Solomon Islands

Primary Science

LEARNER'S BOOK Year 6

solomon islands
CURRICULUM DEVELOPMENT DIVISION

ALWAYS LEARNING

PEARSON

Solomon Islands

Primary Science

LEARNER'S BOOK Year 6

Solomon Islands Curriculum Development Division
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Contents

Chapter 1

Food chains

In this chapter, you will:

- learn the difference between herbivores, carnivores and omnivores
- observe local animals and what they eat
- make a food chain using plants and animals from Solomon Islands
- learn the difference between predator and prey
- explain how the availability of food affects the predator–prey relationship
- learn how energy moves along a food chain
- explain why there should be more producers than consumers in the environment.

Herbivores, carnivores and omnivores

You will remember that green plants use light from the **Sun** to produce food. This process is called **photosynthesis** and is very important for all life on Earth. Because plants make their own food they are called **producers**.

Animals cannot make their own food. They have to eat other things—plants or other animals. For this reason animals are called **consumers**.

There are different types of consumers. Some animals only eat plants. They are called **herbivores**. Herbivores are primary consumers. Some animals eat other animals. They are called **carnivores**. A few animals eat both plants and animals. They are called **omnivores**. Pigs are omnivores. Carnivores and omnivores are secondary consumers.

Do you think we humans are herbivores, carnivores or omnivores?

Activity 1

Draw up a table in your exercise book with three headings: herbivores, carnivores and omnivores.

1. Look at the pictures of animals below and try to identify them.
2. Identify what type of consumer each animal is. Write its name in one of the columns in your table. Remember that carnivores can eat all sorts of other animals including, fish, insects and worms.








Activity 2

Think and Write

All of the animals in Activity 1 are found in Solomon Islands. Some of them are wild animals like crocodiles. Others are farmed animals like pigs.

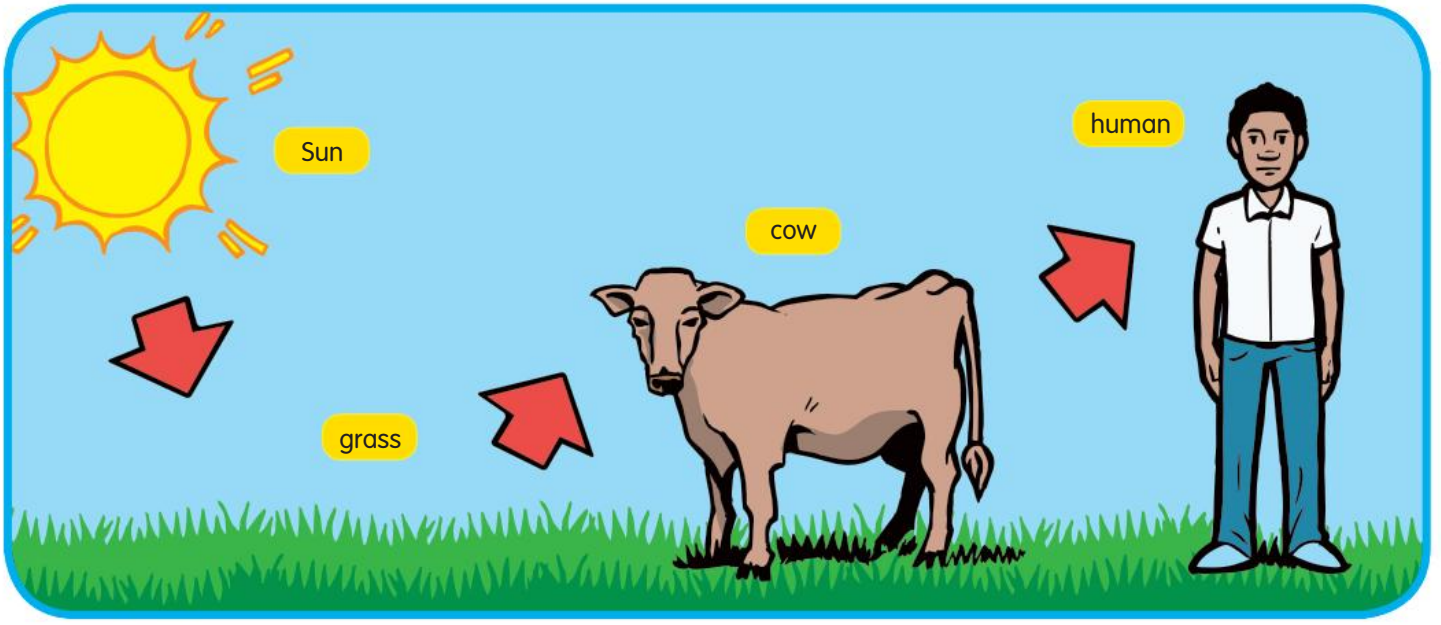
We don't have animals like lions or elephants in Solomon Islands. But you may have seen these in books or perhaps on the television.

Make a list of animals from other places in your exercise book and then group them into carnivores, herbivores or omnivores.

Food chains

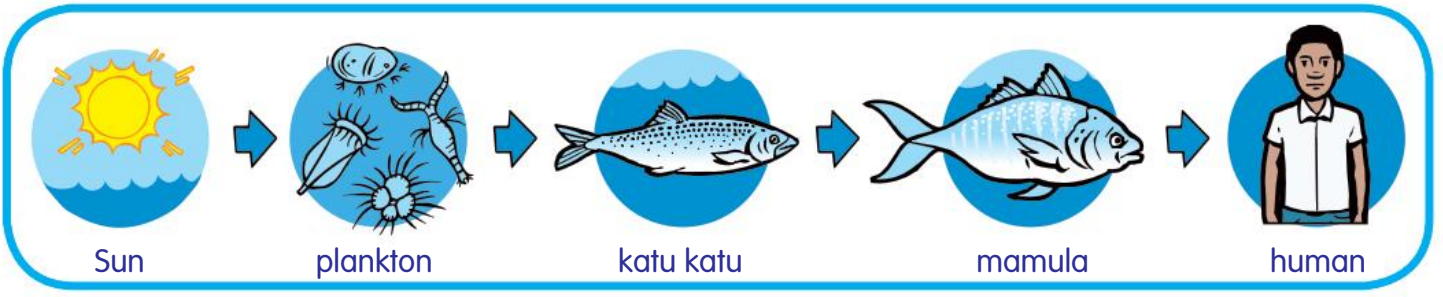
Think about some of the things that you eat. What type of fish do you eat and what type of meat?

Many people eat beef. Beef comes from cows. Cows eat grass and we know that grass is a plant that uses the Sun to make its food. All of these living things are linked in a chain.



A food chain

There are lots of different types of **food chains** on land, in rivers and lakes, and in the sea. In the sea there are very small plants and creatures called **plankton** that use sunlight to make their food. These plankton are eaten by small fish. The small fish are eaten by bigger fish, and in turn these big fish may be eaten by humans. We can make a food chain to show this.



Creative Activity

Activity 3

In your exercise book draw a food chain similar to the one above.

Use this list of living things:

insect	cat	lizard	plant

Observing animals as they feed

Fieldwork Activity

Activity 4

Go outside to where you can sit quietly. If you are quiet, you can watch animals without scaring them away. You can observe animals in the bush, at home or at school.

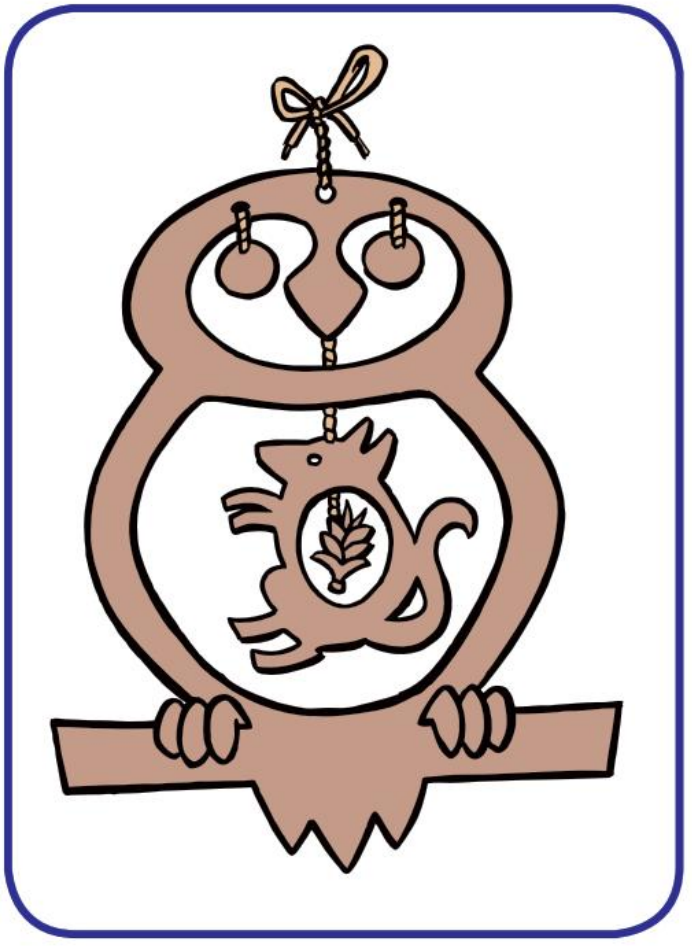
1. Find an animal that you can watch feeding. What does it eat? Is it a carnivore, herbivore or omnivore? Is there anything that might eat it?
2. In your exercise book make a drawing of the animal you have been watching.
3. Write a description of what it looks like.
4. Draw a food chain that includes your animal.

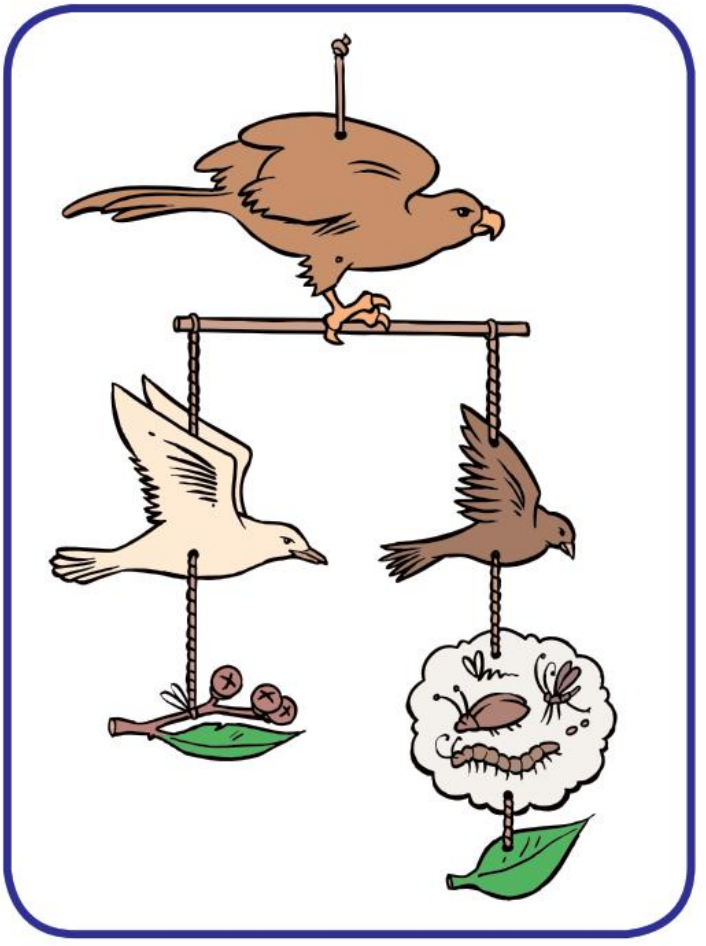
Activity 5

Hands-on Activity

You will need some card, thread and scissors for the following activity.

1. Write out a food chain for Solomon Islands. You can use one that you have already seen.
2. On the card, draw each of the living things that make up the food chain. Colour them if you have crayons.
3. Cut out the pictures and use the thread to link them into a food chain.
4. Hang your food chain from the wall or roof of your classroom. You can link them all in a single line but there are some other suggestions below.





Some examples of food chain hangings

Predators and prey

Animals can be grouped into herbivores, carnivores and omnivores, but there are other ways to describe and group them. Animals that feed on other animals are called **predators**. The animals they eat are called their **prey**.

There are lots of examples of predators and prey in Solomon Islands. Cats are predators and they feed on mice, birds and lizards. These are their prey. Even animals like geckos can be called predators. Insects are their prey.

Sharks and crocodiles are large predators and their prey is usually fish—although they can eat humans too!

Predators have different ways of catching prey. Cats hide and then jump on mice or lizards if they come close. Sharks swim very quickly to catch smaller fish. Geckos use electric lights to help them catch insects. Geckos hunt at night, catching insects that are attracted to bright lights.

Animals that are prey have special ways to avoid being eaten. They may hide, some can run or swim very quickly and others have special **camouflage** that makes it difficult for predators to see them.

Eat different prey

A predator like a shark has to eat a large number of fish to stay alive. It is the same for geckos. Each gecko eats many insects. This means there always has to be more prey than predators. If the number of prey becomes too small, their predators die out.

Predators that eat many different types of prey generally survive best. If one type of prey becomes scarce, they can switch to another type. For example, a cat that feeds on lizards can start to prey on mice if the lizards become scarce.

Activity 6

Here are two groups of animals with pictures of each them. They have been grouped into predators and prey. For each predator, write a few sentences in your exercise book about how it catches its prey. For each prey, write a few sentences about how it avoids being captured.

Predators

snake

owl

barracuda

Prey

mouse

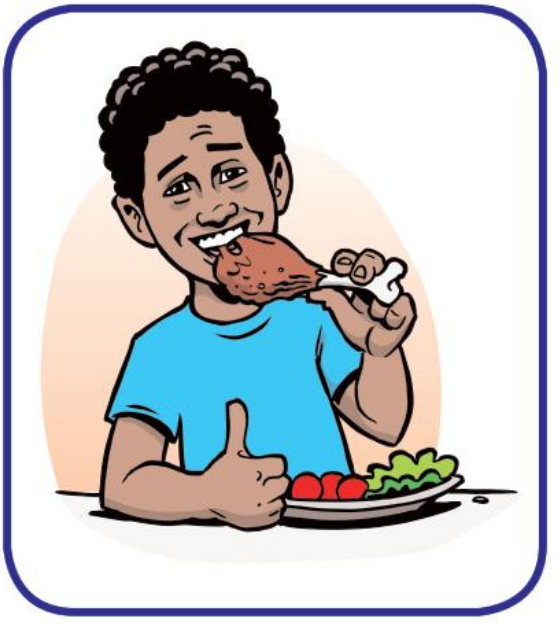
butterfly

grasshopper

Energy in food chains

We have already learnt that all animals get their **energy** from the food they eat. Whether they eat plants or other animals, their bodies use this food to provide the energy they need to survive.

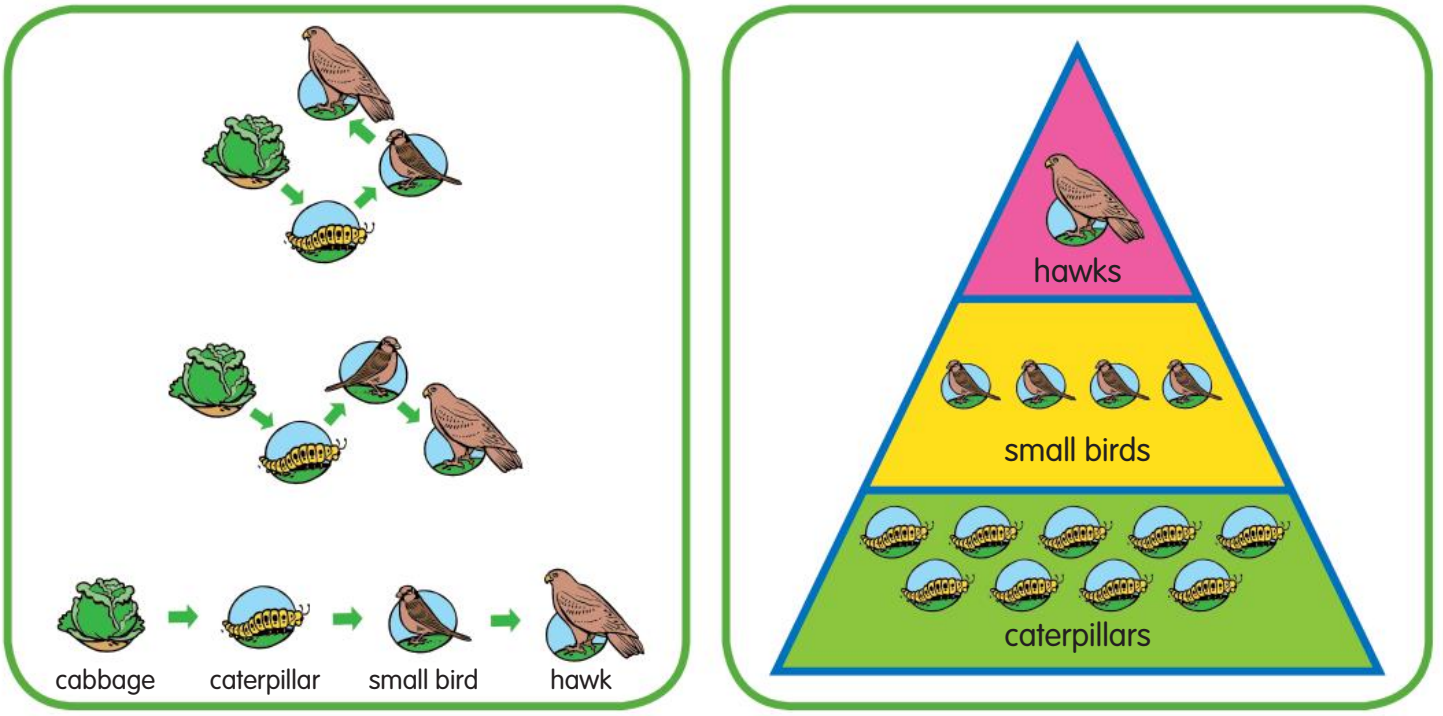
Look at this boy eating a plate of chicken and salad.



The boy is a food consumer. He eats the chicken and salad. The chicken was also a food consumer. It ate grains such as rice, which came from a plant. The plant made its own food. So the boy is indirectly eating food made by a plant when he eats the chicken.

In this way, energy is passed from one link in the food chain to the next. But at each link some energy is lost. In fact, 90% is lost between each link. That is why as we move along a food chain there are fewer living things at each link. In this garden food chain, there will be fewer small birds than caterpillars and then fewer hawks than small birds.

The **pyramid of numbers** shows that there are many caterpillars, less small birds and even less hawks. If there were too many hawks they might eat all of the small birds. What would happen to the number of caterpillars if the small birds disappeared?



Different ways of showing a food chain

Think and Write

Activity 7

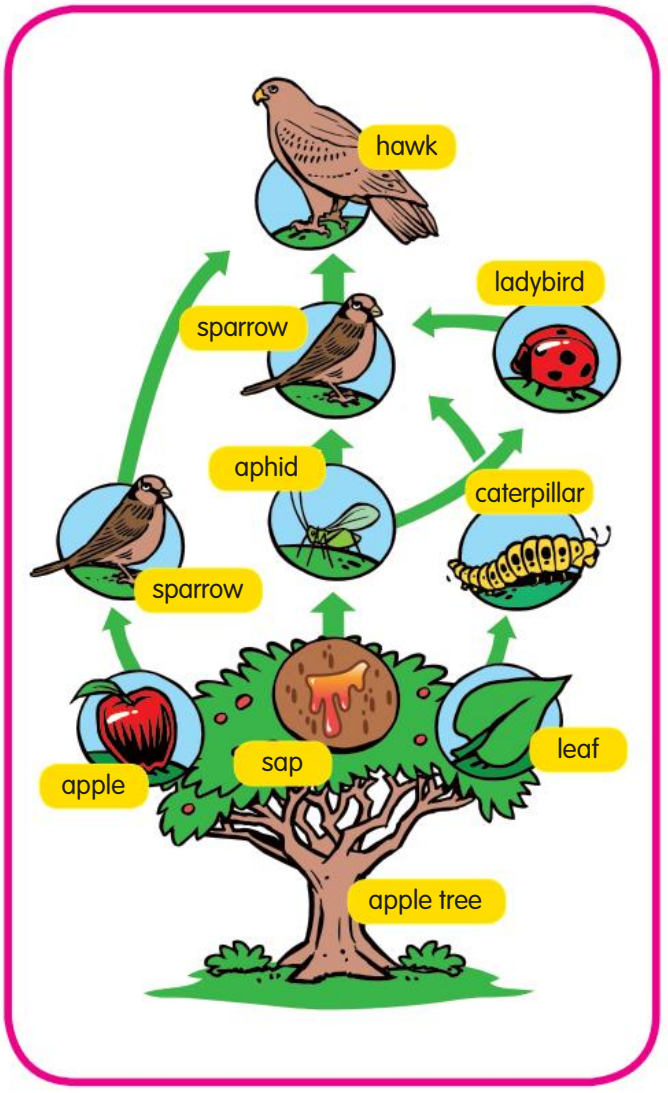
In your exercise book draw a pyramid of numbers for this food chain:

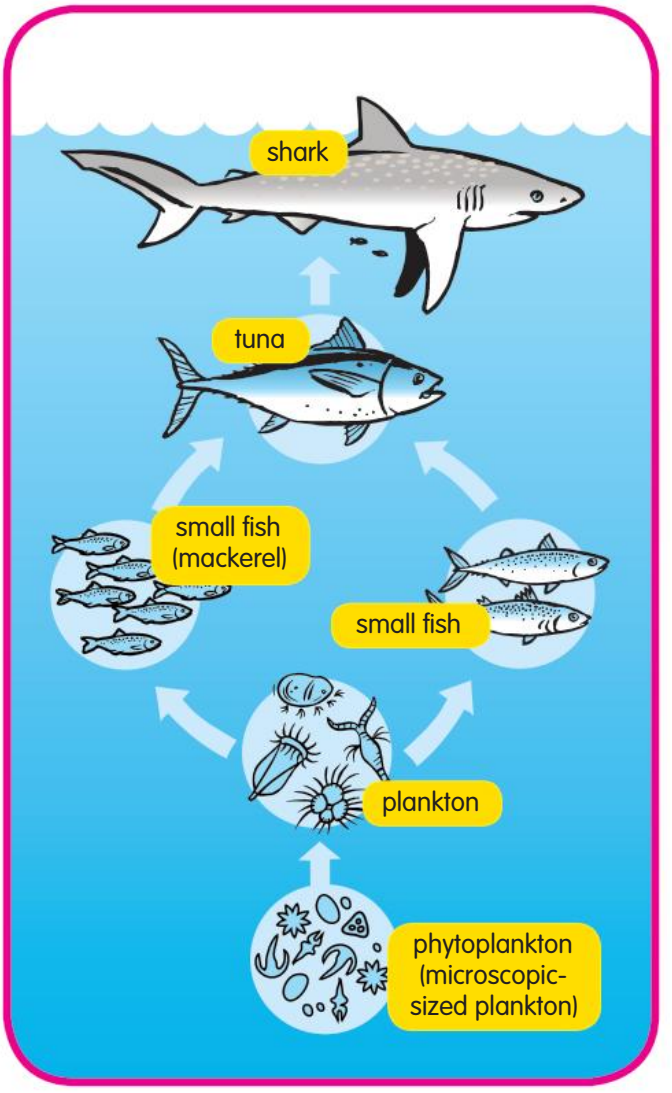
plankton → katu katu → mamula → humans

All living things are dependent on other living things. If humans interfere with food chains too much it can have a serious impact on the environment. Think about what would happen to the food chain above if all the katu katu disappeared because of too much fishing.

