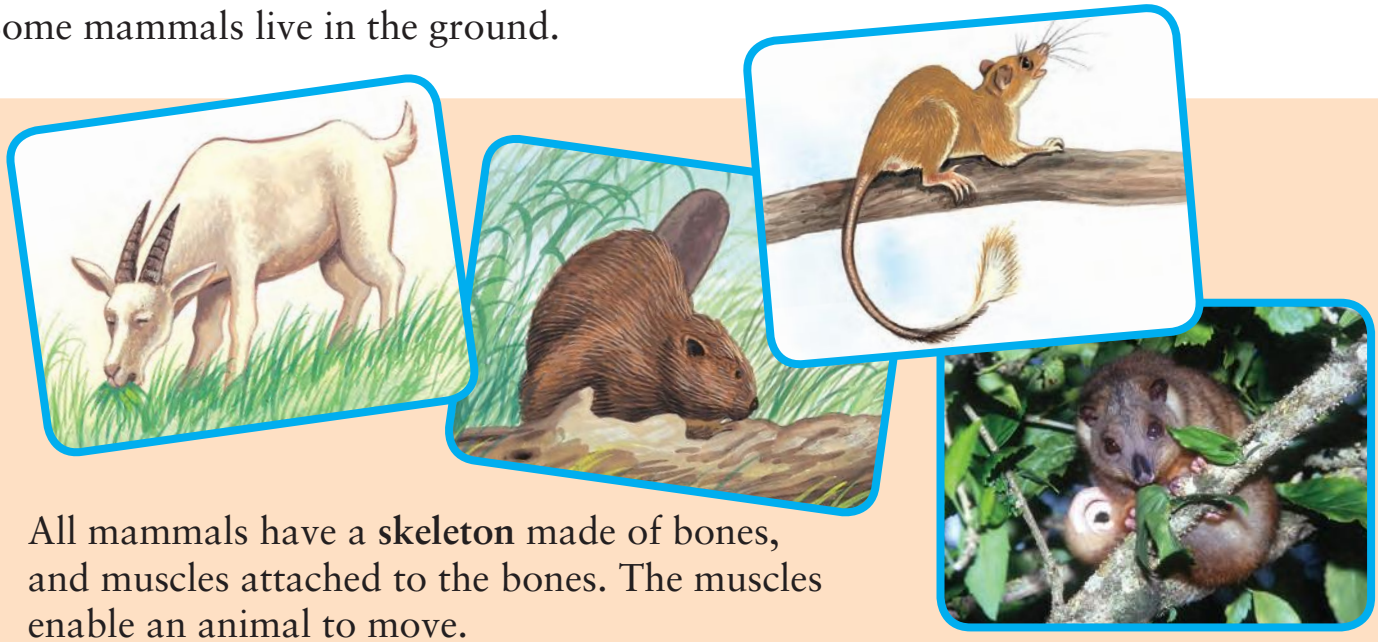
Most mammals live on land.

Some mammals live in the sea and have strong fins for swimming.

Some mammals live in fresh water.

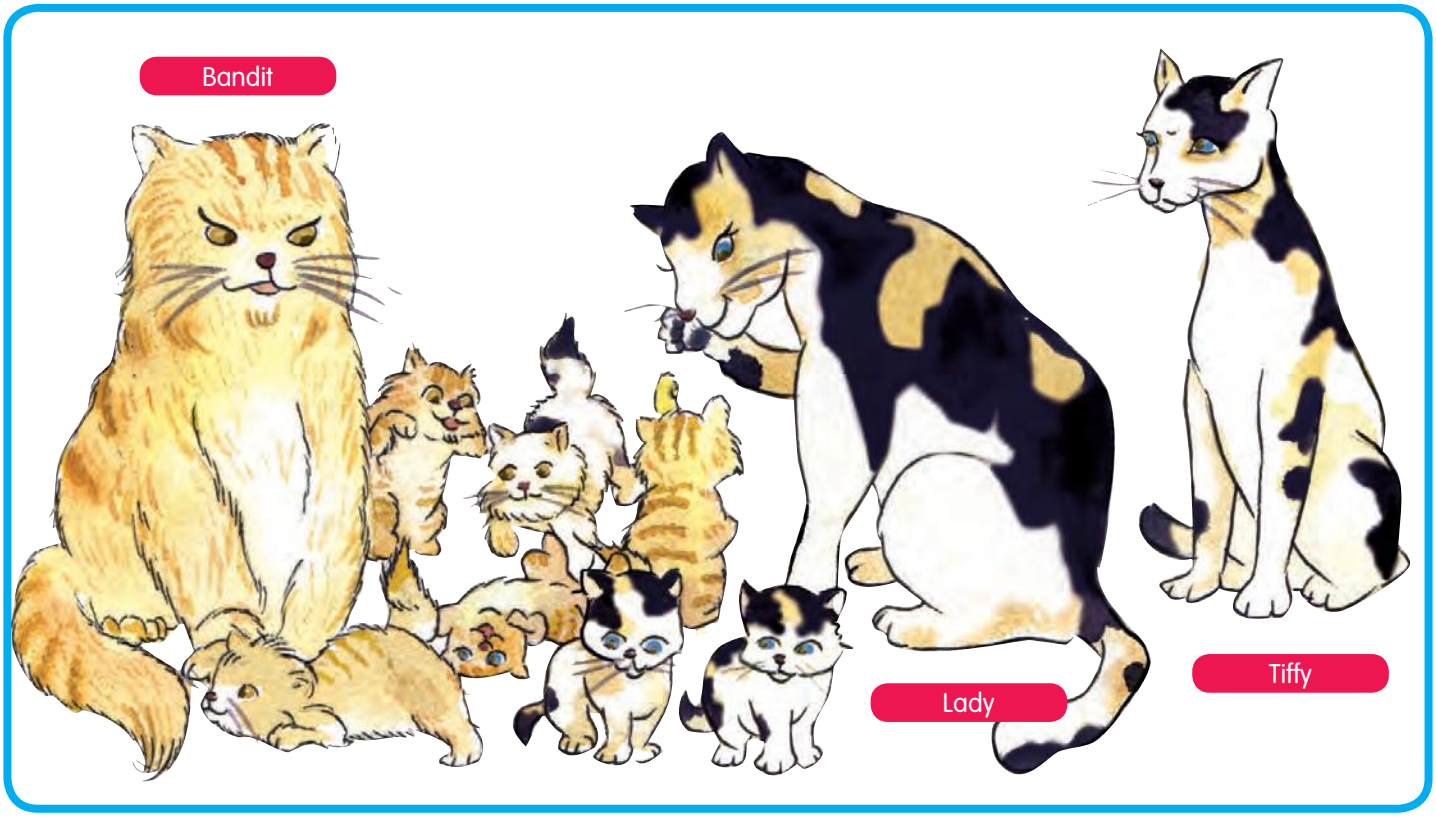
Some mammals live in trees. The bat is the only mammal that can fly. Its wings are made of skin stretched from the fingers to the back limbs.

Some mammals live in the ground.



All mammals have a **skeleton** made of bones, and muscles attached to the bones. The muscles enable an animal to move.

Look at Bandit (a male cat), Lady (a female cat), and their new litter of kittens (below). And look at old Tiffy, looking on contentedly. Tiffy is Lady's mother. See how similar Tiffy and Lady are to each other. See how similar some of the kittens are to Lady, how some are similar to Bandit and how some seem to be a mix of both Lady and Bandit. These cats and kittens are an example of the cycle of life. Adults have young that grow up and have their own young. In the same way, your parents were once babies. They became adults and had babies of their own. Those babies grew up wonderfully, and now they are you!



Need to reproduce

Organisms do not live forever. They die. Before they die, most organisms reproduce. This means that an organism and its kind do not disappear from the Earth. When organisms reproduce, they make sure that their own kind continues. In other words, more organisms of that kind will be alive. Cockroaches, for example, produce many, many offspring. So cockroaches survive, even though humans kill many of them.

Activity 1

Think about the flying fox. There are only a few of these animals left, living in small groups. They are scattered around in parts of the rainforest in Solomon Islands. Humans have cut down forests. They have also hunted the wild pig. Human activities threaten the survival of the flying fox and the wild pig. This means these animals are in danger of becoming **extinct**.

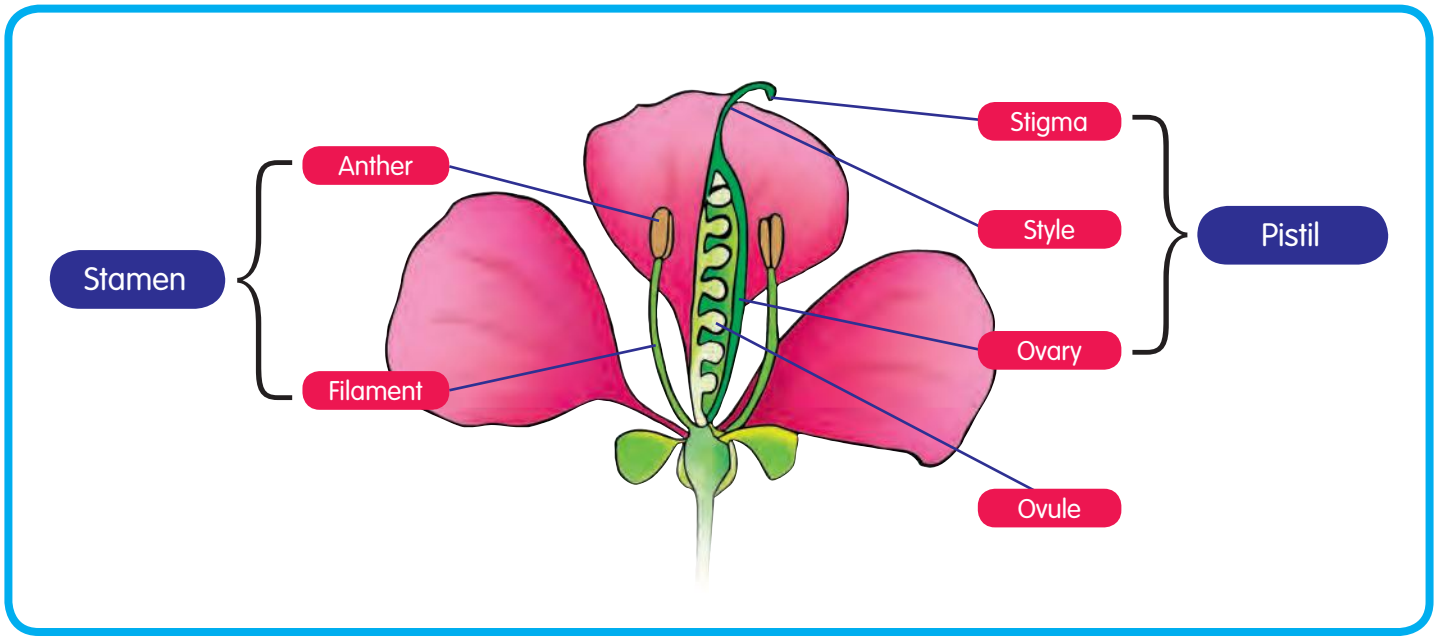
In order to save these animals from extinction, we should not over-hunt them. We should not destroy their habitat. To help to preserve different kinds of organisms, governments sometimes make lists of animals that are threatened. People must not hunt animals on these lists. Examples of threatened animals in Solomon Islands are the leatherback turtle and the flying fox.

The wild pig in its natural habitat

Male and female sex organs in plants

Sexual reproduction can take place in flowering plants. Flowering plants have male and female sex organs. The sex organs are in the flowers.

Look at the diagram below. The female sex organ is the **pistil**. This has three parts—the **stigma**, the **style** and the **ovary**. The male sex organ is the **stamen**. Each stamen has two parts.



The table shows the parts of the stamen and pistil. It also shows their functions.

Part	Function
Pistil:	
• stigma	• receives pollen
• style	• holds up stigma
• ovary	• contains ovule; forms fruit
• ovule	• has egg cell; forms seed
Stamen:	
• anther	• produces pollen; pollen grain has male sex cell
• filament	• supports anther

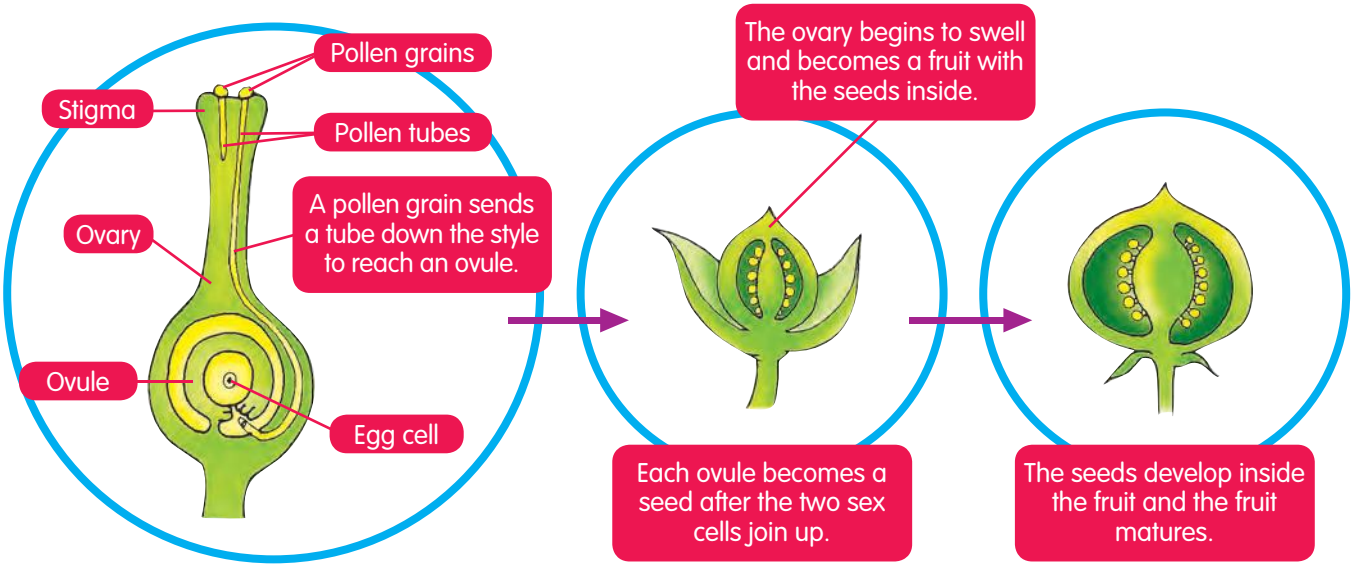
The female sex cells are tiny egg cells. They are in the **ovules**. The male sex cells are in the **pollen** grains. The **anther** produces the pollen grains.

Sexual reproduction in flowering plants occurs when female and male sex cells join together. The female sex cell in an ovule and the male sex cell in a pollen grain come together to form a new **seed**.

Fertilization

Fertilization is the process of a female sex cell and a male sex cell joining up. When a pollen grain reaches the stigma, it sends a tube down the style to reach an ovule in the ovary. Here, the male sex cell and the female sex cell join up and become a seed. The ovary becomes a fruit. The fruit may contain one or more seeds.

Fertilization diagram



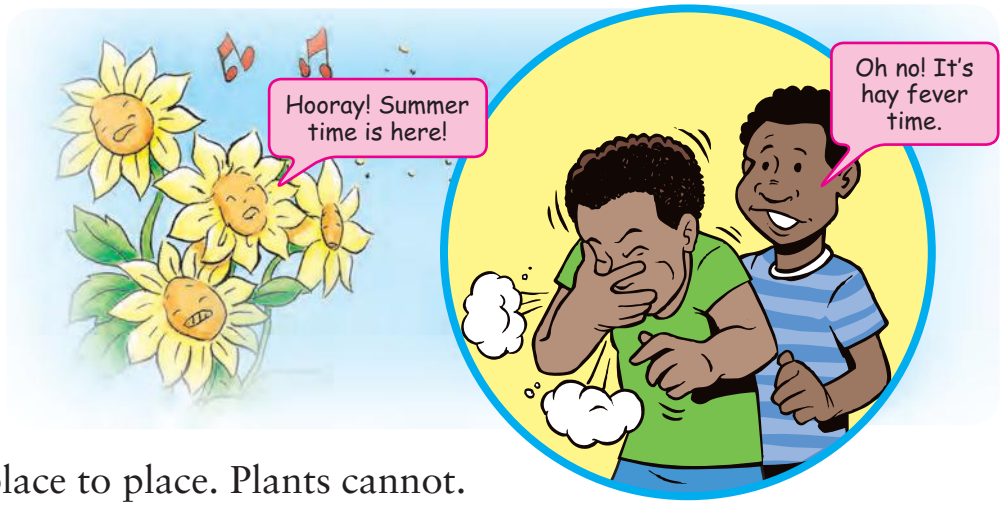
Research Activity

Activity 2

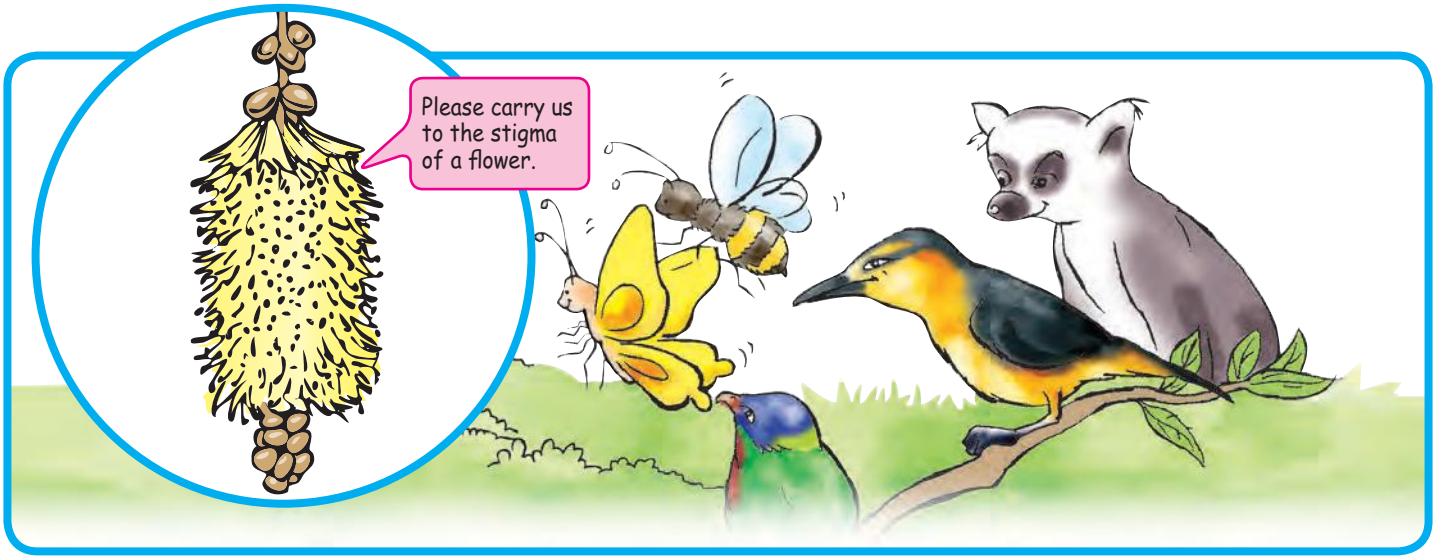
Observe some flowers that attract insects. Note what the insects do.

Nectar guides are markings on the flowers that lead insects to the nectar inside them.

The insects carry pollen from one flower to another. **Pollination** is the first step in sexual reproduction.



Animals can move from place to place. Plants cannot. Nature provides plants with ways to transport pollen from the anthers to the stigma. The pictures below show one way.



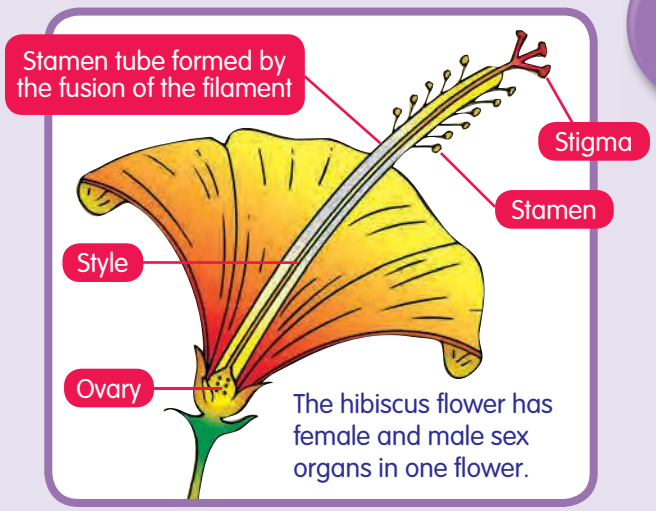
Insects such as bees, butterflies, flies, and mosquitoes, birds such as sunbirds, and mammals such as bats visit flowers. They carry pollen grains from one flower to another. Animals can carry pollen grains to the stigma of a plant.

Activity 3

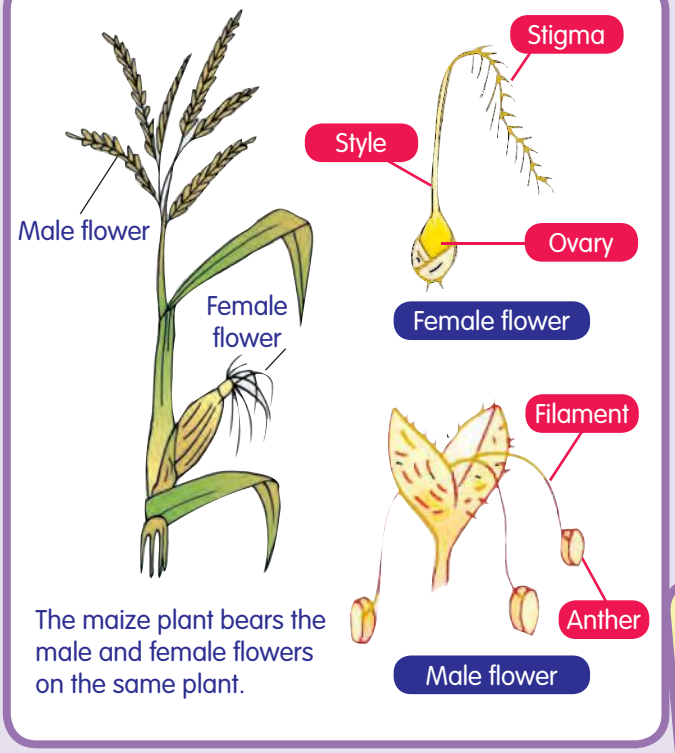
Some plants have both female and male flowers. Other plants have only female or male flowers.

Most flowers have female and male sex organs in one flower. Some flowers have only female sex organs. Others have only male sex organs.

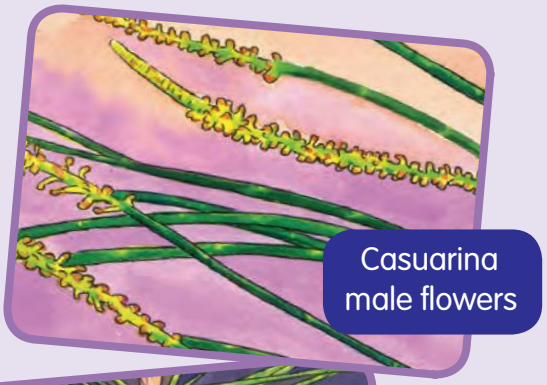
Why would plants like the maize plant have the male flowers on top and female flowers on the side?



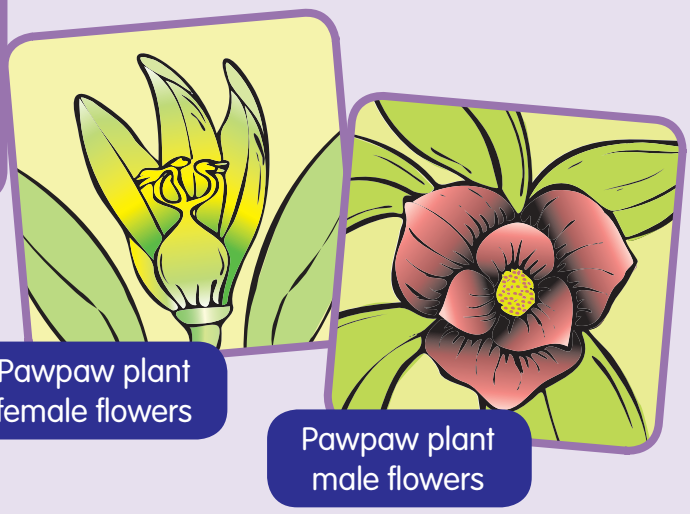
The hibiscus flower has female and male sex organs in one flower.



The maize plant bears the male and female flowers on the same plant.


Casuarina male flowers


Casuarina female flowers


Pawpaw plant female flowers

Pawpaw plant male flowers

The pawpaw plant has female flowers and male flowers. If you were growing a pawpaw plant for its fruit, would you want a plant with only male flowers?

Nature has provided flowering plants with ways to help them live.
Look at some flowers below that attract animals.

The hibiscus is brightly coloured with a stamen and stigma that stick out to attract birds.

The rafflesia smells like rotting meat in order to attract pollinating flies.

The bougainvillea has colourful bracts (leaves modified to protect flowers) surrounding the cream-coloured flowers to attract insects.

The sunflower is brightly coloured with many small flowers gathered together to attract insects.

The ginger plant has small, coloured flowers. They are on brightly coloured spikes, like cones. These coloured cones and flowers attract insects.

Fruits also attract humans by their colour, smell (scent), and taste. Humans eat fruits. In this way, humans can help to spread the seeds of plants. The pollen grains of grasses are spread by wind.

Seed dispersal

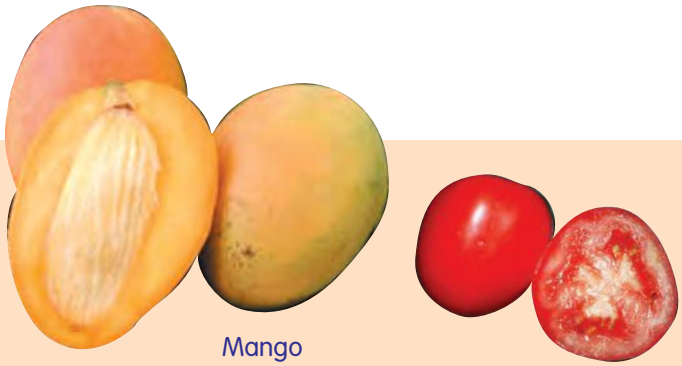
Plants have many ways of making sure that seeds fall on places where they can grow well. Seed **dispersal** is the scattering of seeds from the parent plants. In some plants, the whole fruit is dispersed. In others, the seeds are dispersed from the fruits. Fruits and seeds can be dispersed by:

- animals
- wind
- the fruit itself (explosion)
- people
- water.

By animals

Edible fruits

In some plants, fruits hold the seeds. Some fruits, such as tomatoes, are fleshly and attractive. Animals eat the fruits. The seeds pass through their bodies.

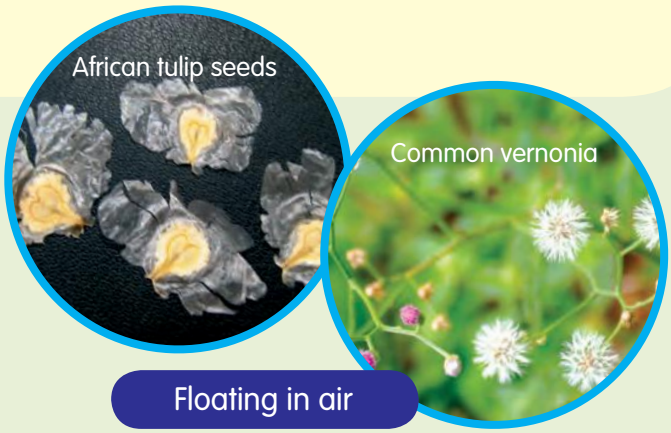


Fruits with hooks

Some fruits have small hooks on them. The hooks catch onto the fur of passing animals. The fruits later fall off. The black jack weed is an example.

By wind

Some fruits and seeds are very small. They have hairs arranged like a parachute. Others have wings. The fruit of the vernonia weed is the parachute. The wind carries it for a large **distance**.



By the plants themselves

In some plants, the fruit dries and becomes a hard seed box. The seed box splits open and the seeds are thrown out. A good example is the fruit of the jacaranda plant.


Balsam

Splitting, exploding

By water

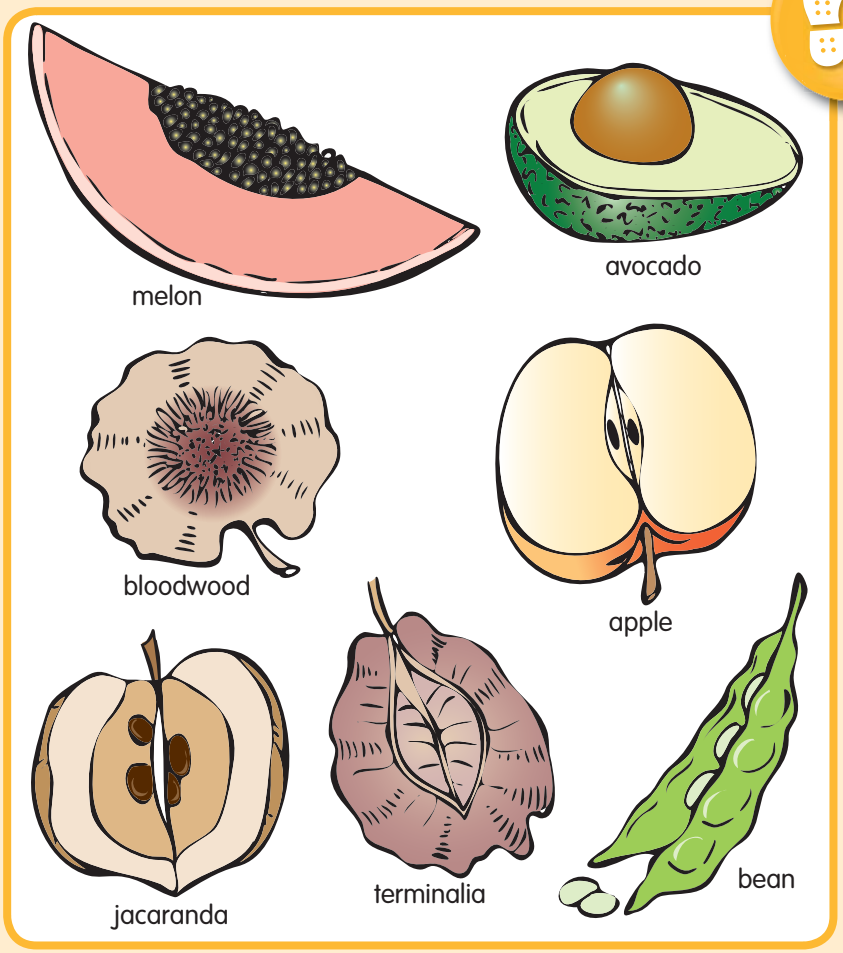
The seeds of water lilies have air containers. This enables them to float on water. Coconut seeds float on water.

Floating in water

Fieldwork Activity

Activity 4

In the area around your school, in the village, or at the market, collect examples of fruits and seed boxes. These pictures, showing some common seed boxes and fruits, should help you to find different types. Some plants have fleshy fruits with one or more seeds inside. Others have dry seed boxes. For each seed box you collect, say which method of dispersal it uses.



Activity 5

Think and Write

Look at the characteristics of fruits and seeds given below. In your exercise book, draw up a table with three columns and the column headings shown here:

Characteristic	Example	Dispersal by

Your table should have eight blank rows below the headings—one row for each plant shown on this page. In the first column, copy the characteristics of the different seeds shown below. In the second column, next to each characteristic, copy the name of the plant shown below. You may add the names of other plants that you know that have the same kinds of seeds. In the third column, write the method of dispersal used by seeds that have these characteristics.

Very light fruit with fine hair, scales or hooks

Shaving brush fruit

Fleshy and brightly coloured fruit

Tomato

Very small and light fruit

Bermuda grass

Fruit that swells and then bursts at the slightest touch

Balsam

A small oval-shaped fruit with white greasy meat

Kat nut fruit

Small fruit with a corky layer

Yellow creeping daisy

Fruit with a fibrous layer that enables the nut to float

Coconut

Large, heavy, woody fruit that splits into five parts, with seeds that are flat and winged

Broad-leaved mahogany

Activity 6

Creative Activity

Use paper to make your own fruit with wings.

Look at the fruits of the leucena and the Christmas tree. What do these fruits have in common? They are seed boxes which explode. They shoot the seeds out of the seed box.

Now look at the fruit of the broad-leaved mahogany. It has flat wings that allow it to float in air.

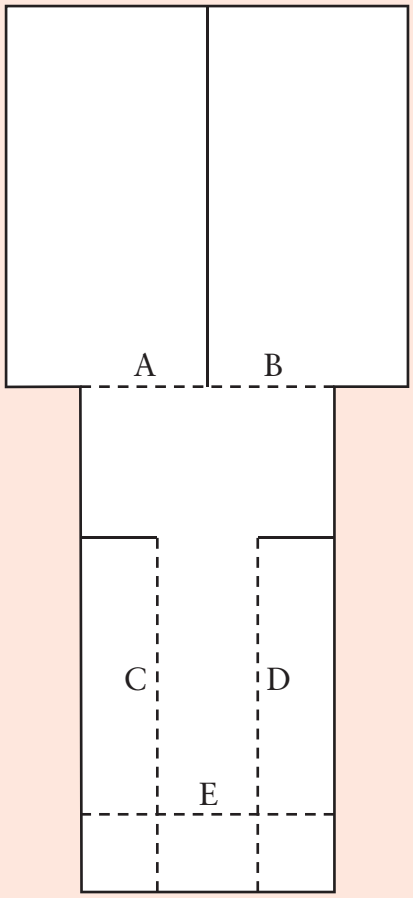
Leucena

Broad-leaved mahogany

Christmas tree

Make your own fruit with wings:

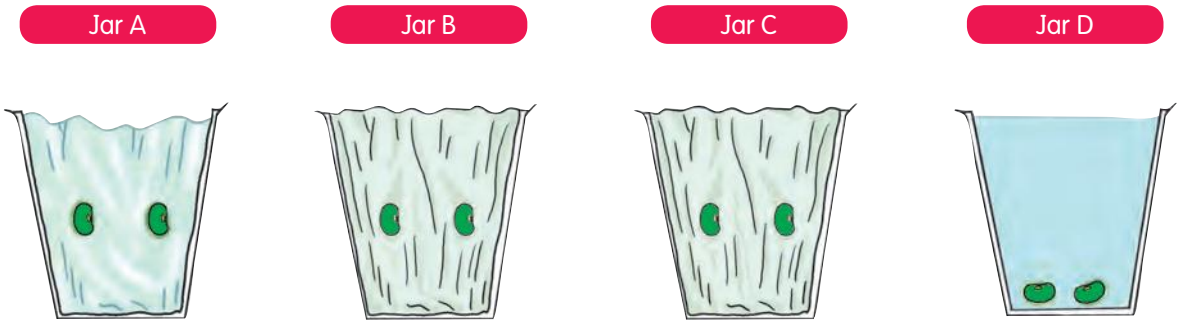
1. On a separate sheet of paper, trace the diagram on the right.
2. Cut the paper along the solid lines indicated in the diagram on the right.
3. Fold 'A' along the dotted line so that it points in one direction.
4. Fold 'B' so that it points in the opposite direction to 'A'.
5. Fold 'C' and 'D' so that they overlap in the centre.
6. Predict what will happen when you drop your fruit.
7. Hold your fruit as high as possible and then let go.
8. Put a paper clip on the folded bottom flap, 'E'.
9. Predict what will happen and then try it.



Activity 7

Hands-on Activity

Set up four glass jars, as shown. Arrange bean seeds in each one as described. Observe the seeds for one to two days. Note what you see in each jar.