Food webs

We can put two or three food chains together to form what is known as a **food web.** See how food webs for these animals are made up of a number of food chains.





Think and Write

Activity 8

1 Make a list of all the living things you can think of in the school garden. Include plants, insects and birds. Use your list to help you draw a food web.

2 Then draw a food web of plants and animals that live in the sea around Solomon Islands.

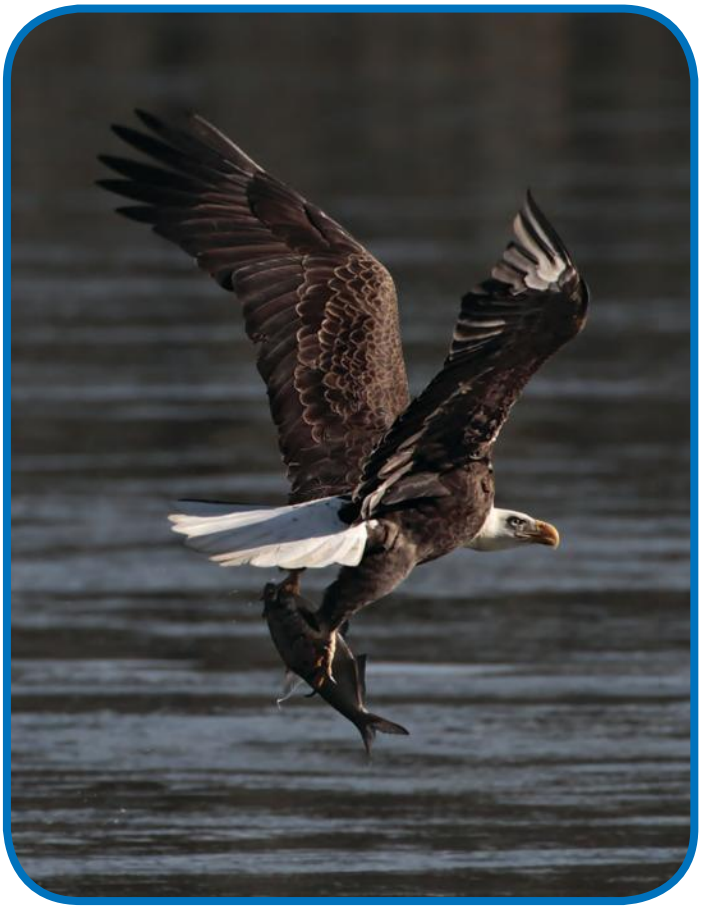
Balance within the food web

Predators are normally large animals and they need lots of food to survive. Each predator has to kill enough prey to survive. The prey have to be numerous enough to reproduce and survive.

If there are too many predators, then they will eat all the prey. This will have a disastrous effect on both populations. The prey will die out because they are eaten by the predators. The predators will also die out because they will run out of food to eat.

The opposite also happens. Without predators there would be too many prey. This can damage the basic food supply. For example, without cats eating rats, the rats would eat all the grain, and humans would have less grain.

In a healthy ecosystem, predators and prey reach a balance so that there are always enough prey animals to continue reproducing. This means a permanent supply of food for the predators.



Predators catching their prey

Decomposers

When plants and animals die, their parts break down and the minerals or nutrients are returned to the earth. These nutrients can be used by living plants to help them grow. This is another cycle.

The **organisms** that break down dead material are called **decomposers.** Decomposers are mainly **bacteria** and **fungi** in the soil. They are very small and we cannot usually see them without a microscope.

Decomposing plants break down into soil which feeds new plants.

Hands-on Activity

Activity 9

1. Put a piece of bread on a dish and add a small amount of water to it.
2. Put the bread in a dark cupboard and leave it for a day or two.
3. Take the bread out and note any changes in your exercise book. Ask your teacher to tell you the name of the decomposer that has started to grow on the bread.

Activity 10

Hands-on Activity

This is an investigation to see what conditions **mould** or fungus grow best in. You could compare dry and wet bread, light and dark conditions, and warm and cold conditions.

1 Write down how you might carry out this test.

2 Draw up a table of your results like the one below.

	Conditions	Size and shape of mould
Day 1	Warm, dry, dark	
Day 2	Warm, wet, dark	
Day 3	Cold, dry, dark	
Day 4	Cold, wet, dark	
Day 5	Warm, wet, light	
Day 6	Cold, wet, light	
Day 7		

Chapter Review

1. The energy needed by plants comes from the Sun (solar energy).
2. Solar energy is taken in by green plants (producers) during the process of photosynthesis.
3. Green plants use the energy from the Sun to make food.
4. Some organisms (primary consumers or herbivores) eat green plants to obtain their energy directly.
5. Other organisms (secondary consumers—carnivores or omnivores) eat primary consumers to obtain their energy.
6. Humans and all other animals depend on plants or other animals for food. Therefore humans and all animals are food consumers.
7. Feeding relationships between organisms in an environment can be shown as food chains and food webs.
8. Living things depend on each other. This can be seen in the way energy is passed from one to another in a food chain.
9. The food chain is a series of living things through which food energy passes.
10. Balance in the prey–predator relationship maintains balance in an ecosystem.

Revision

Answer these questions in your exercise book.

1 **Why are plants called producers?**

2 **Put the following groups of organisms in the correct order to form food chains, starting with the producer.**

   a slug, snake, frog, cabbage

   b caterpillar, leaf, thrush

   c seagull, seaweed, crab

   d caterpillar, leaf, ant, lizard

3 **Explain why we could not live in a world without plants.**

4 **Draw a food chain that ends with humans.**

Chapter 2

Variation in living things

In this chapter, you will:

- compare the physical characteristics of your friends in class
- identify the features of plants and animals that help them to survive
- make a model animal designed to survive in a particular habitat
- learn about the behaviours that help animals to survive
- compare the features of baby animals with their parents
- learn why some animals have died out or become extinct.

Similarities and differences

If you look around the class at your friends, you will see that in some ways they may be similar or different. They may all have eyes, ears, hands and feet, but in other ways they are different. Some are boys, while others are girls. Some people are tall, others are short. Some may have dark skin, while others have lighter skin. You will find some people are left-handed, while others are right-handed. They will have **similarities** and **differences**. These physical features are called **characteristics**.

These children are different. One is female and the other male. They also have different hair and skin colour.

Activity 1

Find out about the following physical characteristics of the children in your class:

- the number of children who are left- or right-handed
- the number of children with blond, brown, or black hair
- the number of children with brown or blue eyes
- number of boys and girls.

Draw bar graphs in your exercise book to represent the information you have collected from your class.

Activity 2

With the help of your teacher, measure and record the height of all of the children in your class.

1. In your exercise book write each person's height beside their name.
2. Now count up the number of children whose height is in the following ranges. Copy and complete this table to help.

Height range	Number of children
less than 1 metre	
1.1 metres	
1.2 metres	
1.3 metres	
1.4 metres	
1.5 metres	
taller than 1.5 metres	

What do plants need to survive?

Can you think of the main things plants need to survive? Plants need water, sunlight, good soil and air to survive. They need **pollination** and to scatter their seed. Plants also need to avoid being eaten. **Survival** depends on many things.

Activity 3

1. Make a list of all the things a plant needs to survive.
2. Go out into the school grounds and examine some plants.
3. Take a small plant back to the classroom to look at it more closely.
4. On your list of plant needs, identify the part of a plant that helps it meet each need. For example, we know that plants need sunlight to make their food. They use their green leaves to do this. So beside the word "sunlight" put the word "leaves". Think about how plants get water. Write down the feature that helps them. Try to do the same for pollination.

Activity 4

Hands-on Activity

1 Draw a picture of a plant in your exercise book, including its roots.
2 Label all of the parts.
3 List down what each part does to help the plant survive.

Some plants have spikes or thorns on their stem or branches. How do you think this helps them to survive?

Other plants can live in very dry places that don't have much rain. One of these plants is called a cactus. These plants can live in the desert where it is very dry. To survive they have very thick stems in which they can store water. They take up lots of water after it rains and store it in their stem. The plant uses the water slowly during very dry times.

This special **feature** is called an **adaptation**.

What do animals need to survive?

Animals are different from plants, as they cannot make their own food. They need to find food to survive and shelter to hide from predators. They also need water and air to survive. Animals use oxygen from the air when they take air into their lungs.

Adaptations

Adaptations are the features that help plants and animals to survive. Remember the thick stem of the cactus plant that stores water?

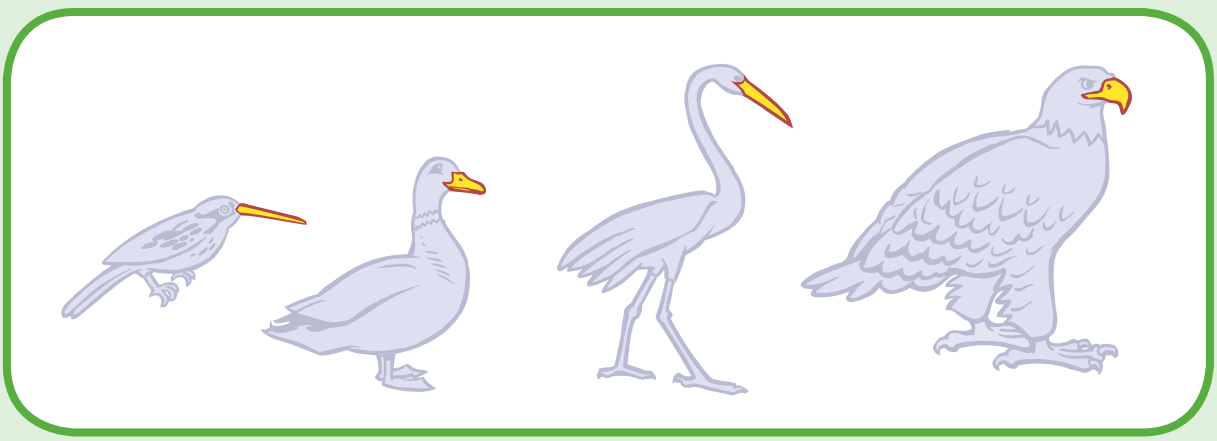
Animals also have certain adaptations that help them to survive. For example, if you look at different types of birds, you will notice that the shapes of their beaks are different. Each shape is specially suited to finding, catching or breaking open food. This is an adaptation to an animal's **structure**.

A woodpecker has a strong sharp beak for breaking wood and bark to find insects. Hummingbirds have a thin curved beak for reaching nectar in flowers.

Birds and other animals have to find food, escape from predators and find a mate. Most animals have special features to help them do these things.

Activity 5

Think and Write

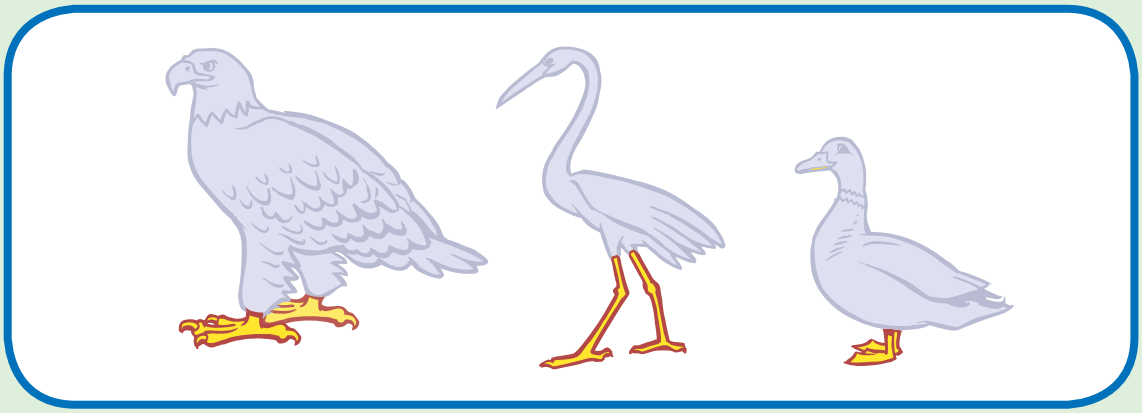


1 Look at the diagrams of the beaks above.

2 Decide which beak is used to catch fish, which is used to catch mice, which is used to eat insects and which is used to get nectar from flowers. For each, say why you think the beak has this job.

3 Draw the beaks in your exercise book and write a sentence about each one.

Activity 6



1 Look at the diagrams of the feet above.

2 Decide which feet are used to catch mice, which are used to paddle through water and which are used to walk over soft mud. For each, say why you think the feet do this job.

3 Draw the feet in your exercise book and write a sentence about each pair.

Activity 7

This bird is called a peacock. This one is a male. It has brightly coloured feathers and a huge tail.

Write a description of the bird in your exercise book. Say why you think the male peacock has these features.

Activity 8

Think and Write

This animal is a grasshopper. You will have seen them jumping away if you walk through long grass.

1 Is it easy to catch a grasshopper?

2 Think of a feature that helps the grasshopper survive.

3 Make a drawing of a grasshopper in your exercise book and write down what you think helps it to survive.

Activity 9

Creative Activity

Do this activity in pairs.

Make a model animal to survive in the following environment. It is hot. The animal likes to eat worms but it has to protect itself from birds that want to eat it.

1 Think about what features your animal will need to stay cool, find worms and avoid being eaten by birds.

2 Draw your animal first.

3 Use available materials to make a model of your animal. If you don't have modelling clay or dough to make the body you can use a piece of fruit or a vegetable.

4 Explain how your animal will survive to the class or in your exercise book.

Animal behaviour

We have seen that plants and animals have many features or adaptations that help them to survive. Animals' bodies may have features like sharp beaks, bright feathers or strong jumping legs. But their **behaviour**—like hiding, digging burrows or building nests—can also help them to survive.

Activity 10

In your exercise book describe the behaviour shown in this picture.

What is it about this behaviour that helps the bird to survive?

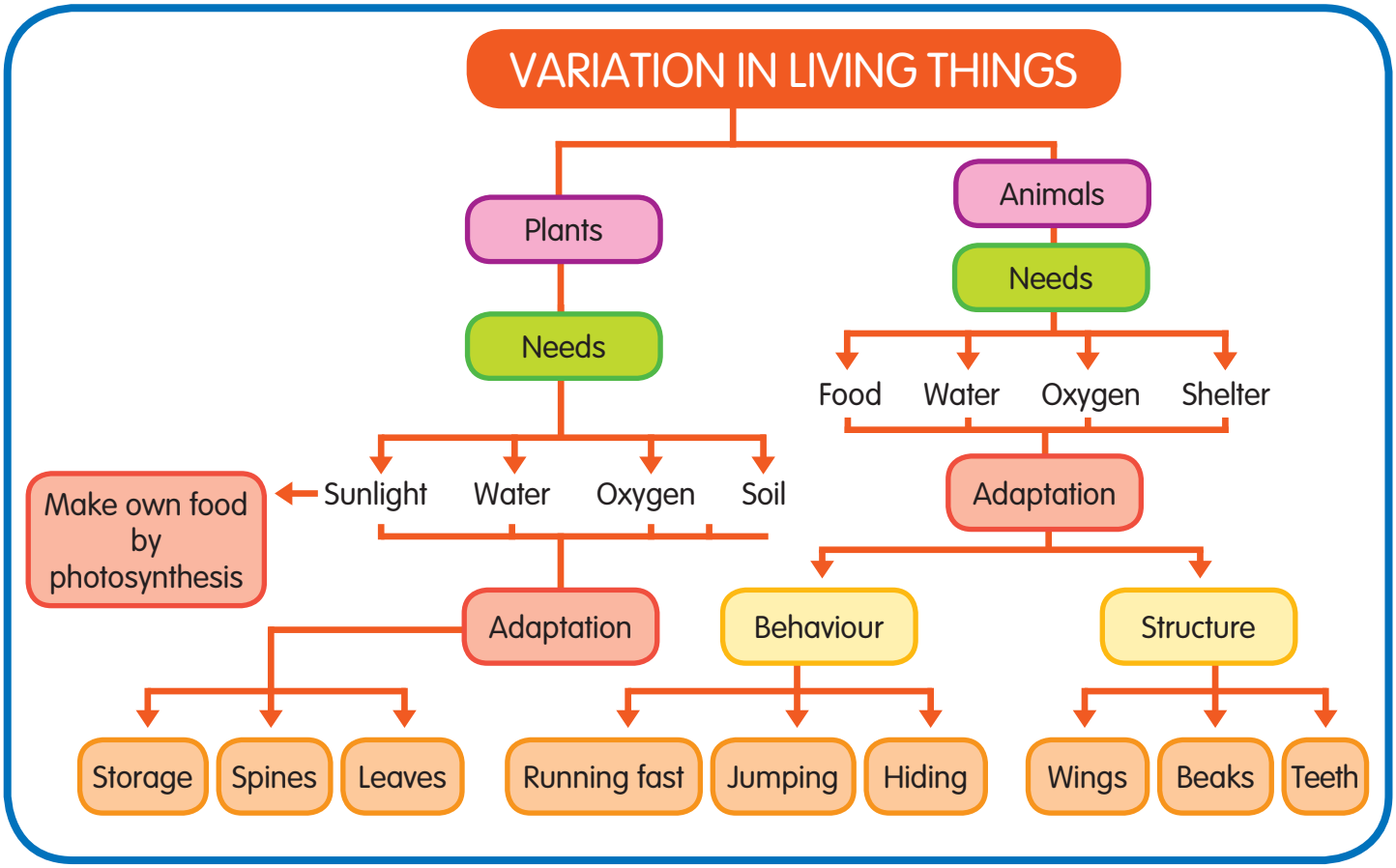
Observing animals' survival behaviour

We can learn a lot about how animals survive by watching them. We know they have some features that help them to survive and also some behaviours that help them. Observe some animals in Solomon Islands and identify the features and behaviours that help them to survive.

Activity 11

You can do this activity at home or at school.

1. Observe an animal carefully, perhaps a mynah bird or a gecko as these are very easy to find. Look at all of the features of the animal and think about how each one helps it to survive.
2. Look at how the animal behaves. How does this behaviour help it survive?
3. In your exercise book draw the animal and label it. Write some notes about its features and behaviour.



Parents and babies

Human babies and the young of other animals have many characteristics in common with their parents. The characteristics that are passed from parents to young include those that help them adapt to their environment and survive.

All animals get some characteristics from their mother and some from their father. In this way characteristics are passed from one generation to the next.

Think and Write

Activity 12

Look at the picture of the mother and her child. Make a note of their common features or characteristics.

Activity 13

Look at these pictures of Solomon Island animals with their young. In your exercise book make a note of all the things the young animals have in common with their parents.

A turtle and young turtles

A dolphin and its young

Extinction

Although animals and plants have adapted to their environment, humans can make things very difficult for them by changing the environment. Humans have damaged many places that animals and plants live by polluting them or clearing the land.

Clearing land for farming or logging and building new settlements or homes changes the environment for plants and animals. Overhunting of one type of animal can also change the natural balance. In these cases, animals and plants may not be able to adapt quickly enough and may die out.

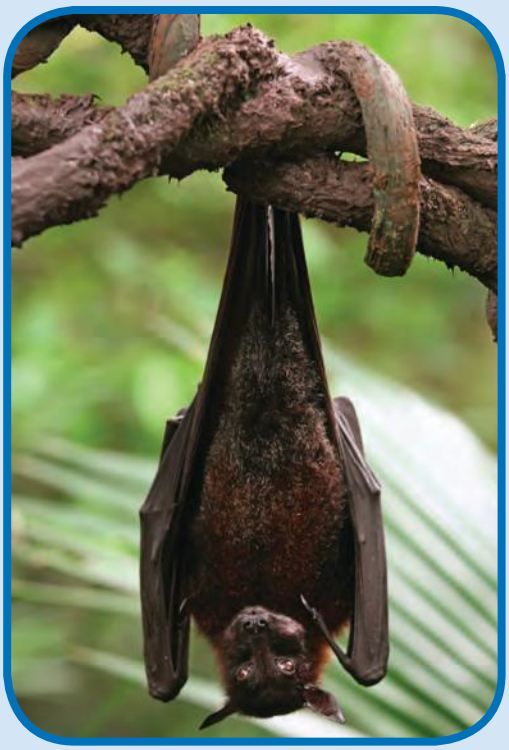
If large numbers of a type of plant or animal die, the whole **species** may eventually face **extinction**. This is happening to a lot of species across the planet. In Solomon Islands a number of types of bats and turtles are close to extinction such as cusp toothed fruit bats and leatherback sea turtles.

We humans need to think carefully about how our actions can affect other species.

Chapter Review

1. Plants need water, sunlight, good soil and air to survive.
2. Animals need food, water and air for their survival.
3. Adaptation helps all living things to survive.
4. Structural adaptations are the special features or body parts of an organism that help it to survive. For example, the webbed feet of a duck help it to move through the water quickly. The thick stem of a cactus stores water and helps it survive in very dry conditions.
5. Behavioural adaptations such as hiding, running or swimming quickly help organisms to survive.
6. Extinction happens when an entire species of animal or plant dies out. Most extinction is caused by human activity such as the clearing of forest or too much hunting and fishing.

Answer the following questions in your exercise book.

1 

What is the animal in this picture? List some of its features and explain how they help it to survive.

2 Here is a picture of some land that has been logged by a company in Solomon Islands. Study the picture and write a sentence or two about how this may affect the survival of organisms living in this environment.

3 Here is a picture of a deep forest that was burnt by a fire. List some organisms that you think might be living in this type of environment.

Chapter 3

Electricity

In this chapter, you will:

- demonstrate how to produce static electricity
- construct a simple circuit
- draw a circuit diagram using symbols
- explain the difference between conductors and insulators
- learn the difference between series and parallel circuits
- make an electromagnet and vary its strength
- understand the importance of working safely with mains electricity.

There are two types of electricity: static electricity and current electricity. In this chapter you will learn about both of these and the differences between them.

Static electricity

If you rub a blown-up balloon against your shirt and hold it near some bits of paper, they will stick to the balloon. They stick to the balloon because it has gained an electric charge. If you comb your hair vigorously, you make the comb electrically charged too. If you place it above your head, your hair will stand on end—not because you are frightened but because it has become charged as well! The electricity of the balloon and the comb is **static electricity**. In static electricity the charged particles cannot flow or move easily.

Hands-on Activity

Activity 1

1. Rub a blown-up balloon against your shirt a few times. Hold the balloon near some small bits of paper. Write down what happens in your exercise book.
2. Comb your hair for 15 seconds. Now place the comb above some small bits of paper. Write down what happens.

Rubbing the balloon on your shirt causes the transfer of electric charges. The balloon ends up with extra **negative charge**, while the shirt ends up with extra **positive charge**. When the balloon is placed near the bits of paper, the extra negative charges will cause positive charges in the paper to move towards them. It is a basic rule of static electricity that unlike (different) charges attract one another. It is this attraction that causes the paper to stick to the balloon. Another basic rule is that like (similar) charges repel or push one another apart.

Hands-on Activity

Activity 2

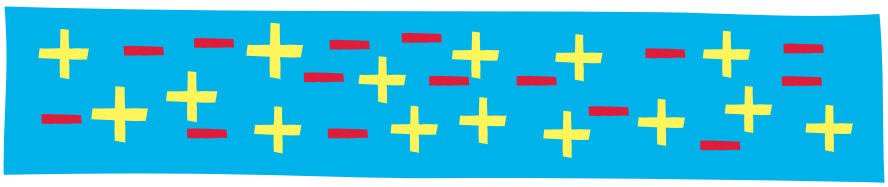
1. Blow up a balloon and tie off the end. Put a dot on one side of the balloon.
2. Rub the balloon with a cloth at the dot.
3. Put the non-charged part of the balloon (away from the dot) near the pieces of paper. Observe what happens.
4. Put the charged part of the balloon (near the dot) near the pieces of paper. Observe what happens. If nothing happens move the balloon closer to the paper.
5. Rub the dot again and try to stick the balloon on different walls using the charged and non-charged parts of the balloon. Try concrete, glass, metal and plastic surfaces. Observe what happens.

Electrical charges

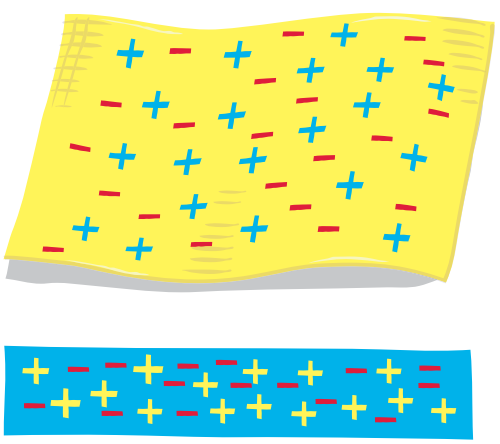
As we have seen, a balloon can do strange things after being rubbed with another object, so can combs and plastic rods. They can pick up small bits of paper or other light objects. They can even make your hair stand on end. These things happen because the rubbing has charged them.

Everything around us is made up of tiny (invisible) particles with either positive (+) or negative (-) charges. Normally most materials such as wood, plastic, rubber or hair have the same number of positive and negative particles. This means that they are neutral in charge. However, when we rub certain materials we can change their charge.

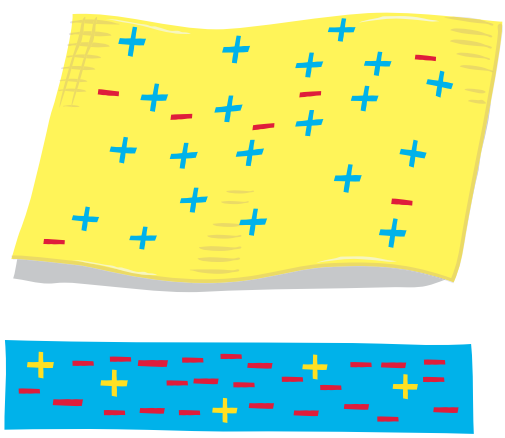
Inside the plastic rod (and many other substances), there are millions of tiny positive and negative electrical charges. Before rubbing, the rod has equal numbers of positive and negative charges. These charges balance each other. The rod is said to be electrically neutral or balanced.



Rubbing can upset the balance. When the rod is rubbed with another object, like a duster or some other piece of cloth, the negative charges travel from the duster to the rod. The rod now has more negative charges than positive charges. It has become negatively charged. Because the negative charges have left the duster, it now has more positive charges than negative. The duster has become positively charged.



before rubbing



after rubbing

Lightning

Things which rub on each other can become charged, and highly charged objects can produce **sparks**. You have all seen the world's biggest, most spectacular sparks—**lightning** flashes! These are produced by highly charged thunderclouds.

All clouds become charged because they contain tiny crystals of ice that are constantly moving and rubbing on each other. A thundercloud can become so highly charged that a huge number of negative particles jump the gap between one cloud and another and cause the flash that we call lightning.

Lightning can jump between different clouds, but it can also jump from clouds to the ground. This is when it is most dangerous. Lightning strikes are a major cause of bushfires. More than 120 fires were started by lightning throughout south-eastern Australia in a single day in 2003. More than one million hectares of land was burnt.

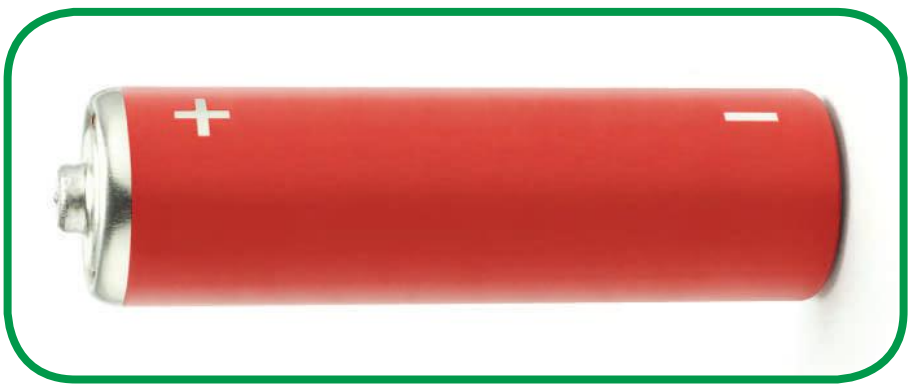
A flash of lightning can travel at 140,000 km per second.

Electric circuits

The second type of electricity is circuit or **current electricity.** A circuit is a path along which electricity can flow. A circuit does not have to be circular in shape, but must begin and end at the same point like a circle does.

This is the type of electricity we find in our homes and schools. In this type of electricity the charged particles can move and flow along wires to light bulbs and move machines.

Below is a diagram of a very simple circuit. It has a battery and a bulb connected by wires.



Batteries

All circuits need a battery in order to work. A regular battery is sometimes called a dry cell. That is because it has no liquid in it. Other batteries such as car batteries have liquid inside them. Dry cells are often used in torches and radios and are the most commonly used battery. A dry cell is cheap and easy to carry. It cannot produce a strong current so is very safe to use.

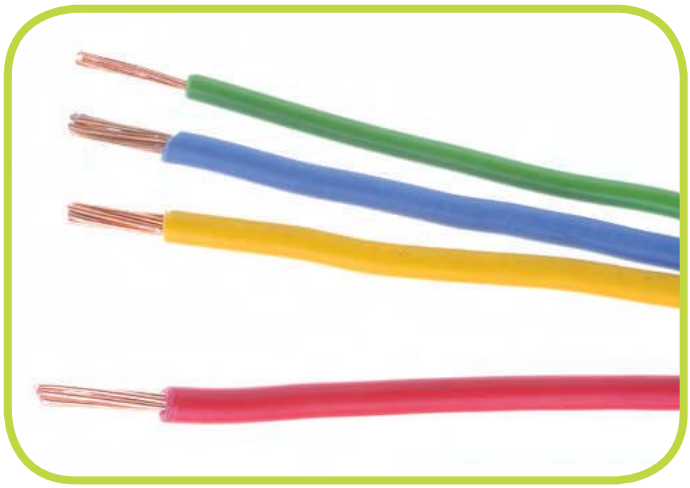
In the circuit shown above, the battery's job is to "push" an electric charge or current through the wires and the bulb. The bulb lights up as the current flows through it. The "electrical push" the battery gives to the current is called the **voltage**. It is measured in volts (V). Different batteries produce different voltages. The bigger the voltage supplied by the battery, the bigger the current will be that flows in the circuit.

Light bulbs

Light bulbs are examples of electrical **devices** often used in circuits. They contain a **filament**, usually made of tungsten, and do not allow the electricity to flow through easily. When electricity passes through the filament it gets very hot until it glows. This result produces heat and bright light.

Wires

Wires allow electricity to flow from one part of an electric circuit to another. They are made of electrical **conductors**, such as copper. For safety reasons, wires are wrapped with electrical **insulators**, such as plastic or rubber. In this way, we do not get an electric **shock** when we touch the wire.



Hands-on Activity

Activity 3

In groups, make a simple circuit to light up a bulb. Ask your teacher for help if needed.

1 List the materials you need.

2 Construct a simple circuit to light up the bulb.

3 Draw a diagram of your circuit.

Switches

A switch is used to control the flow of electricity in a circuit. When a switch is turned to the "off" position, it creates a break in the flow of electricity, resulting in an open circuit. When the switch is in the "on" position, the circuit is complete, or closed, and electricity flows through the circuit.

It is a good idea to switch off lights when you leave a room. It saves energy and the life of the light bulb.

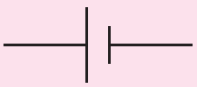
Electrical symbols

We can use symbols to represent different parts of an **electrical circuit.**

These are the symbols for some parts of a circuit:

Bulb 

Wire

Battery 

Switch (open) 

Switch (closed)

Activity 4

In your exercise book draw a diagram of the circuit shown on page 34 using the symbols above. Include a switch to turn the bulb on and off.

Conductors and insulators

A conductor is a material that allows electricity to flow through it. Metals such as copper, silver and **steel** are good conductors of electricity. Electric current is carried around your home by copper wires.

Insulators are materials that do not allow electric current to pass through them easily. They are said to have a high resistance to electricity. Most non-metals are insulators.

Materials like plastic and rubber are used to cover electric wires in the home. This insulating cover does not allow electricity to pass through it easily and this makes it safe. Even pliers have rubber covering their handles in case they touch an electric wire.

Activity 5

Hands-on Activity

Work in groups.

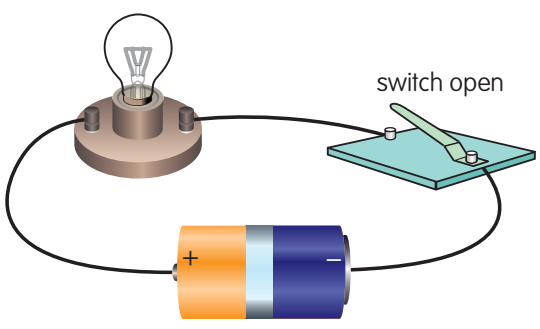
1. Your teacher will show you how to make a simple circuit with a battery, wire and bulb. Make sure you can light the bulb.
2. Collect different materials such as metals, rubber, wood, plastics and glass. Use the circuit to test which materials let electricity pass through them (conductors) and which do not (insulators).
3. Copy the table below into your exercise book and complete it.

Conductors				
Insulators				

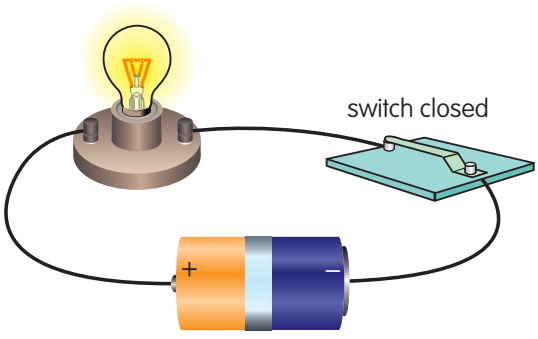
Open and closed circuits

If there are any breaks or gaps in a circuit, the electricity will not flow. The current has nowhere to travel and creates an **open circuit**. It is like an open circle because there is a break in the line of flow. A light bulb goes off when we disconnect a battery because this breaks the circuit.

A **closed circuit** is like a closed circle or a completed circle. Current can only travel through a closed circuit. Opening and closing a circuit is usually carried out by using a switch.



An open circuit

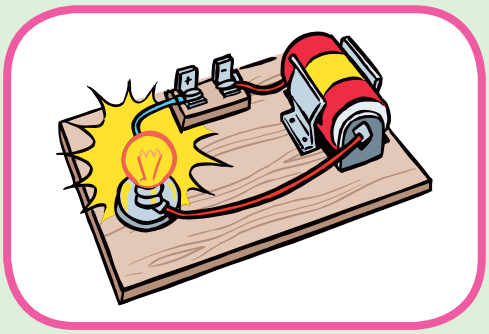


A closed circuit

When two batteries are put together, the electrical charge or current is given a bigger "push". The power going to the light bulb increases and the bulb gets brighter.

Think and Write

Activity 6



Testing open and closed circuits

Work in small groups. Use the circuit made in Activity 5, using a battery, wire and a small light bulb.

Answer these questions in your exercise book.

1. What might happen if we disconnect the battery?
2. What do you think happens if we add more voltage with another battery?
3. Why is the light bulb brighter when two batteries are used instead of one?

Multiple circuits

Products such as radios, televisions and CD players use complicated circuits to make sure everything works at once. For example, numerous circuits are required for a CD player to: make the CD spin, play the music and light up the control panel.

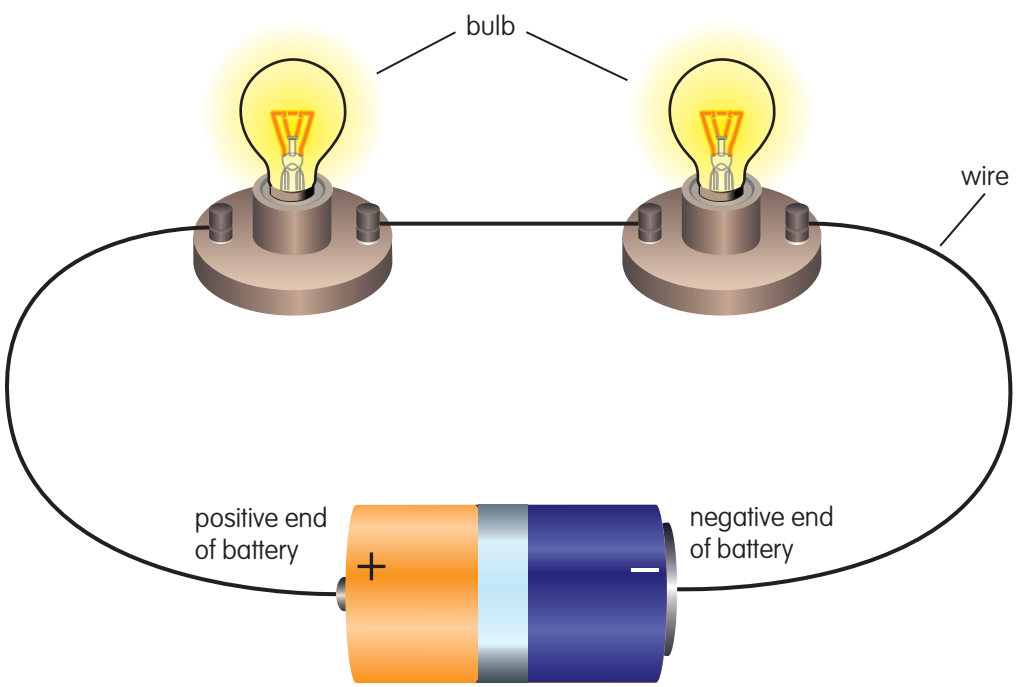
Series and parallel circuits

There are two ways in which we can connect bulbs in a circuit. The bulbs can either be connected in series or in parallel. Each of these circuit arrangements provides a different way for electricity to flow throughout a circuit.

Series circuits

In a series circuit, electricity has only one path along which to travel. In the example below, two bulbs are powered by a battery. Electricity flows from the battery to each bulb, one at a time, in the order they are wired to the circuit.

Because the electricity can only flow along one path, if one of the bulbs blows out the other bulb will not be able to light up. This is because the flow of electric current would have been interrupted. In the same way, if one bulb was unscrewed the flow of current to both bulbs would be interrupted.



Activity 7

Hands-on Activity

Work in small groups. Your teacher will instruct you on what to do.

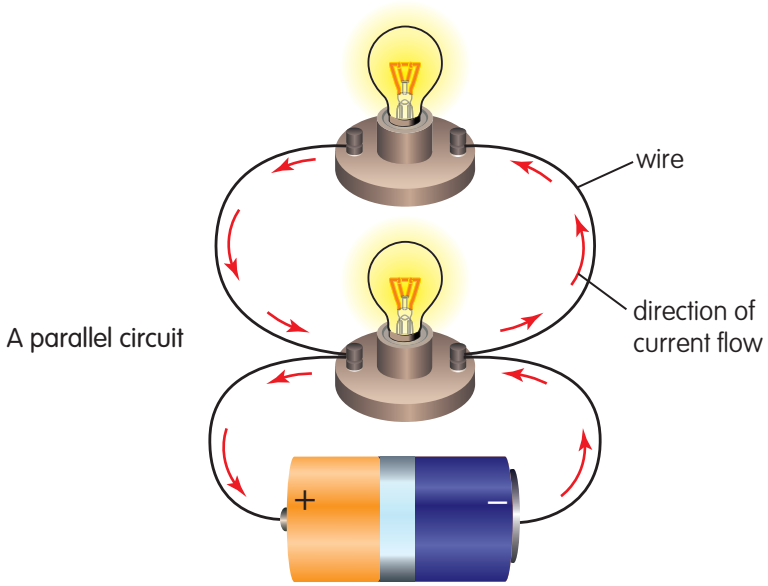
1. Light a bulb using a battery and some wires.
2. Make a circuit to light two bulbs using a battery.
3. Write down in your exercise book what you notice about the brightness of the bulbs when there are two in the circuit.

Parallel circuits

In a parallel circuit, electricity has more than one path in which to travel. In the example below, two bulbs are powered by a battery in a parallel circuit design. In this case, because the electricity can flow along more than one path, if one of the bulbs blows out, the other bulb would still be able to light up. This is because the flow of electric current to the broken bulb would not stop the flow of current to the next bulb.

In the same way, if one bulb was unscrewed, it would not prevent the other bulb from lighting up. Buildings like schools will always have parallel circuits for their electrics. Can you think why this might be important?

When two bulbs are joined in parallel, extra current is drawn from the power supply each time a bulb is added. The bulbs stay bright even when extra bulbs are added. Each bulb can go on and off without affecting the others.



A parallel circuit

Activity 8

Hands-on Activity

Work in groups. Your teacher will instruct you on what to do.

1. Build a parallel circuit for two bulbs.
2. Build a series circuit for two bulbs.
3. What happens if you remove one bulb from each circuit? Does the other one remain on? Write the answers in your exercise book.

A summary of electricity flow

- Electrical current is the flow of microscopic particles around a circuit carrying energy from the battery (power supply) to bulbs or motors.
- Electricity can flow only if there is a complete circuit from the battery through wires to bulbs or motors and back to the battery.
- A basic law of the universe is that like charges repel and unlike charges attract. Two negatives will repel each other. A negative and a positive will attract each other. This law explains how a battery works. The negative (-) terminal of a battery will push the particles that have a negative charge along a wire, while the positive (+) terminal of a battery attracts negative particles along a wire. This causes the flow of particles through the bulb and makes it light up.
- The flow of particles with a negative electric charge is called the current.
- The push given to the current by the battery is called the voltage.
- The more batteries there are in a circuit the bigger the push or voltage.

Electromagnets

An electric current flowing through a wire creates a magnetic field around the wire. Electromagnets can be very strong and are commonly used in items like motors and computers.

Activity 9

Hands-on Activity

It is possible to make a magnet by coiling an insulated wire around a large nail and connecting the ends of the wire to a battery as in the diagram below. You may have already done this in Year 5.

1 Make an electromagnet.
2 Change the number of coils around the nail. Does this affect the magnet's strength?
3 Write down in your exercise book what you discover.

Safety issues

Electricity brings us many benefits, but it is very dangerous if mishandled. It can cause fire and electric shock.

Making simple circuits with dry cells and bulbs at school is quite safe, but circuit or mains electricity anywhere is extremely dangerous because the current and voltage are very high. For this reason, you must never push any objects into plugs or appliances or climb up poles with power cables. Many people have been **electrocuted** and died because they climbed power poles and touched the cables carrying electricity.