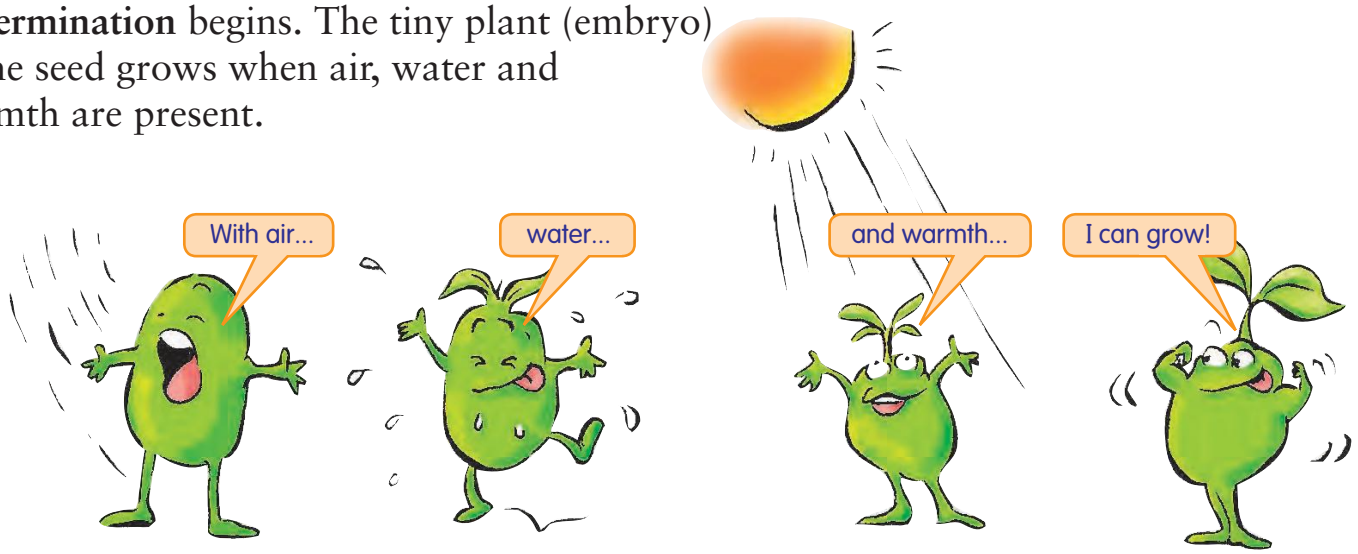


In which jar will the seeds:

a germinate?
b become mouldy and rot?
c shrivel up and die?
d show no germination?

Germination

When a seed has a place where it can grow, the process of **germination** begins. The tiny plant (embryo) in the seed grows when air, water and warmth are present.



Reproduction in plants and animals

Look at the table below. It lists the elements of the process of fertilization in flowering plants. It also shows the stages of sexual reproduction in animals.

	Fertilization in plants	Reproduction in animals
Location of sex organ	Flower	Reproductive system
Male sex organ	Stamen	Testes
Female sex organ	Pistil	Ovaries
Male sex cell	Sex cell in pollen grain	Sperm
Female sex cell	Egg cell in ovule	Egg or ovum
Fertilization	Pollen grain is carried to the stigma from the anther and the male sex cell joins with the female sex cell. Ovule becomes seed; ovary become fruit with seeds inside.	Sperm enters the egg and the egg becomes a fertilized egg. Fertilized egg develops in the body of the female in humans and other mammals such as cats.

Activity 8

What can you say about fertilization in plants and reproduction in animals? Answer the following questions in your exercise book.

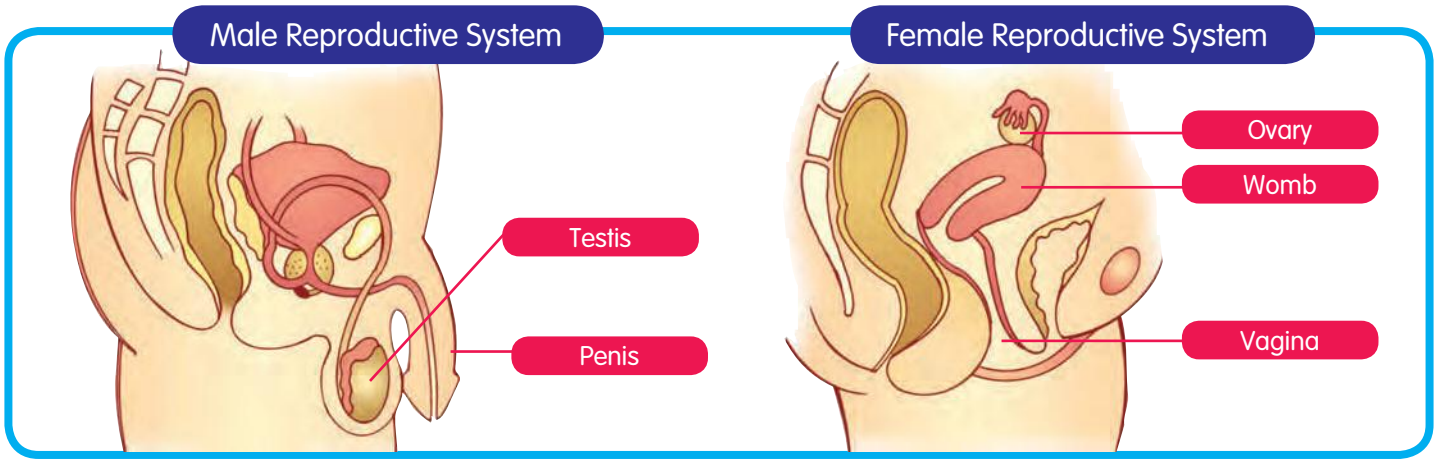
Are the stages similar in plants and animals?

What is the male sex cell in the plant called?

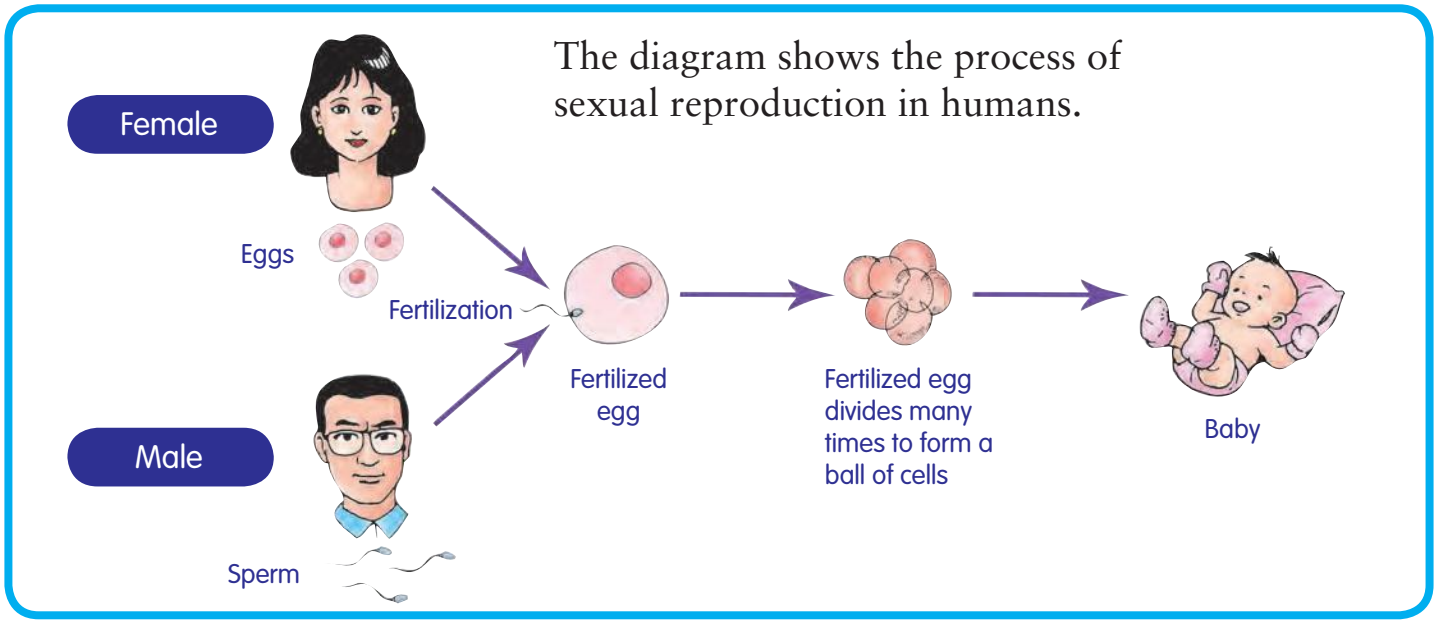
What is the male sex cell in an animal called?

Reproduction in humans

Two parents produce their babies by **sexual reproduction**. Male **sex cells**, called **sperm**, are produced in the **testes**. Female sex cells, called eggs, are produced in the **ovaries**. This diagram shows the sexual organs of the human male and female.



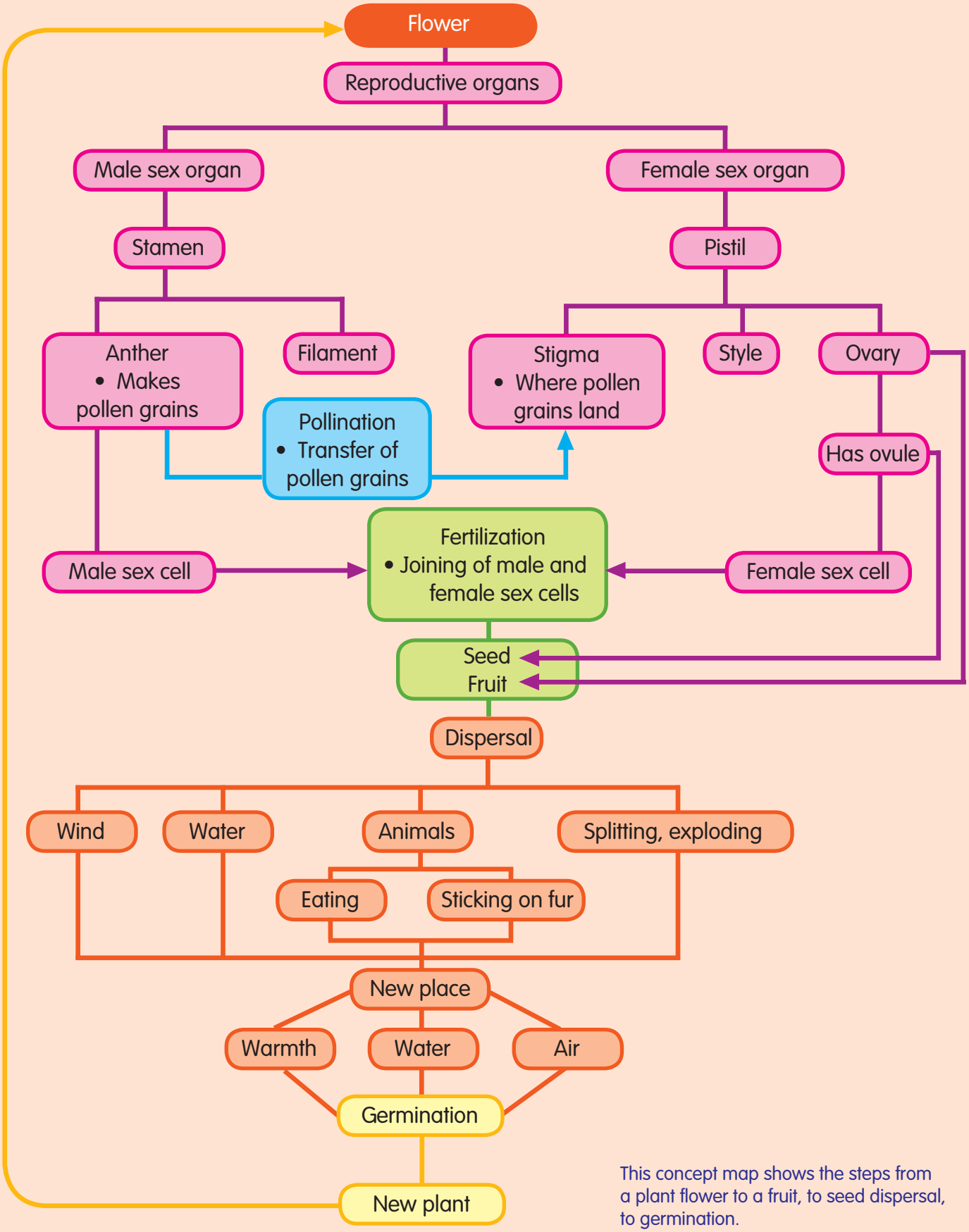
To reproduce, a man and a woman have sexual **intercourse**. The man puts his penis into the female's vagina. He puts his sperm into the female's body. When a sperm cell joins together with an egg cell, this is called **fertilization**. The eggs are fertilized inside the female's body. The fertilized egg then begins to divide. It grows gradually to form a baby.



A fertilized egg becomes a baby in the **womb**. The womb is a special thick-walled organ in females' bodies.

Chapter Review

1. Organisms reproduce to make sure that their own kind does not die out, or become extinct.
2. Both animals and plants can reproduce sexually when two parents are involved.
3. The processes of pollination and fertilization are needed for plant seeds to be made.
4. In plant fertilization, the pollen grain fertilizes the ovule of the flower.
5. Seeds need to be dispersed to reduce competition between parents and offspring and among offspring.
6. Seeds germinate into new plants when there is warmth, water and air.
7. The stages of the process of reproduction are similar in plants and in animals.
8. In mammals such as humans, sexual intercourse produces a fertilized egg, which becomes a baby in the female's womb.



This concept map shows the steps from a plant flower to a fruit, to seed dispersal, to germination.

Revision

Answer the following questions in your exercise books.

1 Use the following list of words to fill in the blanks in the passage below.

big nectar inside pollen wind flowering animals

When pollen goes from the male part of one flower to the female part of another flower on a _____ plant, this is pollination. Pollen can be carried by _____ or by wind. The flowers usually open before the leaves. A lot of _____ is produced. Insect-pollinated flowers are _____ so that they can hold up large insects such as bees. The male and female parts are usually _____ the flowers because insects come to collect the pollen. Some insects use the sweet **liquid** called _____, from inside the flower, for food. Some flowers are pollinated by birds or bats.

2 Which of these statements are true? Answer A, B, C or D.

a Pollination is when the female sex cell and the male sex cell join up.

b Fertilization takes place before pollination.

c Germination takes place when there is warmth, water and air.

d Fruits can be dispersed by water and air.

A a and b only

B a, b and c only

C b and c only

D c and d only

3 Write the first part of each of these sentences. Select the correct second part from the list on the right and complete each sentence.

a	The petals and the sweet scent …	… the male reproductive part of the flower.
b	The anthers contain pollen, which is …	… by visiting insects or by the wind.
c	Pollen from other flowers is placed on the stigma …	… the female reproductive parts of the flower.
d	The styles connect …	… when it is fertilized by pollen.
e	The ovary contains ovules, which are …	… attract insects.
f	The ovule develops into a seed …	… the stigma to the ovary.

4 Copy out each of these sentences and write correctly the mixed-up words shown in brackets.

a (lasrepsid) is what happens when fruits and seeds are carried away from the plant that made them.

b Animals eat (slefhy) fruits and the seeds pass through their bodies.

c Some plants have pods that (trubs) and scatter their seeds.

d The wind (sderispes) seeds that have wings.

e Animals sometimes catch (kedooh) fruits in their fur.

5 Choose the correct answer from A–D below. In human reproduction, fertilization takes place when:

A a male sex cell meets and joins up with a female sex cell

B the testes produce sperm

C the testes meet the ovary

D the ovary produces eggs

Chapter 3

Heat

In this chapter, you will learn:

- about some common sources of heat
- that the temperature of an object is a measure of its degree of hotness or coldness
- to differentiate between heat and temperature
- how to use a thermometer
- to relate the change in temperature of an object to the gain or loss of heat by the object
- about the effects of heat gain or loss in daily life
- that heat flows from a hotter to a colder object until both reach the same temperature
- that heat travels through solid substances by conduction
- that heat travels through liquids and gases by convection currents
- that heat travels through liquids by radiation
- to identify some solid materials as good or poor conductors of heat
- that some materials such as plastics and wood prevent heat loss and/or heat gain; they act as insulators.

Heat sources

Do you feel the heat of the Sun when you stand outdoors on a sunny day? The Sun is the Earth's most important heat source. The Earth would be too cold without the warmth of the Sun. Seeds would not be able to germinate (start to grow). Plants would not be able to grow without the warmth of the Sun.

Look at the pictures below. They show:

- a man cooking at a gas stove
- a woman cooking fish on a barbecue grill
- a boy ironing his clothes
- a girl rubbing her hands together
- a burning candle.

Fuels, such as wood, charcoal, coal, **oil**, natural gas, and petroleum, are sources of heat. Perhaps you have seen cylinders of liquid petroleum gas (LPG). These are the other main sources of heat in our daily lives. Lamps and heaters are also sources of heat. Our bodies are also sources of heat.

Activity 1

Hands-on Activity

Observe the Sun as a heat source

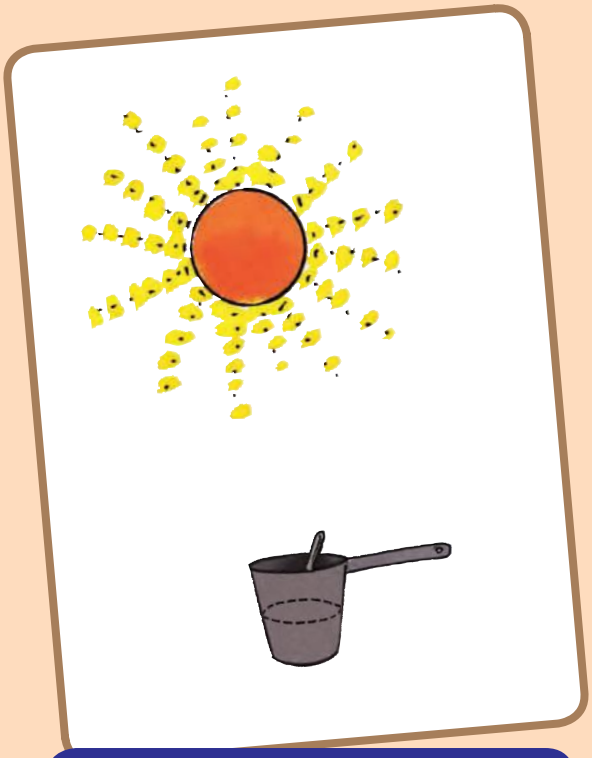
Find two cooking pots of the same size. Place the same amount of water in each pot. Place a metal spoon in the water in each pot.

Leave pot A out in the Sun for two or three hours.

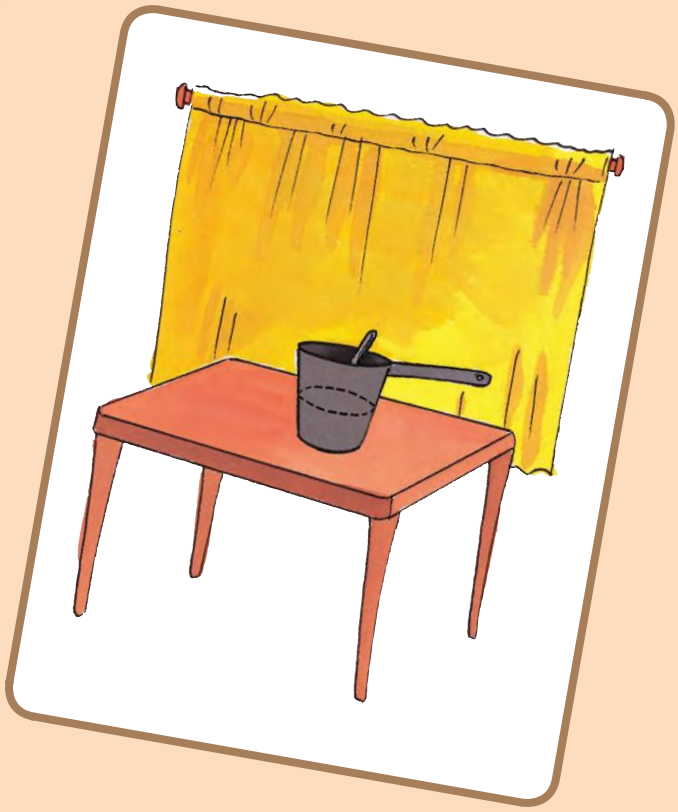
Leave pot B inside, in a shady room, for two or three hours.

In which pot, A or B, do you think the water will be hotter? After two or three hours, test the water to see whether you were right. What does this tell us about the Sun as a source of heat energy?

Is the spoon hotter in pot A or in pot B?



Pot A: Outdoors in direct sunlight



Pot B: Indoors away from the Sun

When we do an investigation like this, we try to find out what happens in two situations. We compare the situations. We must make the two situations the same, except for the thing we want to test.

In these two situations, which thing are we testing?

Heat and temperature

What do we mean by **heat**? What do we mean by temperature? Are heat and temperature the same?

Look at the cup of tea. When we say that it is hot we are referring to the temperature of the cup of tea. **Scientists** use the word 'temperature' to refer to the hotness or coldness of things.

We **boiled** the water to make our cup of tea. The water gained heat when it was boiled. Heat is the energy that can raise the temperature of things. Heat makes things hot. The increase in temperature is due to the heat energy that the water has gained.

Tap water at room temperature. The temperature is 30°C.

Water gains heat as energy is passed to it from the burning gas. The temperature of boiling water is 100°C.

The temperature of the cup of tea is close to 100°C.

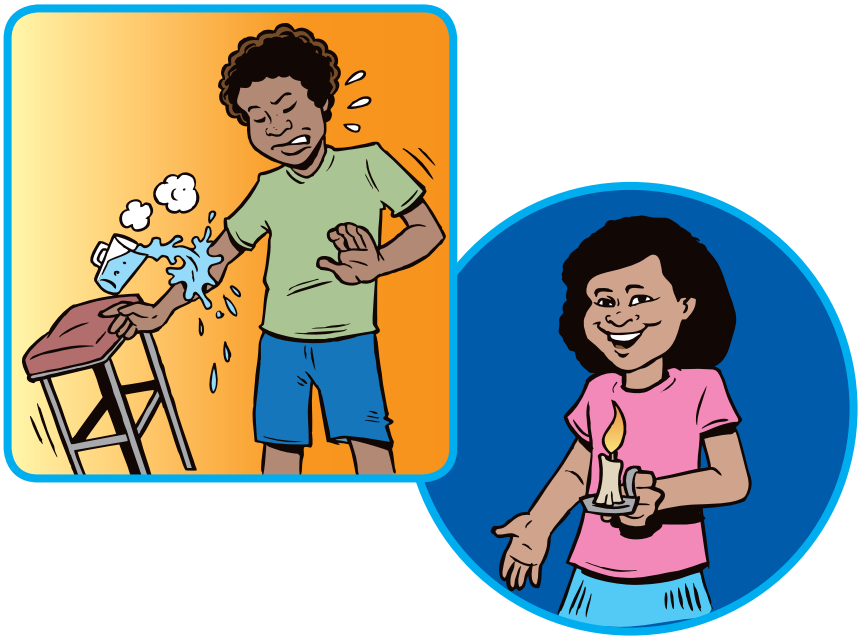
Hands-on Activity

Activity 2

Take two similar pots. Fill pot A so that it is one-quarter full of water. Fill pot B so that it is three-quarters full of water. Place the two pots over equal heat on a fire. Will it take you longer to boil the water in pot B than A? When the water has boiled, will the temperature of the water in pots A and B be the same? Will the boiling water in pots A and B have the same heat energy? Is there more heat energy in the pot of water that took a longer time to boil?

The temperature of the boiling water in pot A is the same as that in pot B. However, the water in pot B took a longer time to boil and had gained more heat energy than the water in pot A.

The candle has a higher temperature than a cup of hot water. But the cup of hot water has more heat energy than the candle. This is why you will not get a burn with the heat from a candle. You will get a bad burn if the hot water spills on your skin.

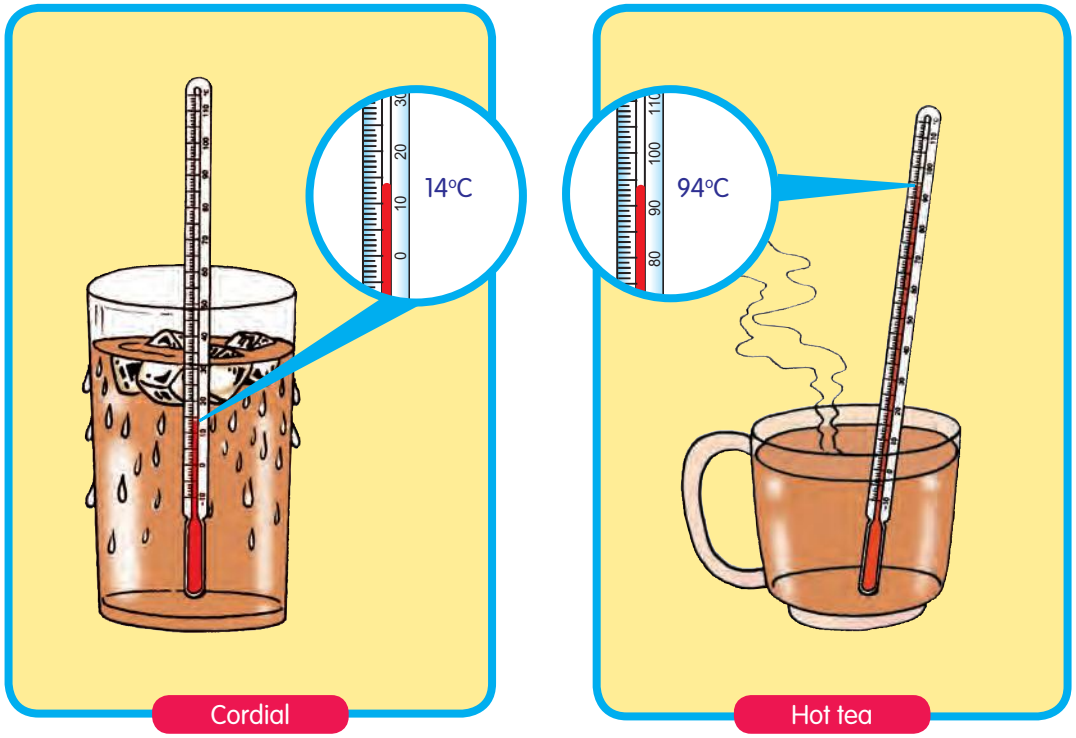


Extending your senses

We can tell that a cup of tea is hot and a glass of cordial is cold by touching them. Our **senses** can give us an idea of the temperature of things. They are not an exact measure of the temperature.

Knowing the exact temperature of things, such as water, air and our bodies, is important. For example, when we are sick, we need to know if our body temperature is higher than normal. We need to know the temperature of the fire so that we do not burn things.

Look at the diagrams. What is the temperature of the cordial? What is the temperature of the hot tea? What instrument do we use to help us tell the temperature accurately?



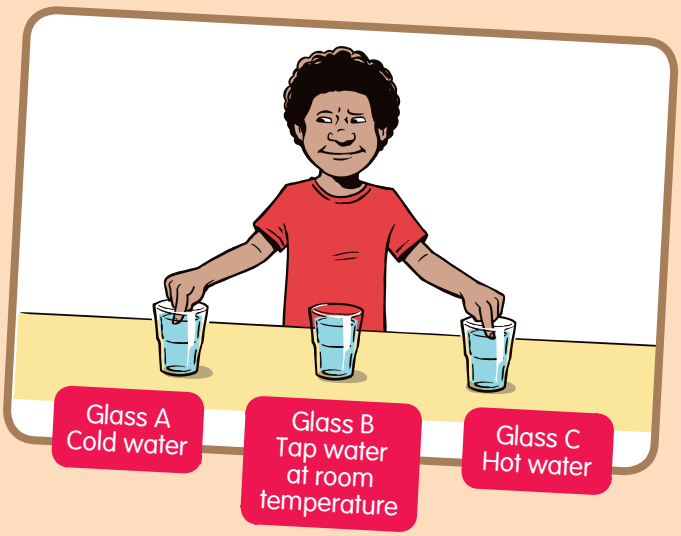
Activity 3

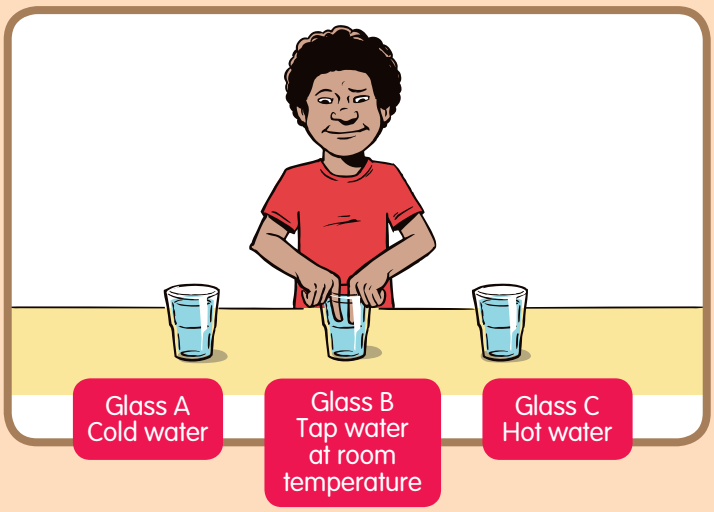
When you first jump into the water in the river, do you feel cool? After you have been in the water for a while, the water feels warmer, as your body gets used to the temperature of the water.

Take three glasses. Fill glass A with ice cold water. Fill glass B with tap water. Fill glass C with hot water (hot, but not so hot that it will burn you).

First, place the index finger of your right hand in the cold water and the index finger of your left hand in the hot water for a minute. Then, place both index fingers in the tap water in glass B. What do you feel?

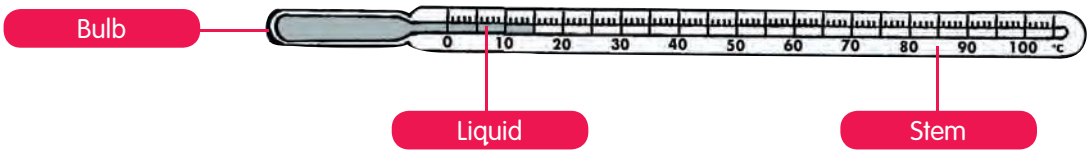
When both fingers are first put into the glass of tap water, the temperature does not feel the same to both fingers. This is because the finger previously in the cold water feels cold, while the finger previously in the hot water feels warm. Our fingers become used to differences in temperature.





We use **thermometers** to find the exact temperature of things. A thermometer is a special **instrument** that allows us to accurately measure the temperature of an object. The temperature of an object is how hot or how cold it is.

Look at the thermometer shown. It is a sealed glass tube with a bulb at one end. Inside is a liquid that expands when the temperature rises and contracts when the temperature falls. The liquid can be **alcohol** or **mercury**. The scale used on this thermometer is the Celsius scale. The scale is marked from number 0, the ice point (**melting** temperature of pure ice), to number 100, the vapour point (temperature at which boiling water changes to water vapour). In between, the space is divided into 100 equal parts or Celsius degrees. The level of the liquid inside the thermometer tells us the temperature of something in degrees Celsius (°C).

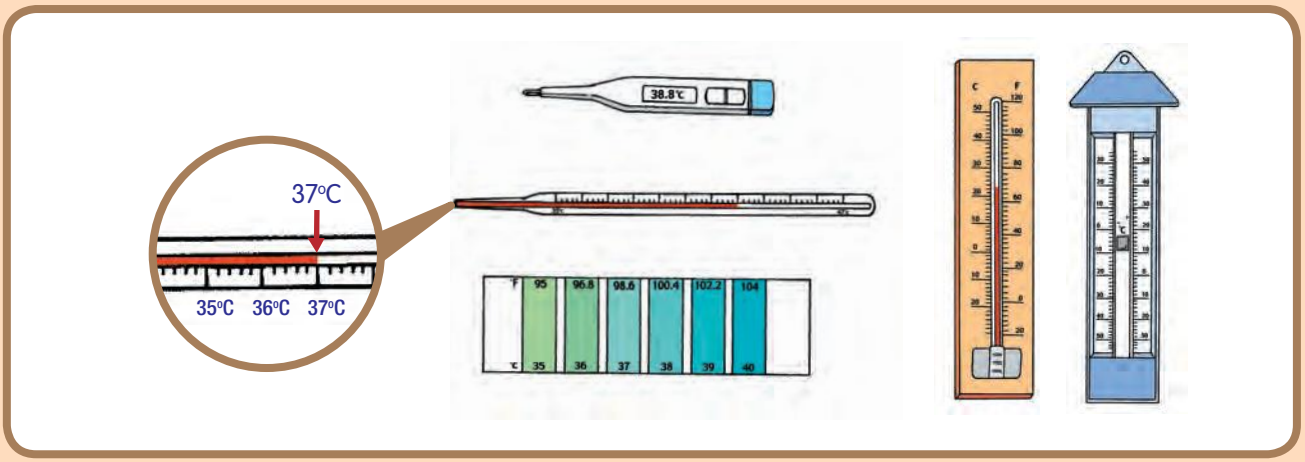


Hands-on Activity

Activity 4

Look at the thermometers shown. Can you read the temperatures shown?

Look at a thermometer if you have one at home or school. Find the temperature of the air in your home or school. Look at a clinical thermometer if you have one at home. Try taking your own temperature. Remember to hold the thermometer at eye level when reading it.



Heat gain, heat loss, expansion, contraction

Look at yourself after a game of soccer. Do you feel cooler after you **sweat?** Look at yourself when you are very cold. Do you **shiver**? Do you then feel warmer? We sweat when we are warm, as this makes us feel cooler due to the heat lost from our body when water evaporates. We shiver when we are cold, as this makes us feel warmer due to the extra heat produced by rapid movements we make.

A gain in heat energy usually causes the temperature to rise. A loss of heat usually causes the temperature to fall. We can see an example of heat gain when water changes to **water vapour**. We can see an example of heat loss when water vapour changes to water.

Discussion Questions

Activity 5

Water gains heat energy when it changes to water vapour. Do you think ice gains heat energy when it changes to water? Water vapour loses heat energy when it changes to water. Do you think water loses heat energy when it changes to ice?

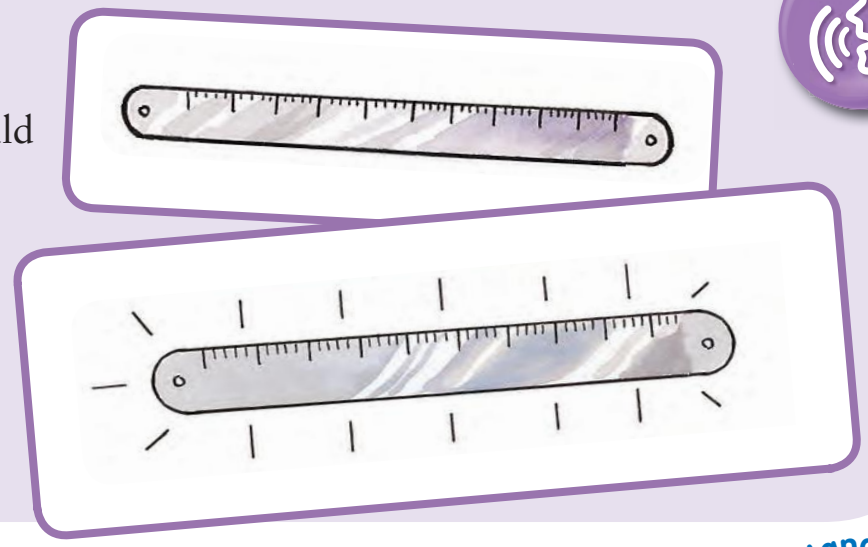
Look at the gaps between the slabs of the concrete floor. Look at the gaps on the rail tracks. Why do we leave gaps between the concrete slabs and between the rail tracks? What would happen on hot days if there were no gaps? Look at the telephone wires on a hot day and during the night when it is cooler. Why do wires hang lower during the day? Look at the loops in the steam and oil pipes. Sometimes, these pipes in hot countries have loops in them. Why do you think a loop is useful?

Heat makes a **solid** expand in every direction. Expansion is usually so slight that we cannot see the expansion with our eyes.

Discussion Questions

Activity 6

Look at the steel ruler. Would you expect it to increase in length, width and thickness when it is heated?
Look at the drawing of a steel ruler when it is at a higher temperature.
It is longer.



Hands-on Activity

Activity 7

You are trying to unscrew the tightly screwed steel cap on a glass bottle. No matter how hard you try, it will not loosen. What can you do to make it easier for you to loosen the cap? What will happen if you pour hot water over it? Do this activity with an adult.

Glass expands when heated. However, metal when heated expands more than glass. Therefore, the steel cap expands more than the glass bottle, making it easier to open the bottle.

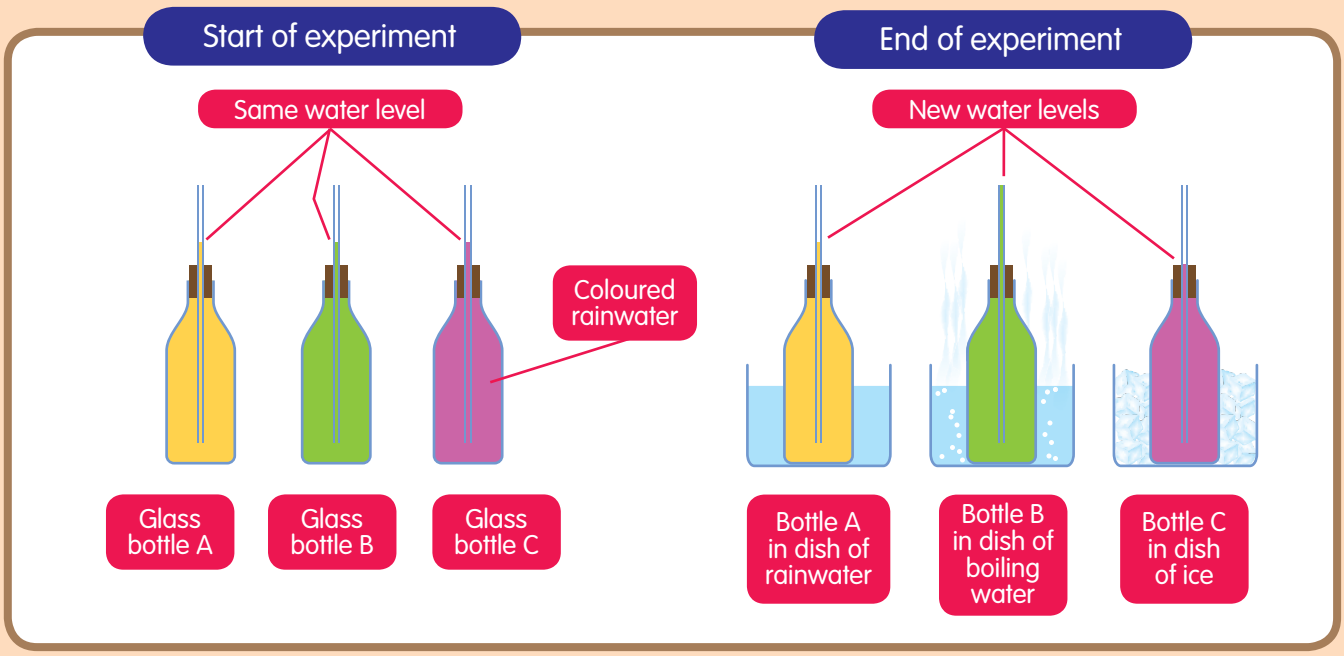
Like solids, liquids and gases also expand and contract with heat gain and heat loss. Look at the hot air balloon. It is an example of the fact that air expands when heated. Remember the liquid in thermometers? It is an example of the fact that liquids expand when heated.

Hands-on Activity

Activity 8

Look at the three glass bottles in the drawing below. They show the beginning of the experiment. The water level in all three glass bottles is the same at the start of the activity. Place the three glass bottles in three dishes of water of the same size. The temperature of the water in each dish is different. Look at what happens at the end of the activity. Is there any change in the water level in glass bottles A, B and C?

If the water level in glass bottle B is higher, we know that water expands when heated. If the water level in glass bottle C is lower, then we know that the water contracts when cooled. The water level in the glass bottle A remains the same, as this is our control.

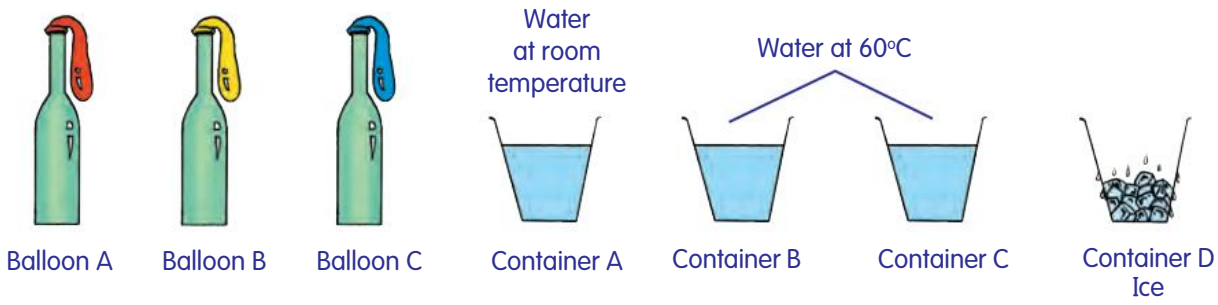


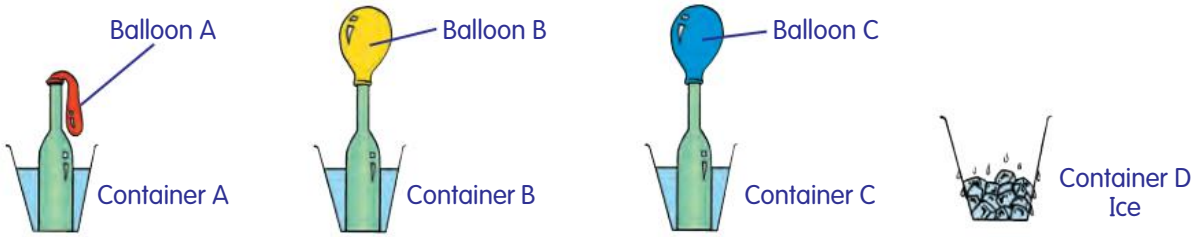
Activity 9

Hands-on Activity

Try this activity to see how air expands when heated and contracts when cooled.

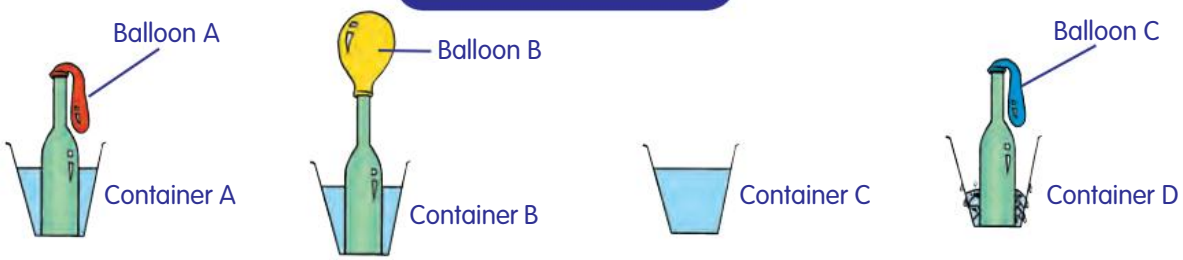
Start of experiment





In your exercise book, write down what you observe for each of the balloons, A, B and C.

End of experiment



Write down what you observe for balloon C when it is in the ice or (in cold water).

The air in bottles B and C **expands**. It moves into the balloons.

When the bottle with balloon C sits in the ice (or cold water), the air **contracts**. It has cooled. The air moves from the balloon back into the bottle.

Solids, liquids and gases expand when heated (heat gain) and contract when cooled (heat loss). Different things differ in how they expand. Usually, a liquid expands more than a solid, and a gas expands more than a liquid.

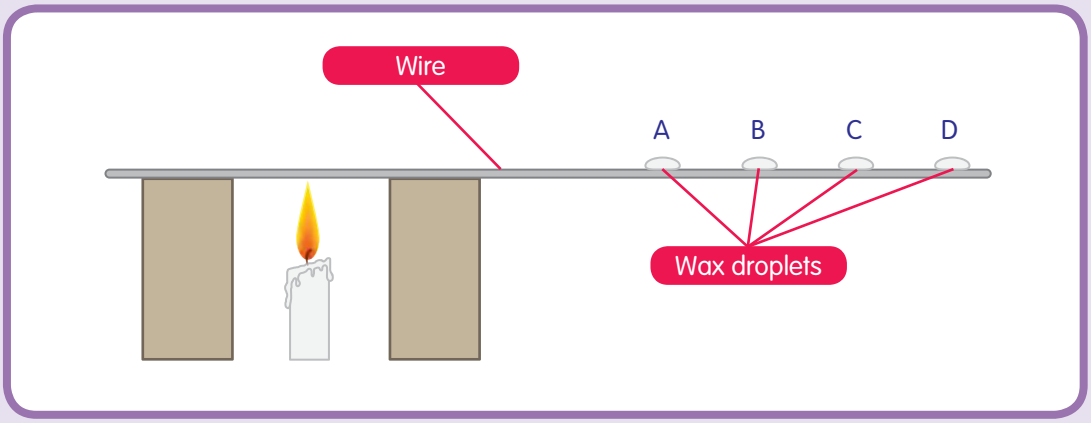
While most things expand when they are heated, water is unusual. It expands when it is cooled and changes to ice (heat loss).

Hotter to colder to same

What happens to a metal teaspoon if you leave it in a glass of hot water? Does the spoon feel warm? Heat from the hot water makes the spoon hot. Heat travels along the whole length of the spoon so that the handle also becomes hot. Heat travels from a hotter area to a colder area. This movement of heat energy is called the **conduction** of heat.

Activity 10

Look at the wire in the drawing. It sits on two blocks of wood. There are four drops of candle **wax** on the wire. They are 2 cm apart. A burning candle sits between the two blocks of wood. The candle heats the wire and the drops of wax at one end of the wire. Which drop of wax will melt first? Which drop of wax will be the last to melt? Will the wire get too hot to hold? Heat energy moves through the wire. We say that the wire **conducts** heat.

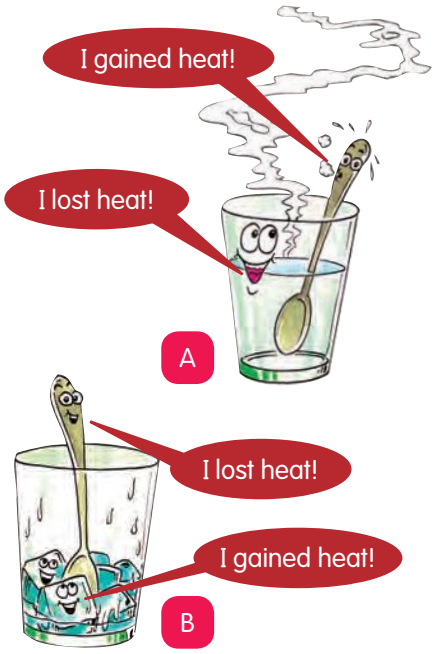


What happens to a metal teaspoon that is left in a glass of ice cubes? Does the spoon feel cold? Heat from the spoon moves to the ice. With the loss of heat, the spoon becomes colder. Heat travels from a warmer object to a cooler object.

In the first glass, the temperature of the water is higher than the temperature of the spoon. So heat travels from the water to the spoon.

In the second glass, the temperature of the spoon is higher than the temperature of the ice. So heat travels from the spoon to the ice. In the first glass, the spoon becomes warmer and the water becomes cooler. In the second glass, the ice becomes warmer and the spoon becomes colder.

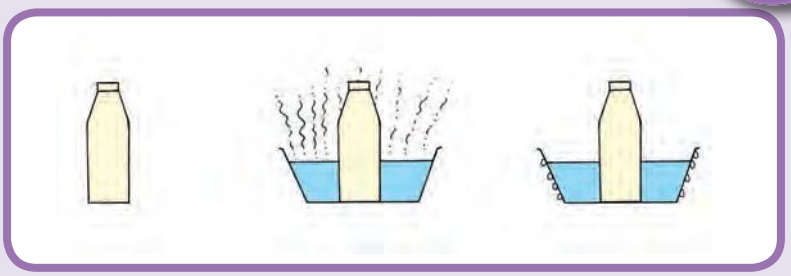
After some time, the temperatures of the two materials are the same.



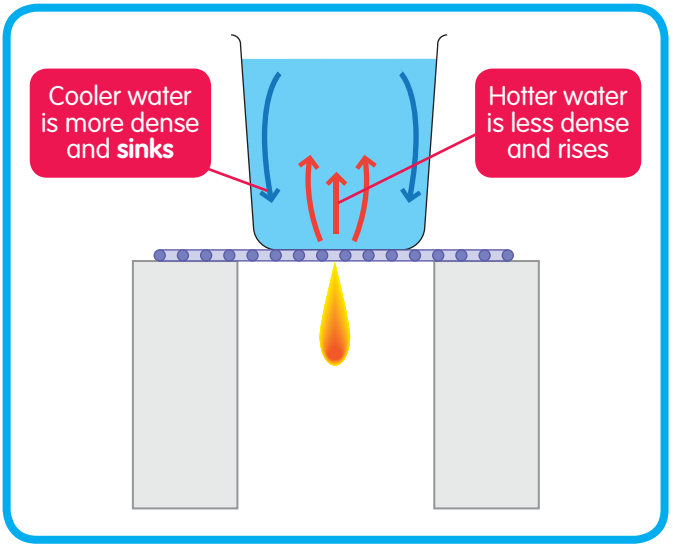
Discussion Questions

Activity 11

If you have a bottle of cold milk, do you place it in a dish of hot water if you want to warm it up? What happens if you place a bottle of warm milk in a dish of cold water?



Another way that heat energy travels is by **convection currents**. Look at what happens when we heat water. Observe the moving **currents** of warm and cold water in the drawing. The water that is receiving the heat becomes warmer than the other water around it. The warm water moves up. It is replaced by cooler water that moves down. The moving currents of warm and cold water are called convection currents. These convection currents cause all the water in the jar to be heated.



Activity 12

Discussion Questions

In a smoke-filled room, why is it better to crawl on the floor? In a refrigerator, why is the freezer compartment placed at the top? Remember that warm water and warm air rise.

What happens when you stand under the hot Sun? Radiation from the Sun makes you warm. This is another way that heat energy can travel.

Good or poor

Your teaspoon became warm when you left it in a glass of hot water. What would happen if you had left a plastic teaspoon in the glass of water? Would it get as warm as the metal teaspoon? Materials differ in how well they conduct heat. Poor conductors allow heat to pass through slowly. They are called **insulators**. Good conductors allow heat to pass through quickly.

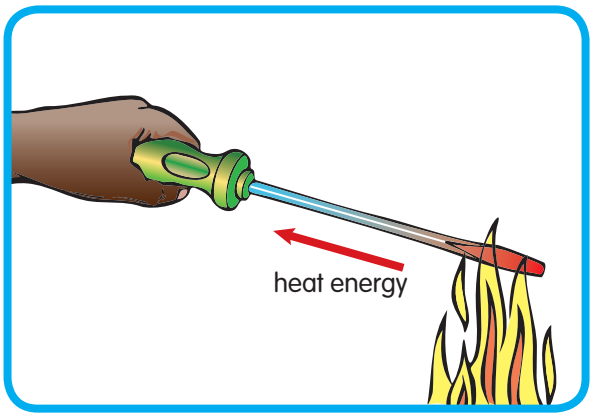
Activity 13

Discussion Questions

Look at the drawing. If someone holds a piece of wire in the fire, what do you think the person will feel? Does this show that the metal in the wire is a good conductor? We cannot see heat travelling along the wire, but we can feel heat when it reaches our fingers.

Look at a pot from your kitchen. Is it made of metal? Metals are usually good conductors of heat. Some metals are better conductors than others. Copper is a better conductor of heat than steel. This is why many pots have a copper base.

Glass, water, and air are poor conductors of heat. Many non-metals, such as plastic, wood, cork, and wool, are poor conductors. This is why they are used as insulators.

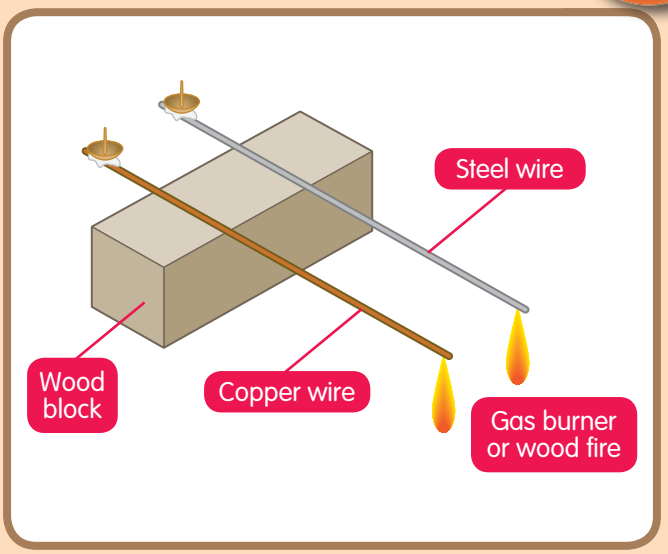


The tip of this screwdriver has a lot of heat energy. The heat energy is moving from the hot area to the cold area of the screw driver.

Hands-on Activity

Activity 14

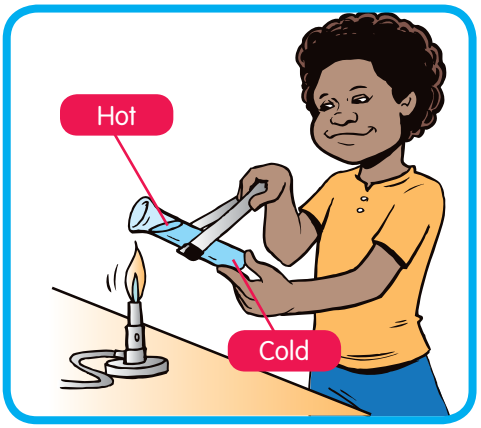
Set up two wires or rods as shown—one copper and one steel. The rods should each be the same length and thickness. Lay them on a block of wood. Attach a drawing pin to one end of each wire, using a piece of candle wax. Heat the other ends of the wires with a small wood fire or gas or oil stove. Observe what happens. Which drawing pin falls down first, the one on the copper rod or the one on the steel? Why do you think this happens?



The girl in the drawing is trying to heat the water in the container. She is heating the top end of the container. Will the water at the bottom become warm?

Heat energy always moves from a hot area to a cold area. When heat energy moves, it lowers the temperature of the hotter area and raises the temperature of the colder area.

Heat energy can move in three different ways—by **conduction**, by **convection** and by **radiation**.



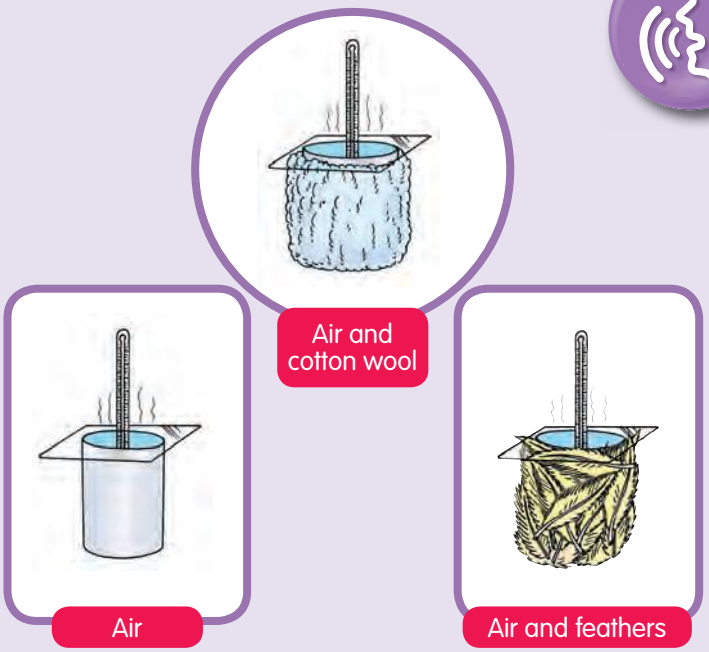
Water is a poor conductor of heat.

Discussion Questions

Activity 15

Here are three cans of the same size filled with the same amount of boiling water. One can is surrounded by air, the second by cotton wool and air, and the third by feathers and air. Which can will lose heat the quickest?

The air trapped in the cotton wool and feathers stops heat loss. The moving air around the can without any insulation carries heat away.



Think and Write

Activity 16

Heat and temperature

Think of more examples that show the difference between heat and temperature, and record them in a table in your exercise book. Two examples are given here.

Example	Heat energy needed (A lot or a little)	Final temperature (High, low or medium)
Red-hot needle	Little	High
Bath of warm water	A lot	Medium

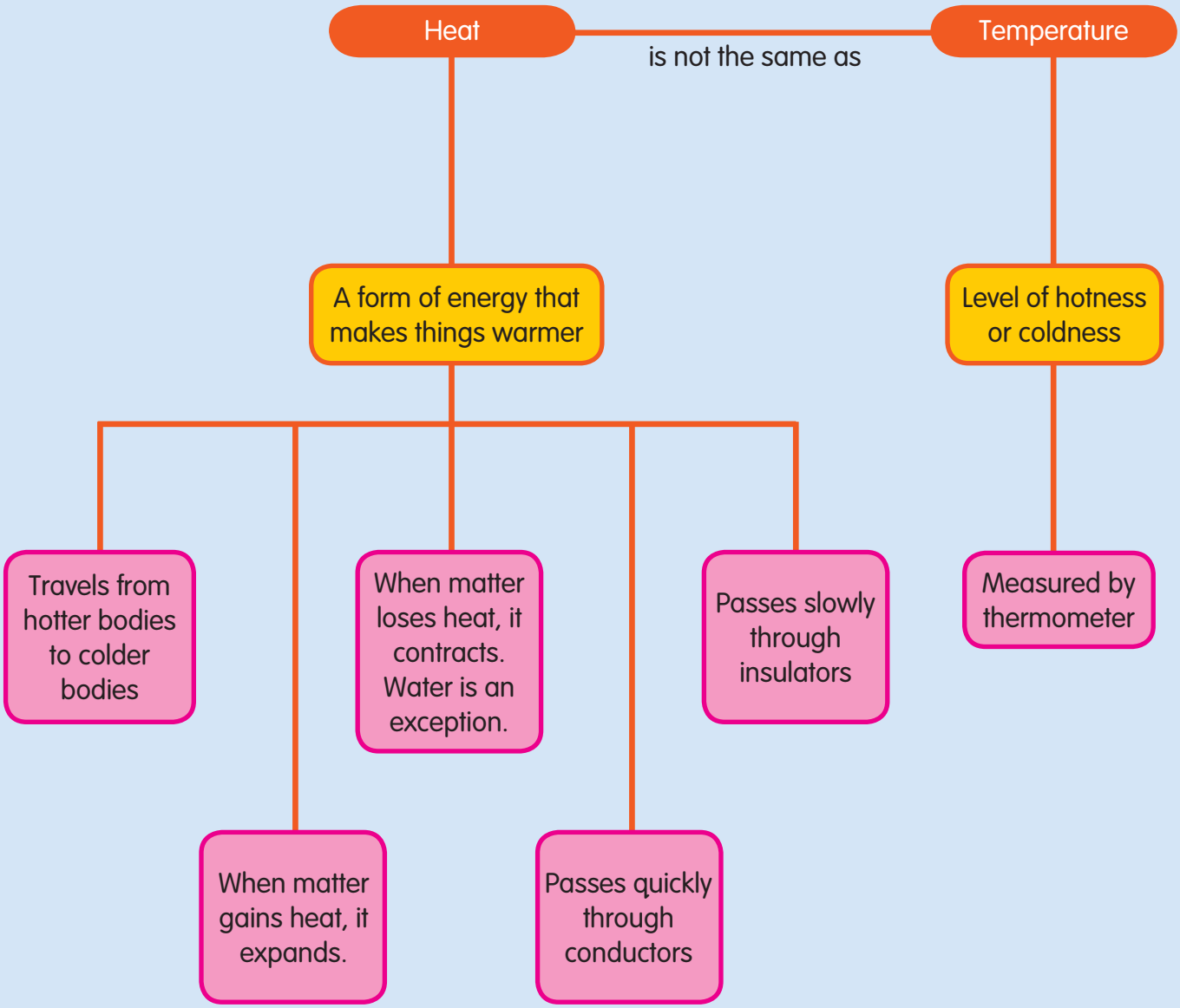
Hands-on Activity

Activity 17

Solar tea

Make your own tea with the power of the Sun. Fill a large glass jar with water. The water should be cool. Put a few tea bags or some loose tea leaves into the jar. Place the jar in the Sun for a few hours. When you return after a few hours, your tea will be ready. How did the heat travel from the Sun into your tea?

Heat and temperature



This concept map shows what heat is and what temperature is. It also shows how heat travels.

Chapter Review

1. The Sun is our main source of heat. It is not our only heat source.
2. Fuels, such as wood, coal, oil, natural gas, and petroleum, are also sources of heat.
3. Heat is the energy that can be given to an object to raise its temperature.
4. Temperature is the level of hotness or coldness of things. Thermometers allow us to find the exact temperature of things.
5. A loss of heat usually causes the temperature to fall.
6. A gain in heat usually causes the temperature to rise.
7. Solids, liquids, and gases normally expand when heated. They contract when cooled (heat loss).
8. Water is different from other liquids. It expands when it is cooled and changes to ice.
9. When the temperatures of two objects are different, heat energy travels from the hotter one to the colder one. The warmer object becomes colder. The colder object becomes warmer. After some time, the temperature of the two objects is the same. This is called conduction of heat.
10. Heat energy also travels by convection. When water is heated in a pot, currents of warm water rise in the water. These are convection currents. They cause the colder water to become warmer.
11. Heat energy also travels by radiation. An example is the Sun's heat coming to the Earth.
12. Metals are usually good conductors of heat. Some metals are better conductors than others.
13. Many non-metals, such as plastics, wood, cork, and wool, are poor conductors of heat. Therefore, they are good insulators.

Chapter 4

Push and pull

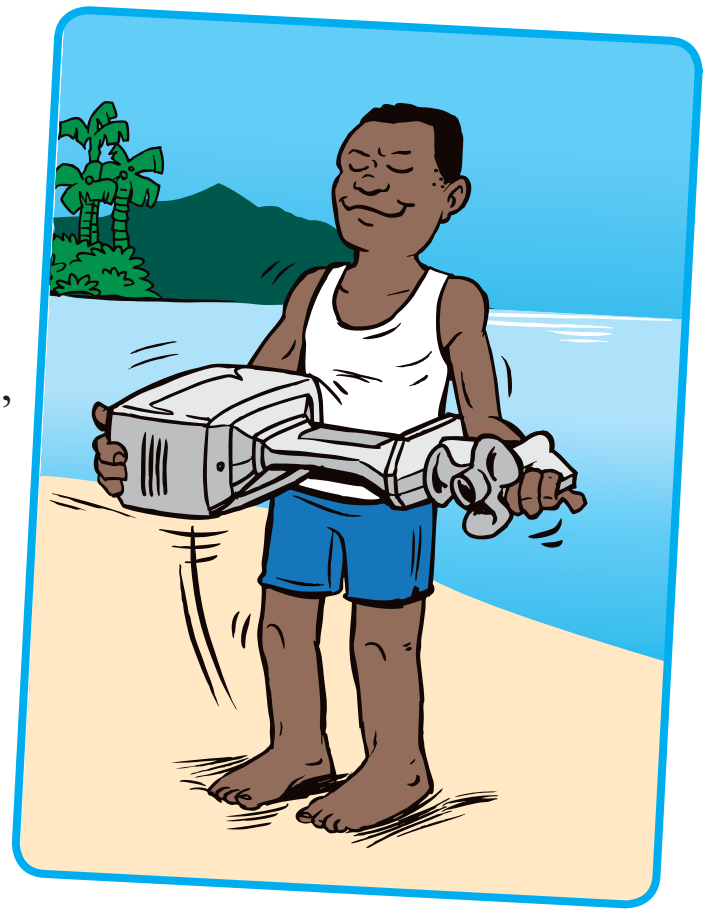
In this chapter, you will:

- identify a force as a push or a pull
- recognize the different types of forces
- understand the effects of a force
- recognize that when springs are stretched or compressed, they apply a force on whatever is stretching or compressing them
- recognize that friction is a force that opposes motion
- understand that simple machines make work easier
- list some simple machines.

Force

Look at the man lifting the outboard motor. You can see him pulling upwards. A pull or a push is called a **force**. A force is the strength used to lift something, push something away from us or pull it towards us. We see forces in action every day when we stretch, bend, twist, squeeze, or break objects. We use force to do these things.

There are forces in action around us every day. Wind pushes a sailboat, a truck tows a trailer, a fisherman pulls in a fish, a person throws a dart towards a dartboard. These are examples of forces at work.



What happens when we push or pull things?

We push the wheelbarrow when we carry **vegetables** from the garden. When we stop pushing the wheelbarrow, what happens to it? Does it still move?

The wheelbarrow stops moving. When an object is not moving, we say it is at rest. It will stay at rest until it is pushed or pulled. When we start to push the wheelbarrow again, what happens? The barrow moves in the direction of the force we apply to it. The push or pull we give to an object causes a change. The object comes to rest or it moves.

Activity 1

Think and Write

Classifying is an important skill. In classifying, we look for the common properties in a set of objects or organisms. We separate the objects or organisms into groups based on their properties.

Look at the people in the pictures below and on the next page. The people are applying forces. Draw up a table in your exercise book using the headings shown here. Classify the forces. Divide them into pull forces and push forces. An example of each is given.

Pull	Push	Pull and push
Child pulling a toy truck	Squeezing coconut	Opening and closing a drawer

Striking a match

Ringing a school bell

Closing a door

Using bicycle pedals to ride

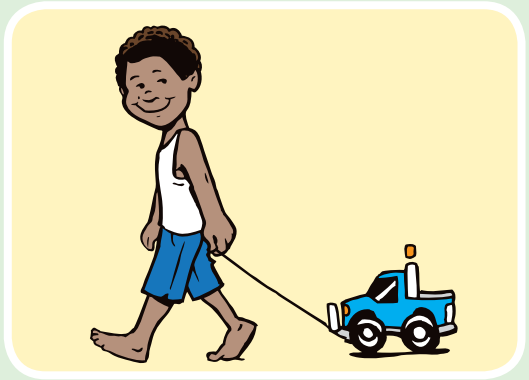
Opening a drink can

Opening and closing a box

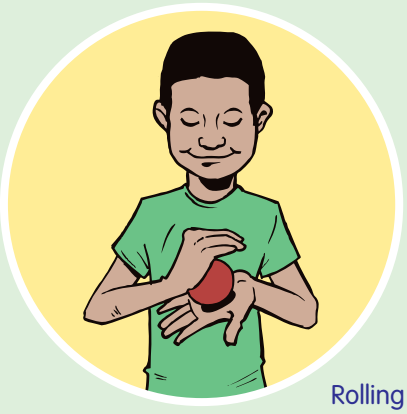
Pressing the keys on a mobile phone

Picking up your school bag from the floor

Squeezing grated coconut



Pulling a toy truck



Rolling a ball of clay

Raising a flag on a flagpole

Opening and closing a drawer

A moving object will continue to move at the same speed and in the same direction unless there is a push or a pull on it. A push or a pull will stop the object, slow it down or speed it up. The push or pull may also change its direction.

If the boy walks at the same speed and pulls the suitcase, will there be a change in the speed of the moving object?

What happens when the boy's sister decides to help him pull the suitcase? Will the suitcase be easier to pull? Will it move faster?

What happens when the boy's younger brother decides to sit on the suitcase? Will the suitcase be easier to pull? Will it move faster?

What happens when the boy decides to run as he pulls the suitcase?

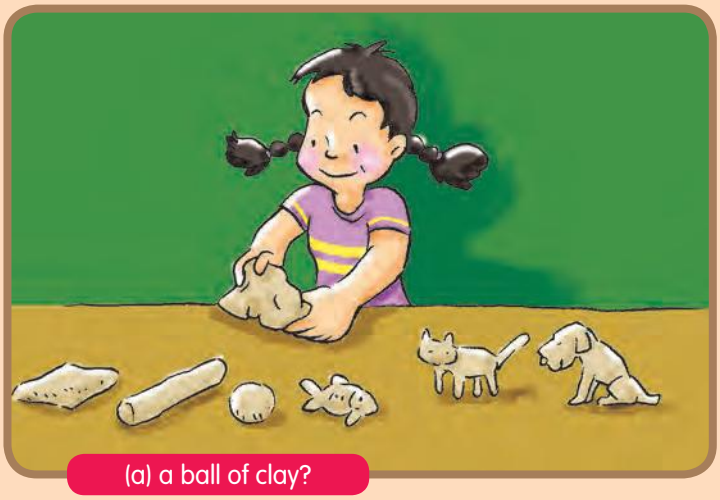
What happens when the boy decides to turn to his left while pulling the suitcase?

A force can change the state of rest or motion of an object. It can also change the shape of an object. We can twist or squeeze an object.

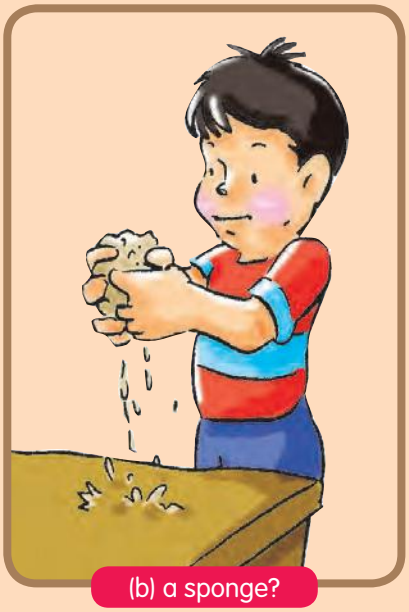
Hands-on Activity

Activity 2

See how many ways you can change the shape of:



(a) a ball of clay?



(b) a sponge?

(c) a sheet of paper?

(d) a rubber band?

(e) a shoebox?

(f) a drink can?

When a force changes the shape of an object, does the object stay in that changed shape? Does it go back to its original shape? Objects that go back to their original shapes are **elastic** objects. Which of the objects above and on page 69 are elastic?

Hands-on Activity

Activity 3

Squeeze a sheet of paper into a ball. You are using a force. Can you see the force you are using? Can you feel the force you are using? You can feel a force but you cannot see it. A force is not something we can see. We can feel a force.

Activity 4

Discussion Questions

Look at the woman exercising. She is applying a force each time she lifts the stones. When she lifts the stones she is doing work. Whenever a force causes an object to move, work is done.

Is the woman doing work if the stone does not move? The stone is not moving, so the woman is not doing any work. Her arms get tired because she holds the stone. Her muscles use energy to hold the stone. However, the stone is not moving, so the woman is not doing any work. She does work only when the stone moves.

Are you doing work when you push hard against a brick wall?

Look at the picture of the girl raising the flag. What is the girl pulling on? Is she doing work? What direction is she pulling in? What made it easy for her to raise the flag? She is using a simple machine called a pulley to help her raise the flag. Anything that makes it easier to apply a force is called a **machine**. Simple machines are tools such as pliers and scissors and things such as pulleys, gears, and door handles.

Levers

Put a large stack of books on the floor. Is it easy to lift this large load ? Can you use something to help you? Do what this drawing shows.