Activity 10

Creative Activity

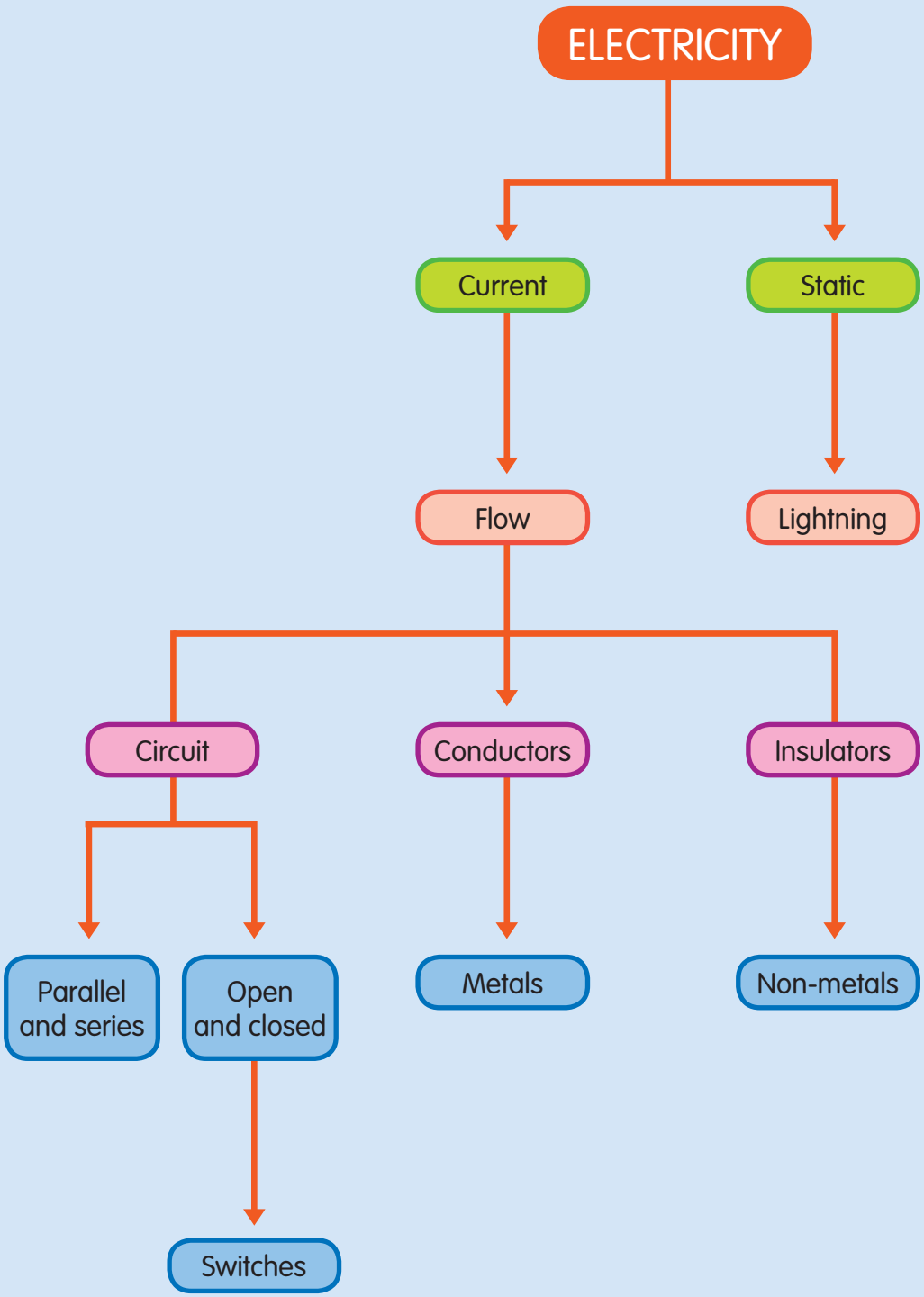
Work in groups of five.

1 Design and make a poster about some of the dangers associated with electricity. For example, draw a picture of a kettle being filled with water while it is still plugged in and switched on. Or you could explain how dangerous it is to put a metal object such as a knife into an electric toaster when it is switched on.
2 Write one or two sentences that illustrate what you have drawn in your poster.

Chapter Review

1. Static electricity is electricity that does not flow and can be produced when two objects are rubbed against each other.
2. The movement of charged particles in a wire is called current.
3. An electric circuit is a path along which electricity can flow. It consists of a power source and other components, such as wires, light bulbs and switches.
4. A battery or dry cell is a source of energy for a closed electric current.
5. Light bulbs contain a filament, a very special thin wire. When current passes through it, the wire gives off a brilliant white light.
6. A switch is a device that allows us to conveniently switch electric current on and off by completing a circuit or breaking the circuit.
7. Conductors are materials that allow electricity to flow through them. Metals such as copper, silver and steel are good conductors of electricity.
8. Insulators are materials that do not allow electric current to pass through them. Examples are wood, plastic and rubber.
9. Series and parallel are two different types of circuit arrangements.
10. Electricity brings us many benefits, but it can be dangerous if mishandled. It can cause fires and electric shocks.

Concept Map


ELECTRICITY
Current
Static
Flow
Lightning
Circuit
Conductors
Insulators
Parallel and series
Open and closed
Metals
Non-metals
Switches

Revision

Answer the following questions in your exercise book.

1 Which of these statements is correct?

a Static electricity does not flow.

b Current electricity does not flow.

c Plastic is a good conductor.

d Silver is an insulator.

2 Which of these statements is correct?

a It is safe to poke a knife into a plugged-in toaster.

b Batteries should be connected in parallel if we want the bulbs to glow brightly.

c A circuit must be complete for electricity to flow.

d Bulbs should be connected in series if we want the bulb to glow brightly.

3 An electric current is "pushed" along a wire by what important part of a circuit?

4 Fill in the missing words in these sentences.

a When electricity flows from the battery to each bulb in a circuit one at a time, it is called a _____ circuit.

b Electricity has more than one path to travel down in a _____ circuit.

5 What do the symbols + and – stand for?

6 Will two negatives charges repel or attract each other?

Chapter 4

Forces

In this chapter, you will:

- learn that movement is caused by applying a push or a pull force
- investigate the effects of force on stationary or moving objects
- experience balanced or unbalanced forces
- measure gravitational force
- demonstrate friction by moving two surfaces against each other
- learn about the use of lubricant to reduce friction
- identify simple machines that make work easier
- locate the points of effort and load in machines.

What is a force?

There are forces all around us. **Force** simply means a push or a pull. A **pull** force is applied when we move things towards us. A **push** force is applied when we move things away from us.

Things move because something or someone gives them a push or a pull. Pushes and pulls are forces that make things move. Some forces are natural forces. For example, wind and waves are natural forces that push against things and make them move. The wind blows over the sea and makes ripples and waves. It pushes against the sails of a yacht and speeds it up. You can feel the wind pushing against you when you stand on the beach. A surfer rides along on the force of a big wave pushing him.

Forces in motion

Motion describes how an object moves or changes its position. When a force acts on an object, it can cause the object to behave in different ways. Usually more than one force acts on an object to cause a change in shape and direction.

How a force affects the motion of an object depends on three factors:

- the **mass** of the object (this is similar to its weight)
- the size of the force
- the other forces acting on the object.

In order for an object to move, a force must be applied to the object. The movement of an object depends on the size of the force and also the direction of the force acting on the object.

A football player uses force to run, kick and pass the ball. When he kicks the ball, the speed and direction of the ball change. The shape of the ball also changes briefly.

When a force starts an object moving, the object will continue to move in the same direction until another force acts on the object to stop it moving. When we kick a ball, we apply a push force causing the ball to start moving. The ball will stop moving after a certain distance because of the forces of **gravity** and **friction**.

You use a pull force when you play tug-of-war or close a door. A push force is applied to a wheelbarrow or when you push a friend on a swing.

You normally use a pull and push force to change the **gears** when driving a car.

A strong man can produce a big enough force to stretch a chest expander. Heavy objects need bigger forces to move them. In other words they need bigger pushes and pulls. You might be able to push a wheelbarrow easily when it is empty, but when it is filled with goods, it's a lot harder to move it because it is heavier and needs more force. A train has a powerful engine to pull its carriages. Train carriages cannot move by themselves. They need the powerful engine to pull them.

Activity 1

Hands-on Activity

Work in groups of five.

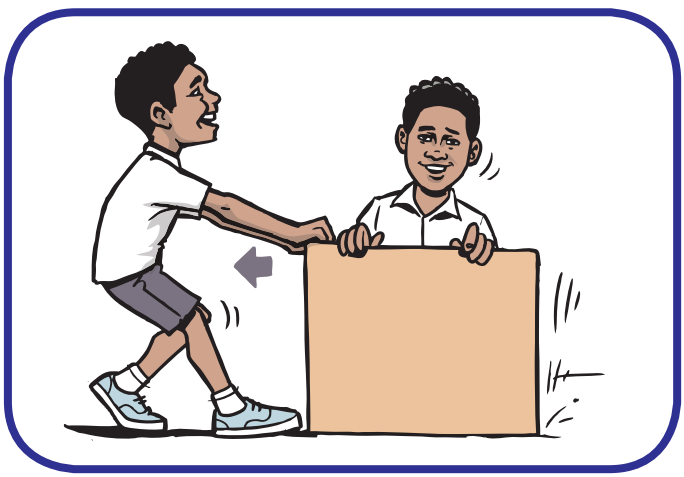
You will need two large, strong cardboard boxes labeled 1 and 2.

1 Ask one friend to get inside box 1, then try to pull the box by yourself.

2 Ask two friends to get inside box 2, then try to pull the box.
- Which box needs more force to move it? Why do you think this is?

3 Now try to pull box 1 and then box 2 with the help of two other friends.
- What happens when you pull box 1 by yourself?
- What happens when two friends help you pull box 1?

4 Record your findings in your exercise book.



Activity 2

Hands-on Activity

You will need a toy car or truck.

1 Try pushing the toy over rough surfaces and smooth surfaces. Which one needs more force?

2 Try pushing the toy up a slope and then down a slope. Which one needs the most force?

3 Record your findings in your exercise book and try to explain the differences you found.

4 Do you think a driver would prefer to drive on a rough or smooth road? Why?

We know that different types of forces are needed for different purposes and in different situations. Pushing, pulling and twisting are all important forces in movement in our everyday lives. We apply force when we do different activities often without realising it.

Activity 3

Think and Write

Answer the following questions in your exercise book.

1 What is a force?

2 What can force do?

3 What kind of force do we use to:

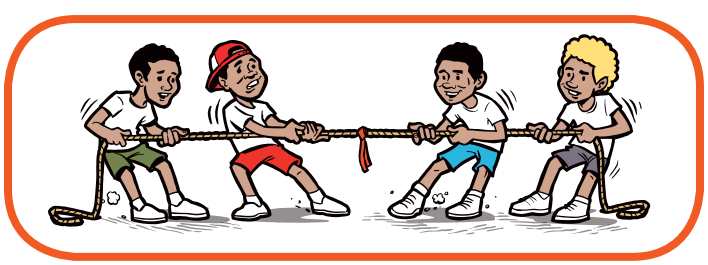
- move a wheelbarrow in the garden?
- win a tug-of-war?
- climb a rope?
- use a chest expander?

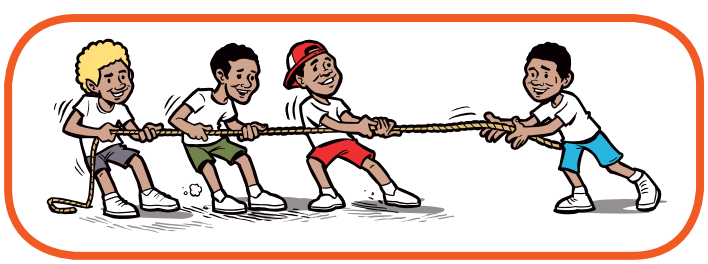
Balanced or unbalanced forces

Forces often act together. A push or pull force does not involve only one force but a pair of forces acting in different directions. We say that these are **balanced** or **unbalanced** forces.

If the forces acting on an object are equal in size and from opposite directions, they cancel each other out. The object will not move. That is what makes a tug-of-war so tiring. If the two teams use the same amount of force in their pulls, then no team is winning because the forces are balanced.

Nothing much happens in a tug-of-war competition if the teams are evenly matched. But once one team pulls harder than the other, they begin to win because the forces are now unbalanced. The stronger team will pull the other side over.





Activity 4

Hands-on Activity

Go outside with your teacher and find a clear space to do these activities in.

1 Find a partner and stand facing your partner, holding hands firmly.
Now demonstrate:
- a balanced pulling force
- an unbalanced pulling force.

2 When you have done this, put your hands against your partner's.
Demonstrate:
- a balanced pushing force
- an unbalanced pushing force.

3 What happened when the forces became unbalanced?

Divide the class in half and have a tug-of-war. You will need a rope.

1 First make the two teams even, with the same number in each team.
What happens when you pull?

2 Then move the biggest students to one side and the smallest to the other.
What happens when both sides pull but one side is bigger than the other?

Gravity

Gravity is a force that pulls objects towards the **Earth**. It is the force of attraction between objects—the bigger the object, the greater the force.

All objects on the Earth attract each other but because of their size we do not notice this pull. The only pull we do notice is the pull of the planet Earth itself. This is because the Earth is so big. Everything on Earth and other planets is affected by the force of gravity. Objects are pulled to the surface of Earth by the force of gravity that pulls everything downwards.

If we jump in the air, the planet Earth pulls us back to the ground. If you fall from a tree, you will not go up but down to the ground. When you throw a stone or ball in the air, it will fall back down.

Every object pulls on every other object near it with the force of gravity. The strength of this pull is related to how much mass the object has, and how close the two objects are to each other. The Earth has a very large mass and it produces a gravitational force that pulls us towards it.

Hands-on Activity

Activity 5

Experiencing gravity

You will need:

- tennis ball
- basket ball
- small stone or pebble
- large stone

Go outside with your teacher and take one of the objects provided.

1. Gently throw the object into the air. Be very careful not to hit anyone, including yourself.
2. Repeat with the other objects. Observe the movement of each object after you throw it.
3. Now jump as high into the air as you can.
4. Write your responses in your exercise book.
   - Where did all the objects end up after they were thrown up?
   - Where did you end up—floating in the air or back on the ground?
   - Why did all these things happen?

The power of gravity

What does the force of gravity do on Earth?

- It keeps you on the ground.
- It keeps the oceans on the Earth.
- It keeps the Moon in place as it **orbits** the Earth.

Hands-on Activity

Activity 6

This activity should be done inside the classroom. Two students can demonstrate this activity while the rest of the class observes.

You will need:

- string
- stone
- scissors

1. One child should tie a stone to a string and hang it on the wall. Is the stone hanging up or down?
2. Predict what will happen if the string is cut. Another child should cut the string with a pair of scissors.
3. Where did the stone go? Were the predictions correct? Why does the stone move in this direction? Write your findings in your exercise book.

Measuring weight

The pull of the Earth's gravity on you is called your **weight**. The unit of measurement for weight is called the newton. The unit is named after the English scientist, Sir Isaac **Newton**. He didn't like school very much but he liked making things, investigating and solving problems. He had a very good imagination. Newton is famous for the modern explanation of gravity in Western science.

Mass is similar to weight in some ways. Your mass is how much of you there is. If you stop eating and get smaller you have lost some mass. Mass is measured in **kilograms**. Your mass is the same no matter where you are.

Sir Isaac Newton

The force of gravity on each planet in the solar system is different because the planets each have a different size and mass. This table shows how much a 35 kg child on Earth would weigh on each planet.

Planet	kg
Mercury	13.2
Venus	31.7
Earth	35
Mars	13.1
Jupiter	88.6
Saturn	37.2
Uranus	31.1
Neptune	39.3

The child would be heavier on Jupiter and lighter on Mercury.

When you hold a rubber band lengthwise in your hand and attach a stone to it, a force is applied to the rubber band, pulling it down. The same thing will happen to a spring. When you hang an apple from a spring balance, the force of gravity pulls down on the apple. The spring inside the balance stretches.

When you hang a bag of sugar from the same balance, the spring again stretches, but this time it stretches further. The bag of sugar stretches the spring further because it is heavier or has a larger weight than the apple.

There are all sorts of weighing machines, but they all do the same job. They all measure the pull of gravity on an object. A spring balance is often used to measure a force because its spring is elastic and it can stretch.

Activity 7

Hands-on Activity

You will need:

- spring balance
- objects of different sizes

Work in groups of five. Your teacher will demonstrate how to use a spring balance to measure weight.

1 Using the spring balance, measure the weight of the different objects.

2 Copy the table below into your exercise book. Write down the weight of each object. You can include other objects that are available in your class.

Objects	Weight	Objects	Weight
Stone			
Exercise book			
Duster			
Box of chalk			
Can of drink			
Packet of biscuits			
Stick			
Ball			
Stapler			
Bag of rice			

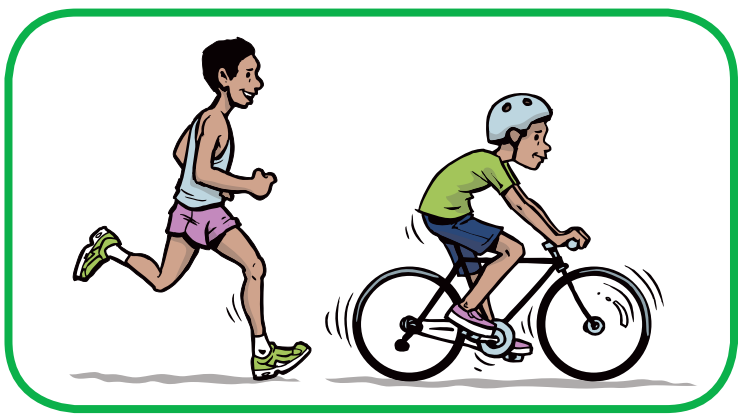
Friction

Friction is a force produced whenever two surfaces rub on each other. There is no such thing as a completely smooth surface. There are some highly polished surfaces that seem to be perfectly smooth but if you use a microscope, you will notice that they have rough edges.

The force of friction slows down moving things. If we slide a book across the floor, it will eventually come to a stop. When we ride a bike on a flat surface, we must keep pedalling if we want to keep moving. Both of these things happen because of the force of friction.

Friction is a force that opposes motion. It occurs when the surfaces of objects are touching each other. Friction occurs in liquids, solids and gases.

When objects or materials are touching, their surfaces grip onto each other, the same way that running shoes grip onto the surface of a running track. The harder those surfaces press against each other and the rougher their surfaces, the more friction there is. The force of friction is less for smooth surfaces like glass and ice. It is much greater for rough surfaces like sandpaper or concrete.



Hands-on Activity

Activity 8

1. Put your hands together gently and rub them against each other.
2. Now press them together hard and rub them again.
3. Write down what you notice in your exercise book. Is it easier to rub your hands when they are pressed together gently or firmly? Do your hands feel warmer or cooler after rubbing?

Friction in air and water

Friction also happens in air and water. This friction is called drag. For example, when an aeroplane flies, the air pushes against it. The force of air pushing against the aeroplane is called drag.

When you swim through water in a swimming pool or in the sea, you can feel the water pushing against you. The force of water pushing against you is called the drag. Drag is greater in water than in air because water is thicker than air.

Friction can be useful

You couldn't walk without friction. Friction prevents the soles of your shoes from slipping over the ground. When you write with your pencil, friction rubs millions of carbon particles off the end of the pencil. That's what leaves the black marks on the paper.

It is often useful to make friction as great as possible. That is why climbers use rubber-soled boots when they climb. They produce more friction and give a better grip. The surface of car or bicycle tyres increases the friction between the tyres and the road, allowing the tyres to grip onto the road when turning corners. We also use friction in the brakes of cars and bicycles.

Friction can cause problems

When the moving parts of **machines** rub on each other, they are worn away by friction. This causes the machine to slow down. Machines need **lubrication** with oil or grease.

Lubricating cuts down friction. A well-oiled machine runs or works more smoothly because the parts move more easily. It also lasts longer. That is why we put oil in bicycle chains, sewing machines and car engines.

Driving a car would be impossible without friction. Tyres grip the road through friction and that helps a driver to control their car. There has to be a large amount of friction between the tyres and the road so that the car can grip the road well. If the friction between the tyres and the road is reduced, driving becomes dangerous. Water on the road reduces friction, so driving on wet roads needs extra care.

Activity 9

Think and Write

Copy this table into your exercise book.

Read the following statements carefully, then complete the table. Put a tick (✓) for each under the correct heading. The first one has been done for you.

Statements	Good Friction	Bad Friction
Friction allows us to walk and run without slipping over.	✓	
Friction slows machines down and uses lots of energy.		
Friction makes things hot, e.g. in machines when surfaces rub together.		
Friction helps us slow down, e.g. in car or bicycle brakes.		

Work and simple machines

What is work?

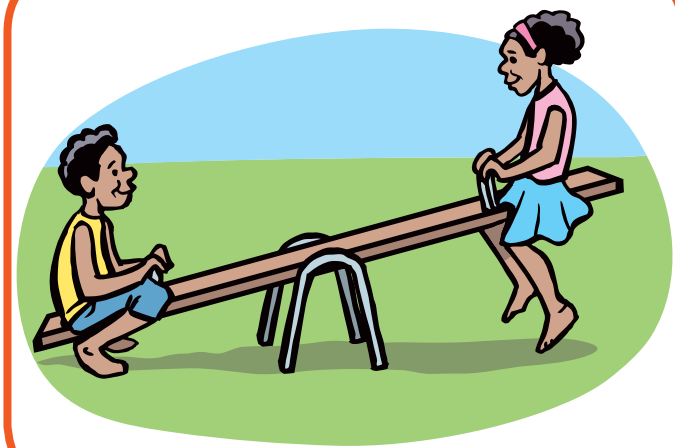
When people talk about "doing work", they can be talking about daily activities such as cooking, sweeping, selling vegetables, fishing or gardening.

In science, work has a very specific meaning. Work is done when a force interacts with an object and moves it a distance. This force is called the **effort** and the object is called the **load**. We do work every time we use a force to make something move. When we close a door, pick up our school bag or kick a ball, we are doing work.

Simple machines

Simple machines are devices that help us perform work more easily. They allow us to use a smaller force to overcome a larger force, or change the direction of a force. Simple machines do not change the amount of work done; they simply make the work easier for us to do. Because some work is too big for our human strength, we need simple machines to do it for us. For example, if a car went off the road and rolled down a cliff, it is impossible for us to lift it up. This is where we could use a **pulley** to lift the car.

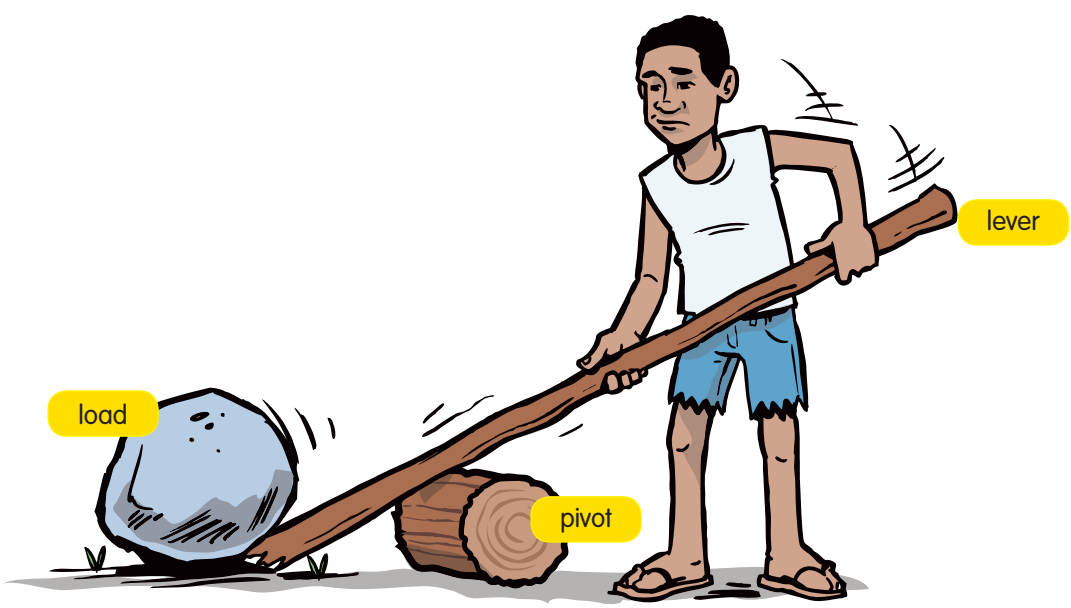
There are five types of simple machines: levers, wheels and axles, pulleys, inclined planes and gears. Some of these are described below.