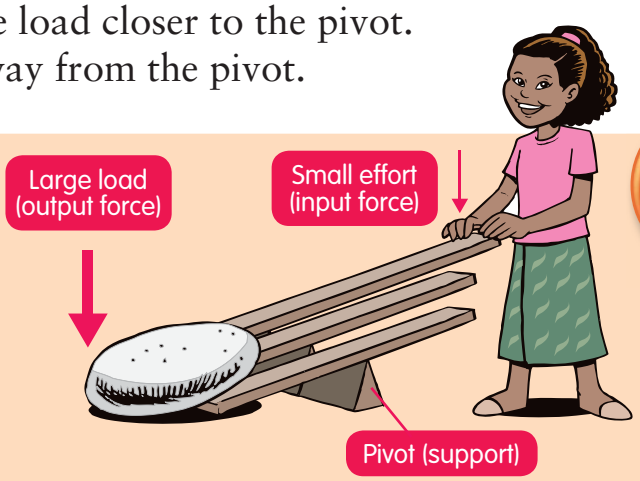
A **lever** is a simple machine that allows us to use a small force to lift a large load. This type of lever is a force **magnifier**. The force that we apply on the machine is called the **input force**. The force that the machine uses on the object is called the **output force**.

You apply a small effort (input force). The lever gives you many times that force. The output force is large. Notice that the **pivot** is between the load (books) and the effort (you). The pivot is a fixed point. The force acts around the fixed point. The lever gives more output force if you move the load closer to the pivot. It gives more force if the effort is far away from the pivot.

Activity 5

Hands-on Activity

Use sticks of different lengths and a piece of wood (as a pivot) to lift a large stone upwards. Which length of stick makes the job easiest?

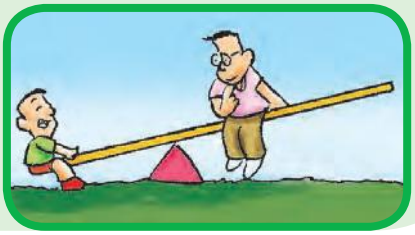


Activity 6

Think and Write

Think about sitting on a seesaw with your father. Should you and your father sit at the same distance from the pivot if you want to lift your father? Should your father sit near the pivot or far away from the pivot? Should you sit near the pivot or far away from the pivot? Write the answers in your exercise book.





Activity 7

Hands-on Activity

Place a stack of books on a table. Slip your hand under the bottom of the books. Can you lift the stack of books?

Place a pencil under a metal bar to make a lever. Place the stack of books on the lever. Use your hand to push down on the lever to lift the stack of books. Did the lever make it easier to raise the stack of books?

A **lever** is a rigid bar that moves about a **fixed point** (pivot). The forces act around the pivot. A force is applied at one point (effort or input force). The force acts through the bar. It overcomes another force (load or output force). It causes movement.

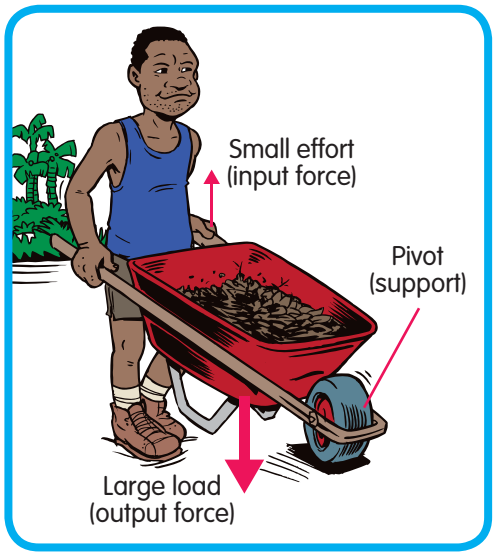
When you apply force at one end of a lever, what happens to the other end? When one end goes down, the other end goes up. The direction of the force changes. Examples of this type of lever are crowbars, scissors, pliers, and seesaws.

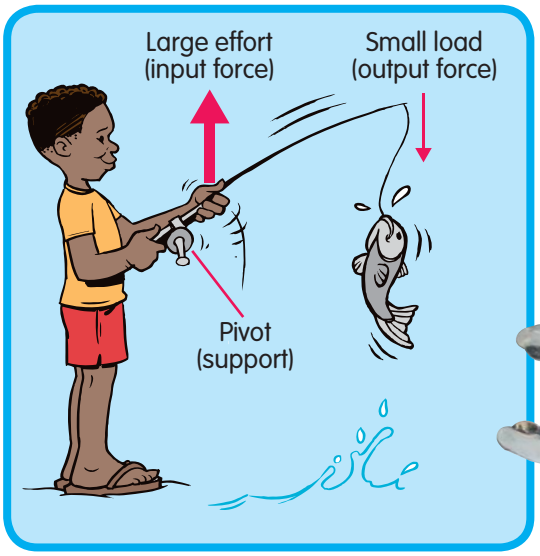
A screwdriver and a claw hammer make work easier. The screwdriver can be used as a lever to open the lid of a can. The claw hammer can be used to pull a nail out of wood.

Look at the wheelbarrow. A small effort moves a large load. Notice that the load is between the effort and the pivot. Another example is the bottle opener.

Some levers do not increase the force. They increase the movement.

Look at the fishing rod. The effort is greater than the load. But a small movement of the effort causes a large movement of the load. The load moves at greater speed over a longer **distance**. Notice that the effort is between the load and the pivot. Other examples of this type of lever are tongs and a broom.



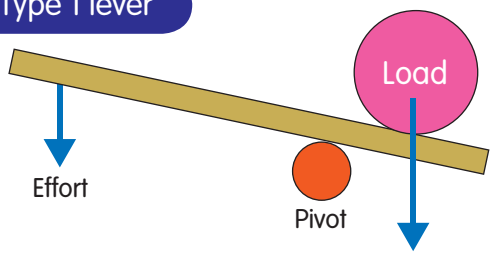


Think and Write

Activity 8

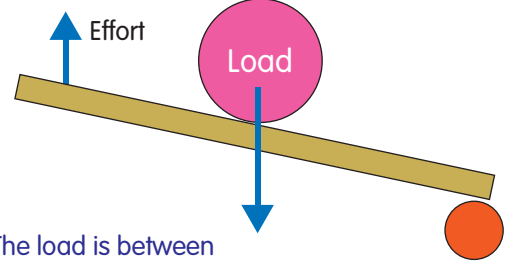
The drawings show the three different types of levers. Look at the levers shown in these drawings.

Type 1 lever



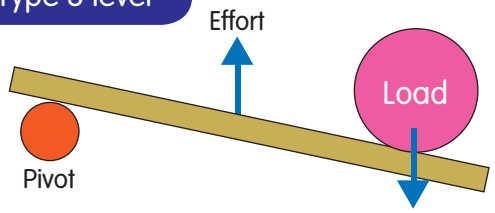
The pivot is between the effort and the load.

Type 2 lever



The load is between the pivot and the effort.

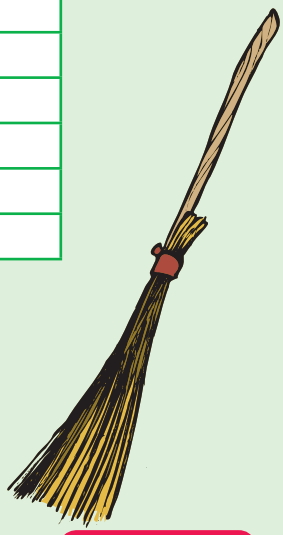
Type 3 lever



The effort is between the pivot and the load.

In your exercise book, draw up a table like the one shown here. For each lever, answer the questions in the table.

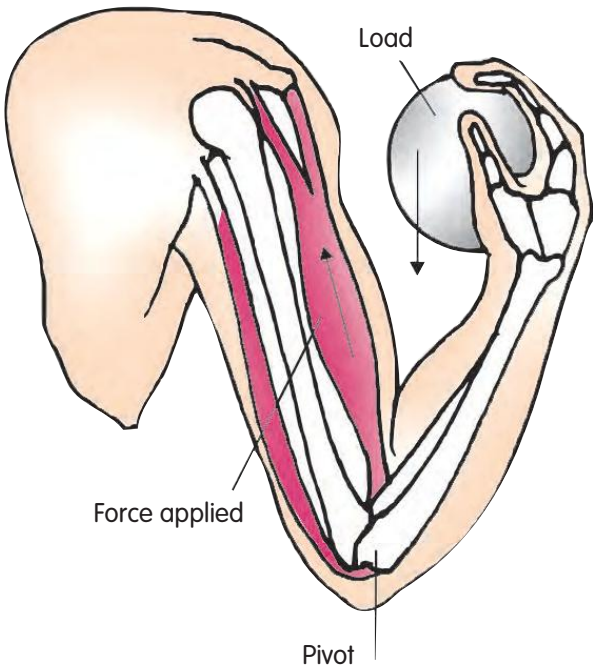
Lever	Is the effort greater than the load? Yes/No	Which type of lever is it? Type 1, Type 2 or Type 3
Scissors		
Tongs		
Pliers		
Broom		
Bottle opener		



Levers in humans

We have levers inside our bodies. The muscles provide the force that enables our bones to move. In your arm (pictured), the biceps muscle provides the input force or effort. The hinge joint at your elbow is the pivot. The output force acts on the load that you hold in your hand. A small movement of your arm muscles causes a large movement of your hand. When we use our arms to lift weights, we are in effect using levers.

Is your arm a Type 1, 2 or 3 lever?

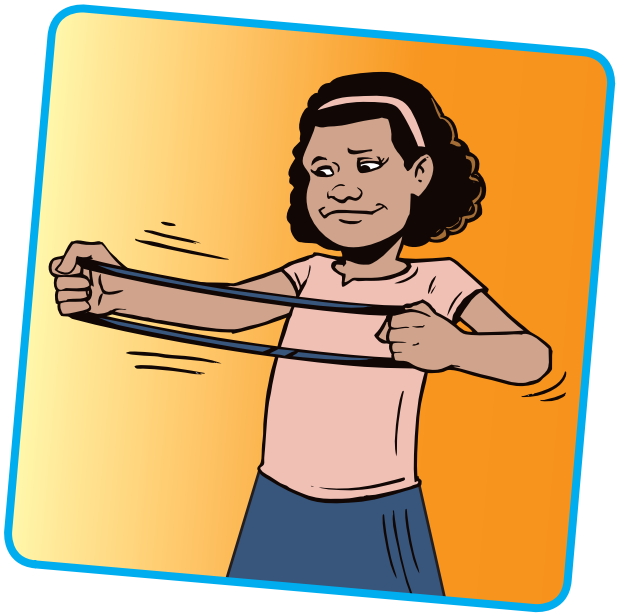


Elastic spring force

Look at the girl stretching the length of strong rubber tubing.

What is the girl doing? What happens to the rubber?

The girl applies a force. The elastic tubing stretches. The elastic applies a pulling force. This is an **elastic spring force**. The pulling force acts on the girl's arm. When the girl stops pulling, the elastic returns to its original length and shape.



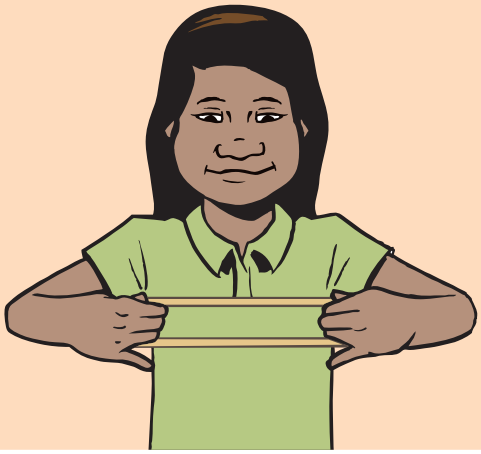
Hands-on Activity

Activity 9

Stretch a rubber band.

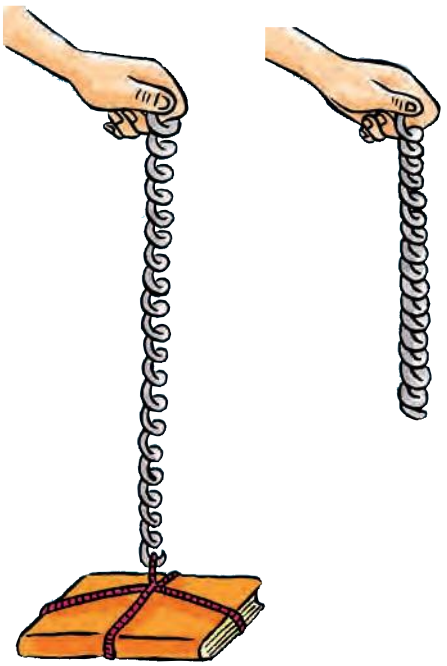
What happens when you stretch it and hold it? The rubber band applies an elastic spring force inward. Your hands apply an outward force.

When the forces acting on the rubber band are balanced, nothing moves. What happens when you increase or decrease your pull on the rubber band? Is there a change in the length of the rubber band? Is the change bigger when you stretch the rubber band more?



Look at the spring with a book tied to it (below).

The spring extends or stretches because the book pulls downwards. When the spring is stretched, it applies an elastic spring force. When the book is removed, the spring goes back to its original length.



Activity 10

Springs are in many things that we use.

In your exercise book, make a list of objects that contain springs. Write a statement explaining the uses of the elastic spring force in each case.

Draw up a table in your exercise book. Record your statements in the table. Some examples of objects are given.

Object containing a spring	Use of the spring
Motor vehicle	
Bicycle saddle	
Market scale	
Mattress	

For example, the spring in the bicycle saddle is squeezed when the person sits on it.

What happens when the person gets off the bicycle?

Frictional force

Activity 11

Walk for 10 steps. Think about the soles of your feet. What do they do each time you take a step? The soles of your feet push down on the ground. The ground pushes back on your feet. Your legs push backwards and your body is moved forward. Walking would not be possible without frictional force. Friction between the soles of our feet and the ground helps us walk, run and stop.

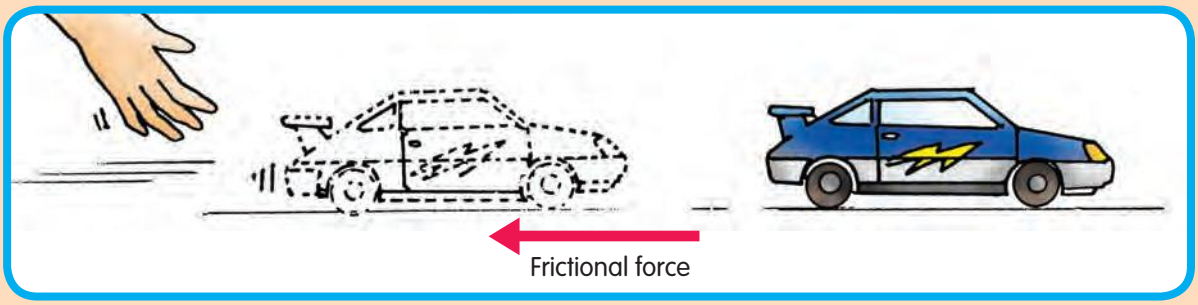
Stand firmly on both feet. Try sliding your right foot across the floor.

Before you slide your right foot, you transfer most of your body weight to the left foot. This happens so that friction is reduced. It allows you to slide your right foot easily.

Frictional force makes it more difficult for objects to move. It slows the movement of objects. It also produces heat. It wears down surfaces of objects.

Observe what happens when you push a toy car forward.

The toy car moves forward. After some time it slows down and stops. Frictional force is a **drag**. It slows down the toy car.



Objects moving through the air also experience frictional force. The drag of a parachute helps a skydiver to land safely.

Look at the soles of an old pair of boots. Why are the soles of the boots worn?

The girl rubs her hands together to get warm. This produces heat by friction.

Give other examples of frictional force at work.

Friction is a problem for three reasons:

- the moving parts of a machine need more energy to overcome friction
- objects suffer more wear and tear
- more heat is produced.

Friction is a problem. But it is also a useful force. Think about these questions.

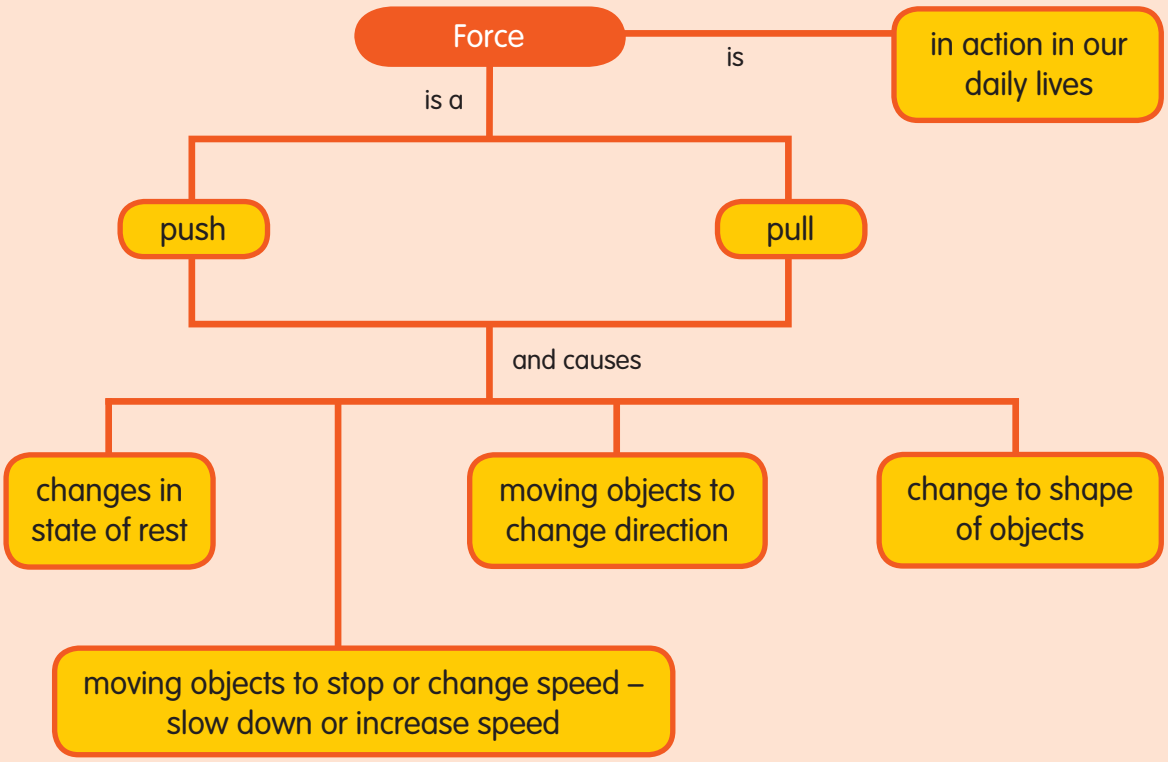
- Can you use your pencil to write on paper without friction?
- Will your feet slip off the pedals of your bicycle without friction?
- Will a bicycle's tyres slip without friction?
- Can we drill holes without friction?

Think of other examples where friction is necessary.

Chapter Review

1. A force is a pull or push.
2. We can apply a force by pulling on an object, pushing it, twisting it, or squeezing it.
3. Forces can make objects move, stop objects from moving, change the speed of moving objects, and change the direction of moving objects.
4. Forces can change the shape of objects.
5. Simple machines make work easier. They include levers and pulleys.
6. Work is done whenever a force causes an object to move. No work is done when the object does not move.
7. The characteristics of simple machines are shown in the table on the following page.
8. In our bodies, most bones and muscles work together as lever systems.

What force is and what force does



Types of lever

	Examples	Work made easier
Lever Type 1	Claw hammer, screwdriver (used as lever), crowbar, scissors, pliers, seesaw	• Enables smaller force (effort) to overcome larger force (load) • Smaller effort has to move over longer distance • Direction of force is changed
Lever Type 2	Bottle opener, wheelbarrow	• Enables smaller force (effort) to overcome larger force (load) • Smaller effort has to move over longer distance • Direction of force is not changed
Lever Type 3	Tongs, tweezers, broom, fishing rod	• Force applied is greater than load • Small amount of effort causes large movement of load, allowing load to be moved at a greater speed and over longer distance

Revision

Answer the following questions in your exercise books.

1 Use the following words to complete the two statements below about levers.

handles greater movement lever arms large

a A pair of pliers is an example of a _____. The force you apply at the jaws of the pliers is _____ than the force you apply at the pliers' _____.

b Your _____ are examples of a lever where a small muscle _____ in your arms causes a _____ movement of your hands.

2 Which one of these statements is not correct?

A In a fixed pulley, the direction of the force is changed.

B If a simple machine increases the force, it also increases the distance moved.

C Not all levers change the direction of the force.

3 Which of these statements are true? Choose from A–D below.

a Friction enables us to use a crayon to colour a picture.

b Friction is always useful.

c A cushion of air reduces friction.

d Rubbing our hands together causes friction.

A a, b and c only

B a, b and d only

C b, c and d only

D a, c and d only

4 In the picture, the force in action is a/an:

A frictional force acting between two surfaces

B elastic spring force

C magnetic force

5 Friction can be a nuisance, but it is also a necessary force. What do we mean by this statement?

Chapter 5

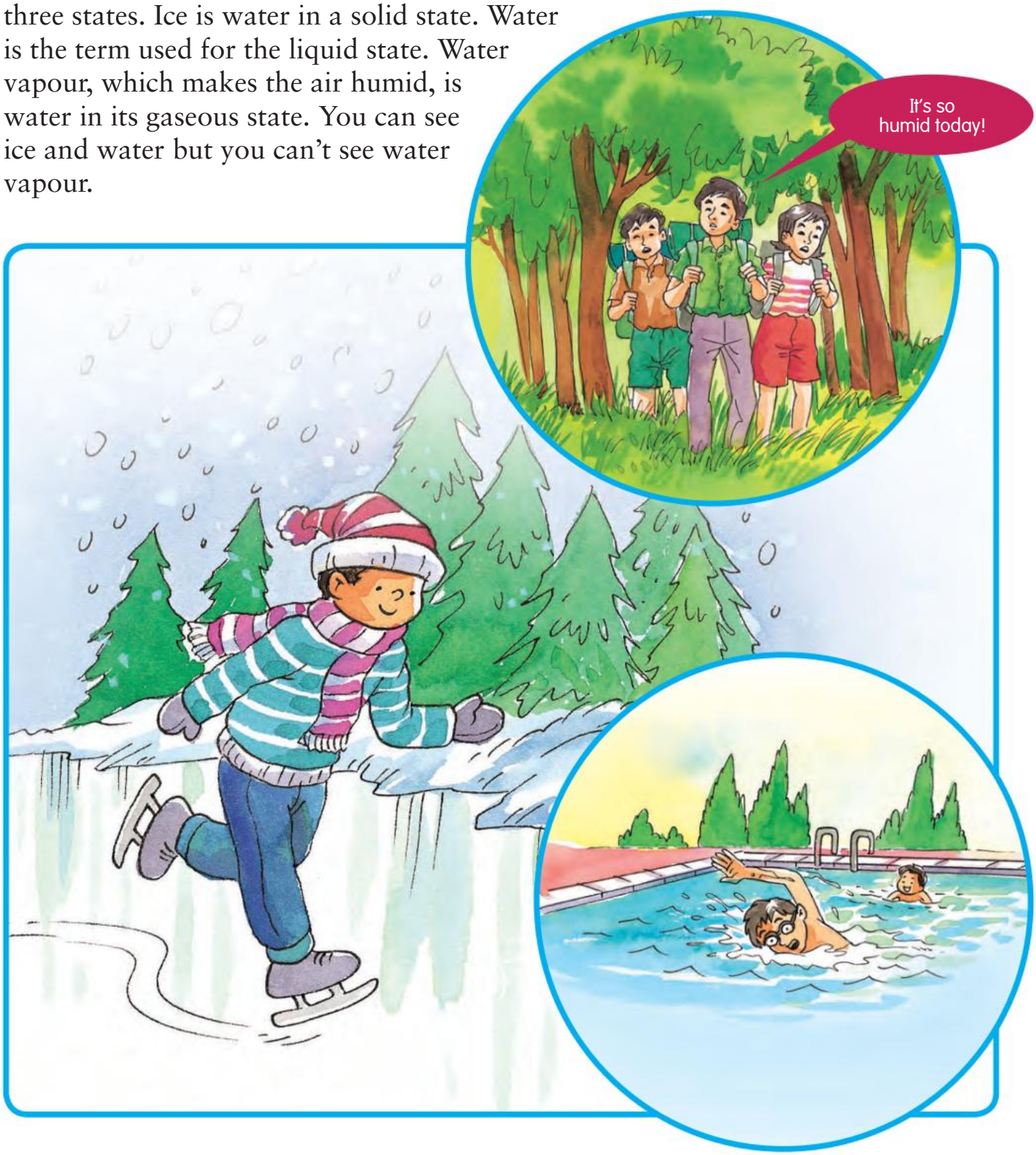
Exploring water

In this chapter, you will:

- recognize that water can exist in three states of matter
- investigate the effect of heat gain and heat loss on the different states of water
- know the freezing point (or the melting point of ice) and the boiling point of water
- understand the importance of the water cycle
- understand the roles of condensation and evaporation in the water cycle
- understand the importance of water and of conserving water in life
- appreciate that water pollution has an impact on the Earth's water resources.

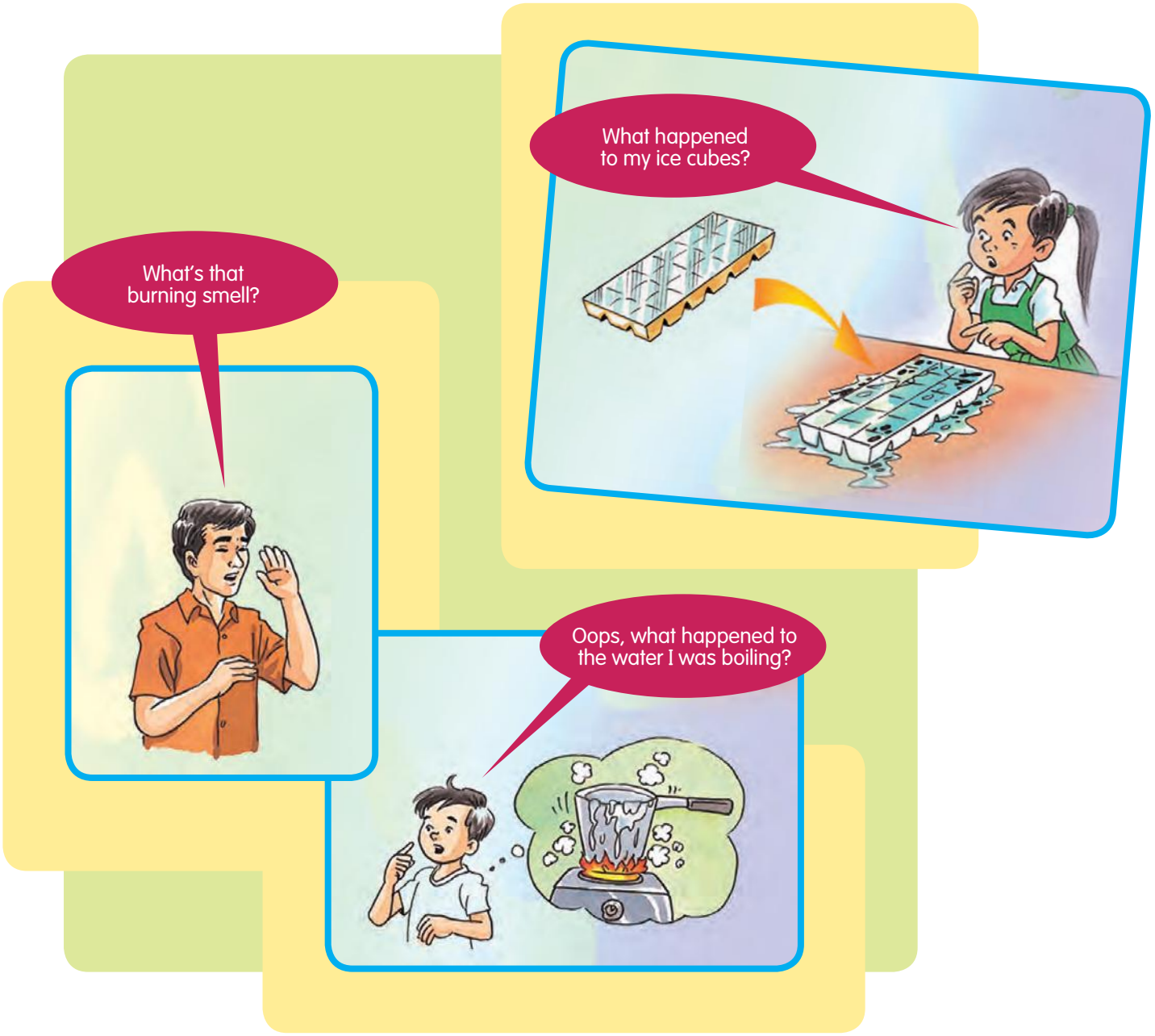
States of water

Look at the children ice skating, swimming in the pool and hiking in the rainforest on a warm, humid day. What is one common thing that all the children come across? They come across water in its three states. Ice is water in a solid state. Water is the term used for the liquid state. Water vapour, which makes the air humid, is water in its gaseous state. You can see ice and water but you can't see water vapour.



Look at what happens when you leave your ice cubes on the table. Look at what happens when you forget about the saucepan of water that you are boiling on the stove.

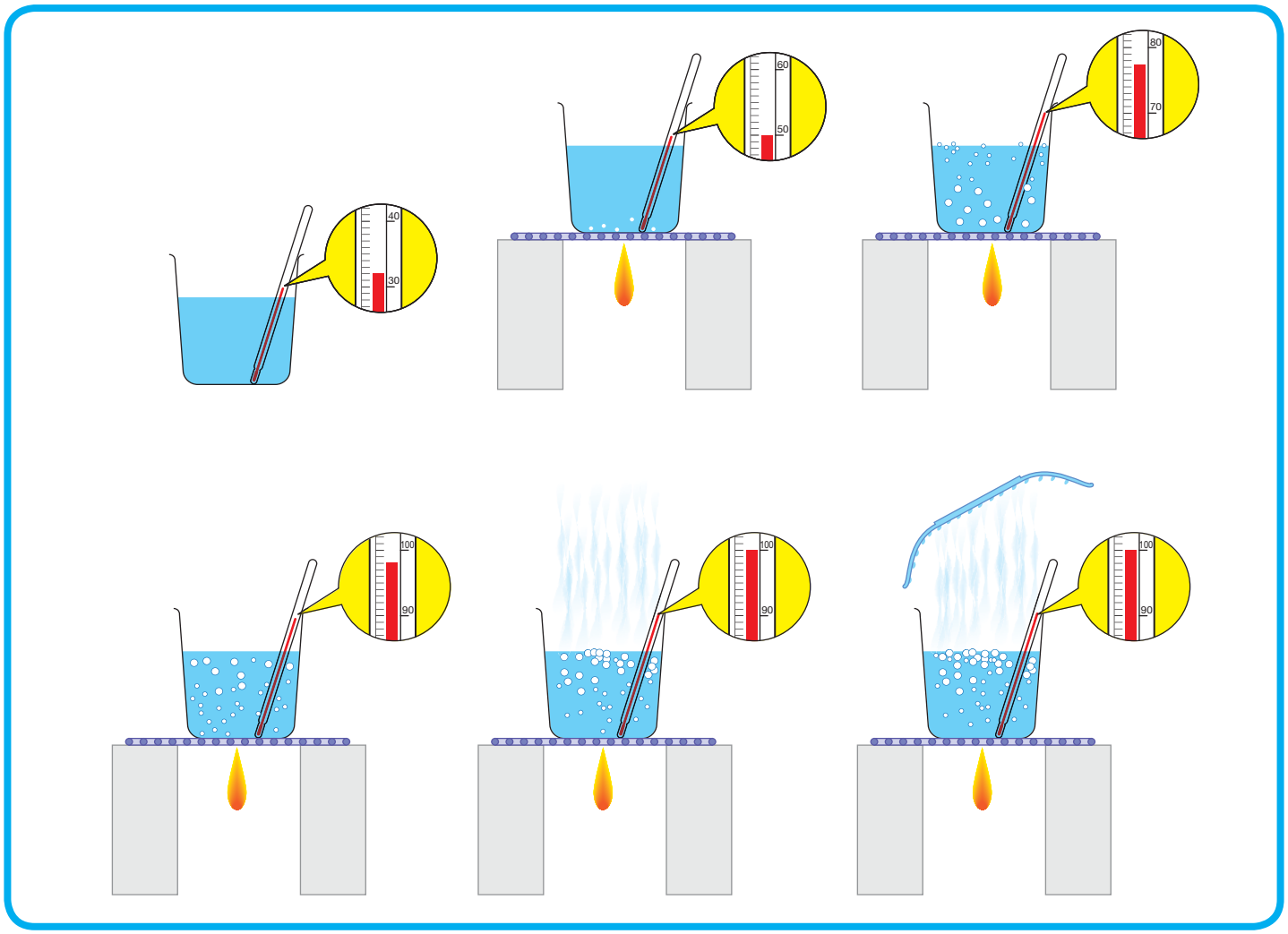
Ice changes to water when it is warmed. Water changes to water vapour when it is heated. Water vapour changes to water when it is cooled. Water changes to ice when it is cooled. What is needed to make water change from one state to another?



From water to water vapour and back

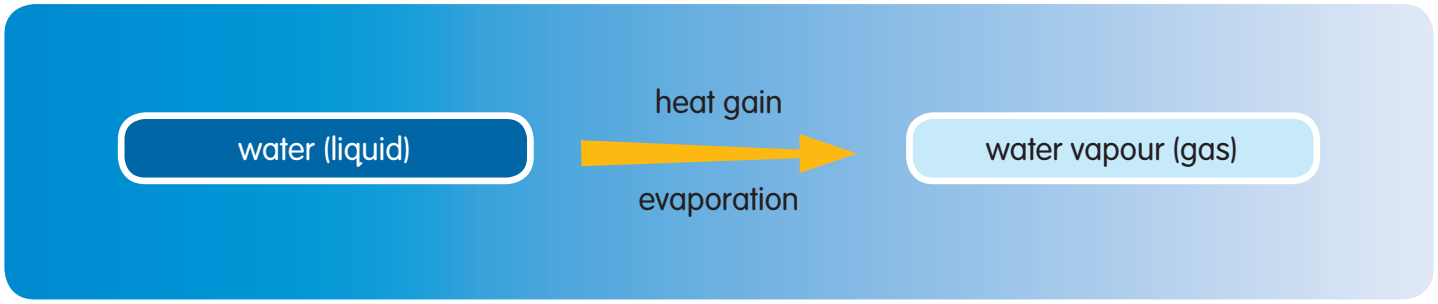
Heat energy is needed when water changes from a liquid to a gas. Look at the series of drawings. They show what happens when water is heated.

- Can you see the temperature of the water at the start?
- Can you see small bubbles moving from the bottom of the glass jar to the top?
- Can you see large bubbles at the bottom of the glass jar?
- Can you see large bubbles moving from the bottom to the top and bursting at the surface?
- Can you see a fine mist of water droplets (steam)?
- What happens when a glass plate is placed above the beaker to catch the steam?
- Can you see the temperature of the water at the end?



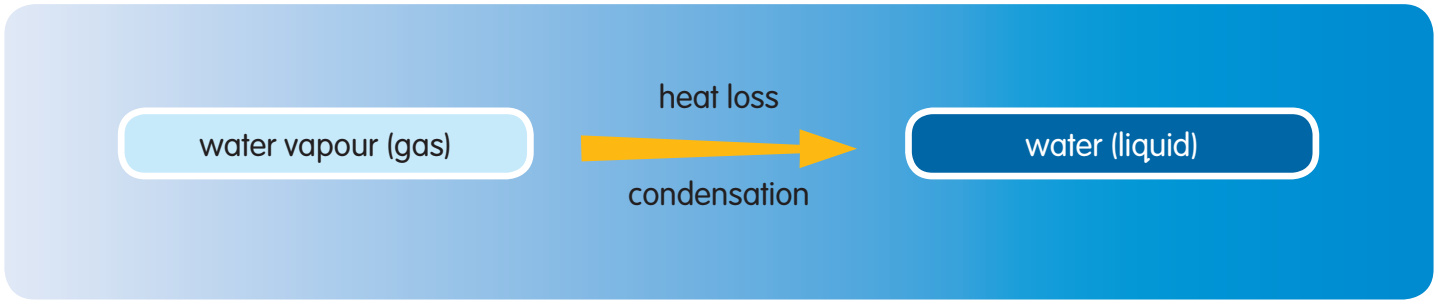
Boiling point and evaporation

Boiling occurs when large bubbles form, rise to the surface and burst. The temperature at which pure water boils is 100°C. This is called its **boiling point**. When water is heated to its boiling point, it changes to water vapour (gas). When a liquid turns into a gas at its boiling point, this is called evaporation. When water changes from liquid into a gas, heat is gained (taken in) by the water.



Condensation

We cannot see water when it is a gas. In the air, water cools and changes to liquid. This is called condensation. Heat is lost (taken out) during condensation.

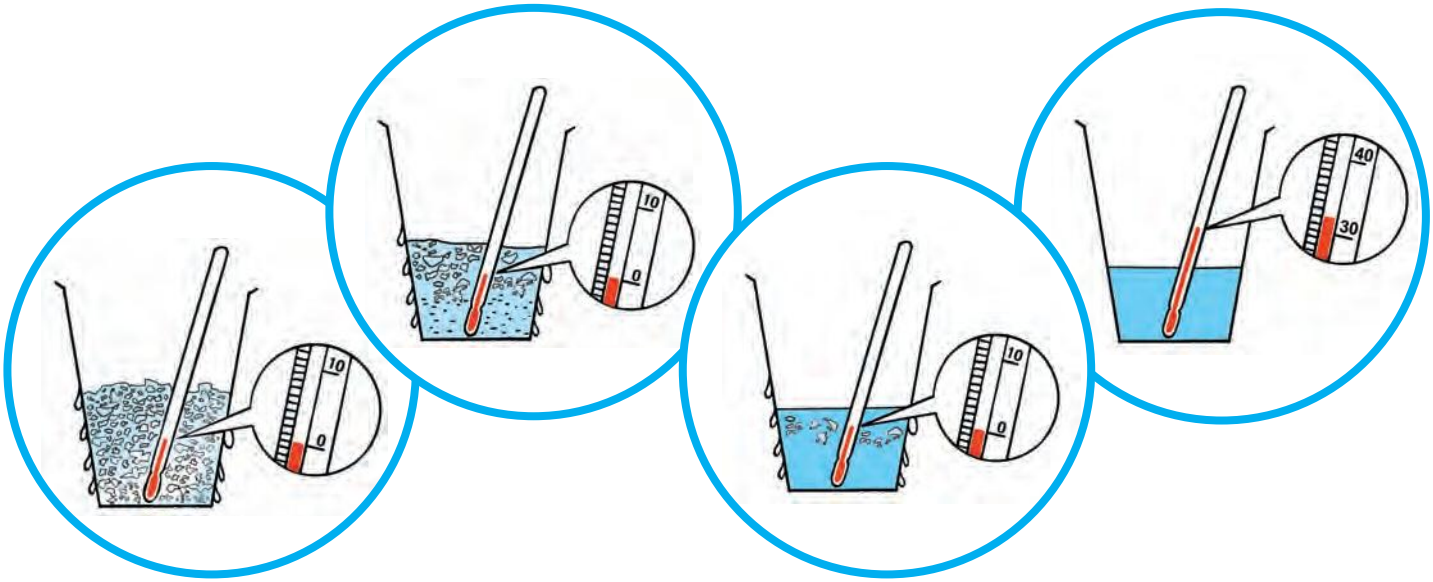


Activity 1

Is condensation the opposite process of evaporation? What happens in evaporation? Water changes to water vapour. What happens in condensation? The opposite process occurs. Water vapour changes to water.

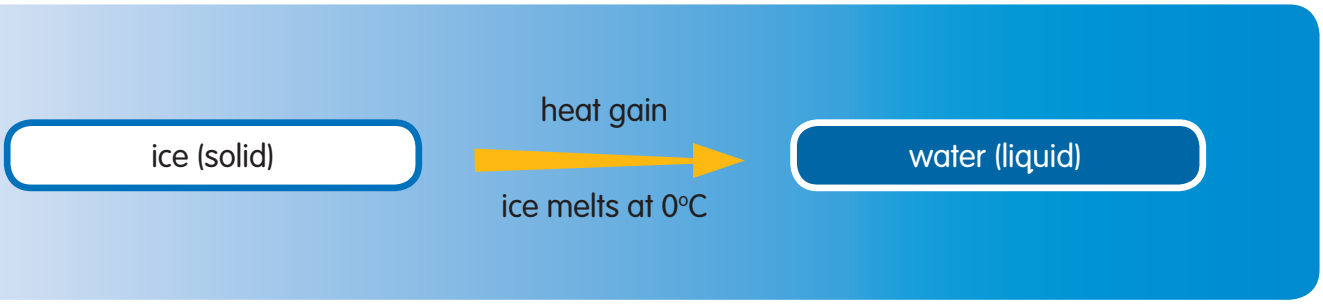
From ice to water and back

Heat energy is needed when ice changes to water. Look at the series of drawings. They show what happens when ice changes to water.



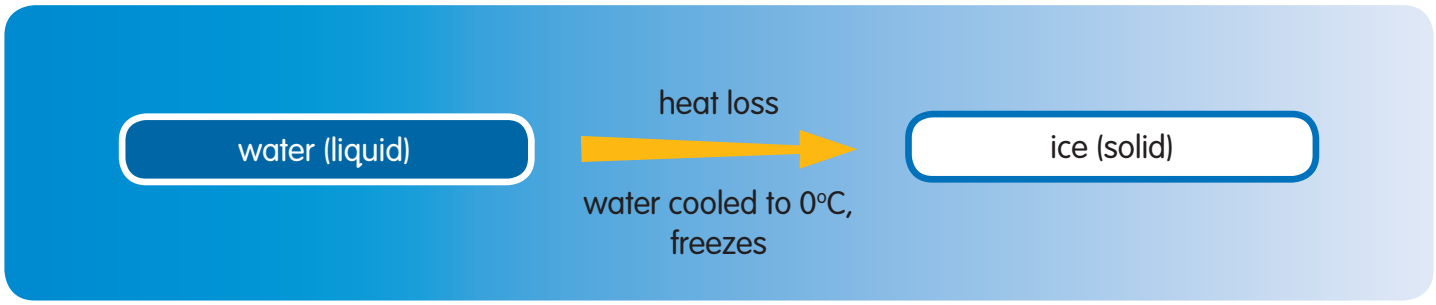
- Can you see the temperature of the crushed ice?
- Can you see that some of the crushed ice has changed to water? What is the temperature?
- Can you see that more of the crushed ice has changed to water? What is the temperature?
- Can you see that all the ice has changed to water? What is the temperature?
- Do you expect any changes in the temperature after a few hours?

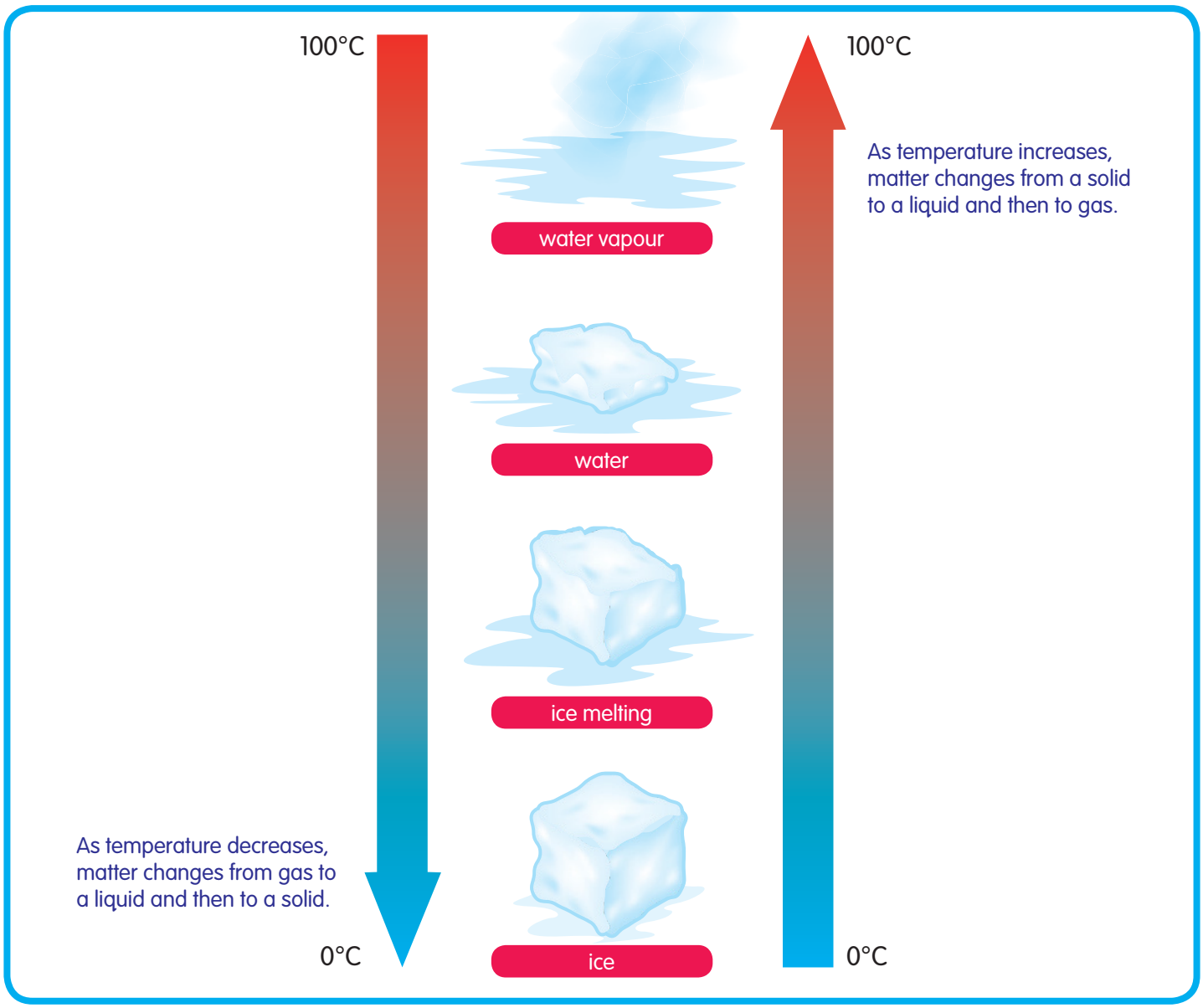
Melting occurs when ice, a solid, changes to water, a liquid.
The solid changes to a liquid. The melting point of pure ice is 0°C.
The ice gains heat when it changes from solid to liquid.



Freezing

Freezing occurs when water is cooled and changes to ice.
The liquid changes into a solid. The **freezing point** of water is 0°C.
The water loses heat when it changes from a liquid to a solid.





Are melting and freezing opposite processes? Would you expect water to freeze at a temperature that is the same as the melting point of its solid state? What temperature does water freeze at? What temperature does ice melt at? The freezing point of pure water is the same as the melting point of pure ice. This temperature is 0°C.

Hands-on Activity

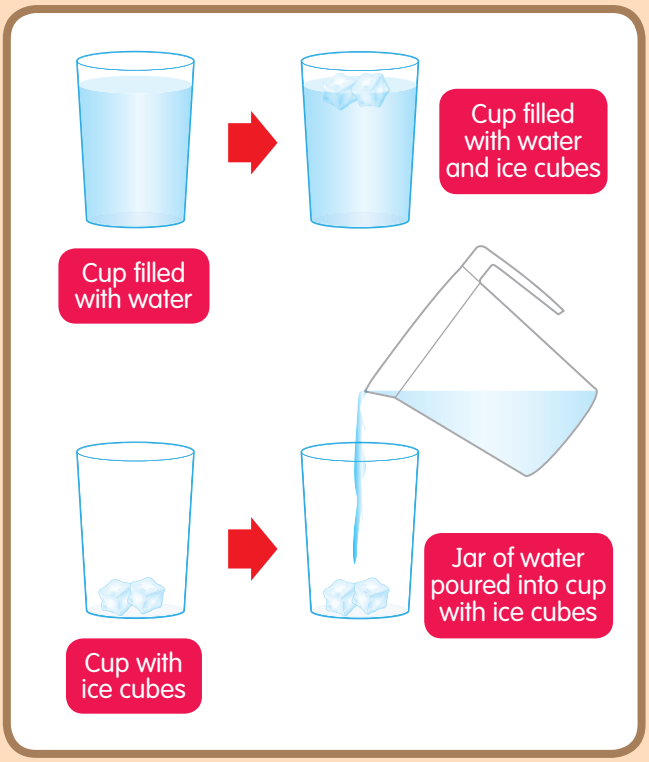
Activity 2

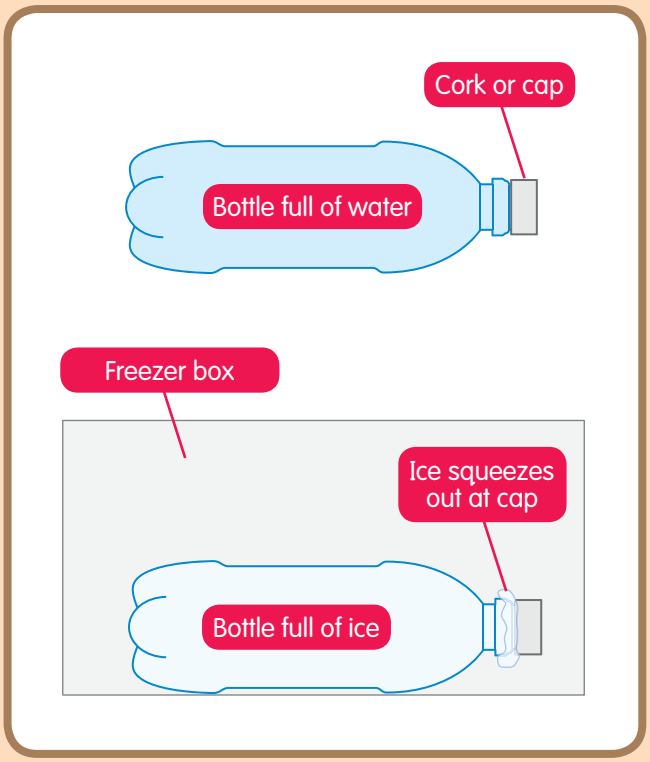
Ice is the solid state of water. When you put ice cubes into water, do they **sink** or float?

Take a clear plastic cup of water. Place a few ice cubes in the cup. Observe what happens. Does it make any difference if you place the ice cubes in the cup first and then add water to the cup? Can you explain what is happening?

Most **substances** shrink when they are cooled. When water is cooled and changes to ice, it expands. It takes up more space.

You can see this if you put a plastic bottle full of water in the freezer. Screw the cap onto the bottle. Put the bottle in the freezer for a few hours. What do you observe when you remove the bottle from the freezer?





Activity 3

Hands-on Activity

Meltdown

Do this project if you have a freezer. Here is a fun activity to help you remember the three states of water. Make ice cubes of different colours using watercolours. Place a plastic bag on a few sheets of used newspaper. Place the different coloured ice cubes on the plastic bag and leave it in a sunny area. Predict what will happen to the ice cubes. Observe what happens. Stop when you have dried coloured paint on the plastic bag.

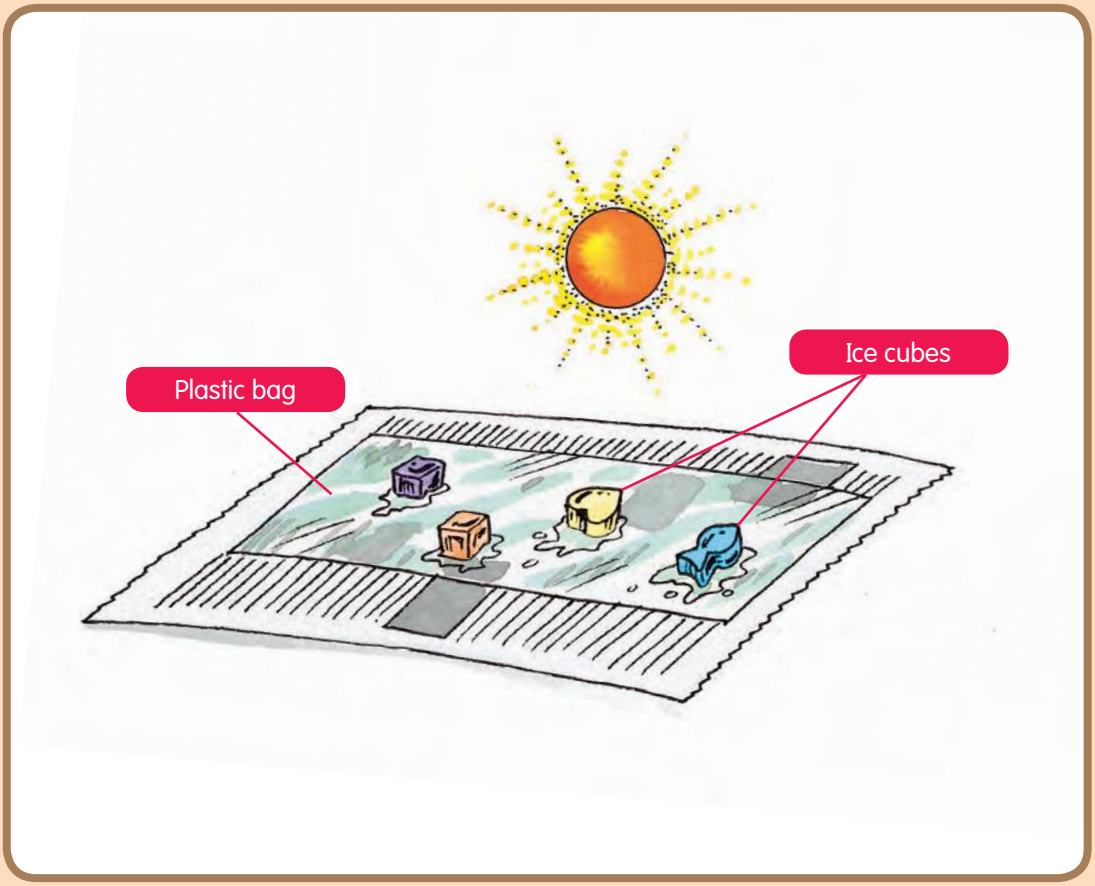
Answer these questions in your exercise book:

a What state of matter is ice?

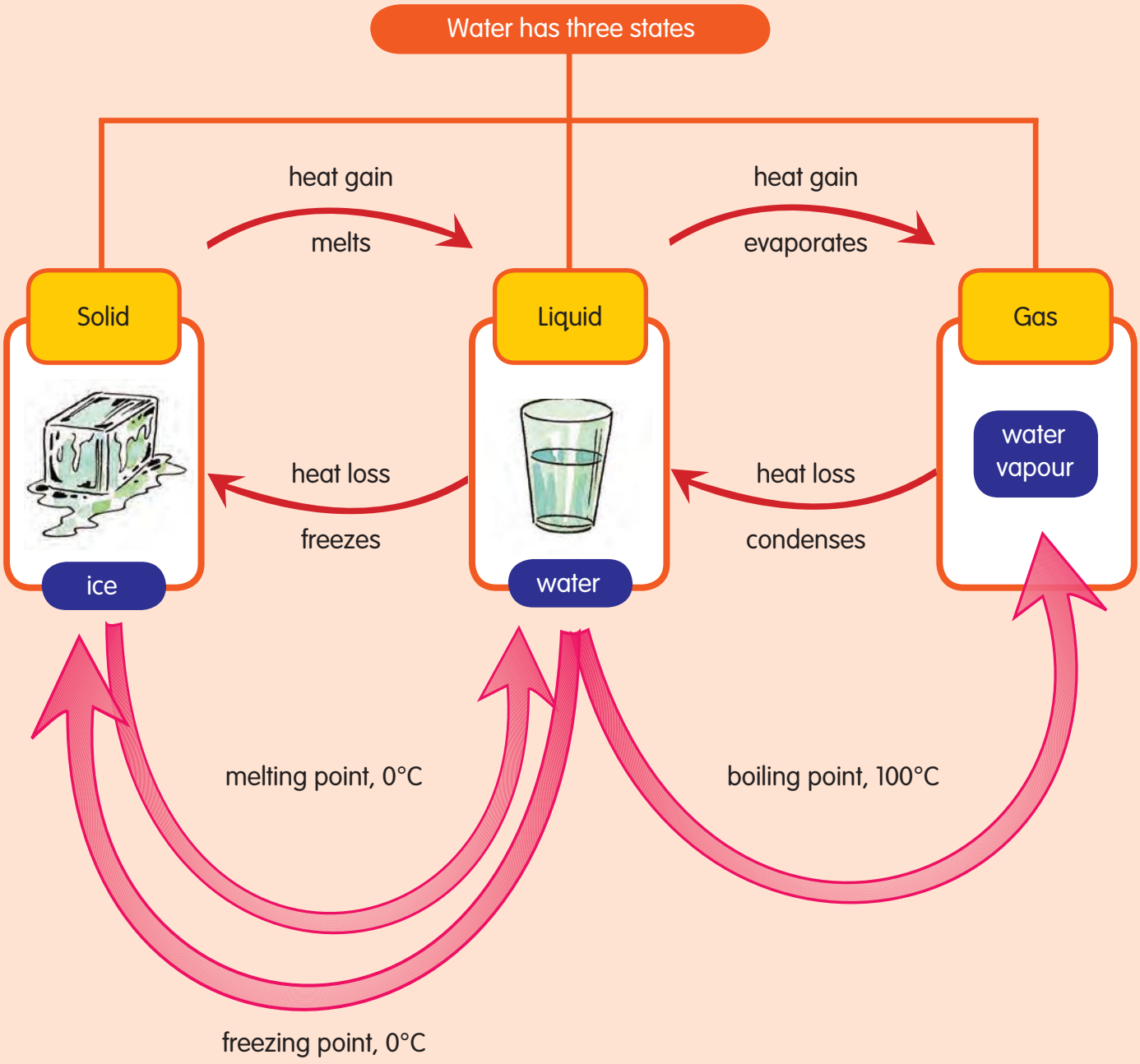
b Did the ice melt? What state did it become?

c Did the water evaporate? What state did it become?

d How many states of matter helped you to create your art?



The states of water

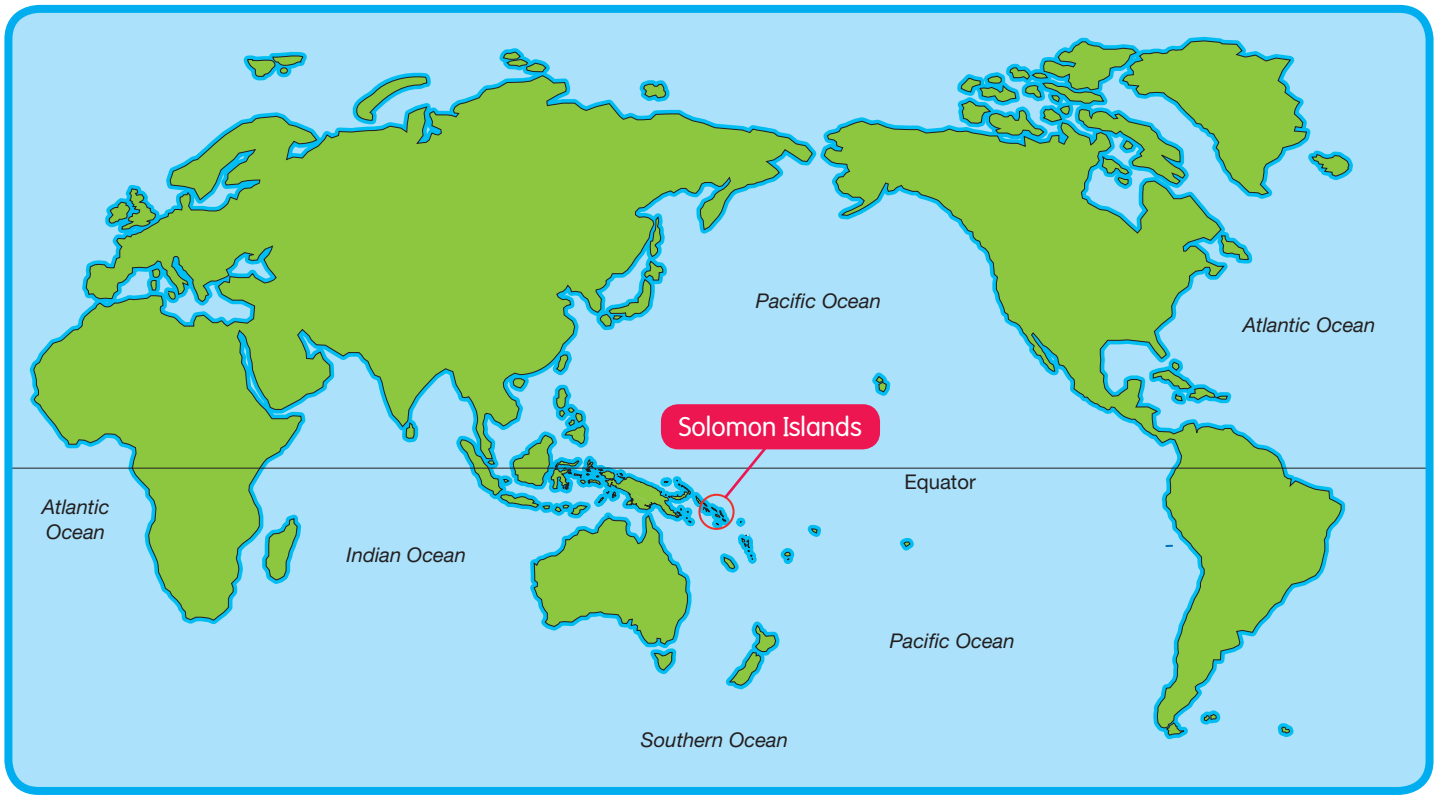


This concept map shows the process of heat gain and loss as water changes from one state to another state.

Water on the move

Look at this map of the world. Is most of the world dry land, or is most of the world covered with water?

Can you see that the world's oceans are really one large body of water? Less than one-third of the Earth is land. Water makes up some 71% of the Earth. Most of the water on the Earth is sea water. You can find fresh water in rivers, streams, ponds, lakes, and wetlands.



In countries such as Solomon Islands we often see a tropical rainstorm. Moisture in our atmosphere becomes heavier and falls to the Earth as rain. When the storm ends, the sun shines again. The puddles of water formed during the storm disappear from the ground. This cycle repeats itself over and over again. This is nature at work. You are seeing water on the move.

Water has a cycle. It moves from the atmosphere to rivers, oceans, and wetlands, into the ground, and into living things. Then it goes back to the atmosphere, again and again. Nature recycles water. It changes water from one state to the other. This is the water cycle.

A closer look at the water cycle

Look at the diagram of the **water cycle**. Two important processes in the water cycle are evaporation and condensation.

Evaporation occurs when a liquid turns into gas. Water does not have to be at its boiling point for evaporation to take place. Evaporation can take place at any temperature.

You have seen puddles of rainwater after a heavy thunderstorm. Soon, there are no longer any puddles. Where has the rainwater gone? You see wet clothes hung out to dry after they are washed. Soon, the clothes are dry. Where has the water from the clothes gone? It is a very warm day. You sweat a lot. You begin to feel cool when your sweat evaporates. In all these cases, you are observing evaporation in action, although you cannot see it. Liquid water turns into gas. The gas is water vapour. It is invisible.

Condensation occurs when water vapour changes back to liquid water as the atmosphere's temperature falls. Tiny water droplets gather as clouds. Eventually, the water falls to the ground as rain.

With evaporation and condensation taking place all the time, we have the continuous movement of water from the Earth to the atmosphere and back to the Earth over and over again. What drives the water cycle? The Sun is the source of this energy. All living things need the water cycle so that they can live.

Activity 4

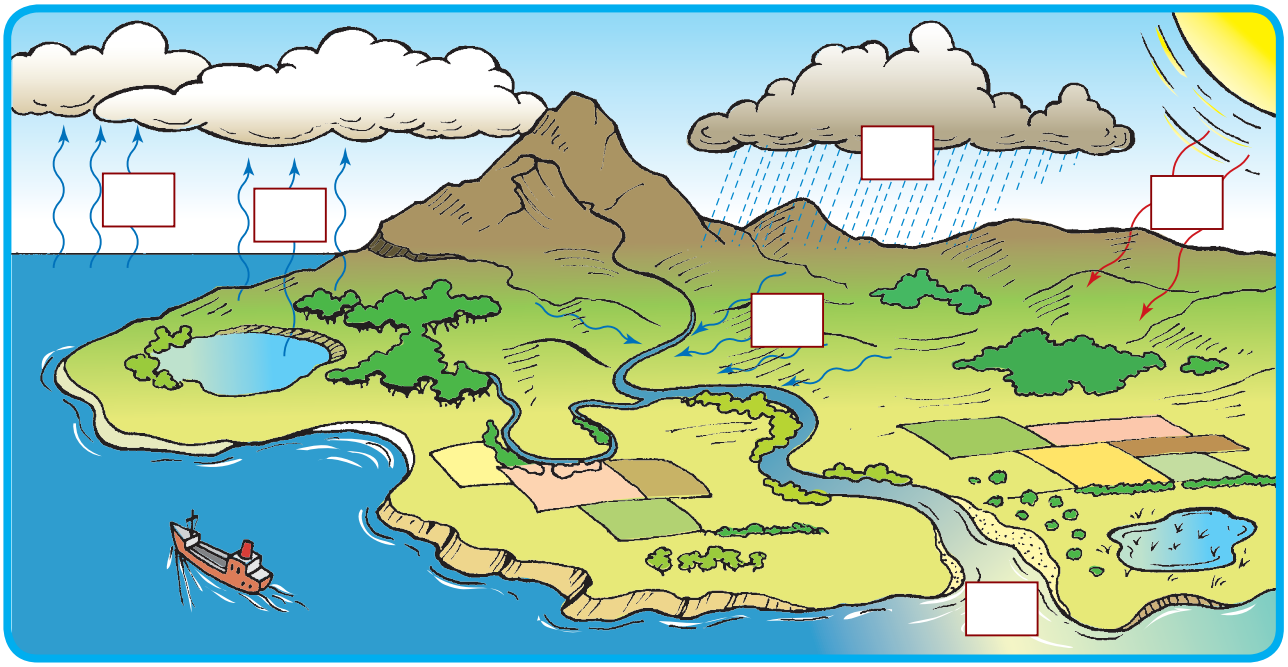
The water cycle

1 In your exercise book, trace the diagram of the water cycle at the top of page 95.

2 Read the sentences below. Write the letters a to f in the correct boxes on the diagram.

- **a** Vapour cools and falls as rain, snow, or hail onto the land.
- **b** Water drains into rivers.
- **c** Rivers flow into the sea.
- **d** The Sun heats water on the Earth.
- **e** Water from oceans, lakes, and trees evaporates.
- **f** Vapour rises into the air and forms clouds.

3 Add arrows to the diagram to show how the water cycle works.



Fieldwork Activity

Activity 5

Observing evaporation

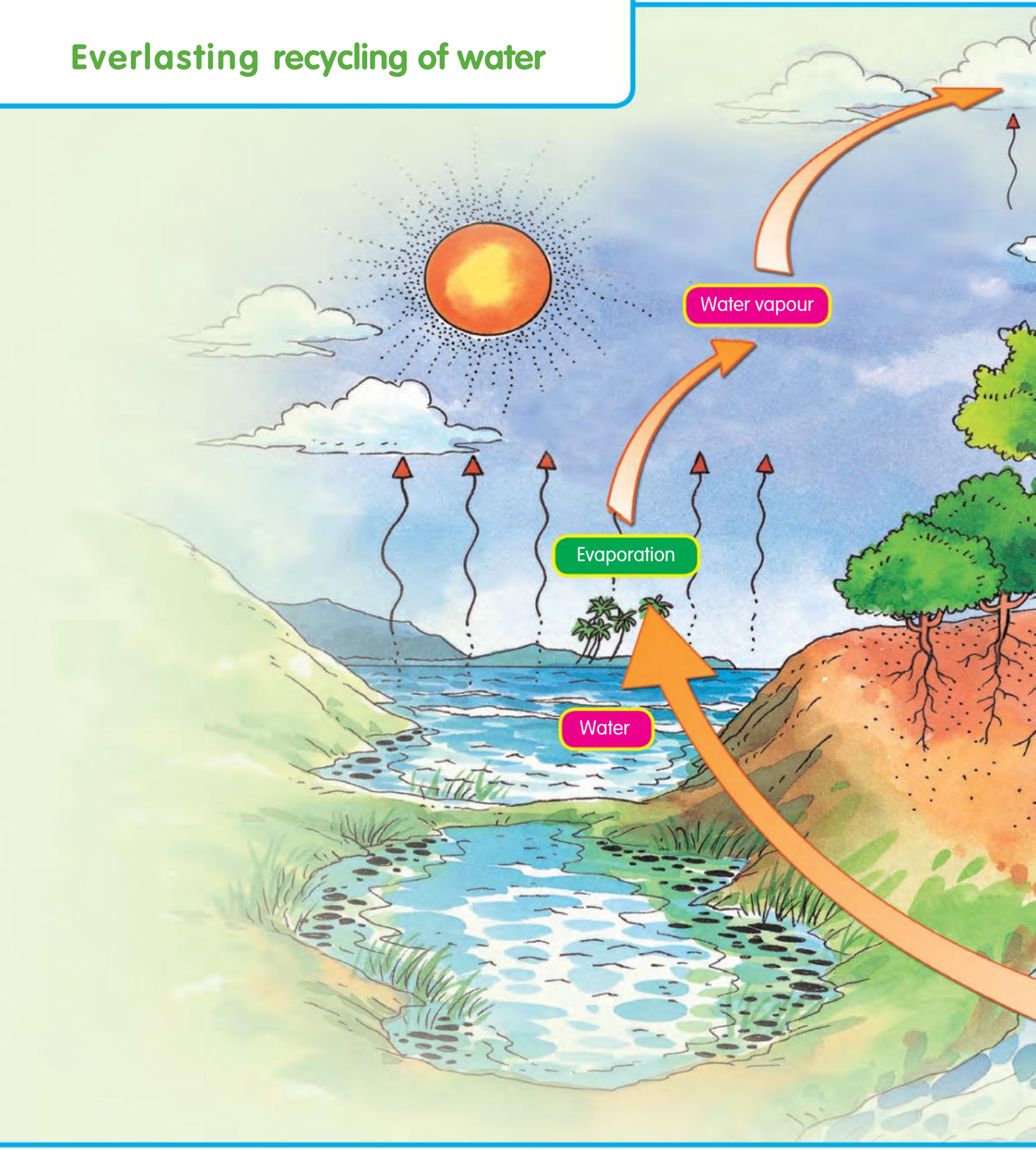
Aim: to observe water level differences due to evaporation

Method:

1. Organize a field trip to a nearby river, dam, wetland, ocean, and one other body of water such as a road with potholes.
2. Visit your sites at the following times: before rain, immediately after rain, and some time after rain.
3. Observe the changes in the water level.
4. In your exercise book, draw up a table like the one below, and record your observations in it.

No.	Sites/Places		Observation	
		Before rain	Immediately after rain	Some time after rain
1	River			
2	Dam			
3	Wetland			
4	Ocean/Sea			
5	Other			

Everlasting recycling of water




Condensation
Plants return water vapour to the air
Water droplets in the clouds grow heavier as they gather
Snow
Rain
First, rain falls on land, seas and oceans. Then, it seeps into the ground.
Soil
Plants take in water
Roots
Water

Activity 6

Hands-on Activity

Model the water cycle

Set up the **model** as shown in the diagrams and observe the water cycle in action. Observe what happens. What can you infer from your observations?