Levers

A **lever** consists of a bar or rod that is free to move around a fixed point called a **pivot**. By changing the position of the pivot, we can reduce the amount of force required to lift something.

Moving the pivot closer to the load reduces the effort required to lift an object. The effort required is also reduced when it is applied further from the pivot.



Activity 10

Hands-on Activity

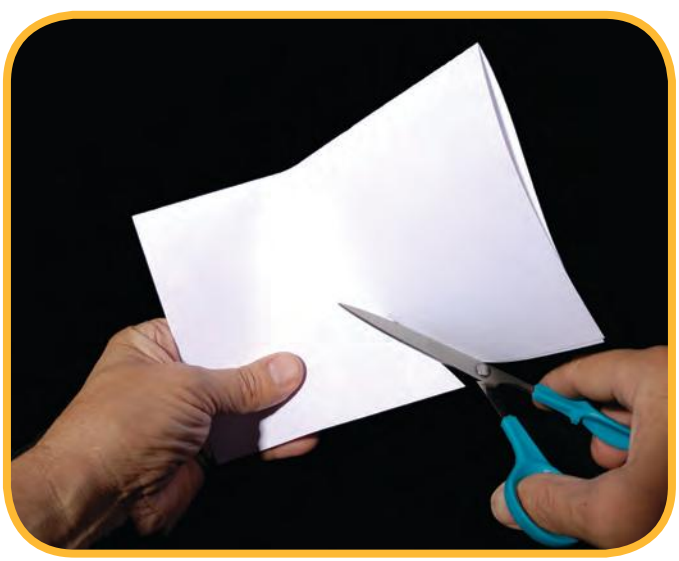
Moving a heavy load

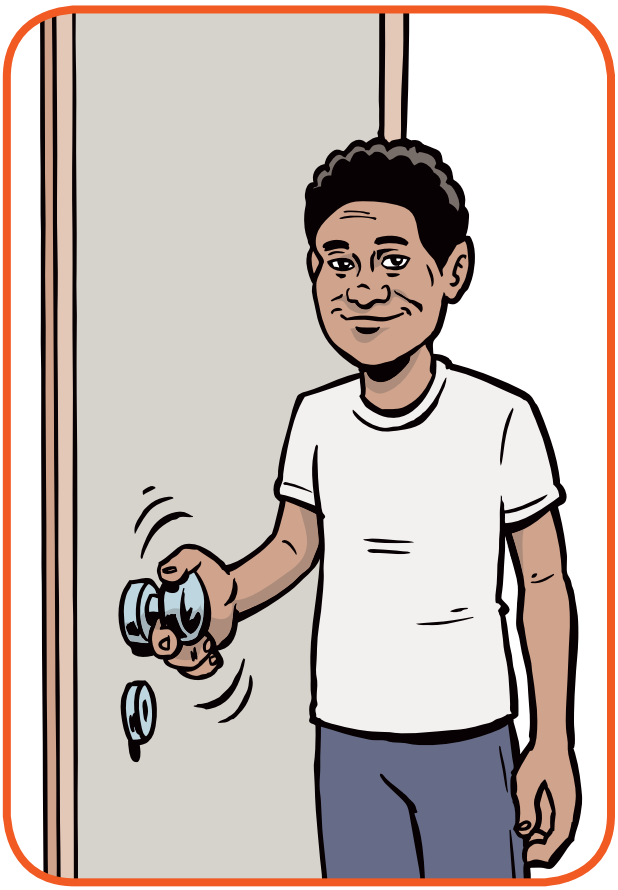
You will need:

- bar or stick (lever)
- piece of timber (pivot)
- heavy rock (load)

1. Draw a diagram of the lever with the pivot close to the rock and another with the pivot further from the rock.
2. Predict if it will be easier to move the rock when the pivot is near the rock or further from it.
3. Lever the rock when the pivot is close to the load and then further from the load. In which position is it easier to move the rock?
4. Write your findings in your exercise book.

Some objects, such as pliers and scissors, use a combination of two levers. Below are examples of levers at work.





Wheels and axles

A wheel and axle is a simple machine that consists of a large wheel attached to a smaller wheel or rod called an **axle**. A wheel and axle is used in two ways. One way is to roll objects instead of sliding them. This reduces the amount of friction between the object and the surface it is moving on.

The second way that a wheel and axle can be used is like a round lever. This type of wheel and axle can be seen in a doorknob that we turn. This then turns the axle in the middle. This reduces the amount of effort, but increases the distance needed to turn the knob.

Pulleys

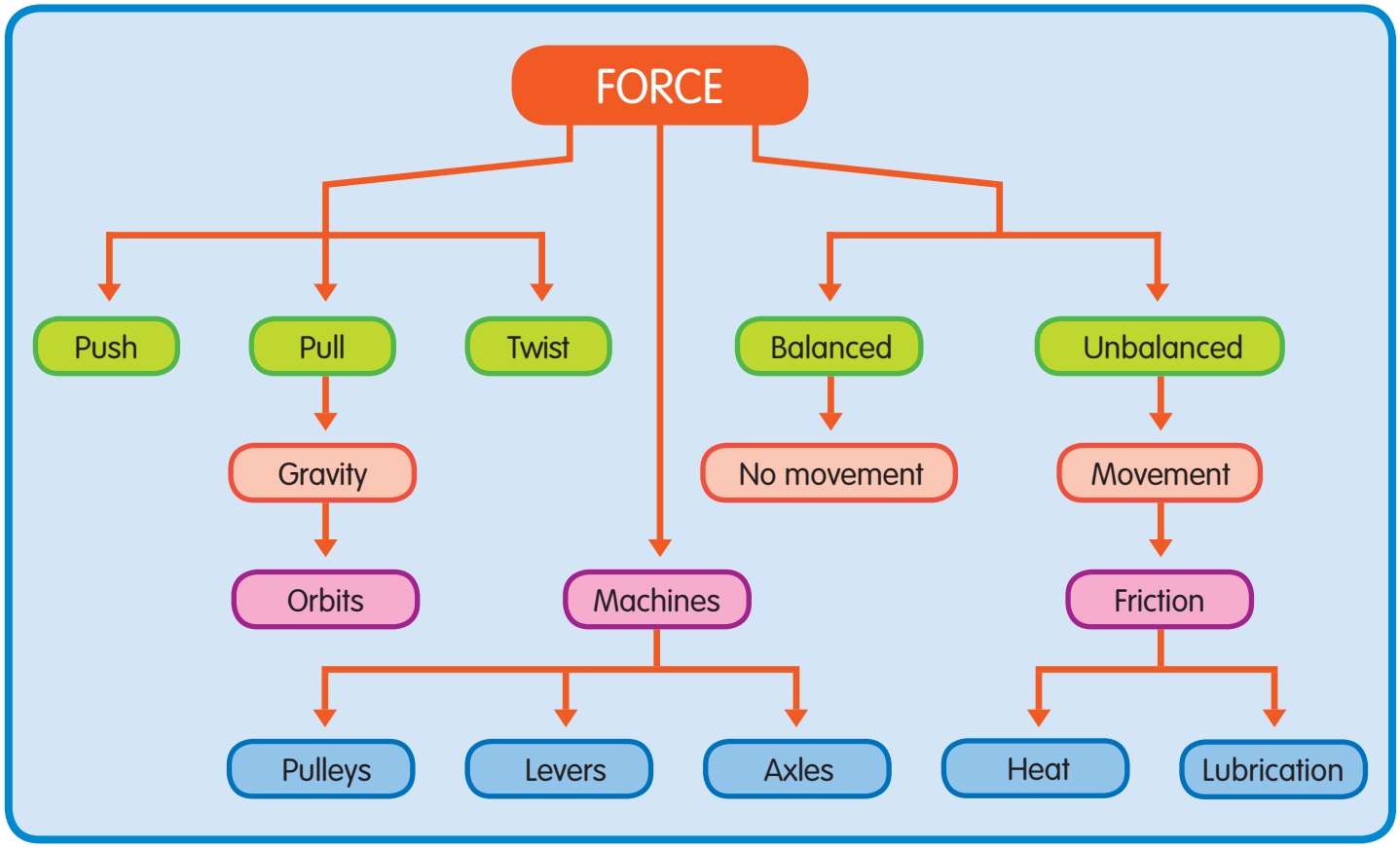
Pulley systems are used to lift heavy objects onto tall heights. You might have seen workers on the roof of a building using a pulley system to lift their tools or **materials** to the roof. A pulley is another example of a simple machine.

A pulley system consists of one or more pulleys, which are like grooved wheels, and a rope or a cable. It is easy to use a pulley but it produces a lot of friction.

Chapter Review

1. A force is a push or a pull.
2. There are natural forces, e.g. wind and waves, and these can push.
3. A force in motion describes how an object moves or changes its position.
4. An object is stationary until a force is applied to it.
5. The movement of an object depends on the size and direction of the force acting on the object.
6. Heavy objects need bigger forces than light objects to make them move.
7. Gravity is a force that pulls objects towards the Earth.
8. Gravity keeps you on the ground, keeps the oceans on Earth and also keeps the Moon in place as it orbits Earth.
9. A spring balance is a weighing machine that is used to measure the strength of the force of gravity on an object.
10. A force of friction is produced whenever two surfaces rub against each other.
11. Friction can be useful when it prevents the sole of your shoes from slipping over the ground. Friction can be a problem when it causes machines to slow down. You need to use oil to reduce friction in moving parts.
12. Work is done when a force interacts with an object and moves it.
13. Simple machines such as levers, wheels and axles, pulleys, inclined planes and gears help us to do work more easily.

Concept Map



Revision

Answer the following questions in your exercise book.

1. Name two types of forces.
2. Explain one way in which friction is useful. Explain one way in which friction is a problem.
3. Why do drivers need to be careful on wet roads?
4. How do we reduce friction in machines?
5. Which planet has the least gravity?
6. Name one type of simple machine.
7. If we move the pivot of a lever nearer to the rock we want to move, will it be easier?
8. If your car had rolled down a cliff, what would be the best simple machine to pull it back up?

Chapter 5

Physical and chemical changes and properties of materials

In this chapter, you will:

- explain the difference between physical and chemical change
- identify a number of different physical and chemical changes
- explain why rusting and cooking are examples of chemical change
- conduct an activity that results in chemical change
- list the properties of various man-made and natural materials
- link the uses of materials to their properties
- provide examples of local materials and their properties.

Changes everywhere

There are two major types of change in science: physical change and chemical change. In this chapter you will learn how they are different.

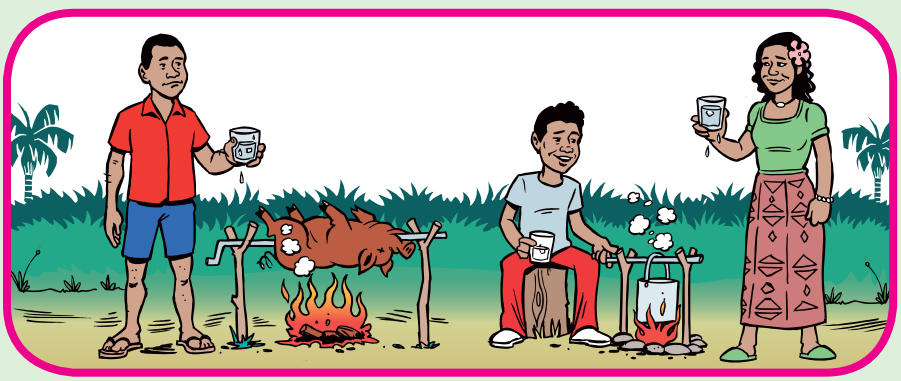
Activity 1

Think and Write

Look at the picture below.

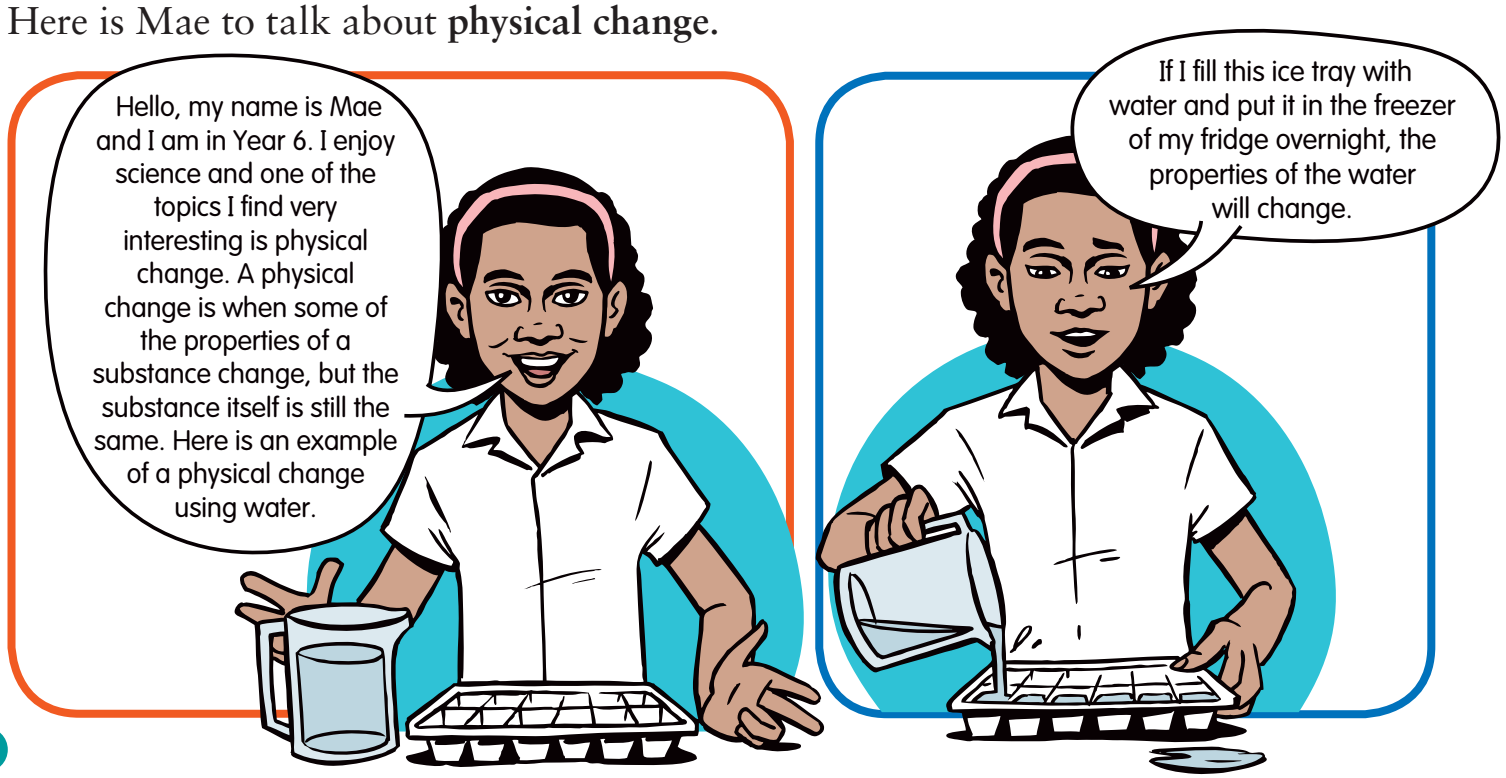
How many examples of change can you see? What things can you see changing around you? Can you explain what causes the changes that you see in the picture and those happening around you?

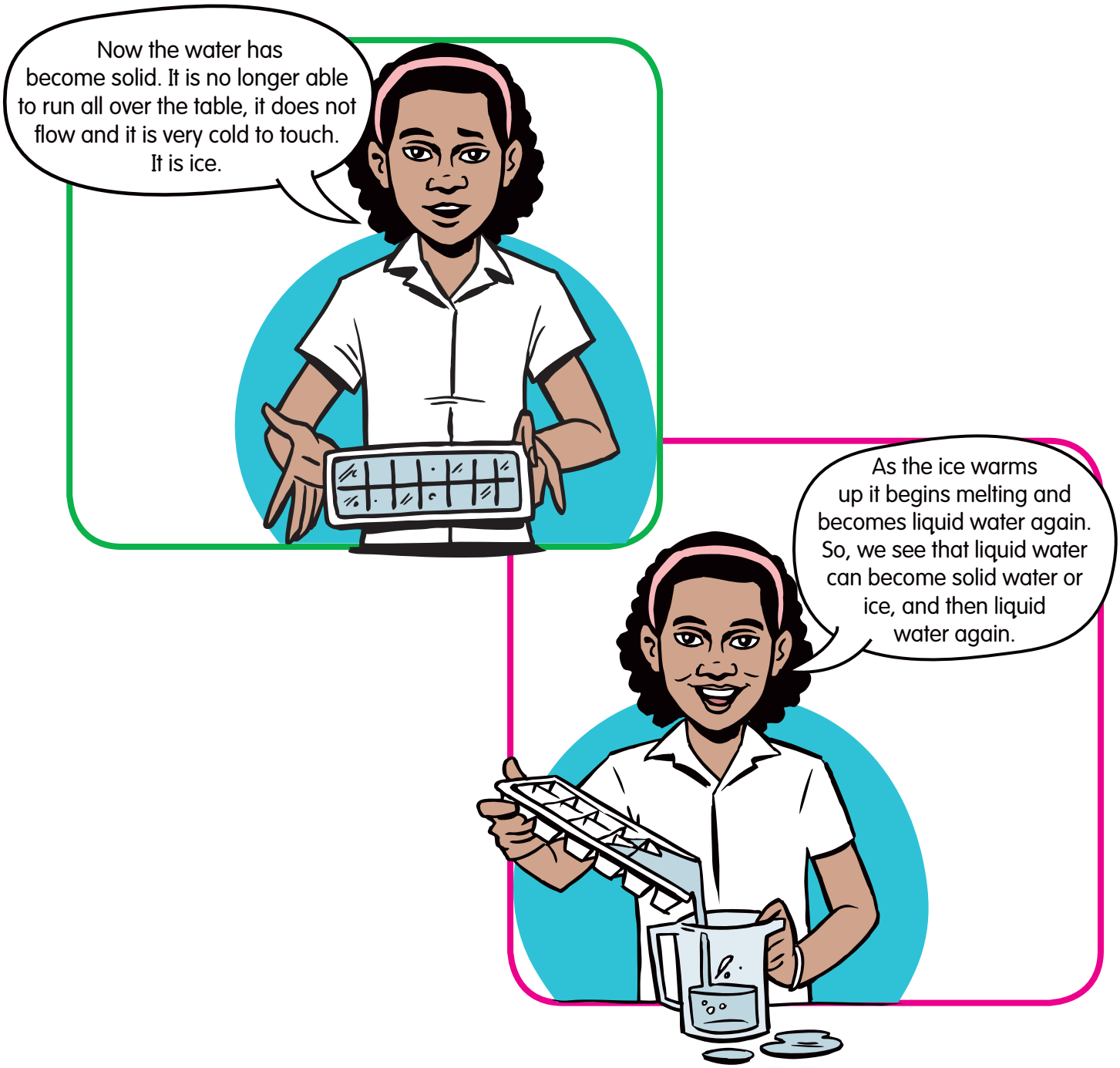
Write your responses in your exercise book.



Physical change

Here is Mae to talk about **physical change.**



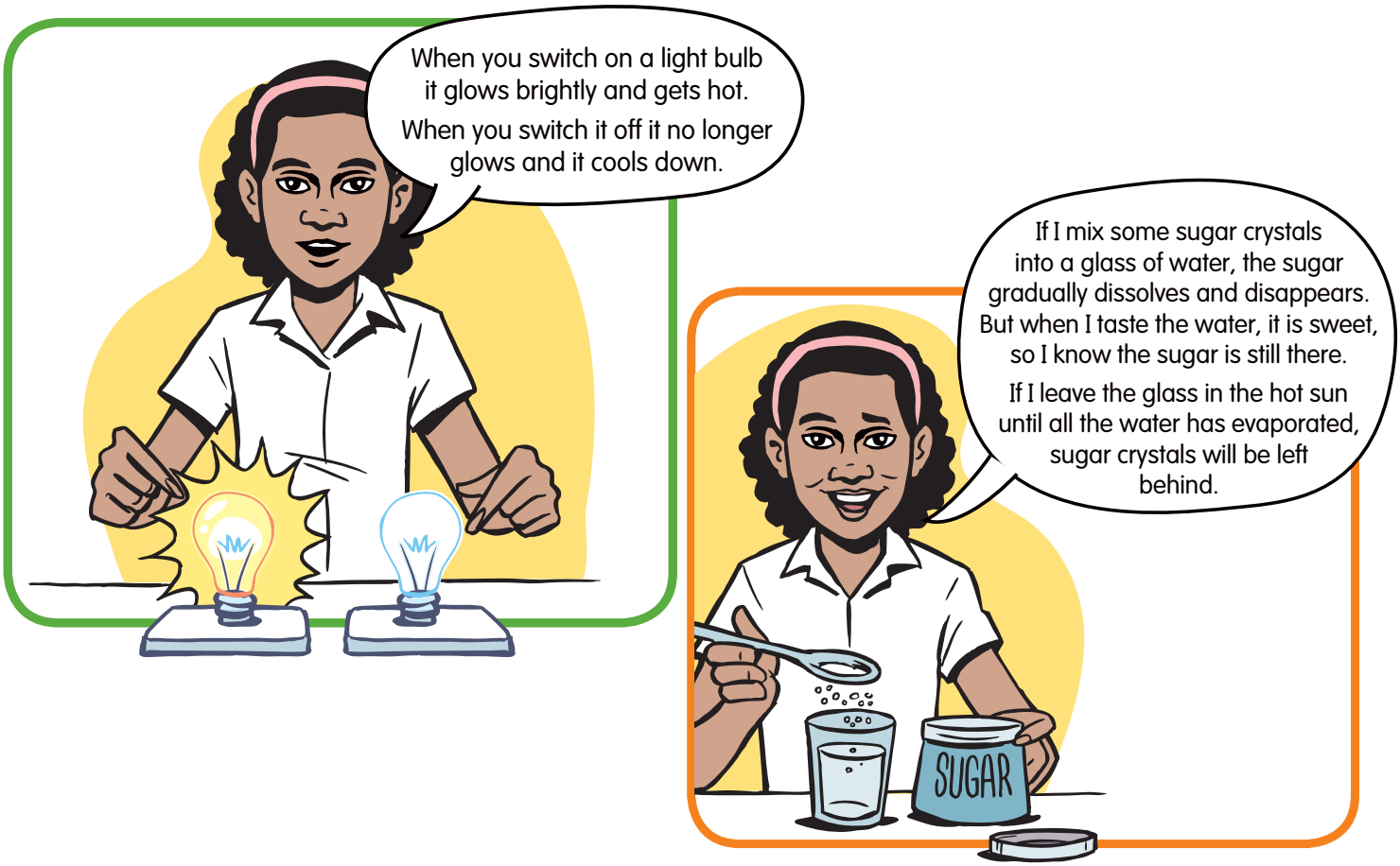


Physical change in water

The properties of water—being solid or being liquid—can change, but it is still water.

running water **liquid** → block of ice **solid** → melted ice **liquid**

Here is Mae with some other examples of physical change.



Physical changes

- A physical change is when some of the properties of a substance change, but the substance itself is still the same.
- Physical changes can be **reversed**. You end up with the same substance you started with.

Hands-on Activity

Activity 2

Try each of the following activities, working in groups.

- **Melt** wax in a candle.
- Make margarine soft in the sun.
- Make different shapes from lumps of clay.

Discuss why each change above is a physical change, then write your explanation in your exercise book.

Activity 3

Think and Write

You may need to ask your teacher for help with this challenge.

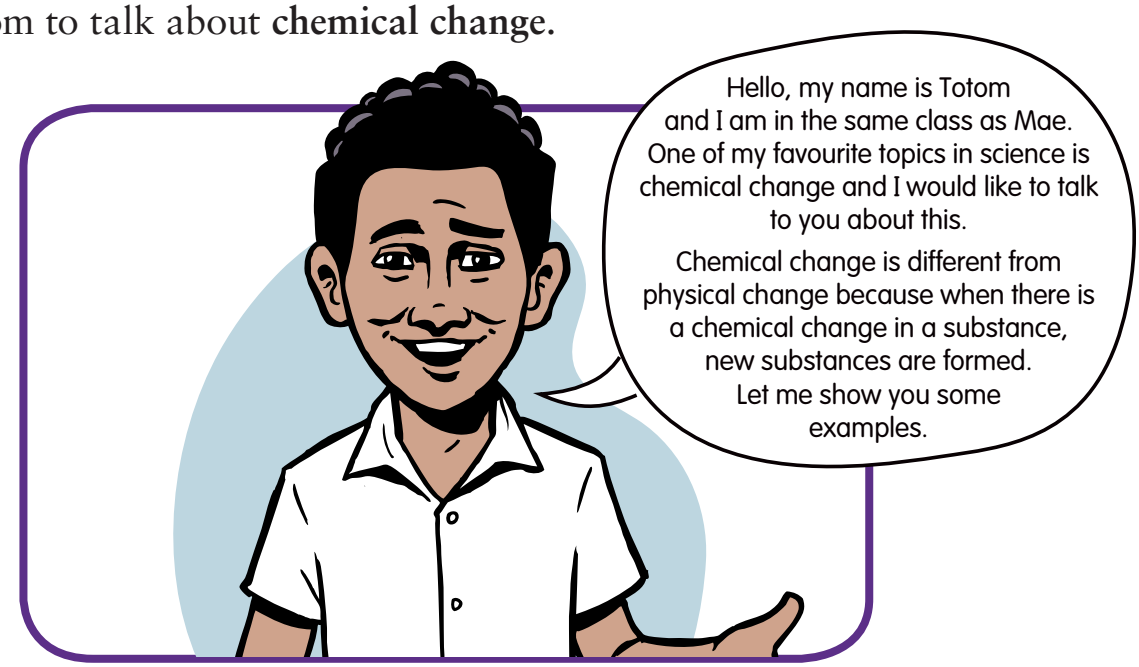
1 List the changes water goes through on our planet during the water cycle.
2 Draw a diagram of the water cycle based on these changes.

Secret formula

Coca-Cola is the name of a sweet fizzy drink that most of you will know. The company makes the drink from a secret formula. The secret formula is kept in a safe in the United States. Although Coca-Cola is made in many different countries, no-one knows the exact ingredients that go into the recipe. The different factories are supplied with the concentrated syrup and they add water and bubbles. But we do know that making Coca-Cola involves a physical change just like mixing salt or sugar in water.

Chemical change

Here is Totom to talk about **chemical change.**



wood → burning wood → ash

Rusting is another example of a chemical change. Cars, nails, roofing and metal bridges all rust over time. The bright, shiny new metal gradually changes to reddish brown rust.

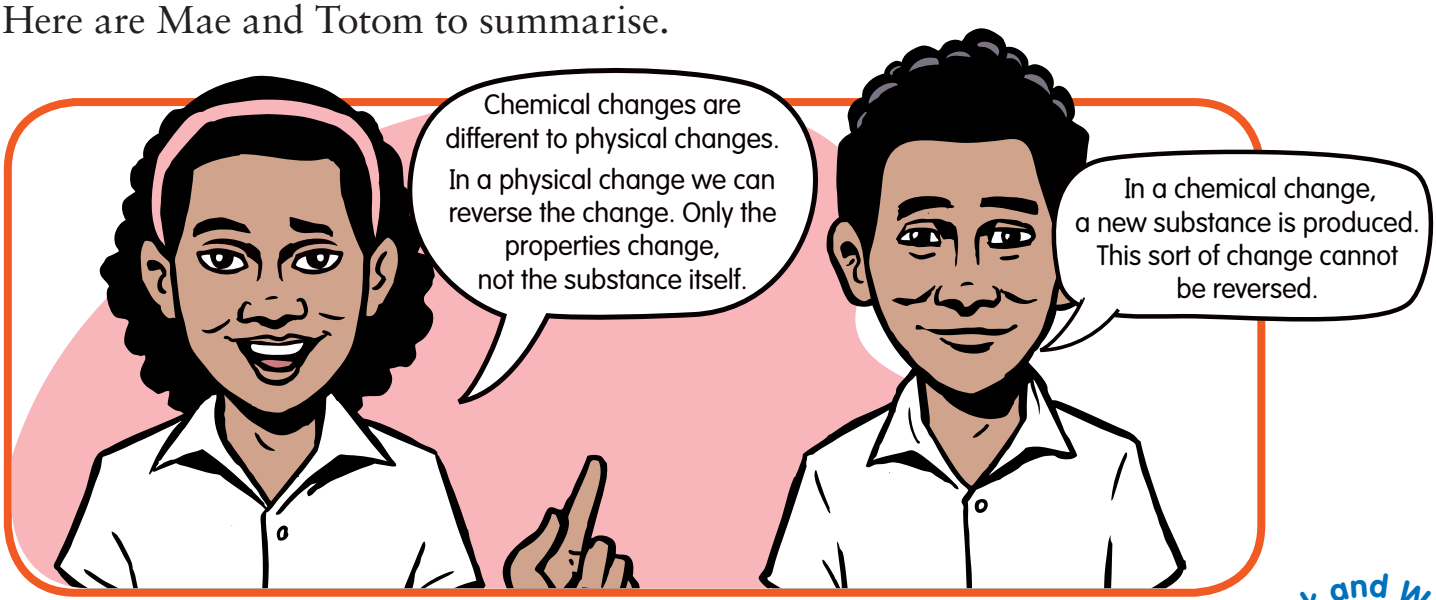
Rusting (or corrosion) is the changing of metal such as iron into rust when it reacts with water and oxygen in the air. Rusting is chemical change and we cannot reverse it easily. Once rusting starts it is difficult to stop.

A rusting oil drum

Other examples of chemical change are:

- fireworks
- a leaf changing colour.

Here are Mae and Totom to summarise.



Activity 4

Think and Write

Chemical or physical change?

You will need to be outside in open space for this activity.

1. Watch your teacher burn a piece of wood.
2. When your teacher has checked that the fire is out and has become cool, observe and touch the ashes.
3. Watch while your teacher also burns some paper.
4. In your exercise book write down what you observe. Is this a chemical or physical change? Explain why.

Cooking and change

Do you know anyone who makes bun cakes to sell at the market? See if you can help them one day, and talk to them about how the bun cakes are made. Describe what they look like before everything is mixed together. What can you smell when the cakes are cooking?

Describe what the cakes look like when they come out of the oven. Is there a physical change or a chemical change when the cakes are made?

Most cooking involves some chemical change. When we make cakes, some of the ingredients change during the cooking. It is not easy to get those ingredients back.

The easiest way to see chemical change in cooking is to watch eggs being fried. Next time someone is frying some eggs, make a note of the changes that take place in the egg white and the yolk.

Activity 5

Hands-on Activity

Observing more chemical changes

You will need:

- three small jars
- **vinegar, baking soda,** milk
- a teaspoon
- small pieces of paper
- matches

Copy this results table into your exercise book and fill it in after the activity is complete.

	Description of substances I started with	Observation: What I saw during the chemical change	Description of substances I finished with
a			
b			
c			

Complete the table with your observations of the following:

a Describe what the small pieces of paper look like. Place them in a jar and ask your teacher to light them with a match. Let the paper burn. Describe what you observe (what you feel, see, hear and smell). Describe the new substances formed in the chemical change.

b Describe the vinegar. Describe the milk. Pour a small amount of milk into a clean jar. Add the vinegar and shake gently. What do you observe? Describe the new substance formed in the chemical change.

c Describe the vinegar. Describe the baking soda. Pour a small amount of vinegar into a clean jar. Add half a teaspoon of baking soda. What did you observe? Describe the new substances formed in the chemical change.

Activity 6

In your exercise book write a few sentences describing the differences between physical and chemical changes. Give some examples for each of these two types of change.

Activity 7

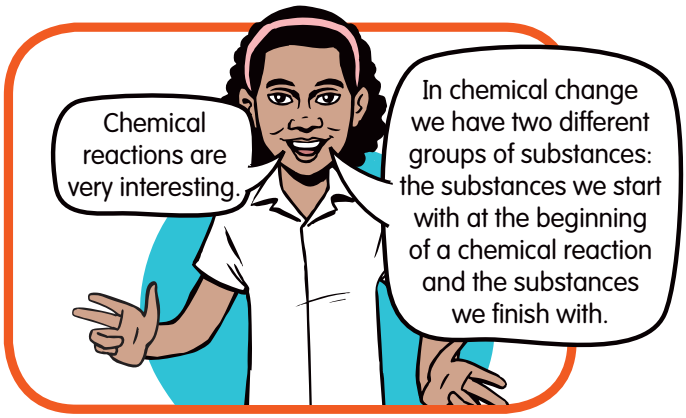
You will need:

- a metal tin lid or bottle cap
- tongs
- sugar
- a jar

1. Stir a small spoonful of sugar into a jar of warm water. Describe what you observe happening and record your results in your exercise book.
2. Place a small amount of sugar in the lid or bottle cap. Use tongs to carefully hold it over a heat source until the sugar melts and then turns black. Describe what you observe and record your results.
3. Which of these changes is a physical change and which is a chemical change? Explain why, using the information you have already covered in this chapter.

Chemical reactions

Chemical changes are often called **chemical reactions.** Chemistry is the study of materials and how they can be changed. Here is Mae to explain chemical reactions.



Substances I started with

vinegar **liquid** + baking soda **solid** → bubbles **gas** + clear liquid **liquid**

Substances I finished with

Activity 8

Hands-on Activity

You will need:

- 4 glass jars with lids.
- steel wool without soap; or 4 nails, water and salt

1 Put some steel wool in the first jar and seal the jar by screwing the lid on tightly.

2 Place some steel wool in the second jar and leave the lid off.

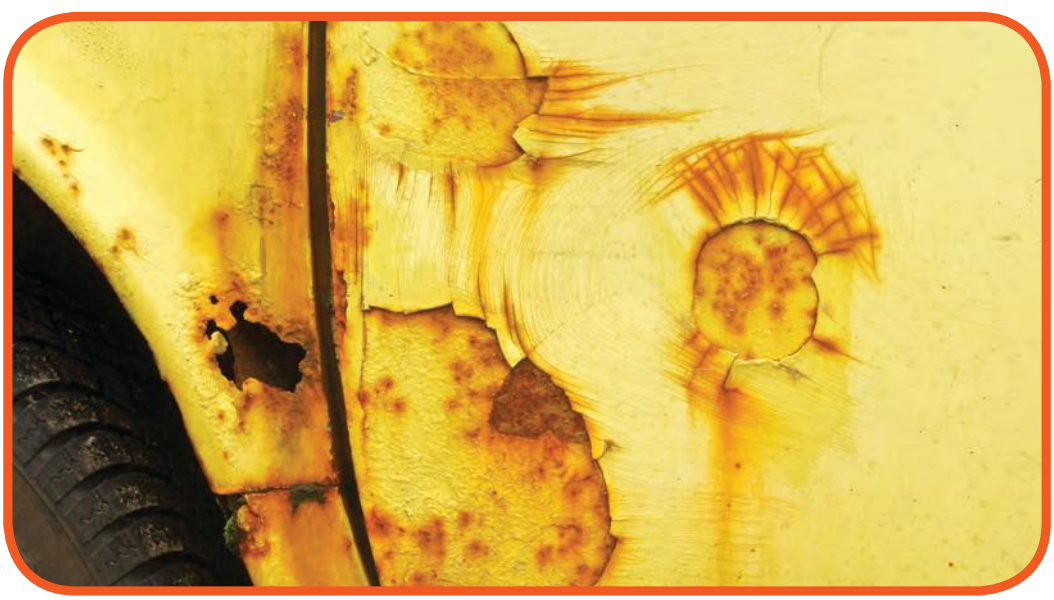
3 Place some steel wool in the third jar and moisten it with water that is not salty.

4 Place some steel wool in the fourth jar and moisten it with some salty water.

Over the next few days observe the changes in the steel wool. Write your observations in your exercise book.

In which jar does the steel wool rust most quickly? Why would this be a problem in Solomon Islands?

Chemical changes are all around us in life. **Burning** petrol to make cars and buses go is a very useful chemical change. So is the chemical change that allows cement to become very hard. However, some chemical changes like rusting can cause us problems.



Properties and uses of materials

Do you think it would be better to build a large bridge over a river out of wood or steel? Discuss this with a partner and come up with some reasons for your decision.

There are several reasons why steel is used to build large bridges and other major projects.

1 Steel is stronger than wood.
2 Steel can be bent into different shapes.
3 Wood rots in water but steel does not.
4 Wood can burn while steel cannot.

When we are considering what to use to make something new we have to think carefully about the material we will use and particularly the **properties** of that material. Different materials have different properties. For example, feathers are soft and light while steel is hard and heavy. We would not use steel in a pillow that we wanted to sleep on, just as we would not use feathers to build a bridge!

In this section we will be learning about the properties of some commonly found materials and testing some of these properties.

Paper and plastic bags

Hands-on Activity

Activity 9

Work in small groups.

You will need a selection of paper and plastic bags.

1 Look at the two different types of bags and compare their properties.
2 Which is stronger? Which is better in the wet? You can test this by putting large stones into both types of bag when they are dry and when they are wet. Write your findings in your exercise book.

Generally people prefer plastic bags because they stay strong even if they get wet. Paper bags are strong when they are dry but they tear very easily when they are wet.

Although plastic bags are strong they can create serious problems in the environment. One of the reasons that plastic bags stay strong is that they are not affected by water, so they do not break down quickly and disappear when they are thrown away.

This means that if plastic bags get into rivers or into the sea they stay there for a very long time. This can be bad for wildlife because turtles can mistake the bags for jellyfish and swallow them and die. It can also affect tourism because tourists do not like to see lots of plastic litter when they are swimming.

So the properties that make plastic bags useful —strength and resistance to water—can also be a problem for the environment when people throw them away without thinking.

Blue plastic wrapped around a bird's beak

Building materials

Activity 10

1 Take a walk around your local area and see what materials are being used to make the roofs of houses. Traditionally roofs were made from **pandanus** or coconut leaves. Now many more roofs are made from **corrugated iron** (sometimes called zinc). Think about the properties of these materials.

2 Write a paragraph in your exercise book about why you think this change has taken place.

A roof made of pandanus leaves

A roof made of corrugated iron

Activity 11

Think and Write

1 Take a walk around your school with your teacher. Identify as many parts of buildings and the materials used to make them as possible.

2 In the classroom, draw a table in your exercise book like the one below. An example has been given for you.

Structure	Material	Reason
Window	Glass	We can see through it

3 Work with a partner to complete the table with as many structures you identified as possible. When you have done this examine some of the things in the classroom such as desks and chairs and add these to the table.

Other properties

When we want to make something we have to examine the properties of various materials before we decide what material we will use. For windows we need a material that we can see through. Glass is usually the best material for that. But for some windows plastic can be used because it will let light in but will not shatter like glass.

A window made of glass

A skylight made of plastic

Activity 12

Properties of plastic and metal

Your teacher will give out some metal knives, forks and spoons and some plastic ones.

1 Examine these and make a list of their different properties in your exercise book.

2 Do you prefer to use plastic forks or metal ones? Why?

Activity 13

Solomon Islands is famous for its wood carvings. The carvers usually use **mahogany** or **kerosene wood** for their carvings. Why do you think they use these particular types of wood?

Discuss in class.

A mahogany carving

There are lots and lots of different types of properties and they can be used to describe different objects or materials.

Activity 14

Below is a list of properties in pairs of opposites. You may be able to think of more. Use these properties to make up sentences that describe an object or material like the one below. Write them in your exercise book.

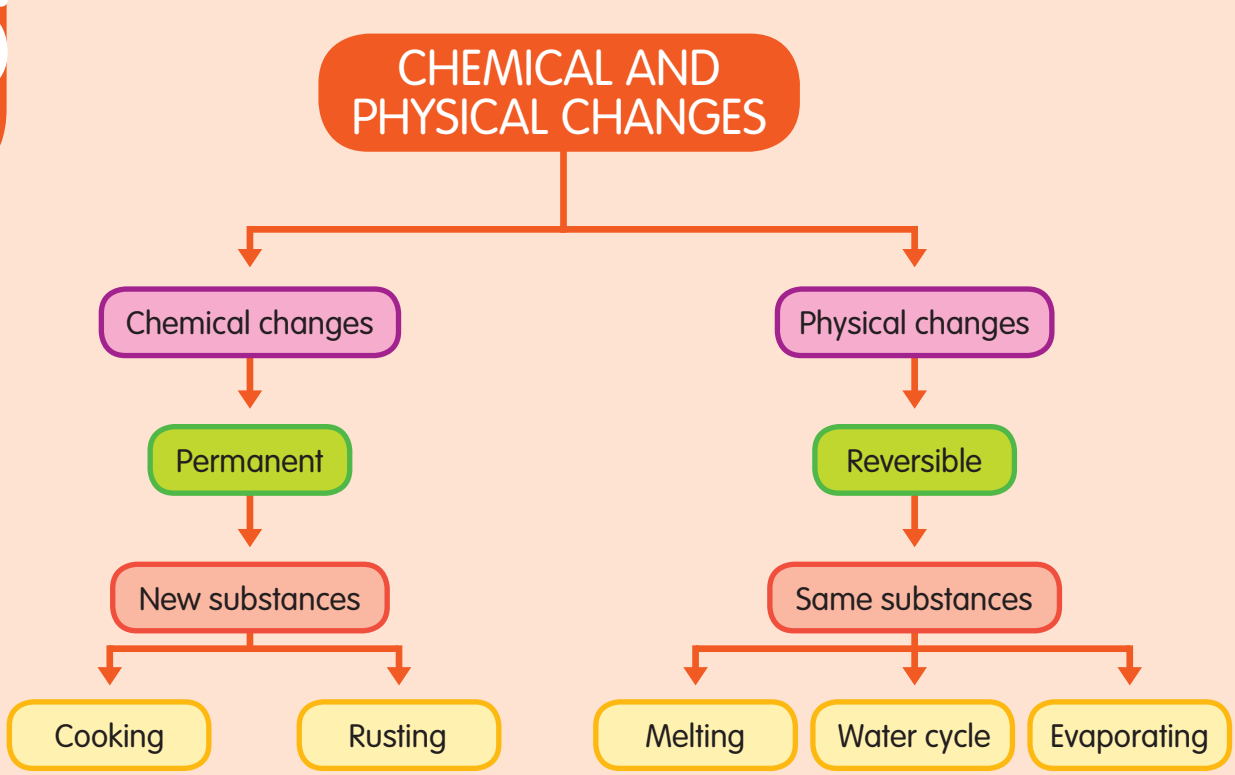
"The mirror was flat, smooth and shiny."

shiny	dull
hard	soft
rough	smooth
big	small

heavy	light
bendy	stiff
black	white

Chapter Review

1. Changes in materials can be either physical or chemical.
2. Physical changes are easy to reverse and do not produce any new substances.
3. Melting ice is a good example of a physical change.
4. Chemical changes are very difficult to reverse as they produce new substances.
5. Burning wood is a good example of a chemical change.
6. Most cooking involves chemical change.
7. Different materials have different properties.
8. Some words to describe properties are hard, soft, shiny and dull.
9. To make things we choose materials with the best properties for the purpose.



Revision

Answer the following questions in your exercise book.

1 **List three examples of physical change.**

2 **List three examples of chemical change.**

3 **How is physical change different from chemical change?**

4 **Think about the following objects and the materials they are made from. Explain why these materials were the best ones to choose to make each object.**

   a tyres—rubber

   b roofs—corrugated iron (zinc)

   c windows—glass

   d bags—plastic

5 **Chemical changes are also called chemical _____.**

6 **Rusting is an example of what sort of change?**

7 **Name three properties of steel that make it useful for building.**

Chapter 6

Selling garden produce

In this chapter, you will:

- learn why it is important to produce your own food
- find out how produce is prepared for market
- learn how to keep good records of the money you spend and make producing food
- learn how to set the best price for your produce
- learn about the best places to sell produce locally.

Importance of producing food crops

People produce food crops for many different reasons. Food crops are produced for daily **consumption**, feasting, cultural events and for **commercial interests**.

Here are pictures of some common food crops produced in Solomon Islands.

Activity 1

Copy the following two headings into a table in your exercise book.

Food crops mostly produced for consumption

Food crops produced for consumption and other reasons

List food crops in your local area under either heading. Identify other reasons, if any, for their production.

Let's make some money!

"I need to make some money," said Joy to her friend Rose. She closed the door of the chicken house. They had just completed the first egg collection at school and would take them to the office when the bell went.

Joy turned to Rose, an idea on her face, and looked down into the egg basket. "There are two and a half dozen eggs in there. At $35.00 per dozen, that would be…"

"It would be exactly $87.50," snapped Rose. "You can't seriously be thinking of steal…"

"Of course I'm not!" said Joy, laughing, because the thought of stealing the eggs was so ridiculous. "What I did think was that perhaps you and I could make some money if we had some laying hens of our own."

"Or perhaps something else which could make us money a bit quicker," replied Rose.

Both girls were excited now and talking eagerly. Joy picked up the basket and they made their way towards the school office. "Okay, what's your first idea?" she asked.

In the story Joy and Rose were very excited about what they could do to make some money! Being able to make money for yourself and your family is very exciting. You are never too young to start.