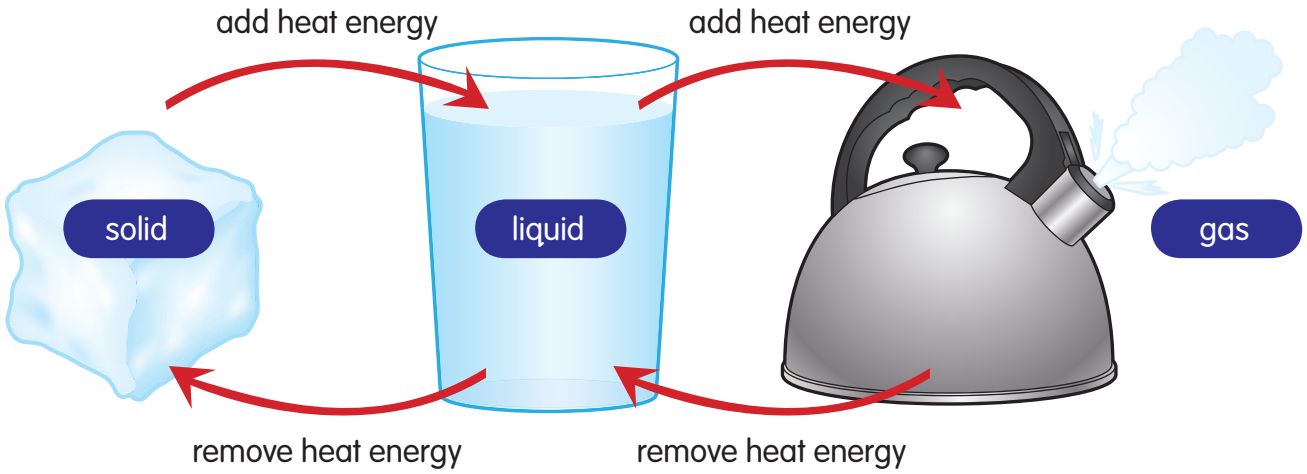
Put a clear plastic cup inside a plastic bag

Pour 20 ml of salty water into the cup

Tape the plastic bag at an angle to a window pane

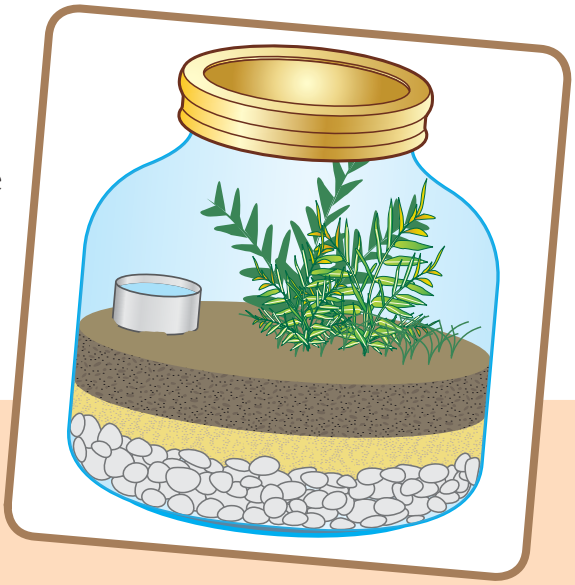
Look at the table to see what happens in the model and what happens in nature.

Model	In nature
Water evaporates from the cup. Salt is left behind in the cup.	Water evaporates from the oceans, lakes and rivers. Salt is left behind in the oceans.
Condensation of water droplets on the inside, at the top of the plastic bag.	Condensation of water vapour, forming clouds in the sky.
Droplets of water drip back into the cup and the bottom of the plastic bag.	Further cooling of clouds leads to large droplets of water which fall as rain on land and into bodies of water.



Model of nature at work

Look at the picture (right) of a mini water cycle which has been set up to show nature at work. Set up this mini water cycle and observe what happens. Why do you not have to water the plants inside the model?



Hands-on Activity

Activity 7

Make your own mini water cycle

What you need

- big glass jar with a screw-top lid
- soil
- sand
- plants
- bottle top
- pebbles or small rocks

What to do

1. Add small rocks or pebbles to the jar first, then the sand, and finally the soil.
2. Add your plants to the soil.
3. Fill the bottle top with water and place it in the jar.
4. Put the lid on the jar and stand it in a sunny place.
5. Watch your miniature water cycle in action!

Observe condensation and evaporation in life

What do you see on the grass early in the morning? In your exercise book, make a list of situations where condensation and evaporation take place. Explain what you think is happening. Draw up a table to record your observations and ideas. An example is shown.

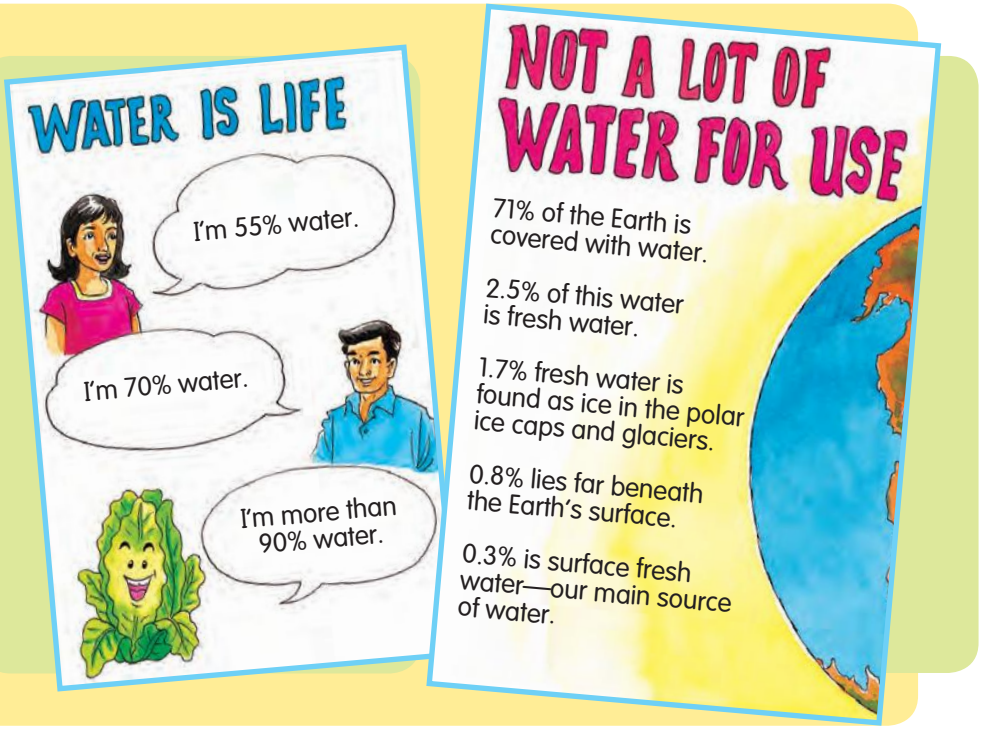
Observation	What is it?	Why
Dew on grass	Condensation	During the day, water evaporates into water vapour. At night, the air cools and water vapour condenses into droplets of dew.

Why do adults wipe your body with cold water when you have a high temperature? Why do you sweat when you are too hot? Why do you feel cold when you get out of a water pool, especially if it is a windy day?

No water, no life

Living things are made mostly of water. Without water there is no life. Without water and air, life cannot exist. Water sustains life. It is a very important ingredient of our wellbeing.

Think about why water is important. Where does water come from? Do we waste it? Are we careful when we use water? Look at the posters. They show the importance of water. They also show why we need to be careful when using water.



Why water is essential

Many of our activities need water. Look at the pictures showing some of the many uses of water.

We drink water.

We use water to transport things.

We use water to put out fires.

We use water for watering plants.

We use water for swimming and other fun water-based activities.

We use water for washing ourselves, our food, clothes and other things.

Without water, can plants make their own food? Do animals need water for life? Can the processes of life continue without water?

Discussion Questions

Activity 8

Imagine a place where it is warm and there is plenty of rain. Imagine another place where it is very warm with hardly any rainfall. In which place would you see many plants growing? Which place is likely to be home to many different animals? What does this tell you about the importance of water to living things?

Save water

The water cycle recycles water over and over again. We are surrounded by water. But we are able to use only a small percentage. We say that water is a limited resource. Look at the drawings. They show how we use lots of water in our world.

Village living

Town living

A town person with a washing machine uses more water than a village person.

Factories

Throwing rubbish into our water sources.

Water is scarce in some parts of the Solomon Islands—for example, Reef Islands, Bellona, and Ontong Java. It is also limited in many other parts of the world. We should use water wisely and carefully. What are some ways to save water?

Some water-savers are:

- In town houses, make sure that taps are turned off properly to stop drips.
- In town houses, make sure that pipes and taps are not leaking.
- In town houses, use the half flush in dual-flush cisterns for liquid waste.
- In town houses, take a short shower rather than a long shower.
- Use a glass of water when brushing your teeth rather than leave the tap water running.
- Use a mop and a bucket of water rather than a hose to wash floors outdoors.
- Use a basin with water rather than a running tap when you wash dishes.
- Use a basin rather than a running tap to hand-wash clothes.
- Use a basin of water rather than a hose for washing cars, motorcycles and bicycles.
- Reuse water, such as the wastewater from washing vegetables, to water plants.
- Reuse water from rinsing clothes for cleaning and flushing toilets.

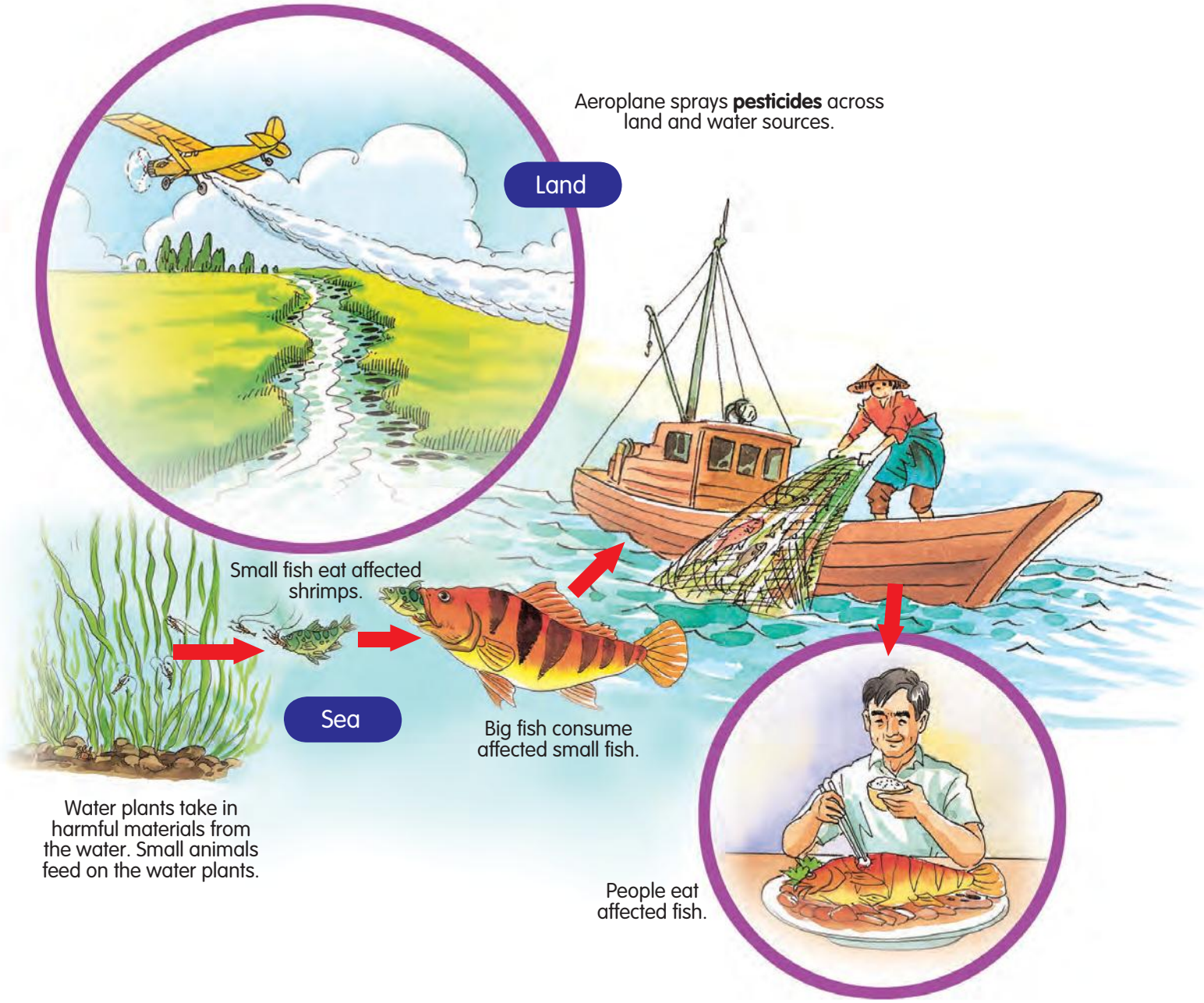
Activity 9

Observe and record your family's water usage. Think about how you can save water. Make your own plan for smart water use. How can every family member contribute to saving water?

Water pollution

Water in our oceans, lakes and rivers used to be in a pure state. It was able to clean itself. The actions of humans have disturbed nature. The amount of waste in the oceans, lakes, and rivers is more than nature can clean.

The waste releases damaging materials into the water. These materials enter living things, such as small water animals. They are passed on to other living things through the food chain. Humans are at the top of the food chain, so they eat a lot of food with harmful materials.



In what ways do humans cause water pollution? A **pollutant** is a substance that damages the water and the living things in it.
Do we know we are damaging water sources with pollutants?

Water pollutants	Effects
Fertilizers Pesticides Untreated **sewage** Agricultural waste Household **detergents**	• Waterweeds and algae grow quickly in rivers, canals, lakes and seas. The large amount of plant material uses up all the oxygen in the water. • This affects other living things. If it becomes very bad, everything dies.
Oil spills in the seas	• Oil spills kill or harm organisms in the seas. For example, birds die when they cannot fly. Fish die when oil coats their gills and they cannot breathe. • Oil spills damage coastal land and beaches.
Silt caused by clearing of forests	• The quality of water is affected when soil is washed into lakes and rivers. • Less sunlight enters this water, so water plants cannot make their own food. • Because of this, other living things suffer.

We can do things to prevent or reduce water pollution.

Examples of things we can do are:

- Use detergents that can rot or break down.
- Use water-based paints rather than oil paints.
- Clean the materials factories put into rivers or oceans.
- Grow new trees.
- Use natural fertilizers, such as **manure**, instead of human-made fertilizers for gardening.
- Dispose of sewage properly.

Activity 10

Save water

Check for yourself how much water you can save if you turn off a tap properly.

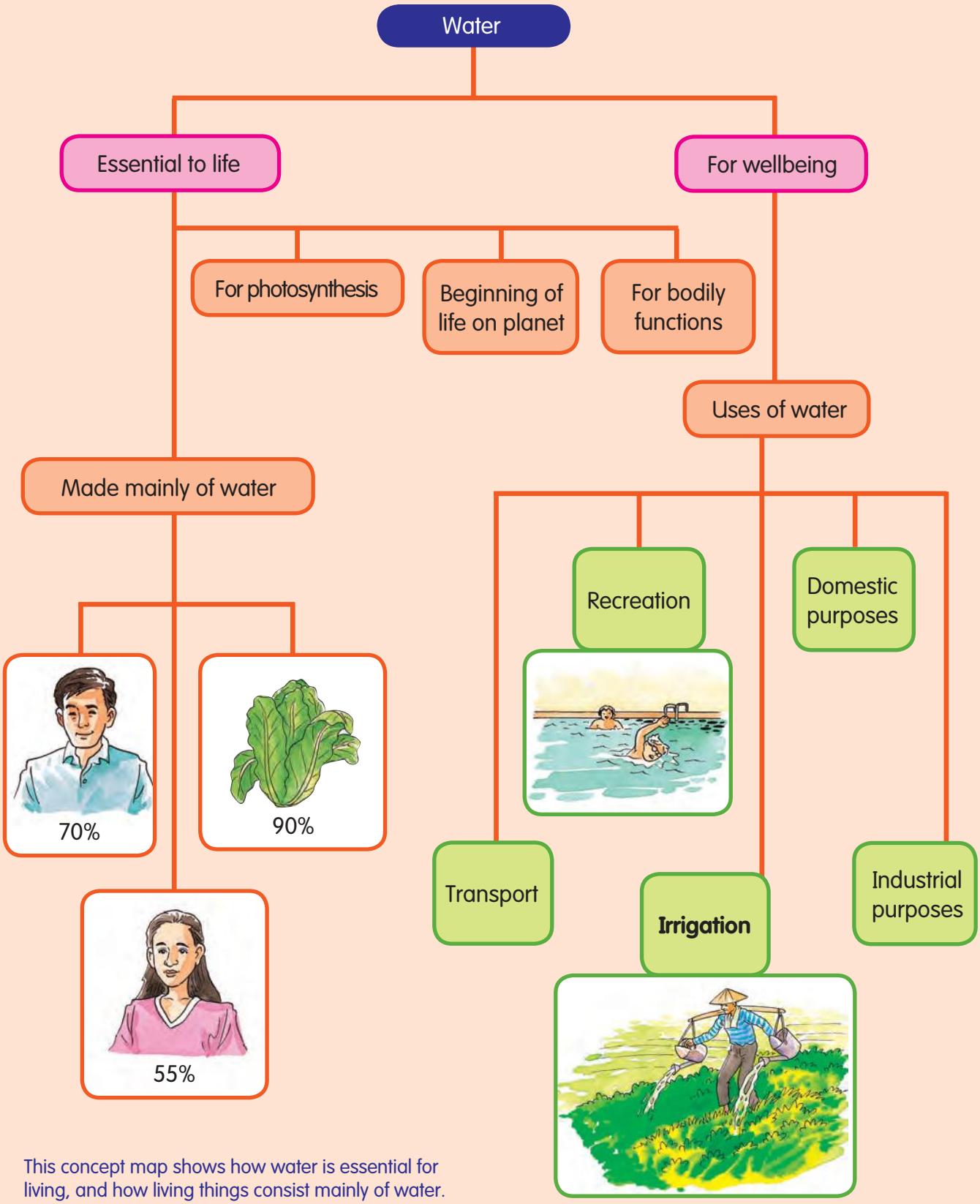
Let a tap drip gently. Collect the water droplets for 10 minutes. Measure the amount you have collected in millilitres. Find out how much water is lost in an hour (millilitres lost in 10 minutes × 6). How much water is lost in a day? Repeat the activity but with the tap dripping at a faster rate. Now, how much water is lost in a day? Can you help to save water?

Activity 11

Desalination

For a long time, humans have looked for ways to remove the salt from sea water to make it drinkable. This is called **desalination**. It allows us to remove salt from sea water. Desert countries are very dry. In these countries, people produce millions of litres of fresh water using desalination. Do we need to use desalination in Solomon Islands? Find out more about it.

Water for life and wellbeing



This concept map shows how water is essential for living, and how living things consist mainly of water.

Chapter Review

1. Water has three states: solid, liquid, and gas.
2. At 0°C, water freezes and turns into ice. The water loses heat energy. Zero degrees Celsius (0°C) is the freezing point of water.
3. At 100°C, water boils and changes to water vapour. Water gains heat energy. One hundred degrees Celsius (100°C) is the boiling point of water.
4. When ice is heated, it melts and changes to water. The melting point of water is 0°C. The melting point of ice and the freezing point of water are the same.
5. When water vapour is cooled, it condenses to water. When water is heated to 100°C, it evaporates.
6. Melting, freezing, condensation, and evaporation are the four ways that water changes from one state to another.
7. Nature endlessly recycles water. The evaporation of water, the condensation of water, and the return of water as rain and snow, happen over and over again.
8. Evaporation and condensation are the two most important processes in the water cycle.
9. Evaporation takes place when a liquid (for example, water) turns into a gas (water vapour) at its boiling point.
10. Condensation takes place when a gas (for example, water vapour) changes back to a liquid (water).
11. Water is essential to life. Humans and other organisms are made mainly of water. Our life processes need water.

12 The main uses of water are:

- **a** domestic purposes such as cooking and washing food, drinking, showering, and using the toilet
- **b** recreation—swimming
- **c** irrigation for agriculture
- **d** industrial purposes—especially manufacturing
- **e** transport.

13 Water pollution affects the Earth's water resources. A pollutant is a substance that damages the water and the living things in it. Pollutants damage natural bodies of water.

14 Pesticides, fertilizers, household detergents, **poisonous** chemicals, sewage, oil spills, and silt from deforestation all contribute to the pollution of our water resources.

Chapter 6

Farming

In this chapter, you will learn:

- how to identify a good gardening site
- the important things to think about when making a new garden – soil type, water source, slope of ground, shade
- that good soil contains organic material
- the variety of plants and animals that are food sources
- the common gardening tools
- how to plan a school garden project
- how to plant seeds in seed boxes, using good soil mixture
- how to prepare planting beds and plant out seedlings
- how to make animal houses from local materials
- the three types of pig keeping areas – fenced area of garden, house with earth floor, raised house with slatted floor
- the three types of asexual reproduction for growing vegetable crops – planting cuttings, planting suckers, layering stems.

Gardening site

Thinking about a site for gardening

Fieldwork Activity

Activity 1

In groups of four or five, go outside to a gardening area close to the school. Take a note pad and pencil. In your group, observe one area where there are gardens. In your exercise book, write answers to these questions.

1. What crops are growing?
2. Is there fresh water nearby? How far away is the water?
3. What kind of vegetation surrounds the garden (for example, bush/forest, grassland, plantation)?
4. Does the garden have shade from the sun?
5. Is the garden area on flat ground or on a slope?
6. How far is this garden from the village?
7. What can you say about the kind of soil in the garden?

With your teacher, discuss the information that each group has collected. Your teacher will summarize the information in a chart like this:

Garden information				
Questions	Group A	Group B	Group C	Group D
What crops are growing?				

Looking at soil

The most important thing in deciding on a garden site is the type of soil. Do this activity in groups.

Hands-on Activity

Activity 2

Are soil particles the same?

1. Collect a jar or bottle from your teacher.
2. Put in about 3 cm of loose dry soil.
3. Fill the jar or bottle with water until it is about three-quarters full.
4. Put your hand over the top and shake the mixture of water and soil.
5. Put the jar in front of you and look carefully at what happens.
6. Draw what you see in your exercise book.
7. Leave the jar for 24 hours and then look again.

Do numbers 8, 9, 10, and 11 in your exercise book.

8. Draw what you see in your exercise book.
9. You will notice a number of different layers at the bottom of the jar. Each layer has different-sized soil particles in it. Why does this happen?
10. Are the biggest particles at the bottom or at the top?
11. What was the reason for the change after you left the jar for 24 hours?

Large particles are heavy. These **sink** quickly to the bottom of the jar. The very small particles are light. They take a long time to sink. There are five types of soil particle. The pictures below show the different types. The phrases in brackets give you an idea of the actual size of the particle.


Gravel (a grain of rice)


Rough sand (a particle of sugar)


Fine sand (a grain of salt)


Silt (chalk particles)


Clay (Milo or milk powder)

Organic material in soil

When the soil settled in the jar, you saw another kind of material. To find out more, do this activity.

Hands-on Activity

Activity 3

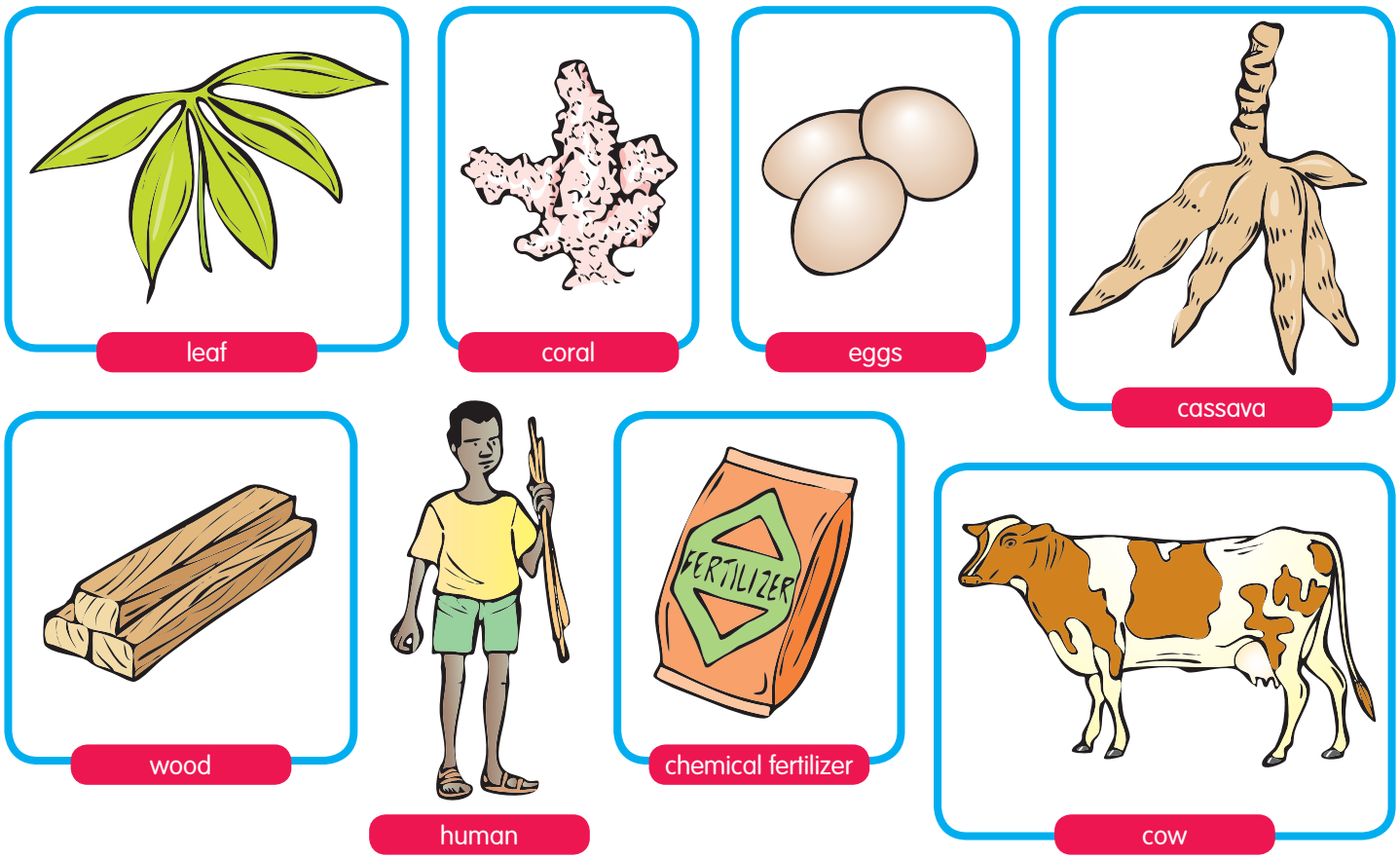
1. Dig some soil and spread it out on a piece of newspaper or a plant bag.
2. Look for anything in the soil which is alive (plants or animals) and anything which was alive but is now dead.
3. Collect all these living and dead things in two tins or jars.
4. Identify the items in the tin. Your teacher will help you.
5. Write a list of the items in the tin into your exercise book under the headings “Living organisms in the soil” and “Things in soil which were alive but are now dead”.

Your lists should contain some of these items:

Living organisms in the soil	Things in soil which were alive but are now dead
worms	dead insects
beetles	leaves
millipedes	pieces of wood
ants	pieces of bone
leaves	
snails	

The plants and animals and pieces of dead material are a very important part of the soil. They are **organic matter.**

Everything that is living or has once been alive is organic matter.



Examples of organic matter

Choosing a gardening site

When we choose a site for a new garden, there are very important things to think about. They are:

Soil type

- What colour is the soil?
- Is there moisture in the soil?
- Is it good soil for vegetable growing?

Water source

- What water source is there?
- How far is it from the garden?
- Does it flow all the time?
- Does it dry up in hot **weather**?

Location

- How far is the site from the school?
- How long does it take to walk to the garden?

Distance from water supply to the garden

- Estimate the distance to the creek or water pipe. Do this by walking with long strides (each stride should be about 0.75 m).

Slope of the land

- Decide whether the slope is steep, gently sloping or flat. Is it suitable for gardening? Will it lose soil by erosion?

Sunshine and shade

- Does the garden have shade from the sun?
- Is there shade all day or for part of the day?
- Are there some large shade trees?

Vegetation near garden

- Are there trees and shrubs near the garden?

Bush clearing

- Will there be a lot of work to clear the area?
- Will some trees have to be cut?
- Will stones need to be removed?
- Is there moisture in the soil?
- Is it good soil for vegetable growing?

Activity 4

Go with your teacher to an area near the school. Use the questions above to decide if the area would be a good gardening site.

Why we grow crops and rear animals

Ways of getting food

Fieldwork Activity

Activity 5

In groups, go to a garden close to the school. Study and observe the garden and answer these questions in your exercise book.

1. Which food crops grow in the garden?
2. Which crop takes up the largest area?
3. What is the favourite food crop in your area?
4. How is it prepared and cooked?

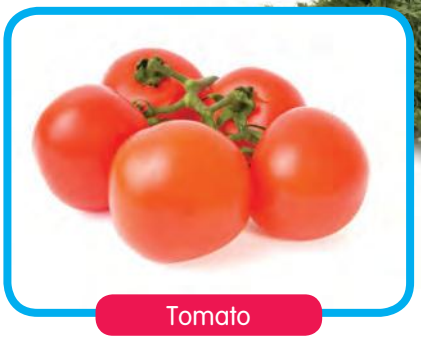
A vegetable garden

Look at the vegetables in these pictures:

Okra

Melon

Ball cabbage

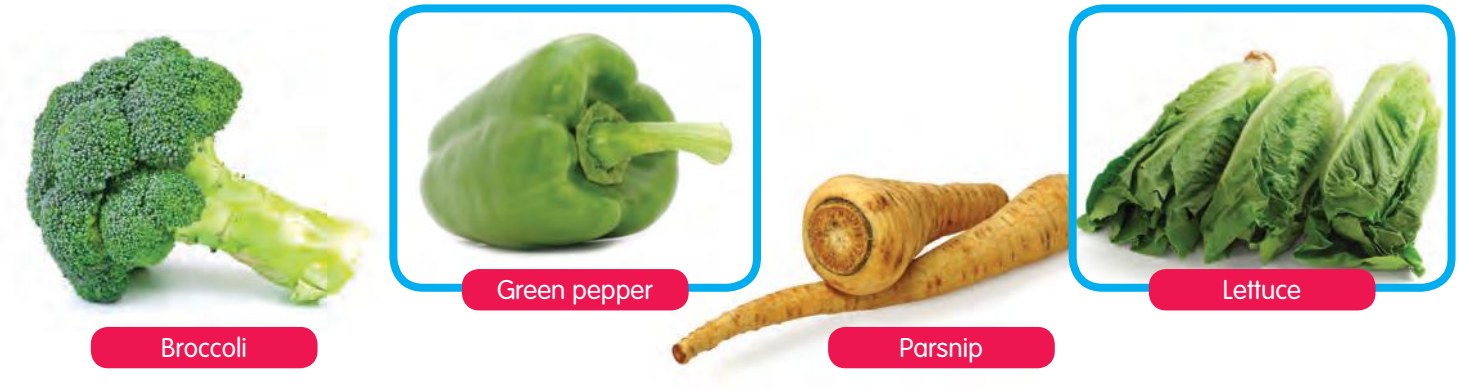


Tomato

Carrot

Pac choi

Shallot



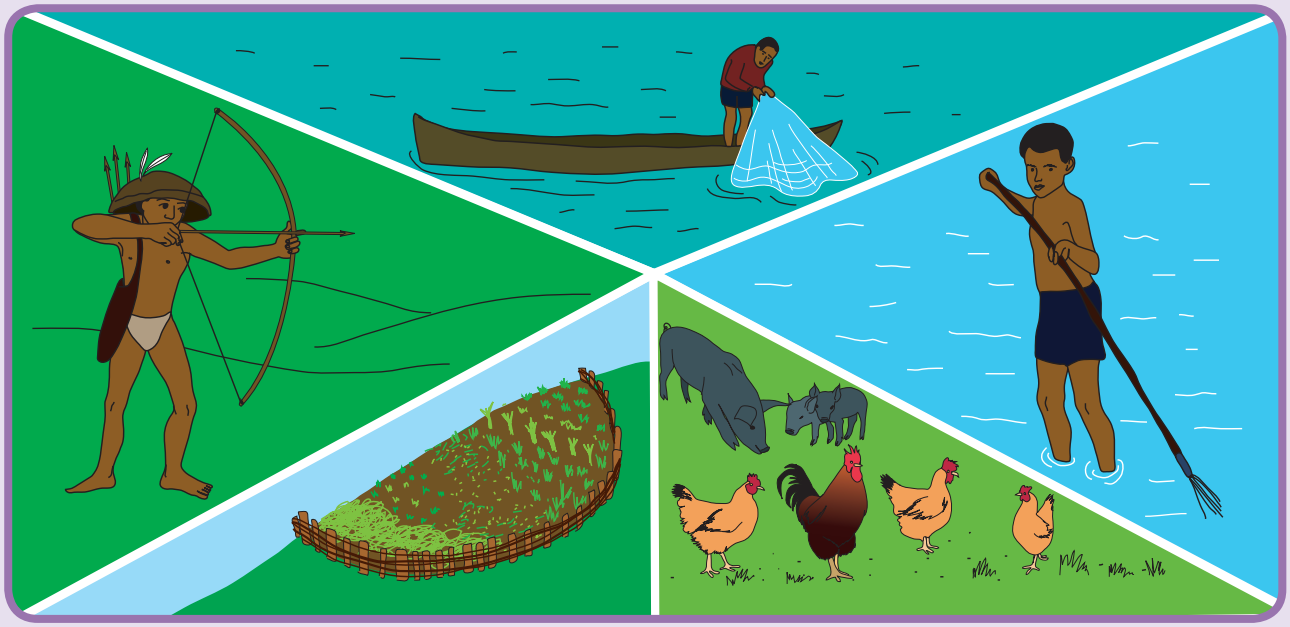
How many of them did you see in the garden you visited?

People have different ways of obtaining and growing food. You may live near a river, so you are able to catch mud crabs or fish. You may live on the coast, by the ocean, so you can fish in the sea. You may also have a garden where you grow crops. You might live near a forest, so you can trap and hunt opossums, pigs, or birds. Many people raise animals such as chickens or pigs. They use these for food.

Discussion Questions

Activity 6

Look at these pictures.



Say what is happening in each picture.
What kind of food will the people get from each activity?

The picture below shows a Solomon Islands village garden. There are many different things in the garden. They all have one thing in common. They are all growing.

A typical village scene

Good farmers grow many types of plants and rear different animals. The plants and animals are used for:

- eating
- selling
- other purposes.

A typical market scene

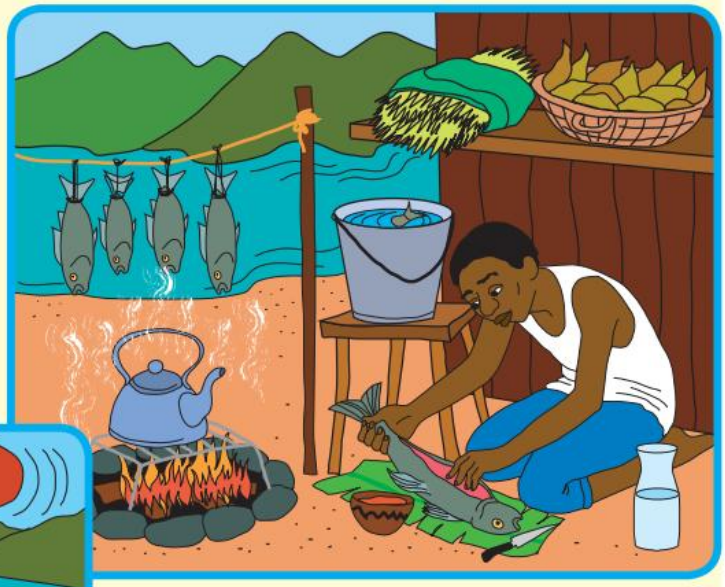
Animals for food

Most villages keep animals for food. Usually, the animals run free and find food for themselves.