You could raise chickens to sell eggs like they did at Joy and Rose's school, but there are other things you might produce at school or at home too.

Activity 2

Think and Write

1 Make a list of all the possible things you might produce to sell.

2 Apart from making money, think of any other benefits of producing your own food and make a list in your exercise book.

Preparing food for market

Once you have produced some food by gardening or keeping animals you need to prepare it properly to take to the market. It is important that your **produce** arrives at the market in the best possible condition if you are to get the best price. Remember, at the market there may be a lot of other people selling the same produce as you. Shoppers will generally choose what they want based not just on the price but also on the quality of the produce.

Produce arriving at the market

Fruit, vegetables and eggs should be carefully washed. It is important not to bruise fruit or vegetables or crack eggs. If you do damage any of your produce or it is not good enough to sell, don't just throw it away—keep it for your own use.

Produce should then be carefully packed before taking it to market. It is a good idea to pack produce in cardboard boxes filled with paper or straw. This protects the fruit or eggs from bruising or breaking. Once you reach the market it is also important to present your produce in a way that is attractive to the shopper. Generally this means putting it into neat heaps. Show the price of your produce clearly on a sign.

Washing produce

Some damaged produce

An attractive display of produce

Eggplant at $5.00 a heap

Money management

Once you start to make some money from your sales it is very important to keep a good record of what is happening to your money. There are a number of things that you need to record regularly.

Expenses

Almost everything you produce will involve some **expenses**, and you usually have some expenses before you start getting **income**. For example, to grow fruit or vegetables you will need to buy some equipment to help you prepare the soil. Make a list of the types of equipment you might need. You may also need seed and fertilizer, and there will be a cost in transporting your produce to market. When the cost of these items has been added up, you have the total expenses.

Income and profit

The money you get from selling your produce is called income.

When you take away or subtract your expenses from your income the amount leftover is your **profit**. It is important to keep your expenses as low as you can so that you can get the most profit from your produce.

Think of ways of keeping expenses low when you are growing a crop. One way might be to use compost from food scraps and other vegetable waste rather than buying expensive fertilizer.

Once you begin to make some profit you have to decide what to do with it. It is often a good idea to use some of your profit to improve your business. You might buy more chickens, or get better tools for working in your garden. If you can improve your business you should end up making more profit.

Activity 3

Hands-on Activity

Mary takes 240 green peppers to the market. She sells them for $5 per heap of 6 peppers.

She had to pay $15 for the minibus she took from her village to the market and will have to pay the same to get back.

She also had to spend $30 to pay for her space at the market.

Use this information to complete the following record for Mary's business. Copy and complete the record in your exercise book.

Mary's income:	
Mary's expenses:	
Mary's profit:	

Keeping records

There are many ways of keeping records. A simple one is shown here.

Ani keeps a record of her income and expenses. She has been keeping a record of her fruit and vegetable business in an ordinary exercise book. This is what her account book looks like for the month of March.

Date	Income	$	Expenses	$
1/03/11	vegetables sold	20.00		
1/03/11			market fee	5.00
1/03/11			transport	2.00
4/03/11	vegetables sold	30.00		
4/03/11			market fee	5.00
4/03/11			transport	2.00
8/03/11	vegetables sold	40.00		
8/03/11			market fee	5.00
8/03/11			transport	2.00
12/03/11	vegetables sold	40.00		
12/03/11			market fee	5.00
12/03/11			transport	2.00
16/03/11			seeds	5.00
		Total $130.00		**Total $33.00**
Profit = Income – Expenses				
Profit = $130.00 – $33.00				
Profit for the month = $97.00				

Activity 4

Hands-on Activity

Mary sells her fruit and vegetables at the central market. She keeps a record of her sales and expenses for the month of June. This is what she recorded.

5/06/11: vegetables sold–$30.00, transport–$3.00, market fee–$5.00

10/06/11: vegetables sold–$40.00, transport–$3.00, market fee–$5.00

15/06/11: vegetables sold–$45.00, transport–$3.00, market fee–$5.00

20/06/11: vegetables sold–$45.00, transport–$3.00, market fee–$5.00

1 Transfer these values into a table in your exercise book showing income, expenses and profits for each date.

2 In the final line enter the totals for each of these including the total income and profit for June.

Selling at the right price

To be successful at selling you need products that people want to buy. Commonly sold produce in Solomon Islands includes: corn, cabbage, lettuce, spring onions (shallots), eggs, peanuts, papaya, pineapple, local apples, guava, sugar cane, green pepper, taro, chilli and bananas. However, before you take your produce to the market to sell, it is important to work out the price you are going to sell it for.

If you make the price of your produce too high, no-one will buy it and it could go to waste—especially if you are selling fresh fruit and vegetables. If you make the price too low, you will probably sell everything but you may not make any profit.

When you are deciding on a price for your produce, you need to consider how much it actually cost you to make it and get it to the market. So for a crop like tomatoes, you may need to consider the cost of things likes seeds, fertilizer or pesticides. There may also be the cost of your or someone else's work or labour, transport costs to market and the cost of your selling space at the market. You also need to consider what price other people around you are selling their tomatoes for.

Fieldwork Activity

Activity 5

Visit your local market and talk to some of the people selling produce.

1. Ask them what costs they have getting their produce to the market and how they decide on a selling price.
2. Walk around the market and compare prices of the same produce.
3. Write your findings in your exercise book.

Where to sell your produce

There are a number of places where you could sell food that you have produced. You could sell it at school or at your local market. If your produce is very good quality and you can ensure a regular supply, you might be able to sell it to a local shop, restaurant or hotel.

It is much cheaper for even the very big international hotels like the Heritage or Kitano Mendana in Honiara to buy local produce than ship or fly produce in from another country. Why might this be? Are there any other advantages for hotels in buying local produce?

Some local hotels

A local restaurant

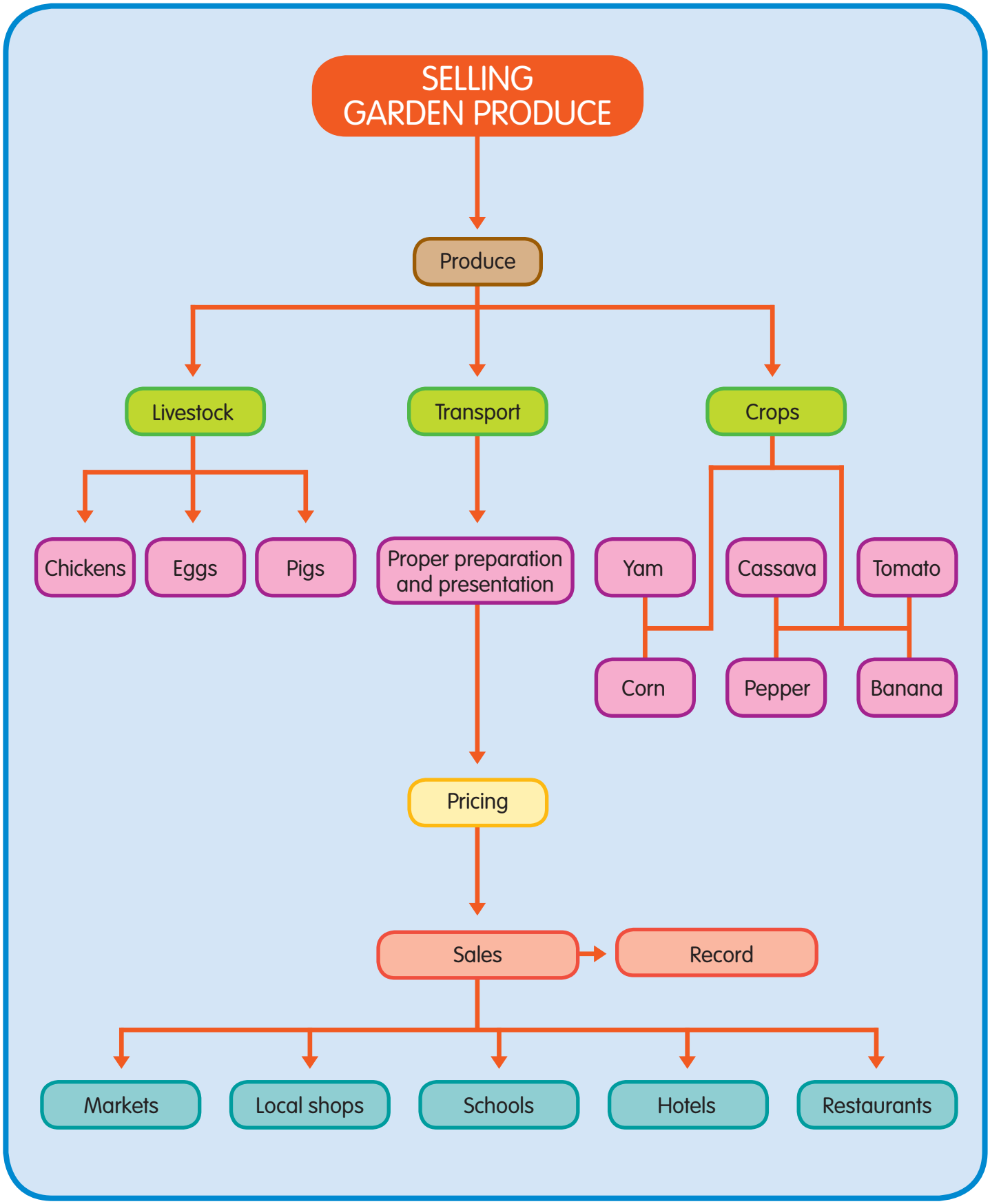
A local shop

Fieldwork Activity

Activity 6

Visit a local hotel or restaurant and ask them where they buy their fruit, vegetables and eggs. Find out if they use local suppliers and why or why not. List these reasons in your exercise book.

Concept Map


SELLING GARDEN PRODUCE
Produce
Livestock
Transport
Crops
Chickens
Eggs
Pigs
Proper preparation and presentation
Yam
Cassava
Tomato
Corn
Pepper
Banana
Pricing
Sales
Record
Markets
Local shops
Schools
Hotels
Restaurants

Chapter Review

1 The main reasons for producing your own food crops are:
- daily consumption
- commercial interests
- feasting and cultural events

2 Expenses are the total costs of your spending.

3 Income is the money you get from selling your produce.

4 Profit is the money that you are left with when all expenses are deducted from income.

5 To be successful in selling, you need products that people want to buy and you need to decide the best price to sell them.

6 Produce can be sold to local hotels, restaurants, schools or hospitals, or in markets.

Revision

Answer these questions in your exercise book.

1 List as many reasons as you can why people grow their own food crops. Also list the benefits of growing your own food.

2 Which of these three formulas is true for a small business?

a Profit = Income - Expenses

b Expenses = Profit - Income

c Income = Expenses - Income

3 List three possible expenses you may have in growing food and selling it at market.

4 Name two things you should do to prepare your produce for sale.

5 Explain why good record-keeping is important to run a successful small business.

Chapter 7

The solar system and the structure of the Earth

In this chapter, you will:

- name the eight planets in order as we move away from the Sun
- make a model to represent the solar system
- learn that some planets, other than Earth, have moons
- demonstrate the attraction of planets to the Sun
- learn the different layers that make up the structure of the Earth.

The Milky Way

There are billions of stars in the universe. From Earth, stars look like tiny points of light because they are so far away, but they are really giant fireballs. They give out so much light that we can see them from millions of kilometres away.

The **Milky Way** is where our Earth and the solar system are located. Stretched right across the sky at night is the Milky Way. The early Greeks thought it looked like milk spilt in the sky. We now know that it is billions of very distant stars. Many of the stars are so far away that you need a pair of binoculars or a telescope to see them. If you stay away from the bright lights of your town or village, you can see the Milky Way as a band of stars across the sky. We see many more stars along the Milky Way than anywhere else in the sky.

Fieldwork Activity

Activity 1

This is an individual activity and should be done at home.

You will need a pen and a notebook.

Go outside on a clear night and observe the night sky.

Use a pen and a notebook to record your observations.

1 Did you see the Milky Way?

2 Write a description, poem or story about the night sky and the Milky Way.

The solar system

The **solar system** consists of the Sun and everything that orbits around it. This includes the **planets**, moons, comets, asteroids (big rocks) and man-made **satellites**. It belongs to the much larger formation or **galaxy** called the Milky Way.

The solar system was formed 5000 million years ago from a cloud of dust and gas. The Sun was the first object to be formed. Asteroids and comets were then formed from the loose particles left from the formation of the Sun, some of which then grew into planets. The word *solar* comes from the Latin word for sun, *sol*.

Activity 2

This activity is designed to find out how well you remember this topic from Year 5.

In your exercise book make a simple drawing of the planets in the solar system, including the Sun. Draw the planets in order of nearest to furthest away from the Sun.

Here is a clue to help you start: there are eight planets in our solar system. Four of them are called the inner planets and four are the outer planets.

Jupiter, **Saturn**, **Uranus** and **Neptune** are the four outer planets of our solar system. These four planets have rings and Saturn's rings are easily observed from Earth. The outer planets have larger orbits than the inner planets. This is because the outer planets are further from the Sun. The inner planets have smaller orbits as they are closer to the Sun.

The four inner planets—**Mercury**, **Venus**, Earth and **Mars**—are heavy and they have few or no moons and no rings. They are made up of minerals in their outer layers and metals such as iron and nickel that form their **cores**.

Activity 3

Hands-on Activity

In this activity we will make a human model of the solar system. You did a similar activity in Year 5 but this activity will help you to better understand the distances between the planets and their sizes.

Work in groups, with one person to represent each different planet. Copy the table below into your exercise book. You will need seeds and balls for the activity.

1. Measure out the distances. Measure a one-metre step and then count out the correct number of steps between the planets. Mark the spot. For most schools it is easy to make a human model of the Sun to Saturn, as the distances are not too great. But if you are near a beach you may also be able to include Uranus and Neptune.
2. Once the distances have been worked out, collect the seeds and balls.
3. Take up your positions and hold up your items for the rest of the class to see.

Planet	Scaled diameter	Suggested model	Scaled distance from Sun
Sun	30 cm	Beach ball	
Mercury	1 mm	Poppy seed	12 metres
Venus	3 mm	Dried pea	23 metres
Earth	3 mm	Dried pea	32 metres
Mars	2 mm	Pepper/corn	49 metres
Jupiter	30 mm	Tennis ball	167 metres
Saturn	26 mm	Tennis ball	300 metres
For schools with access to more space			
Uranus	10 mm	Marble	about 600 metres
Neptune	10 mm	Marble	about 900 metres

The Sun

The Sun is more than 100 times wider than the Earth. The Sun is the centre of the solar system. The Sun is not a planet but a **star**. Like other stars, the Sun is yellow and it is a ball of gas. It produces its own heat energy. It is much brighter than anything else in the sky. We cannot see any other stars in the sky when the Sun shines. The Sun is mainly made of the gas hydrogen, which burns and gives us heat and light.

Mercury

The closest planet to the Sun is Mercury. It is the second smallest planet in our solar system. Mercury has very little atmosphere and has a dusty rocky surface with many **craters.**

Mercury is almost three times closer to the Sun than Earth. Because of its closeness to the Sun, it is very hot but it gets freezing during the night—much colder than any of our nights. It is also a dry planet. There is no water to drink on this planet

Mercury looks very similar to our moon. Mercury spins fastest of all the planets in our solar system. It orbits around the Sun in 88 days.

Activity 4

Fieldwork Activity

This is an individual activity and should be done at home. You will need a pen and a notebook.

1 Look out in the evening sky (just after sunset) and observe the sky.
Observe the stars. Do you see a very bright star?
Observe whether it remains in the same position or moves.
Record what you observe in your notebook.

2 Look out in the early morning sky (just before day light) and observe it.
Do you see a bright star?
Keep observing it. Does it stay in the same position or does it move?
Record your observations.
What planet have you been watching?

Venus

The second planet from the Sun is Venus. After the Sun and Moon, it is the brightest object in the sky. Venus has a rocky surface with craters, volcanoes and large cracks. The surface of Venus is dry and very hot—it is hot enough to cook on. Venus is named after the Roman god of love and beauty.

Venus is about the same size as the Earth and is sometimes called Earth's twin. It is a planet of thunderstorms where lightning flashes all the time. It has a very thick carbon dioxide **atmosphere**. The carbon dioxide traps the heat from the Sun and makes it very hot.

Venus appears like a very bright star just after sunset or before sunrise. This is why it is called "evening star" or "morning star". Venus has no moon. Venus orbits the Sun in 225 days.

The temperature on Venus ranges from 180°C to 470°C. There is no life on Venus because it is so hot. Animals and plants cannot survive. It is so hot that some rocks on Venus glow a dark red colour.

The planet's surface has very strong air pressure and winds can be as fast as a cyclone. Over half of the surface of Venus is lava plains. There are also large mountains and thick clouds.

The extreme surface conditions make it hard to study Venus. Several spacecraft that have landed on Venus were destroyed before much information could be gathered. Spacecraft orbiting close to Venus have been able to study the planet more safely. The American spacecraft *Magellan* mapped 98% of the planet in its four-year mission. *Venus Express* was launched in 2005 and is still orbiting Venus.

Activity 5

Write your answers in your exercise book.

1 What would happen to you if you climbed out of a spacecraft onto the surface of Venus?

2 Can animals and plants survive on Venus? Why or why not?

Earth

Of all the planets in the solar system, the planet Earth is the only planet with life on it. Earth is our home. We belong to the Earth. We should treasure our Earth with its oceans, forests, mountains and rivers, and its insects, fish, birds and people.

Activity 6

Discussion Questions

What planet am I?

- I'm round with brown and green land and blue oceans.
- I'm third from the Sun.
- I rotate completely in 24 hours.
- I support life because my atmosphere suits all living things.
- The Moon is my only natural satellite.

Earth is the third planet from the Sun and it is the fifth largest planet in the solar system. The Earth is unique from other planets because it has features to sustain life that are not found anywhere else in the solar system. It has the right temperature for living things to survive. It is neither too hot nor too cold and it contains the right mixture of gas and water needed by plants and animals. It has only one satellite and that is the **Moon**. The Earth is just the right distance from the Sun.

The Earth takes 365 days (one year) to travel all the way around the Sun once. It spins once every 24 hours (one day). The temperature on Earth ranges from -70°C to 55°C.

Earth shines brightly in the solar system. It reflects about one-third of the sunlight that falls on it. Its atmosphere scatters the light and creates a blue-coloured planet. Brown and green land can be seen in the blue oceans. The ocean covers two-thirds of the Earth's surface. The Pacific Ocean alone covers half of the globe.

Many clouds are seen in the atmosphere. The Earth's atmosphere is made up of gases. The sun warms this layer of gases during the day and then cools at night. This warming and cooling influences our weather. Different parts of the Earth have different types of weather.

Mars

The fourth planet from the Sun in the solar system is Mars. It is located between Earth and Jupiter. Mars is named after the Roman god of war. Mars is half the size of Earth and is known as the "red planet". It is the bright red star we see from Earth. Its surface is covered by rust-red rock. Mars has two small moons shaped like potatoes. They are Phobos and Deimos.

Mars is a dry and cold planet. It is a desert where there is no water; it has high mountains, deep craters and large volcanoes. The hottest place on Mars is like the North Pole on Earth. This means that it is very cold.

Scientists having been looking for life on Mars but have found none so far.

Creative Activity

Activity 7

You will need: a round balloon, glue, string, paints or crayons, newspapers and scissors.

1. Blow up a balloon and tie off the end.
2. Cut the newspaper into strips and glue these to the surface of the balloon. The whole surface should be covered with a thick layer of newspaper. Put the balloon in the sun to allow the glue to dry.
3. When the glue has dried, use a needle or pin to burst the balloon inside the paper.
4. Colour the surface red and write Mars on it. Then hang it in the classroom for display.

Jupiter

The biggest planet in the solar system is Jupiter, named after the Roman king of the gods. Jupiter is three times bigger than the other seven planets put together. It is 318 times larger than Earth. It is mostly made up of gases and liquids. The **mantle** of Jupiter is made up of liquid and its core is solid. The atmosphere is thick.

Jupiter's night sky is full of moons. It has the most natural satellites or moons of all the planets in the solar system—more than 60. Four of Jupiter's moons are much larger than the rest. They are called Io, Europa, Ganymede and Callisto. On Io, there is always a volcano erupting. The other three are made of rock covered in ice. In our night sky, Jupiter appears as a very bright white star.

A stormy planet

Jupiter is very cold because it is five times further away from the Sun than Earth. Jupiter's surface shows light and dark oval spots, which are storms. The largest spot is called the "Great Red Spot" and it is the fiercest storm on Jupiter. It is a hurricane almost four times the size of Earth. Jupiter is a stormy planet and spins very fast. A day on Jupiter is only 10 hours long, but it takes 12 years to orbit the Sun.

Think and Write

Activity 8

Copy these sentences in your exercise book and fill in the blanks.

1 Jupiter belongs to the four _____ planets.
2 Jupiter is named after the Roman _____.
3 There are _____ known moons of Jupiter.
4 The fiercest storm on Jupiter is called_____.
5 Jupiter's moon _____ always has a volcano erupting.
6 The three moons of Jupiter that are rocks covered in ice are _____, _____ and _____.

Saturn

The sixth planet in the solar system and the second largest planet after Jupiter is Saturn. It is named after the Roman god of agriculture. It is a beautiful planet that appears like a bright yellow star at night.

Saturn is special because it has a ring system that can be visible from Earth. The rings consist mostly of ice particles, rocky debris and dust. Saturn's rings were first observed by Galileo in 1610.

Saturn— along with Jupiter, Uranus and Neptune—is referred to as a **Jovian** planet, which means Jupiter-like planet. Saturn is 95 times larger than Earth. But even though Saturn is big, it is a very light planet because it is mainly made up of gases. It is so light that it could float on water.

Saturn's atmosphere is very thick. It has more than 50 natural satellites or moons. The largest of these moons is called Titan. Titan is the only moon in the solar system that has a similar atmosphere to our Earth.

Creative Activity

Activity 9

Make a model of Saturn in the same way that you did for Mars but add some coloured rings.

Uranus

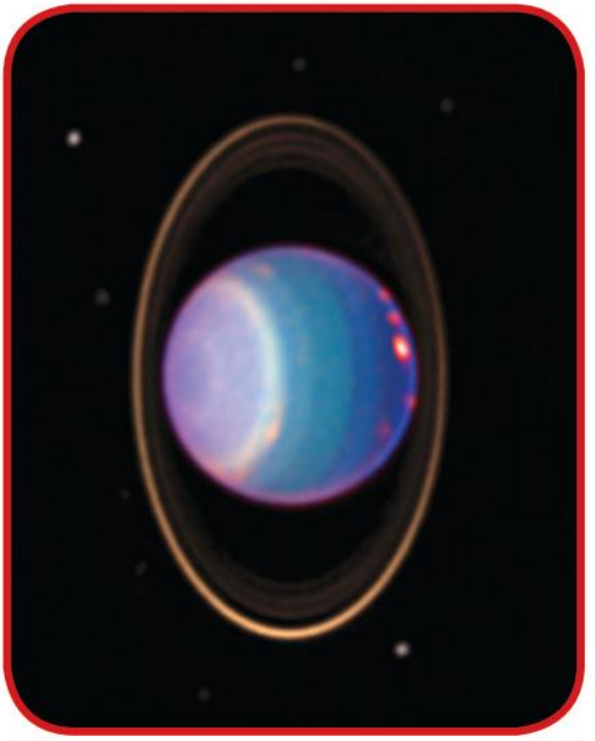
The seventh planet in the solar system is Uranus. It is the greenish-blue planet and is one of the outer planets. It is about four times the size of Earth. Uranus is named after the Greek god of the sky. The planet was first discovered in 1781 by astronomer William Herschel.

Like Saturn, Uranus is also a gas planet and has an icy ring system around it. Uranus contains the gases hydrogen and helium. Its atmosphere contains methane, which causes the planet to appear a greenish-blue colour.

Conditions on Uranus are very harsh. It is the coldest planet, with a temperature low of -224°C and winds of 900 kilometres per hour!

A day on Uranus is shorter than an Earth day and takes only 18 hours. However, it takes about 84 Earth years to orbit the Sun. Uranus has 27 natural satellites or moons. The five largest moons of Uranus are Oberon, Titania, Umbriel, Ariel and Miranda.

A strange thing about Uranus is that it rotates on its side. It is the only planet in the solar system that rolls around the Sun like a barrel instead of spinning upright.



Activity 10

Discussion Questions

Would it be possible to live on Uranus? Why and why not?

Discuss this question as a class.

Neptune

The smallest of the four gas planets in the solar system is Neptune. It is the eighth planet from the Sun and named after the Roman god of the sea. It has 13 known natural satellites or moons. In 1989 *Voyager 2* was the first space probe to visit Neptune, taking pictures and sending them back to Earth.

Because Neptune is far away from the Sun it is very cold and dark. Like the other gas planets, Neptune has an icy ring system that orbits around it. Neptune is made up of liquid and gas. It takes 16 hours for Neptune to rotate or complete one day. A year on Neptune lasts over 164 Earth years.

Earth's moon

We know from our study in Year 5 that the Earth has a moon. We see it in the sky most nights. The Moon is about 383,000 kilometres from Earth. If you could drive to the Moon it would take months to get there.

The Moon is the Earth's only natural satellite. It is a ball of rock that spins on its own axis as well as orbiting the Earth and travelling with the Earth as it orbits the Sun.

Like the Earth, the Moon is not a source of light. The Moon is the brightest object in the night sky because it reflects light from the Sun. As the Moon travels around the Earth, we see different amounts of its sunlit face, ranging from a thin crescent to a full face. When the side of the Moon facing us has no sunlight on it, we cannot see the Moon at all.

Even with our naked eyes, some features of the Moon's surface can be seen. People have different stories or beliefs about what they see. Some people say it is the shape of a rabbit; some say it is the image of two children sitting on a beetle's back.

The Moon is a dry and barren land, dotted with craters. There is no rain or wind: it is very quiet because there is no atmosphere surrounding it. Neil Armstrong was the first man to land on the moon in 1969. The world watched in amazement as he stepped on this airless, waterless satellite of the Earth. The footprint he left was a permanent one because there is no air or wind that will disturb it. Samples of moon rock and soil were brought back to Earth to be studied.

Activity 11

Think and Write

Each night for one month, go outside and look at the Moon at night.

1 Draw the Moon each night to show how it changes over the month.

2 Then write a story about the Moon or about the marks you can see on the Moon's surface from your island or province.

Other planets' moons

The Earth is not the only planet in our solar system that has a moon. Most of the planets in our solar system do. Only Mercury and Venus do not have any moons. Some planets have many moons. Mars has two moons, Jupiter has more than 60, and Saturn has over 47 moons. Uranus has 27 moons and Neptune has 13.

Mars and its two moons

Jupiter and four of its moons

Scientists believe that some of the moons that belong to other planets are made of ice.

You will remember that our moon orbits the Earth once every 28 days. The moons of Jupiter take much longer to orbit that planet, as it is much bigger than Earth.

Let's revise how our moon orbits the Earth while the Earth orbits the Sun.

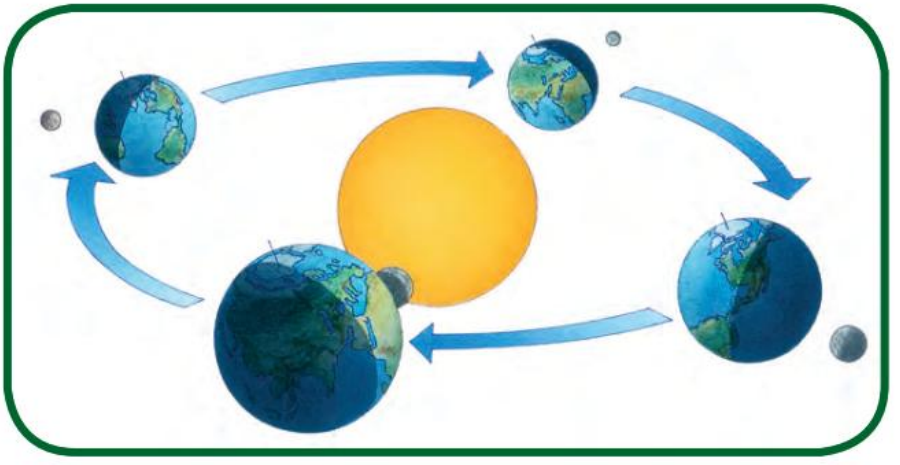
Activity 12

Hands-on Activity

Work in groups of three.

Look carefully at the diagram, then make a human model of the Earth, Moon and Sun orbiting each other. Each student should act as one planet, star or moon.

You may have done this activity in Year 5 but doing it again will help you to remember how the planets orbit.



Planets in orbit

We have learnt how a special force called gravity keeps the Earth in its orbit as it moves around the Sun. This same force of gravity acts on all the planets in the solar system as they orbit the Sun.

You will remember how in Year 5 we used a ball and string to show the Earth's orbit around the sun. Now let's demonstrate the orbit of two other planets, Mercury and Jupiter around the Sun.

Activity 13

Hands-on Activity

You will need three pieces of string and a ball to represent the Sun.

Use string of different lengths to show how Mercury, Jupiter and the Earth orbit the Sun. You will have to think about where the planets sit compared to the Sun and choose the correct piece of string to show each orbit.

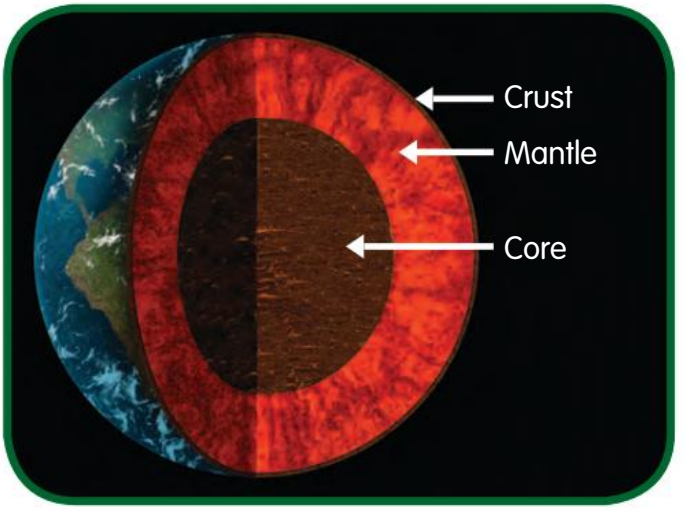
Lay the string out with plenty of room to show each planet's orbit.

Inside the Earth

We live on the outside of the Earth on the Earth's **crust**. The crust is the outer layer of Earth but there are other layers inside. Look at the diagram below. How many layers can you count including the crust?

The Earth is made up of different layers just like a large onion. There are three main layers. The crust is the outer layer and is made up of hard, cold rocks. Below the crust is a layer called the mantle. Here the rocks are softer. At the centre of the Earth is its core, made up of rocks that are so hot they are liquid.

In some places there are large cracks in the Earth's crust. These are called fault lines. If the crust moves or shifts at one of these fault lines it often causes an earthquake. There are some fault lines near to Solomon Islands and earthquakes can sometimes be felt here. Earthquakes make the land shake and can cause buildings to collapse. If an earthquake takes place below the sea, it can cause large waves to form called tsunamis. These are extremely dangerous if they reach the shore.



Hands-on Activity

Activity 14

You will need:

- flour and water
- knife
- paper
- coloured crayons

1. Mix flour and water together to make a thick paste or dough.
2. Shape the dough into a ball to represent the Earth. Before the ball becomes too hard cut it into two halves with a knife.
3. Make labels for the crust, mantle and core. Use the diagram above to help you colour the labels to match the layers.
4. Take one of the dough halves and stick the labels to the correct layer.

Activity 15

Hands-on Activity

This is another way of modelling the Earth.

Work in groups for this activity.

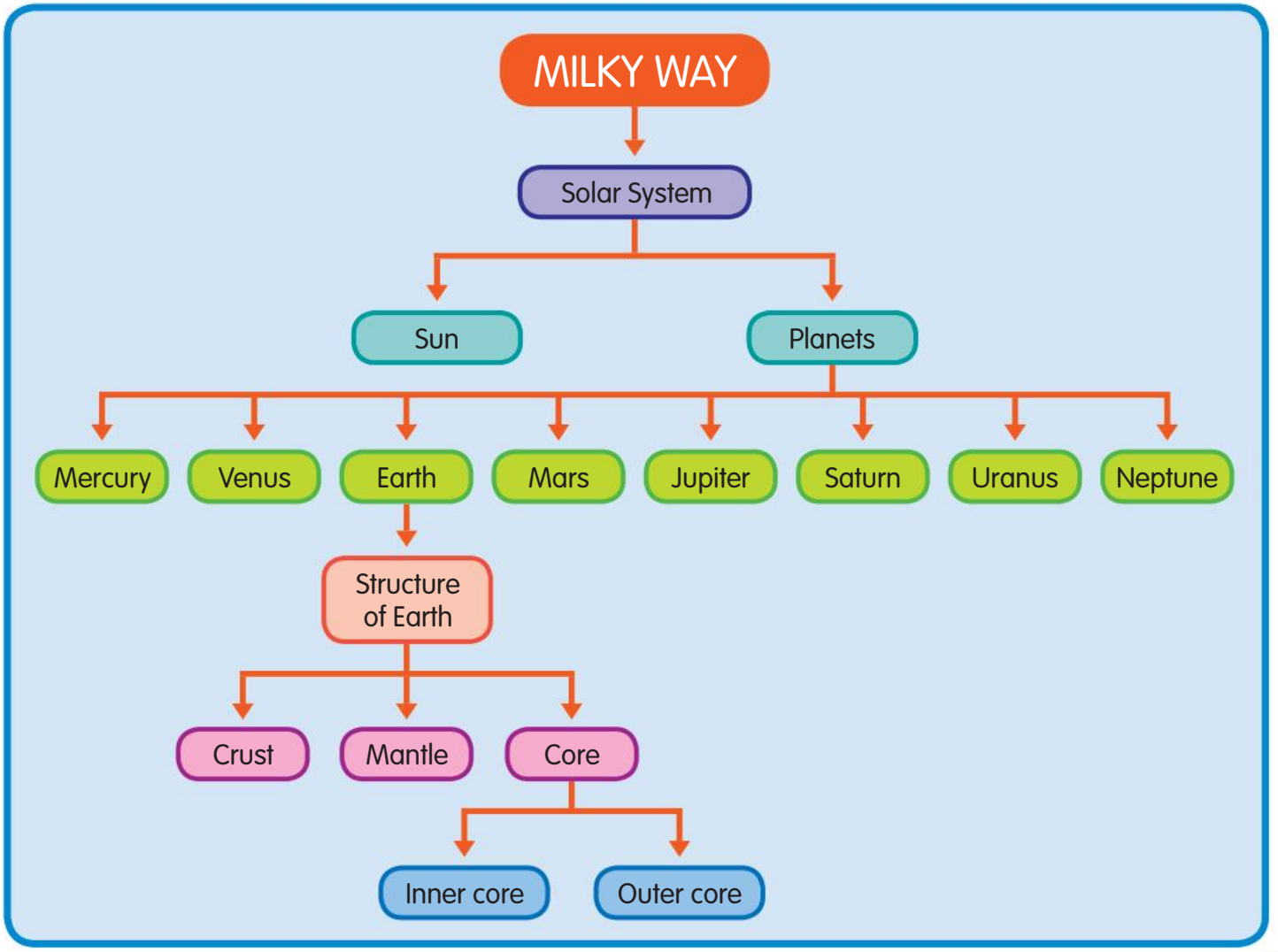
You will need:

- onion
- small knife

1 Cut the onion in half.

2 Explain how the inside of the onion is similar to the inside of the Earth. Which layer of the onion best represents the crust of the Earth?

Concept Map



Chapter Review

1. The Milky Way contains our solar system.
2. The solar system consists of the Sun and everything (planets, moons, comets, asteroids and man-made satellites) that orbits around it.
3. A planet is a round object that moves around the Sun.
4. The four planets that are closest to the Sun (the inner planets) are Mercury, Venus, Earth and Mars.
5. The four planets that are furthest from the Sun (the outer planets) are Jupiter, Saturn, Uranus and Neptune.
6. Venus, the brightest object in the sky after the Sun and Moon, is sometimes called the "Morning Star" or "Evening Star".
7. The Sun is not a planet but a star. It is a ball of gas that produces its own energy.
8. The Sun is made up of two gases and it is Earth's source of light and heat.
9. Mercury is the closest planet to the Sun, so it is a very hot planet where living things cannot survive.
10. Venus, the second planet from the Sun, is about the same size as the Earth. Its surface is very dry and hot.
11. The third planet from the Sun is our Earth. It is the only planet that sustains life for all living things.
12. It takes 365 days (1 year) for the Earth to orbit around the Sun.
13. Mars, named after the Roman god of war, is the fourth planet from the Sun.
14. Jupiter, the giant planet in the solar system, is fifth from the Sun. It is a stormy planet and it spins very fast.
15. Saturn is the sixth planet from the Sun and it is the second largest planet in the solar system. It is a very special planet because of its ring system, made mostly of icy particles.

16 The four outer planets are also known as Jovian planets. This means Jupiter-like or like Jupiter.

17 The greenish-blue planet that is seventh from the Sun is called Uranus, named after the Greek god of the sky.

18 Uranus was discovered in 1781 by astronomer William Herschel. Uranus seems to be lying on its side. That is why it rolls around the Sun like a barrel instead of spinning.

19 The planet that is eighth and furthest from the sun is Neptune. Because of its distance from the Sun, it is a very cold and dark planet.

20 Our Earth has only one natural satellite—the Moon. The Moon is not a source of light. It reflects light from the Sun.

21 The first man to step on the Moon was Neil Armstrong in 1969. Samples of moon rock were brought back to Earth to be studied.

22 The Earth is made up of layers—the core, mantle and the crust. The crust is the thinnest but it is the layer where all living things exist. The mantle is mostly made up of molten rock. The core is made up of iron and nickel.

Revision

Answer these questions in your exercise book.

1 Which of these planets are the inner planets?

a Mercury, Earth, Mars and Jupiter

b Mercury, Venus, Earth and Mars

c Venus, Earth, Mars and Neptune

d Jupiter, Saturn, Mercury and Neptune

2 Which of the eight planets rolls around the Sun like a barrel?

a Mercury

b Jupiter

c Uranus

d Saturn

3 Which of these statements is true about Venus?

a It is also known as the "morning star" or "evening star".

b It rolls around the Sun like a barrel.

c It has a ring system.

d It is a very cold and dark planet.

4 What year was Saturn first observed?

a 1981

b 1610

c 1871

d 1781

5 Who was the first man to land on the Moon in 1969?

a William Herschel

b Neil Armstrong

c Sir Isaac Newton

d Galileo

6 On which layer of the Earth do we live?

a crust

b mantle

c inner core

d outer core

7 Copy these sentences into your exercise book. Fill in the blanks with the correct words from the list below.

planet	nickel	star	solar system	layers
hot	satellite	days	inner	Earth

a The _____ consists of the Sun and everything that orbits around it.

b A _____ is a round object that moves around the Sun.

c The four planets closest to the Sun are called the _____ planets.

d The Sun is not a planet but a _____ .

e Mercury is a very _____ planet because it is the closest to the Sun.

f The third planet from the Sun is our _____.

g It takes 365 _____ for the Earth to go around the Sun.

h Our Earth has only one natural _____, and that is the Moon.

i The Earth is divided into _____.

j The Earth's core is made up of iron and_____.

Glossary

A

adaptation change in a living thing, over time, that better enables it to survive and multiply

atmosphere the gases surrounding Earth or another planet held in place by gravity

axle supporting rod on which a wheel or a set of wheels turns

B

bacteria very small living things that you cannot see. Some kinds of bacteria cause diseases

baking soda white powder used to raise bread during baking

balanced state of being steady

behaviour typical actions of an animal

burning to be on fire

C

camouflage way of hiding by colouring it so that it looks like its surroundings

carnivore animal that eats the flesh of other animals

characteristic something that makes a living thing different from others

chemical change change in a substance that cannot be reversed

chemical reaction process that leads to the change of one set of substances to another

closed circuit electric circuit without any gaps in it which allows electricity to flow

commercial interest business

conductor anything that carries or allows passage of heat or electricity, usually a metal

consumer animal that eats either plants or other animals

consumption process of eating something

core centre; in this case, referring to the centre of the Earth

corrugated iron iron sheet with lots of folds in it to increase its strength

crater hollow area shaped like the inside of a bowl; the mouth of a volcano is a crater

crust outer layer of Earth

current electricity electricity that moves or flows through wires

D

decomposer organisms that break down dead or decaying organisms, e.g. bacteria, fungi, worms

device invention or machine used to perform simple tasks

differences things that are not the same

E

Earth the planet on which we live

effort force needed to move a lever

electrical circuit continuous series of connected wires that allow electricity to flow

electrocuted be killed by electricity

energy power or ability to make something work or be active

expenses money needed to buy or do something

extinction when a species ceases to exist

F

feature a part of the face such as the eyes, nose or chin

filament fine wire that lights or heats up when electric current is passed through it

food chain series of living beings in which each serves as food for the next

food web a number of food chains linked together

force a push or a pull

friction rubbing of objects against each other which produces heat

fungi plant-like living things such as mushrooms, yeasts and moulds. Fungi help decompose dead plants and animals

G

galaxy system of millions of stars, gas and dust, e.g. the Milky Way

gears part of a machine that causes another part to move using a connecting toothed wheel

gravity force by which all objects in the universe are attracted to each other

H

herbivore animal that only feeds on plants

I

income money received for work or selling something

insulator material that does not allow electricity to pass through it, e.g. glass or plastic

J

Jovian belonging to Jupiter

Jupiter biggest planet in the solar system and fifth in distance from the Sun

K

kerosene wood type of tree used for wood carvings

kilogram unit of weight equal to one thousand grams

L

lever simple tool used to lift or move something, e.g. a crowbar

lightning electricity produced in thunderclouds; appears as a bright flash or streak in the sky

load object moved by a lever

lubrication coating of oil or grease to reduce friction between moving objects

M

machine device with a system of parts that work together to perform a task, e.g. a pulley to lift an object

mahogany tree with hard, dark wood which is good for carving

mantle part of the Earth that lies between the crust and the core

Mars seventh largest planet in the solar system and fourth from the Sun

mass amount of a substance or material

materials anything used for building or making something

melt process of change from a solid to a liquid due to heating, e.g. when ice turns to water

Mercury planet that is nearest to the Sun; the second smallest planet

Milky Way galaxy that contains the Earth, Sun and the solar system

Moon Earth's natural satellite, which revolves around the Earth from west to east in about 28 days

motion movement

mould fungus that grows on the surface of food, plant and animal matter

N

negative charge charge given to certain objects when they are rubbed and negative charges are added to their surface

Neptune fourth largest planet in the solar system and eighth from the Sun

Newton Isaac Newton was a scientist who worked out the law of gravity

O

omnivore animal that eats plants and other animals

open circuit series of wires that have a gap in them (usually produced by a switch) which does not allow electricity to flow

orbit path a planet takes around the Sun

organism living thing

P

pandanus type of plant with very strong leaves that can be dried and used to make roofs or baskets

photosynthesis process by which green plants use carbon dioxide and water and energy from the sun to make food

physical change change in a substance that can be reversed, such as boiling water or melting ice

pivot the point of support on which a lever turns

planet large body in outer space that moves around the Sun or another star. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune are all planets in our solar system

plankton very small plants and animals that live in fresh or salt water. Most kinds of plankton are microscopic

pollination when pollen is moved to another plant in order to fertilize it and produce seed that will grow into new plants

positive charge charge given to certain objects when they are rubbed and negative charges are removed from their surface

predator animal that hunts and eats other animals for food

prey animal being hunted and eaten by another animal

produce something grown or produced, especially farm goods, fruit and vegetables

producer things that make something, e.g. when plants make their own food or farmers grow a crop

profit amount of money made by a person or business after all expenses have been taken away

properties qualities or characteristics of something, e.g. stone is hard

pull bring closer using a force

pulley simple machine that makes lifting objects easier

push force that moves things away

pyramid of numbers way to show the numbers of organisms in a food chain

R

reversed changed back or undone

rusting (corrosion) process which occurs when a metal such as iron is exposed to air and water and develops an orange coating

S

satellite anything that orbits a planet, e.g. a moon, or spacecraft sent to send back information

Saturn sixth planet in the solar system, with a system of rings

shock feeling caused by electricity passing through the body

similarities things that are alike between things

solar system the Sun and its planets

spark very small bit of hot and glowing material thrown off by burning wood or paper

species group of living things that are very similar and can mate with one another but not with those of other groups

star heavenly body visible from Earth as a point of light in the night sky

static electricity electricity made by rubbing objects. This electricity does not flow

steel hard, strong metal made from iron when it is mixed with carbon. It is used to make machines, bridges, tools, knives

structure anything that has been built

Sun star in the centre of our solar system. The Earth and other planets revolve around it and receive heat and light from it

survival staying alive

U

unbalanced not balanced

Uranus third largest planet in the solar system and seventh in distance from the Sun

V

Venus sixth largest planet in the solar system and second nearest to the sun

vinegar sour liquid which is also a weak acid, used to flavour or preserve food

voltage force of an electric current as measured in volts

W

weight force of gravity acting on an object

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