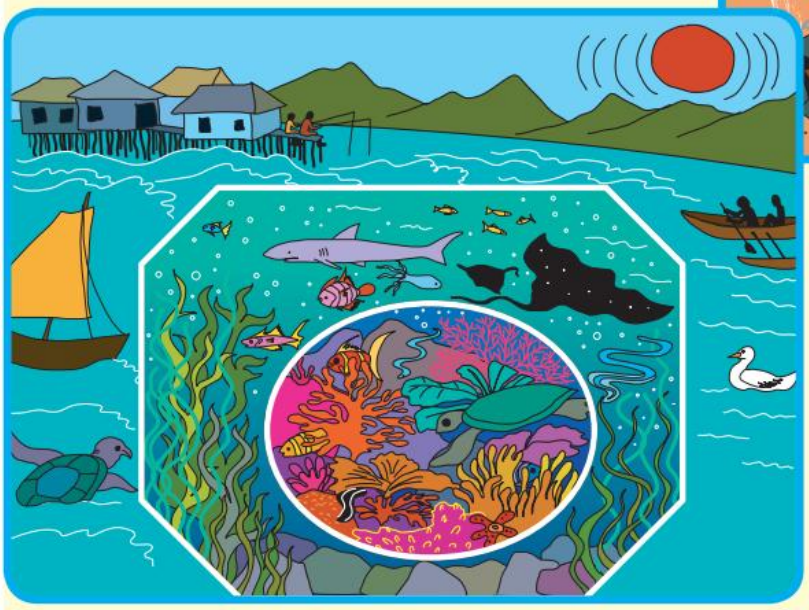
Animals kept for food

In some villages, people build fences and keep the animals in one area. People who live on the coast can fish in the ocean.

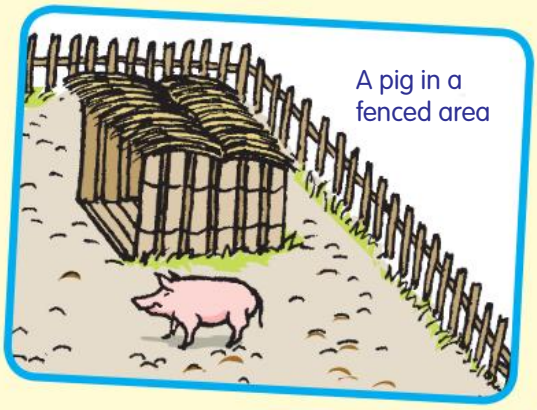
When people want to eat the meat from the animals, they must hunt them and kill them, prepare the meat and cook it.



Preparing fish to cook



The sea contains water, rocks and many living things.



A pig in a fenced area

Fieldwork Activity

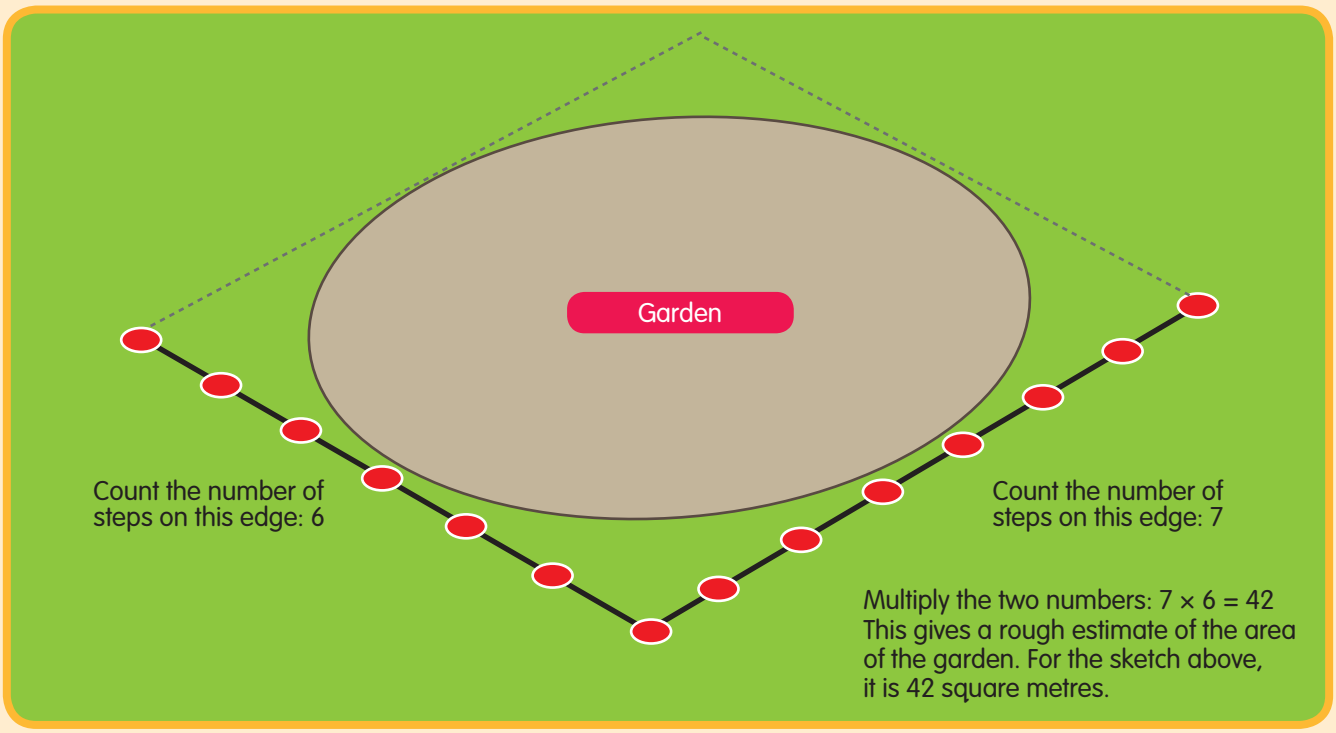
Activity 7

Planning a garden

In Activity 5, you visited a local garden. Go to this garden again. Ask the following questions and write the answers in your exercise book.

1 How large is your garden? (What is the size in square metres?)

You can help the gardener to make an estimate of the area by taking large steps along two of the garden edges, like this:



2 How many different crops do you have?

3 Does the garden provide enough vegetables for the family for the year?

4 How many times each year do you plant new crops?

5 How many people are in the family? Who owns this garden?

6 How many days do you work in the garden in a year?

7 What tools do you use for gardening work? (Make a list.)

Activity 8

Group Activity

Planning the garden project

Every school should have a vegetable garden. Your teacher will show you the area for a small Year 4 garden. As a class project, you will prepare a small garden, plant some vegetables and look after them.

The first job is to collect the tools you need. These drawings show the basic gardening tools.

1 shovel for cleaning and digging
2 garden fork for loosening soil
3 trowel for planting
4 hoe for cultivating
5 bush knife for cutting, weeding and cleaning
6 hand sprayer for pest control
7 watering can for watering
8 chicken wire or other material for fencing to keep out animals
9 rake
10 fork hoe
11 mattock
12 wheelbarrow

Garden project planning chart

This planning chart shows the stages in your garden project. The time from buying seeds to **harvesting** vegetables will be between 14 and 16 weeks.

Get tools

1 week

Decide the vegetables you want and buy the seeds

3 weeks

Plant seeds in seed boxes

Thin seedlings in nursery

2 weeks

Clear garden area

Fertilize with animal manure

2 weeks

Cultivate soil with manure

Transplant seedlings into beds in garden

2 weeks

Water, weed, and use pesticide (if necessary)

4 to 5 weeks

Harvest

Use at home or sell at market

1 week

Group Activity

Activity 9

Selecting the vegetables to grow from seeds

Here are pictures of the common vegetables. Choose the ones you want and make a list of them in your exercise book. Ask the school to buy the seeds you need. For some, you will find stem cuttings or vines or tubers.

Tomato

Shallot or spring onion

Pac choi

Okra

Green pepper

Melon

Yam

Cassava

Long bean or snake bean

Kumara

Taro

Carrot

Ball cabbage

Lettuce

Activity 10

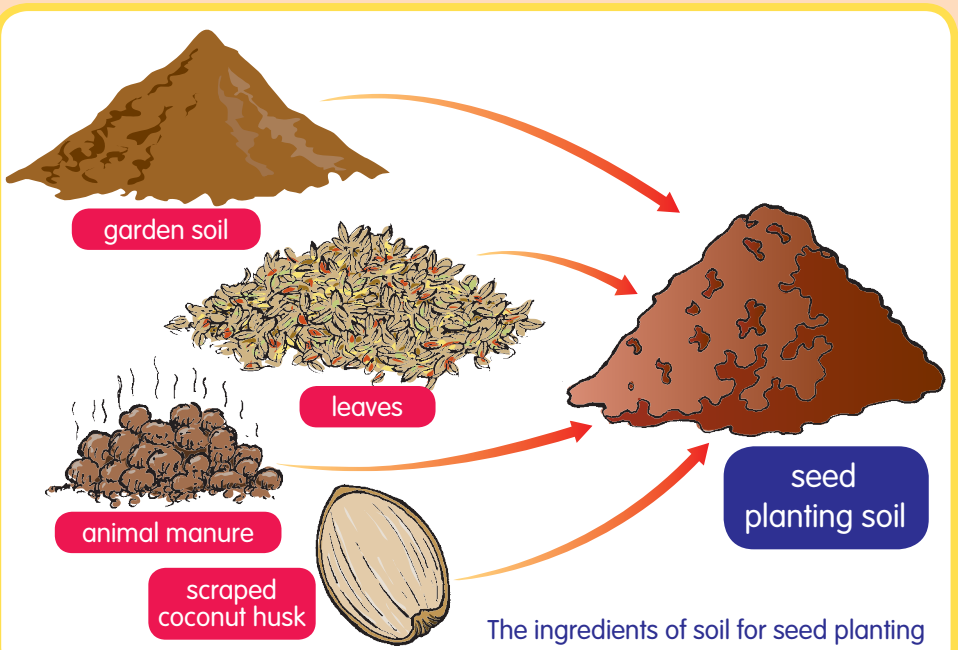
Hands-on Activity

Planting seeds in seed boxes

It is good to sow the new seeds in seed boxes. Prepare some soil mixture for the seed boxes. The soil mixture should contain:

- soil from the garden
- chicken/pig/cow manure
- coconut fibre
- **organic** material (for example, leaf compost).

Mix the soil and remove stones and pieces of plastic, glass, and metal.



The ingredients of soil for seed planting

Home-made wooden seed boxes with seedlings

Make some seed boxes, using pieces of wood and nails.

Sow the seeds in rows. Cover the rows of seeds with fine soil. Water the box every day. After three weeks the new seedlings will appear. There will be many seedlings crowded together in a row.

Remove the smallest ones. This is called thinning. The bigger ones will continue to grow in the seed boxes.

Choosing seedlings for thinning

Put the small seedlings into growing cups. These growing cups can be made from pieces of banana leaves.

Seedlings in banana leaf cups

You can also use cheap plastic drinking cups.

Seedlings in plastic cups

After another two to three weeks, the seedlings are ready to move to the garden area.

Activity 11

Hands-on Activity

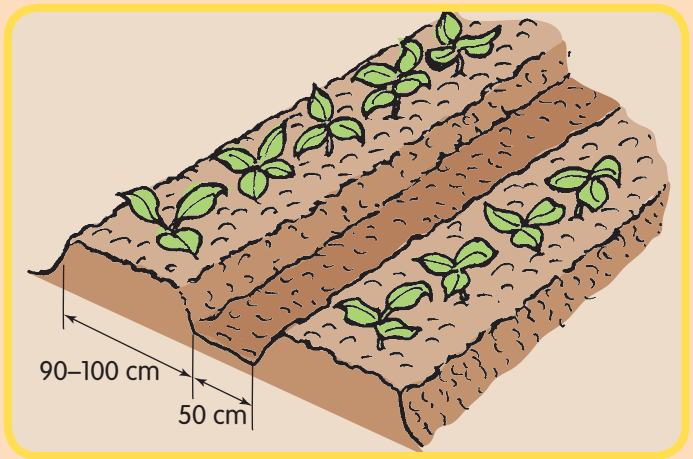
Clearing the garden area and preparing the beds

Slash or pull out all weeds and put them on the compost heap.
Remove stones, roots and rubbish etc.
Loosen the soil, as deep as possible, with a hoe, garden fork, shovel, or spade.
Add animal manure.
Dig the manure into the soil.

The steps in clearing and preparing a garden bed

Prepare raised ridges. A ridge is about 20 cm high.

Make the ridges 1 metre wide. Plant two or three rows of seedlings in each ridge. Leave half a metre between the ridges. Make each ridge 6 metres long.



A raised seedling bed, showing two seedling rows and the space between two ridges

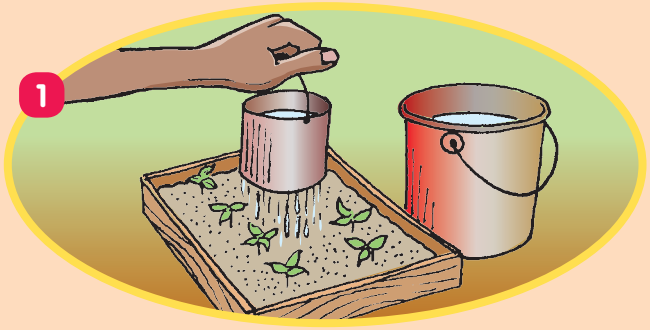
Seedlings planted in a new ridge

Activity 12

Hands-on Activity

Planting the seedlings

Water seedlings an hour before you take them out of the seed box.



Loosen the soil around the seedlings with a hand tool.

Remove the seedlings with damp soil around the roots.

Make holes in the garden bed to set the plants into.

If you used banana leaf seedling cups, you can drop them into the holes in the bed.

Seedlings grow in banana leaf cups

New seedlings in a bed

Build a simple grass roof over the young plants. This shelters the seedlings.

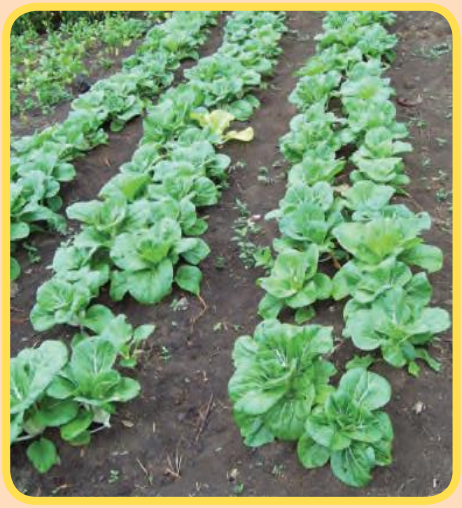
A seedling shelter made from grass

Hands-on Activity

Activity 13

Watering and weeding

Seedlings will take seven to eight weeks to be fully grown. During this time, you must water regularly. Also you must remove weeds. Weeds use up water. They use the food from the soil. This makes the vegetable plants weaker.



Pac choi ready for harvesting in a village garden

Use the trowel to remove the weeds. This will enable the plants to grow well.

When the vegetables are fully grown, harvest the bigger ones first.

A gardener waters seedlings with a fish tin. There are small holes in the bottom.

Finding out about animal houses

Visit a village pig rearing house and a chicken rearing house. Your teacher will arrange a class visit.

Use the simple questionnaire below to find out about the houses for rearing chickens and pigs. Record the answers in your exercise book.

Fieldwork Activity

Activity 14

Chicken house questionnaire

Find out the answers to the following questions.

1 What materials are used for the chicken house? (List the materials used for the walls, floor, roof, door, and **troughs**.)

2 Are the chicken being reared for eggs or for meat?
3 How many chickens are there?
4 Is there enough space for the chickens?
5 Is there a tap water or a stream close to the chicken house?
6 What type of food do they eat?
7 How often does the chicken owner fill up the eating or drinking troughs?
8 Is the chicken house safe from harmful animals or thieves?
9 How often does the owner clean the chicken house?
10 How long does it take before the chickens lay eggs or are ready for eating or selling?
11 Is there an agricultural extension officer to give assistance with chicken rearing?

A village chicken house

There is a drain around the house to take away rain water. The floor is covered with dry grass or sawdust. Feeding and drinking **troughs** are made of split bamboo.

Chicken houses

A village chicken house is made on a frame of large bamboo or rough timber posts. The posts are 1 metre long. They are set in holes in the ground. The house has a grass or palm roof. The walls have palm matting 50 cm high or chicken wire. The upper part is made of split sticks (bamboo), with spaces between.

Ducks eating and drinking from bamboo troughs

Activity 15

Fieldwork Activity

Pig house questionnaire

Find out the answers to the following questions.

1. What materials are used for the pig house? (List the materials used for the walls, floor, roof, door, and troughs.)
2. Is there a drain near or around the pig house?
3. Is the pig house too close to houses where people live?
4. What type of floor does the pig house have?
5. How many pigs are there?
6. Is there enough space for the pigs to move around?
7. Are the house and the fence strong enough for the pigs?
8. Is there clean drinking water close by?
9. What type of food do the pigs eat – food scraps or imported food?
10. How often does the pig owner clean the pig house?
11. How often does the owner feed the pigs?
12. How long does it take before the pigs are ready for **slaughter**?
13. Is there an agricultural extension officer to give assistance with pig rearing?

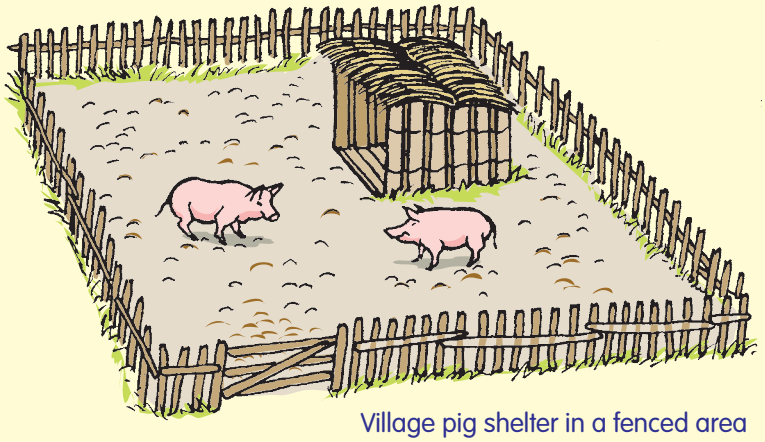
Pig houses

In some villages, pigs move around freely. They find their own food. People feed them with scraps from the homes. But the pigs damage many things. They eat vegetables. They dig holes in the garden. They drop their waste near houses. This is bad for the village areas. It is a danger to health.

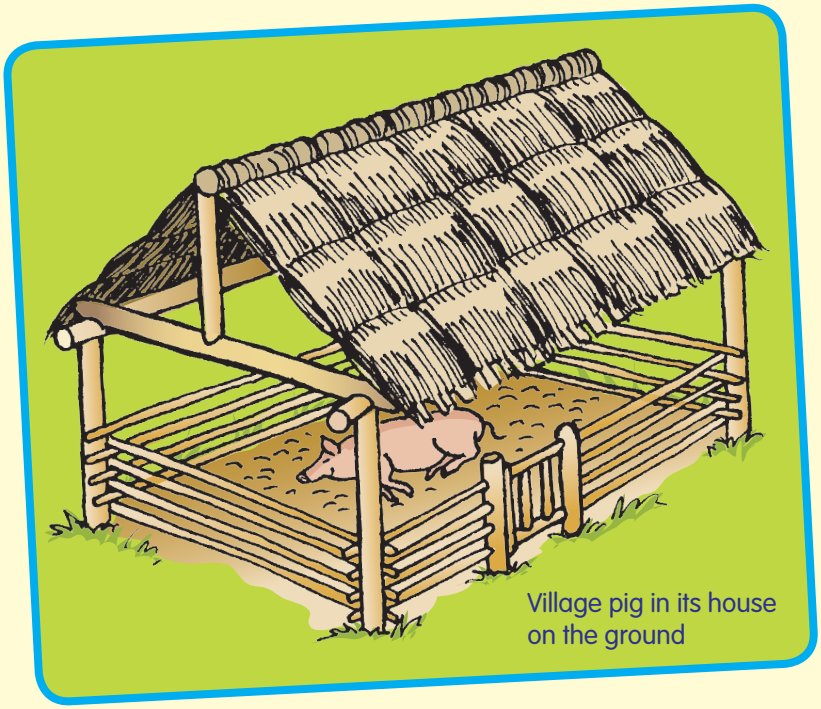
It is better to rear pigs in their own areas. This means that people must work to look after them. The pig area needs a pig house, feeding troughs, fences, and a floor. The pig manure must be cleared away every day.

The drawings on this page and over the page show the three common types of pig area.

These pigs have their own area. There is a strong fence. They move around freely inside the fence. There is a small house with a **straw** roof. They can shelter during rain and hot sun.

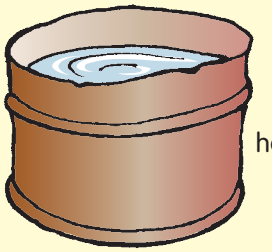


Village pig shelter in a fenced area



Village pig in its house on the ground

These pigs live inside a house. It has an earth floor. It has a grass roof. The walls are made of strong wooden posts. There is a gate so that people can go inside. The earth floor is covered with straw. There are food and water troughs. They are half oil drums, wooden logs, or large clam shells.



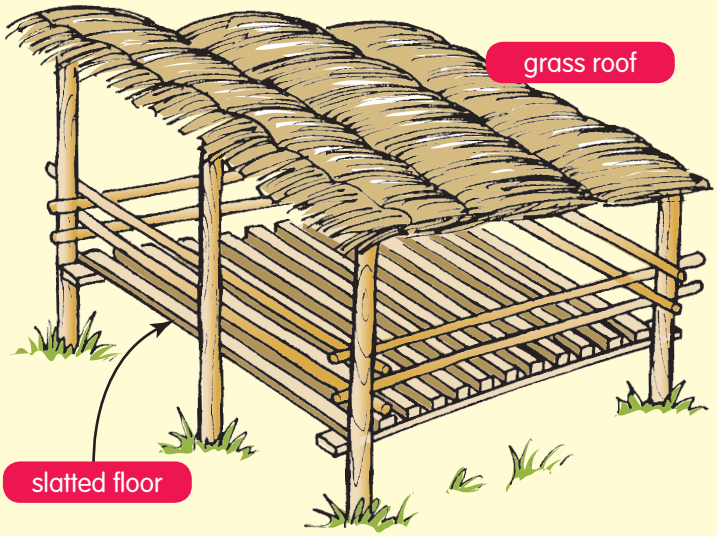
half oil drum

dug-out log

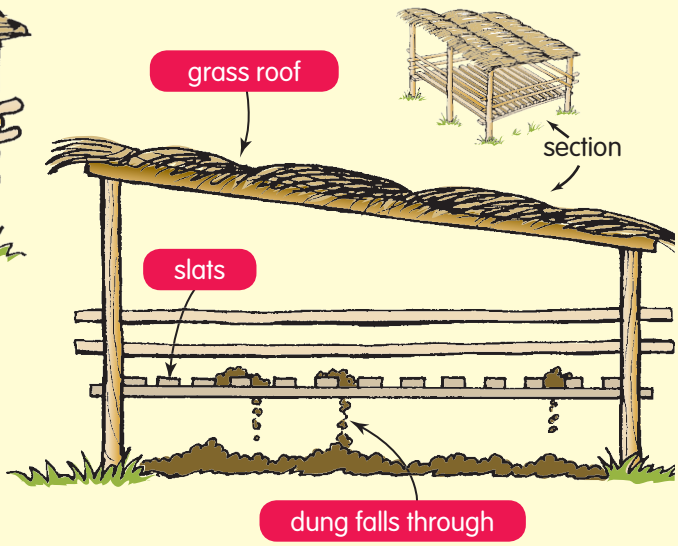
Near the coast, people can find large clam shells. They use the shells as food and drinking troughs.

Large clam shell used as a drinking trough

Pictured below is a pig house with a wooden floor. The floor is made of strong wooden logs. The floor is raised up. It may be 1 metre high. The logs are 5 cm apart. This is a **slatted** floor. The pig can move around. Their manure falls out to the ground. A person can go underneath to clear away the manure. The walls are strong wooden posts. The roof is made of palm leaves or grass. The drawings show what the raised floor and walls look like.



Raised village pig house



A section through a raised, slatted village pig house

Planting materials

We have used seeds to grow new plants. The seeds form in the flowers of a mother plant. The flower is the sexual organ of the flowering plant.

Many plants can reproduce without seeds. New plants grow from parts of a parent plant. This kind of plant reproduction is called asexual reproduction.

We grow many of our food crops in this way. We normally use stems or roots from parent plants.

Kumara or cassava cuttings

We cut a piece of the vine from the growing kumara plant. The cut piece must have a growing node.

A newly planted kumara vine showing fresh shoots

People put several of the kumara stem cuttings into a new earth mound in the garden. They put three to four cassava cuttings into a mound. These cuttings sprout new roots and shoots.

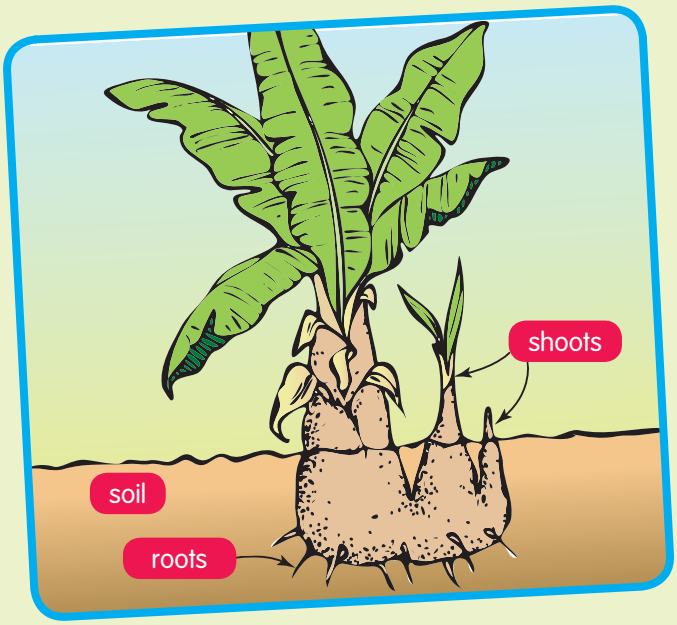
Newly planted cassava cuttings showing fresh shoots

The farmer must water the mounds and remove weeds. A new root develops within about two weeks.

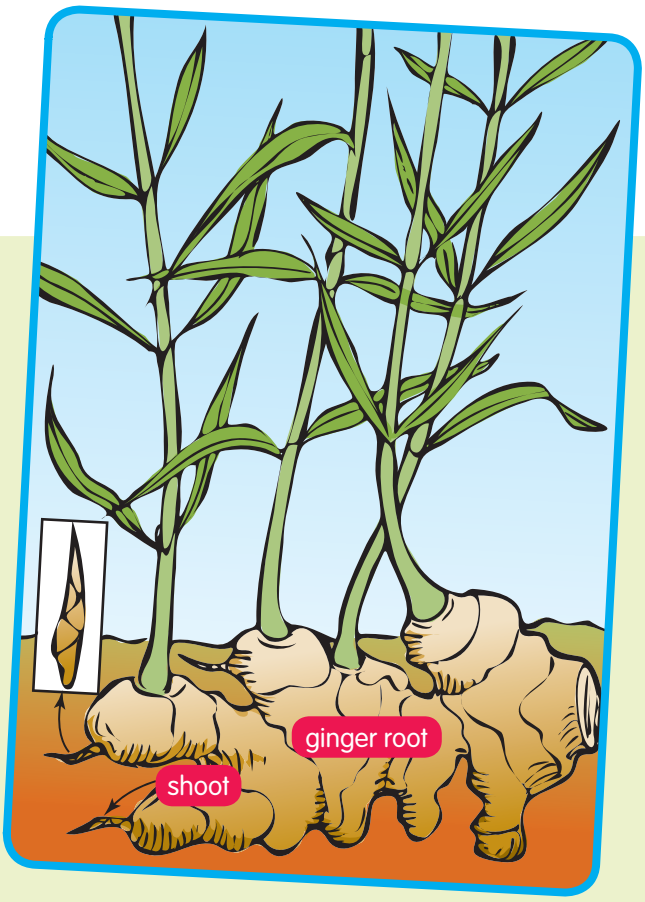
New kumara and cassava tubers develop from the roots. Kumara takes about five months. Cassava takes about seven to nine months.

Banana and ginger stems

The banana and ginger plants have underground stems. These stems produce shoots, as in these drawings.



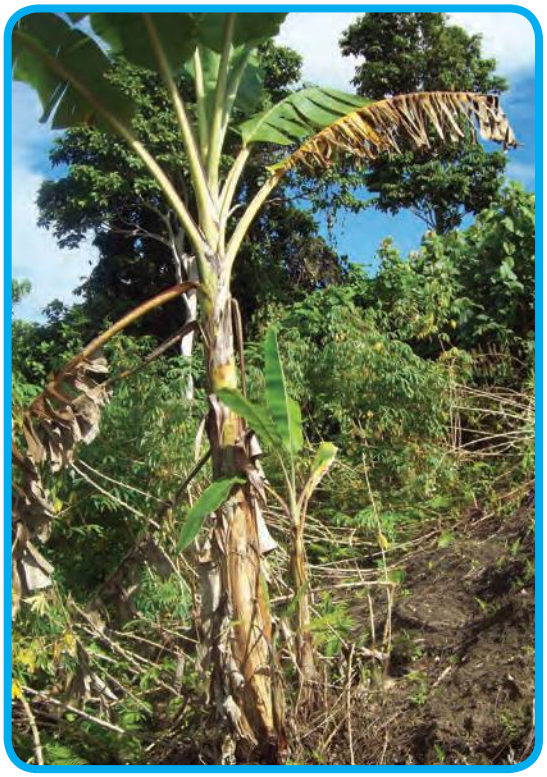
Underground banana stem with new shoots



Underground ginger stem with new shoots

The new shoot produces a new young stem. The young stem is the **sucker**.

People cut off the sucker and plant it.

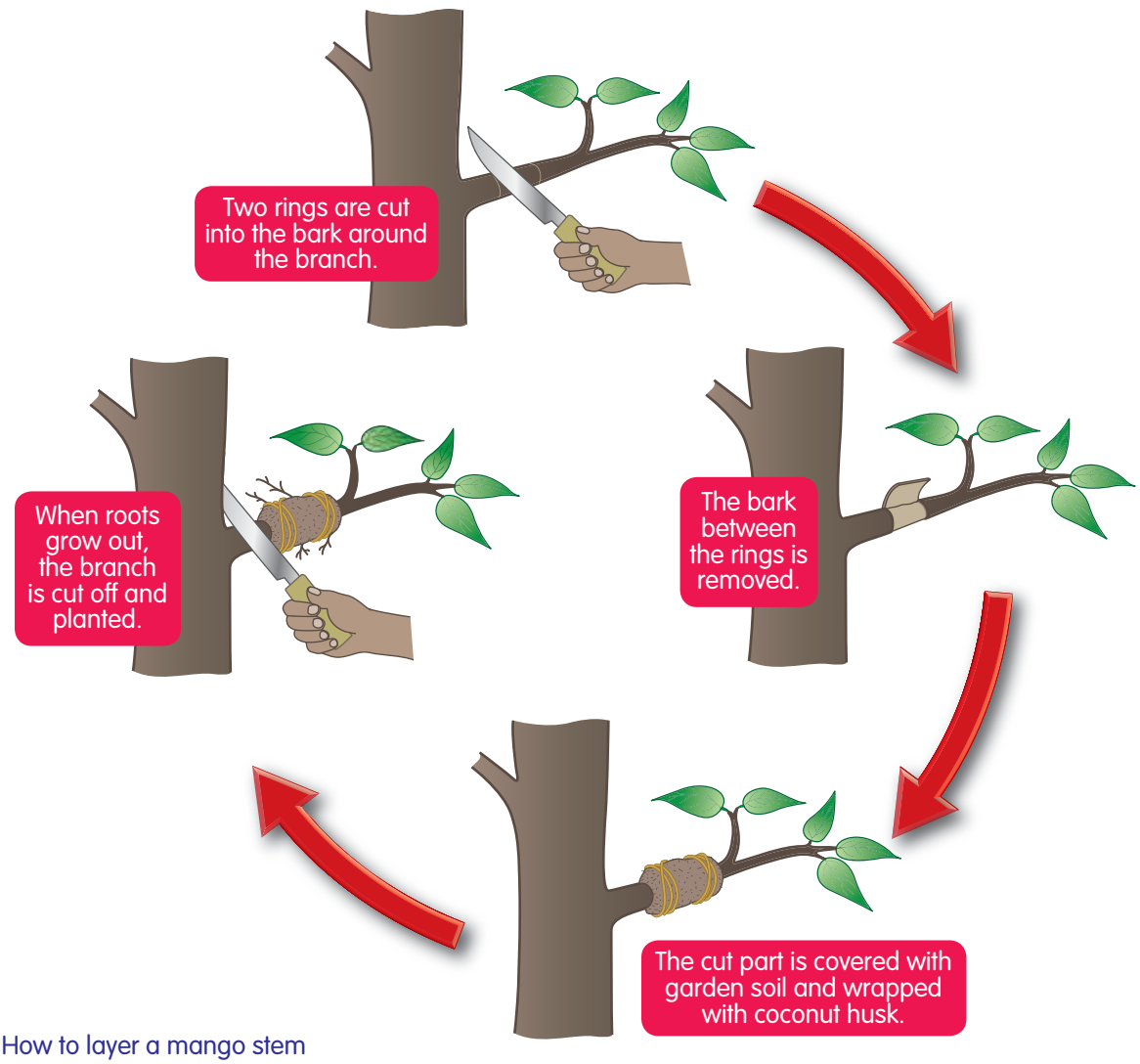


Mature banana tree with a new sucker

The sucker planted by itself

Mango layering

Some plants are difficult to grow from cuttings. Another way we can use the stem to grow new plants is by **layering**. We can reproduce the mango fruit tree in this way.



How to layer a mango stem

This method causes a new root and shoot to grow on a branch of the mother tree. When the new roots stick out of the husk, we can cut off the new plant in the husk. Then the new plant inside the husk can be planted in the ground.

Chapter 7

The stars, the Earth and the cycle of time

In this chapter, you will:

- know that the Earth is a sphere (K)
- appreciate that Earth is one object in the Universe (V)
- understand that the stars are in space, at huge distances from Earth (U)
- know that groups of stars appear to make patterns in the night sky because they are so far away; they are at different distances from Earth (K)
- identify the North and South poles using a globe and the axis of the Earth (K)
- understand that the rotation of the Earth in relation to the Sun causes day and night (U)
- know that the Earth takes 24 hours to make one complete rotation (K)
- appreciate that parts of the world to the east start the day before those in the west, because of the Earth's spin on its axis. (V)

Fieldwork Activity

Activity 1

Look up into the sky at night.

In your exercise book, write down three things you see. If the night is clear, you may see the Moon. You will also see many stars.

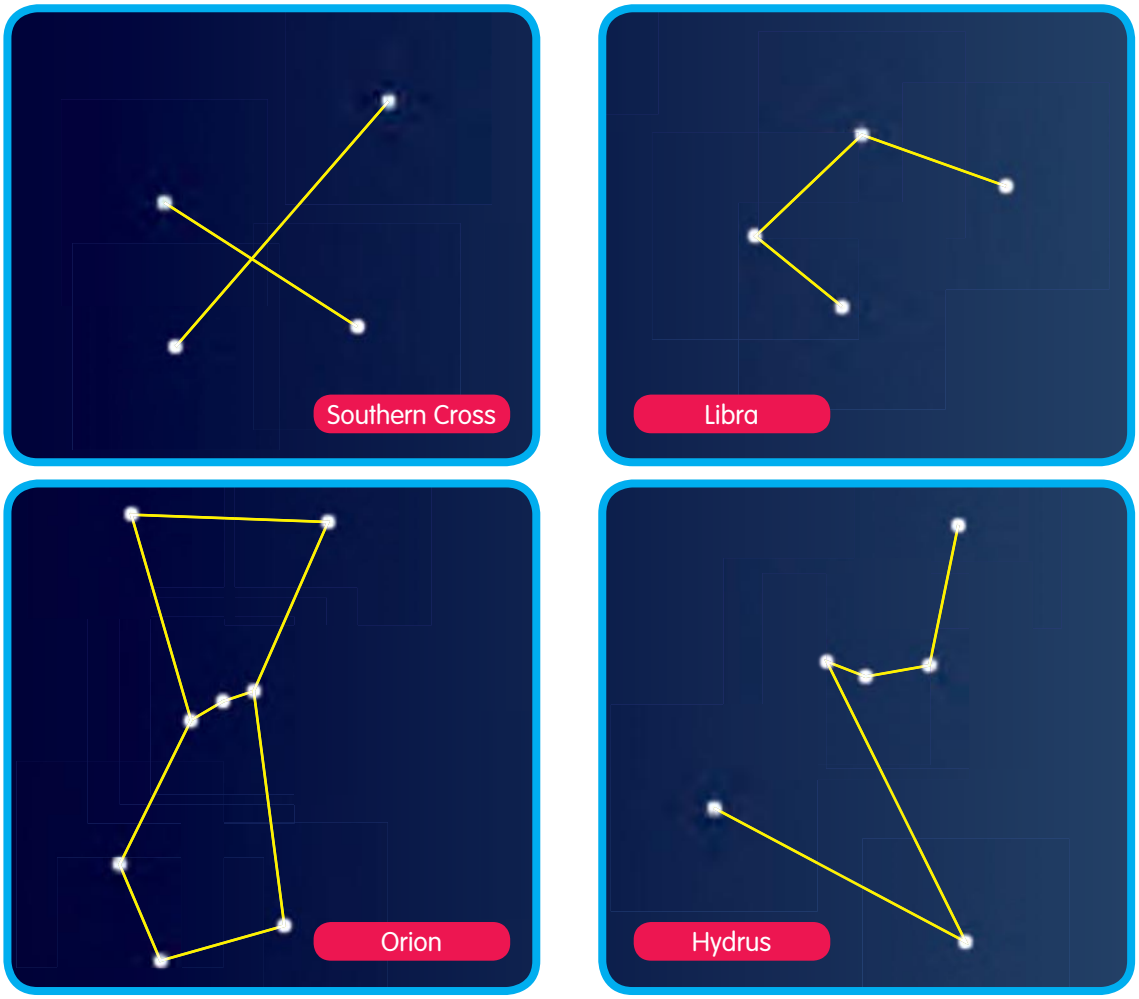
Try to observe some of the **patterns** that the stars make. Draw some of the patterns. Try to show about 10 bright stars in your patterns. Share your patterns with the class in your next science lesson.

Cut around your star patterns. Ask your teacher to help you stick them to the inside of an open umbrella. This makes a simple model of part of the night sky. It looks like this.

When you look at the sky, you see patterns in the groups of stars. Sometimes, people imagine that the stars form pictures in the sky. They think they see the shapes of animals, objects, or people.

Can you find out if people in your village use special names for the star patterns?

Here are four star patterns that you might see in the night sky.



People in different countries often give names to the star patterns they see. **Ancient** Europeans named these four patterns. In Western Solomons, some people see the pattern in Hydrus as three brothers holding up a bamboo fishing rod and line.

The Guale people call this star pattern *Folemaneata* (the three wise men).

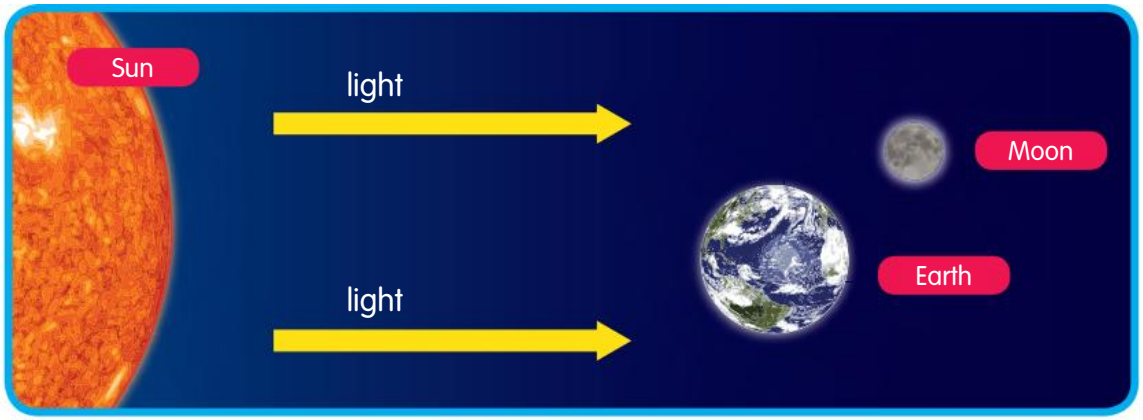
In the Are Are language, the pattern of the three wise men is called *Erara Erau*.

Earth, Moon and Sun

In a clear night sky, we see millions of stars. We also see the Moon. The Moon and the stars sit against a black background. The black background is space.

We see the Sun in the sky during the day. Sunlight is very bright, so we do not see the Moon or the stars during the day.

This drawing is a diagram of Earth, the Moon and the Sun in space.



Creative Activity

Activity 2

Ask your teacher to help you make a paste from newspaper and glue. Use the paste to make three balls of different sizes. Form the balls by covering balloons with the paste. When the balls are dry, name the Earth, Moon and Sun. Hang them in the classroom.

If you observe the sky for many nights, you see that the star patterns change position. They appear to move across the night sky. In ancient times, people saw this. They thought that the Moon, Sun and stars moved around Earth. They thought Earth was at the centre of the **Universe**.

About 450 years ago, scientists **invented telescopes**. They observed the night sky through telescopes.

The telescope makes things appear bigger. By using telescopes, scientists **discovered** that Earth is not at the centre of the Universe. They learned that it travels in a path round the Sun.

An ancient telescope

The shape of the Earth

Early people thought Earth was flat. When people began to travel across oceans by ship, they learned that this was wrong.

Sailors saw that the **horizon** was **curved**. The horizon is the line where the sky and the Earth's surface appear to meet.

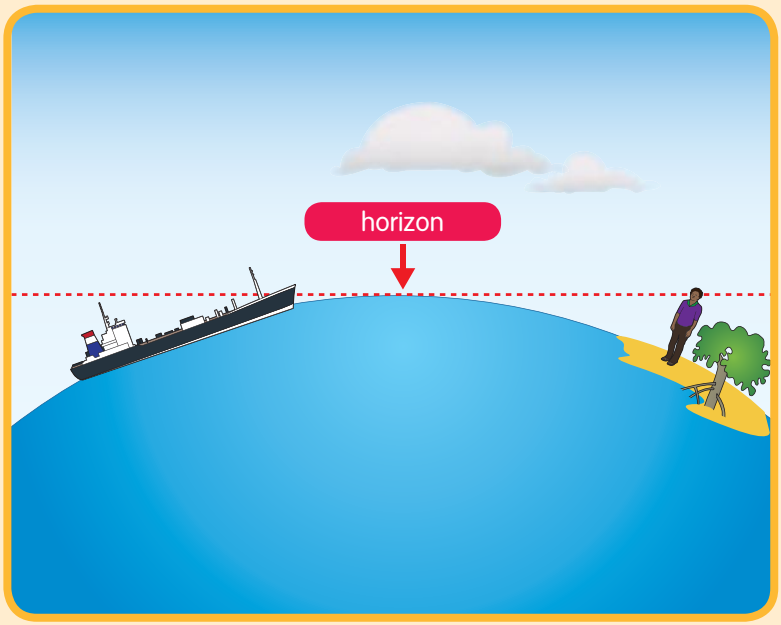
Fieldwork Activity

Activity 3

If you live near the ocean, go to the shore. Watch as a ship **approaches** the land.

What do you notice?

The front part of the ship appears on the horizon. As the ship moves closer, more of the ship's shape appears. Later, you see the whole ship.



Nowadays, we have many pictures of the Earth in space. The pictures show that the Earth is a **sphere**. This picture shows an **astronaut** working in space. The Earth's shape is below him.

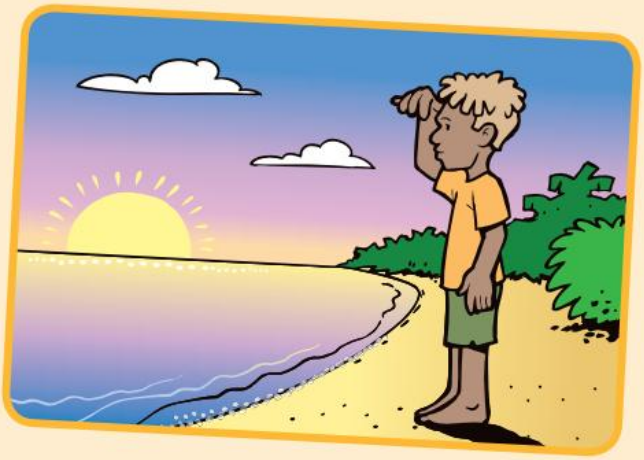
You can see part of Earth's surface. It is like a sphere.

Earth in space

As a day passes, from early morning to sunset, you see that the Sun changes position in the sky.

Fieldwork Activity

Activity 4

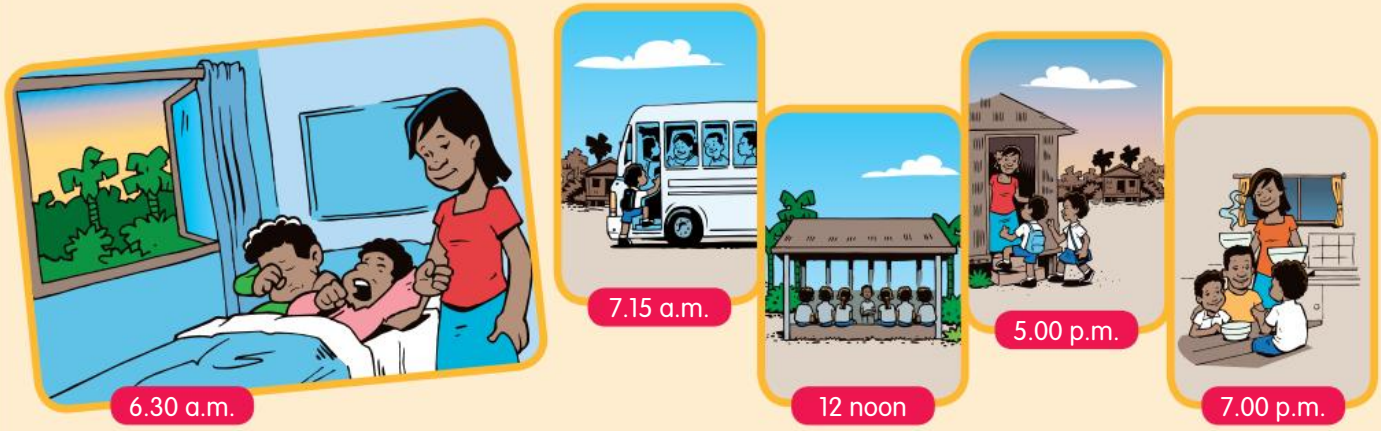


Observe the Sun during a whole day.

Point to the sun early in the morning. *Do not look at the sun directly!* It is low in the sky.

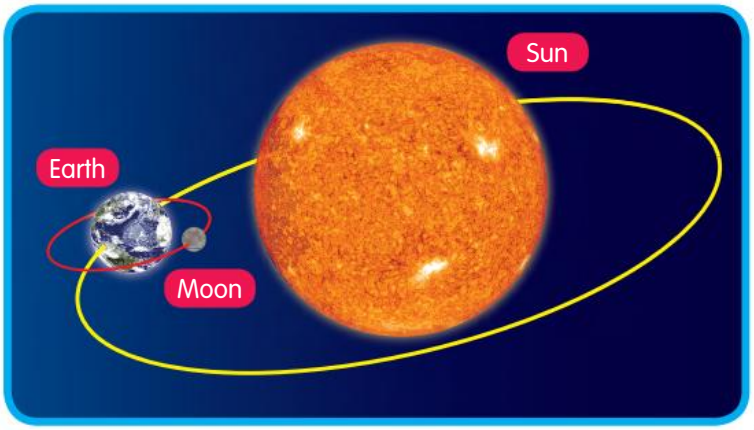
Point to it again when it is midday. It is high up in the sky.

Point to it when it is late in the afternoon. It is low in the sky again, but now it is in the opposite direction.



The time when a place gets sunlight is daytime. The time when the place does not get sunlight is night-time. All places on Earth get sunlight for a part of the day during most of the year. The North and South poles of the Earth get no sunlight at all in Winter.

Here is a drawing of the Earth, the Sun and the Moon in space.



To learn why there is day and night, do this activity.

Hands-on Activity

Activity 5

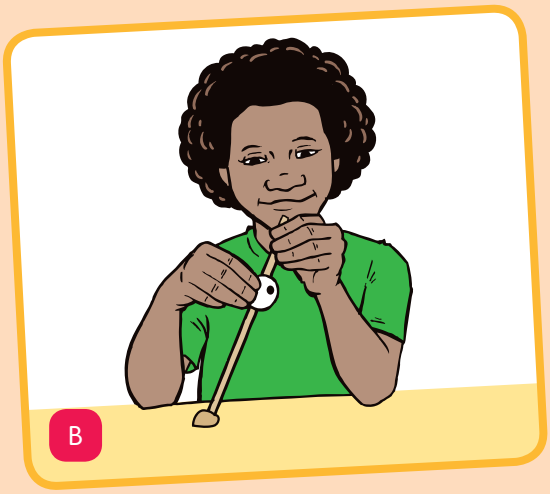
What you need

- sharp piece of stick
- soft ball or round fruit (such as a lemon)
- marker pen
- torch

What to do

1. Push the sharp stick through the centre of the ball (or lemon fruit).
2. Mark a line of dots around the middle of the ball (look at picture A).
3. Stand the stick and ball upright (use a tall jar, or push it into a piece of sago palm pith).
4. Find a dark place (you could do this activity at night).
5. Switch on the torch.
6. Spin the stick so that the ball spins.
7. Watch as the dots on the ball move into the light and then out of the light.

The pictures show you how to do this.



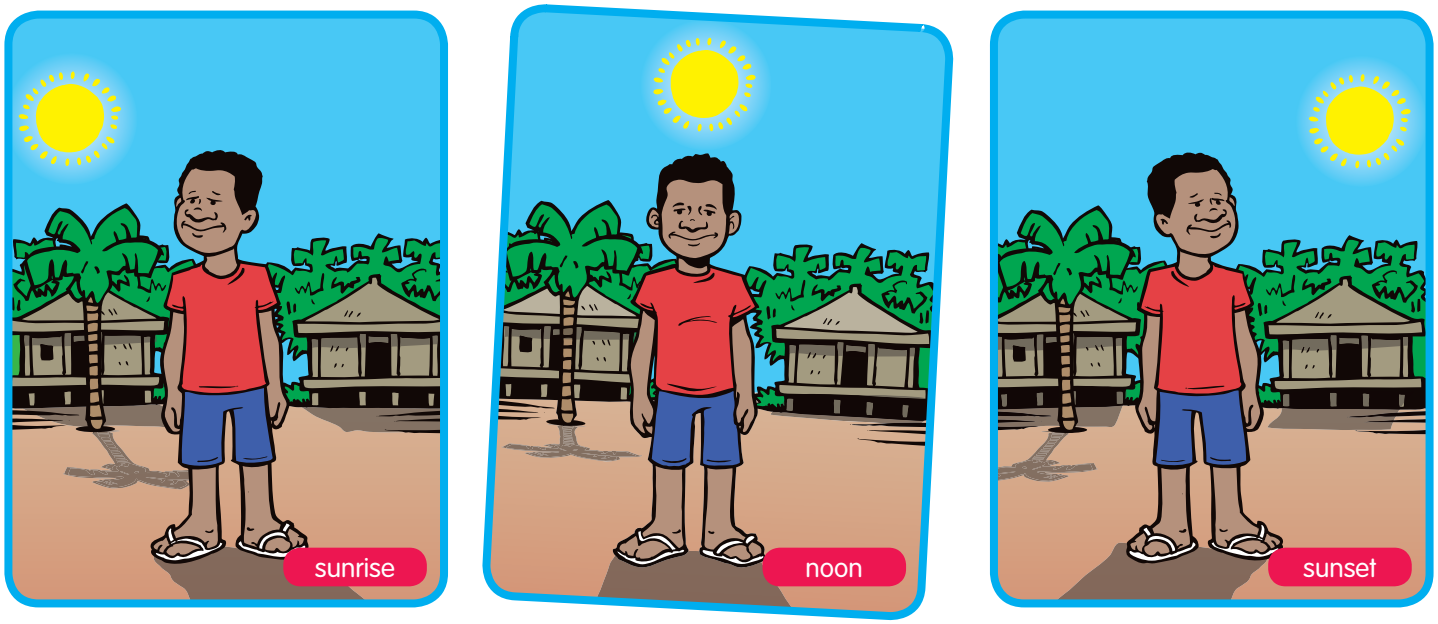
What happened when you spun the ball on the stick?

How much of the ball did the light shine on at one time?

How many dots were in the light at one time?

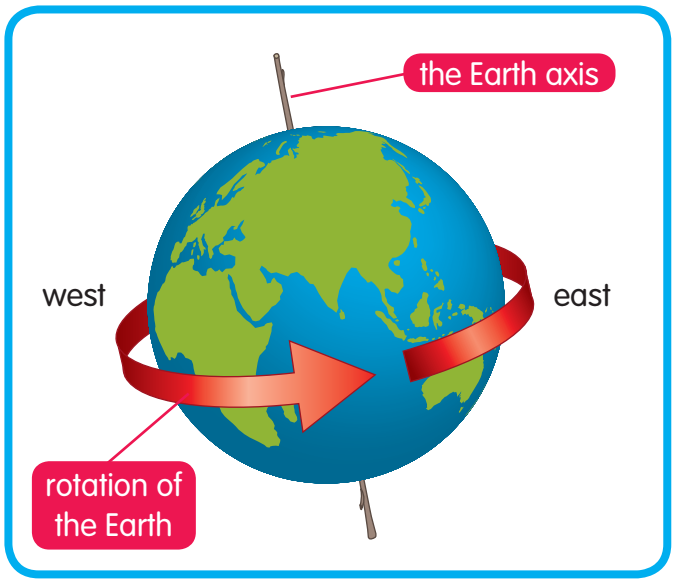
When the ball spins, different sides move into and out of the light. One side of the ball faces towards the torchlight as the other side faces away from the light.

The **globe** and torch activity shows what happens during day and night on Earth. There is day and night because the Earth spins, just like the ball on the stick. As Earth spins, the part facing the Sun has daytime. It is night-time on the part of the Earth that is facing away from the Sun



An Earth day

Imagine the Earth as a huge ball. Imagine pushing a stick through it, just as you did with the lemon fruit. This diagram shows the idea. We say that the imaginary stick is an "**axis**" for the Earth. The spin of the Earth is on this axis—just as the spin of the lemon fruit was on the stick.



The Earth spins in the same direction all the time. The Earth makes one complete spin in 24 hours. This is an **Earth day**. As Earth spins, and a new day starts, sunlight appears to come from the east. Later, the Sun appears to be overhead. Finally, late in the day, the sunlight appears to come from the west.

The spin of the Earth is the reason why we think that the Sun rises in the east and sets in the west.

The dotted line on the diagram shows how the Earth spins—from left to right.

Spin your model Earth on its stick again. Shine the torchlight onto it.

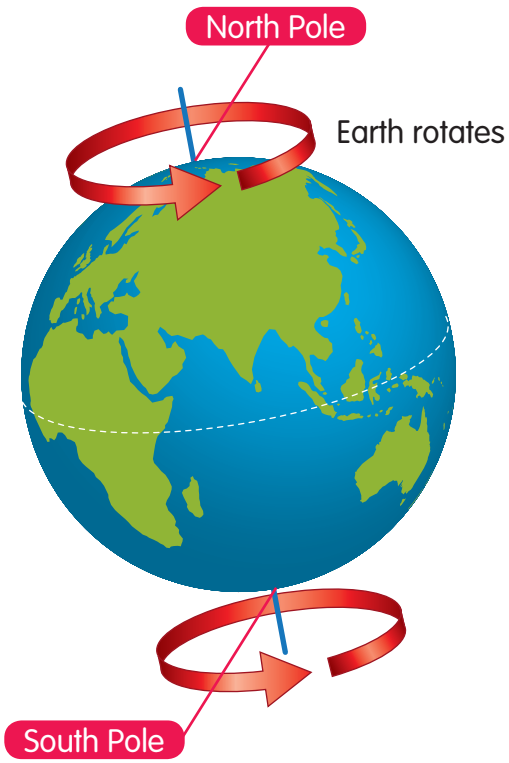
Choose one of the dots to be Solomon Islands.

Observe your dot as the model spins.

Does the dot move from light into darkness, then from darkness into light?

If it is daytime in Solomon Islands, it is night-time on the other side of the Earth. Europe is on the other side of the Earth. Is it night-time in Europe when it is daytime in Solomon Islands?

Our part of the world starts its day before Europe. As we spend time in daylight, Europe spends time in darkness.

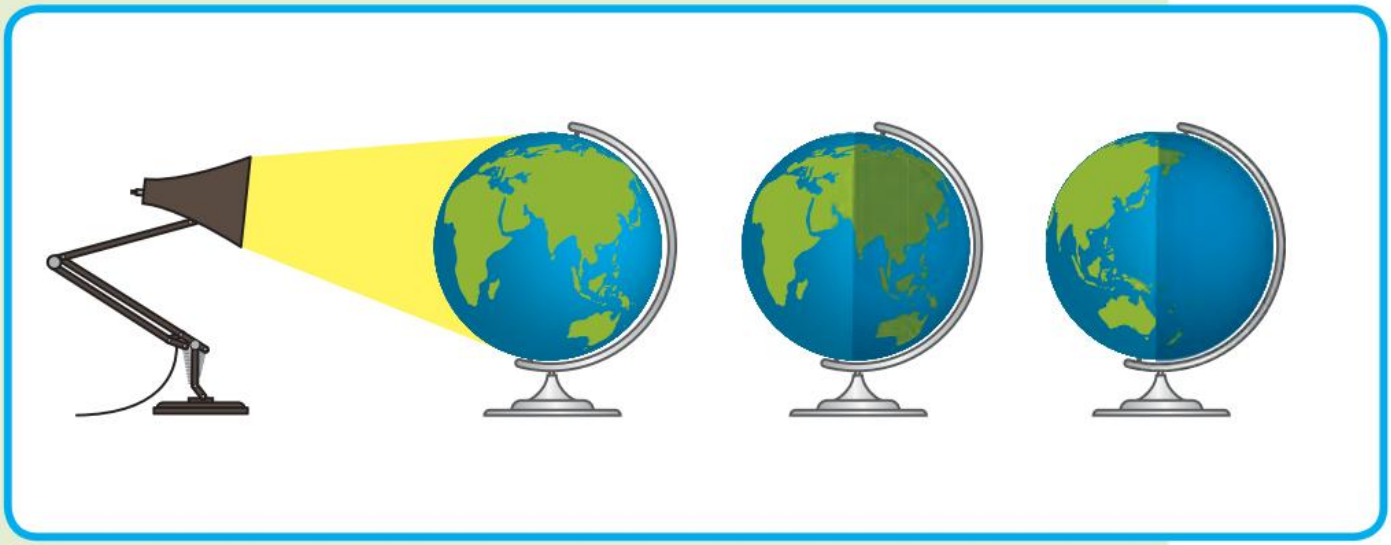


The word we use for the imaginary stick through the Earth is **axis**. In the model, we can tilt the soft ball (or lemon fruit) on the stick.

The Earth also sits on its axis like this—at an angle. The diagram shows this.

The word we use for the spinning of the earth is **rotation**. One full day is made up of daytime together with night-time. When the Earth spins once, it makes one full day. The day lasts for 24 hours. This is why our daily time runs from midnight (00:00 hours) to midday (12:00 hours) and then to midnight (24:00 hours).

If you have a globe, look on it and find Solomon Islands. Shine a bright torchlight onto the globe. Turn the globe slowly.



Is Solomon Islands moving from light into darkness?

This is a **model** of the Earth and the Sun. What do you think the dark area of the globe shows? What do you think the bright part shows?

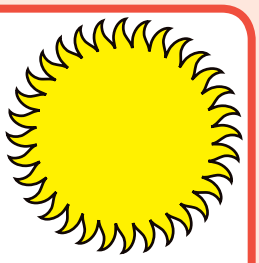
Activity 6

Creative Activity

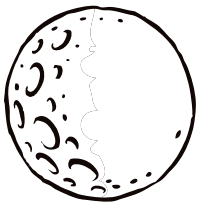
In your exercise book, trace the diagram of the Sun, the Earth, and the Moon. Shade the part of the Earth that has night-time.

Write the words "day" and "night" on the Earth.

When your part of the Earth is facing towards the Sun, it is daytime. Draw a daytime picture in your exercise book.



When your part of the Earth is facing away from the Sun, it is night-time. Draw a night-time picture.



Activity 7

Copy the passage below into your exercise book and use the words in the following list to correctly fill in the blanks.

start **direction** **day** **spins** **night** **direct**

The Earth _____ on its axis once every 24 hours. We have day and _____ because of the Earth's spin. The part of the Earth receiving light directly from the sun is having _____. The part of the Earth not getting sunlight is having night. The _____ of the spin is from the west to the east. This is why people in Solomon Islands _____ each day before people in Africa.

Chapter Review

1 The travelling pinpoints of light in the night sky are stars.

2 The stars appear to form groups because they are so far away.

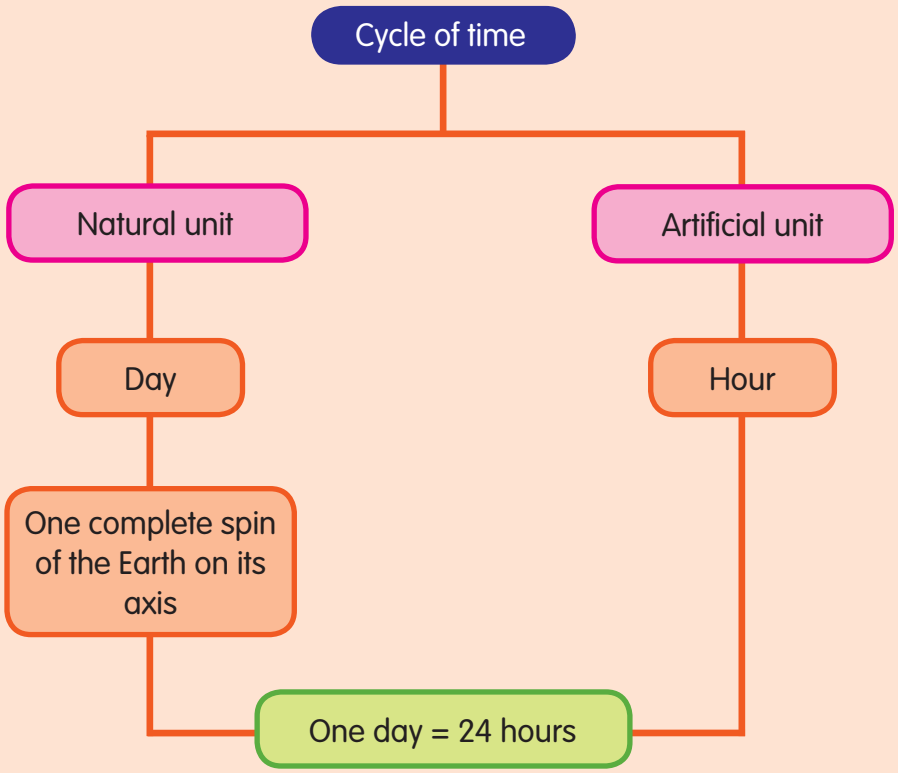
3 The Earth is a planet that moves around the Sun.

4 The Earth is like a spinning top moving in an orbit around the Sun.

5 A day is the time it takes for the Earth to complete one spin on its axis. A day has 24 hours.

6 The day is a natural unit of time that depends on the movement of the Moon and the Earth. The hour is an artificial unit of time.

Units of time



This concept map shows the Earth day as a natural unit of time, and the hour as an artificial unit.

Revision

Answer the following questions in your exercise book.

1 What is a day?

A The time the Earth takes to spin once on its axis.

B The time the Moon takes to travel once around Earth.

C The time taken by the Sun to orbit Earth.

D The time taken by the Sun to spin on its axis

2 Which of these statements about the Sun are true?

A The Sun appears to move from west to east during each day.

B The Sun appears to move from east to west each day.

C The Sun is a planet.

D The Sun is a star.

Glossary

A

alcohol colourless liquid contained in drinks such as beer and wine

ancient something from a time long ago; very old

anther the part of the male sex organ of a plant that produces pollen

approaches gets closer to

astronaut a person who travels in a spacecraft

atmosphere the air that surrounds and protects the Earth

axis an imaginary line that runs through the centre of a planet, for example the Earth, and which it spins around

B

bacteria microscopic (very, very small) living things. Some bacteria cause diseases.

beak the hard, pointed outer part of a bird's mouth

boil to heat a liquid until it becomes so hot that it bubbles and steams; to bubble and steam in this way

boiling point the temperature at which a liquid boils and changes to a gas

brittle hard and easily broken

C

classifying separating into groups based on common properties

community all the different populations of living things that live in an area

condensation when a gas or vapour changes into a liquid

conduct to allow something to move from one place to another, such as heat or electricity along a wire

conduction the movement of heat or electricity through a substance

conserve to store up, or to keep from going bad or being wasted

consumer a person or organism that depends on plants and other organisms for food

contract to become smaller. Most substances contract when cooled.

convection the movement of heat through a liquid or gas

current the flow of a liquid or of heat or electricity

curved bent in shape; not straight

D

deforestation the clearing of natural forests, by burning or cutting

desalination the removal of salt from sea water

desert a large area of land where very little rain ever falls

detergent a substance that removes dirt

discover to find out something

dispersal the action or process of scattering or spreading something

distance the amount of space between two places

drag another name for frictional force

E

Earth day the time it takes the Earth to spin once on its axis; 24 hours

ecosystem an area in which organisms interact with each other and with their environment

elastic describes a material that can stretch and then go back to its original shape

elastic spring force force that allows a spring to return to its original shape after it has been stretched or compressed

energy the ability to do work

environment the surroundings and conditions in which people, animals and plants live

erosion the washing away of soil by rain or wind, or due to human activities on the land

evaporation when a liquid changes into a vapour or gas

expand to become larger. Many materials expand due to heat.

extinct no longer found alive anywhere

F

fertilization the fusing of a sperm to an ovum in humans and animals, and of pollen to a stigma in plants

fertilizer a natural substance or chemical added to soil to make it more fertile

fixed point a point that does not move

float to stay at rest or move on the surface of a liquid

force power or strength

forest large area of land covered with trees

freezing when a liquid changes into a solid

freezing point the temperature at which a liquid changes into a solid

frictional force force between objects or surfaces that slows movement and produces heat

fuel source of heat such as firewood or oil

fungus (fungi) a plant-like organism without flowers, leaves or green colouring, such as a mushroom

G

gas substance like air that is neither liquid nor solid

germination when a seed starts to grow into a plant

globe a ball-shaped object with a map of the Earth on it

H

habitat the place where an animal or plant naturally lives or grows

harvest the cutting and gathering of crops

hatch an egg hatches when it breaks open and a chick or reptile comes out

heat hotness or warmth

horizon the line in the distance where the sky and land or sea seem to meet

I

imagine to have a picture of something in your mind

input force the force we apply to a machine

insect a small animal with six legs, no backbone, and usually with wings, such as a butterfly, fly, or beetle

instrument a tool used to help you with your work

insulator a material that reduces or stops the flow of heat

intercourse the act of mating between a male and a female animal

invent to make or think of something for the first time

irrigation the supplying of water to the land or crops by constructed channels or pipes

L

lake a large area of fresh water with land all around it

layering a way of growing new plants without seeds or cuttings

lever a rigid bar that moves about a pivot, and is used to cause movement of a load at one point by applying force at another point; a type of simple machine

light energy the ability of light, especially from the Sun, to do work

liquid any substance that flows, such as water

M

machine something that makes it easier to apply a force

magnifier a device that makes things larger

mammal warm-blooded animal that produces live young and feeds its young on milk

mangrove a common tree in tropical freshwater and saltwater swamps

manure dung or animal waste used as a fertilizer

melting when a solid changes to a liquid

mercury a very heavy liquid metal, used in some thermometers

model a small copy of something

moss a small plant that forms a soft covering on stones in damp places

N

natural made by nature and not by humans

nectar a sugary liquid found in the flowers of some plants

O

observe to watch somebody or something carefully

oceans the great masses of salt water that surround the continents

oil a kind of smooth, thick liquid that does not mix with water but burns easily

opossum a small nocturnal tree-dwelling marsupial with dense fur, a long snout, and a hairless prehensile tail

organic matter a natural substance

organism any living animal or plant

output force the force a machine applies to an object

ovary one of the pair of organs in women and female animals and plants that produce female sex cells

ovule the part of the female sex organ of a plant that forms a seed

P

particle a very small piece or amount of a substance

pattern an arrangement of lines, shapes or colours

pesticide a chemical substance used to kill pests such as insects

pistil the female sex organ of a plant

pivot a point or pin on which something turns; also, to turn around

plantation a large area of land where a single crop such as coconuts, oil palms, or cocoa is grown

pollen a fine yellow powder on the male part of the flower that fertilizes other flowers to produce seeds

pollination the transfer of pollen grains to the stigma of a flowering plant

pollutant a substance, such as a waste chemical, that damages the air or water and living things in it

pollution when the water or air is made dirty by pollutants

population a group of the same type of organisms living and reproducing in the same place at the same time

producer an organism that makes its own food. All plants are producers.

R

radiation the movement of heat through empty space. Heat moves from the Sun to the Earth by radiation.

rainforest a tropical forest with tall trees, in which it rains a lot

reforestation the work of planting trees to replace those that are cut down

reproduce to make a copy of something

reproduction the process of making a copy of something, such as new plants or the offspring of humans and other animals

rotation movement in a circle around a fixed point or axis

S

scientist somebody who studies science

seed a small structure that carries the beginnings of a new plant

sense the ability to make good judgements; also, any one of the ways we discover information about our surroundings, such as sight, hearing, smell, taste, and touch

sewage human waste produced by people where they live

sex cells special cells produced by male and female organisms that join during fertilization to produce a new organism

sexual the type of reproduction that involves male and female cells

shiver the rapid contracting of body muscles to produce heat

sink to drop beneath the surface of a liquid

skeleton the framework of bones or other hard structures in a human or animal body

slatted made of strips of wood with gaps between them, like a fence

slaughter to kill animals for food

solid the state of matter with a definite shape that is not easy to change

sperm a male sex cell in humans and animals

sphere a round shape like a ball

stamen the male sex organ of a plant

stigma part of the female sex organ of a plant

style part of the female sex organ of a plant

straw dried stalks of grain

substance matter or stuff

sucker new stem that grows from the roots of a parent plant

sweat moisture that is given off by the body through the skin; to give off this moisture

T

technology the practical use of science in industries

telescope a tube-shaped instrument with lenses that you look through with one eye and that makes distant things appear closer

temperature a measure of how hot or cold an object is

testes the two male sex glands

thermometer an instrument used to measure temperature

trough a long, narrow container for food and water for animals

U

Universe the whole of everything that exists, including the Earth, Sun, planets and all the stars in space

V

vegetable a plant that is grown to be eaten

vegetation plant life. A rainforest is a habitat that contains much vegetation.

W

water cycle the route by which water circulates in nature

water vapour the gas state of water

wax a solid substance made from fat or oil that becomes soft and sticky when heated

weather the condition of the atmosphere at a particular time or place, including temperature, humidity, wind and rain

womb the organ in female humans and other mammals where a baby forms and develops up until birth

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