

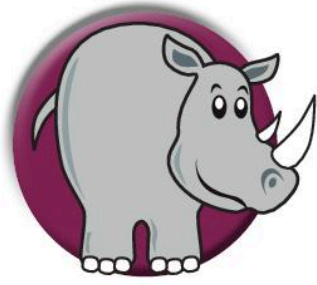


Nelson International Science Student Book 3



Anthony Russell

OXFORD



Nelson International Science

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Key to symbols



Observe



Write



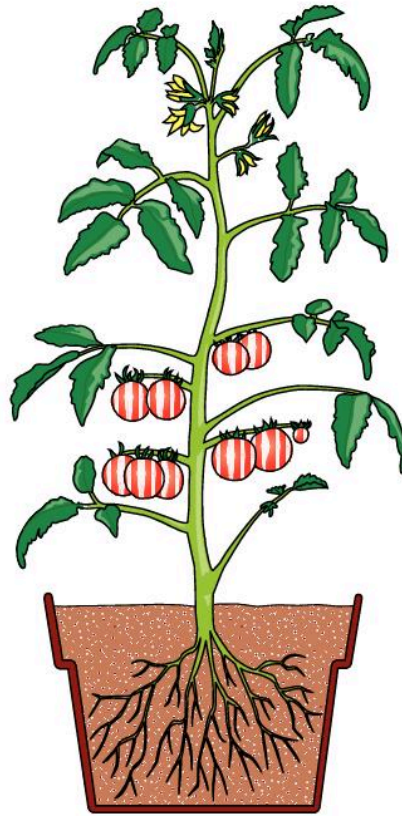
Discuss

Chapter 1: Plants



Plant parts

Every plant has parts. Look at the picture. It shows some plant parts. Can you identify them?



Activity 1

You will need: paper (or Workbook) and a pen or pencil.



1 Draw a picture of the tomato plant.



2 Label it with the names of the plant parts.

Here are the names with the letters mixed up. You will have to **sort** them out:

toro fale urtif smet wfolre

3 Show your drawing to the class.

Most plants have these parts, but they can be very different in many ways. They can differ in their size, their **shape** and their colour.

Activity 2: Compare two plants

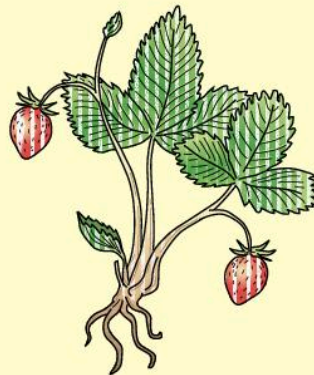
You will need: some plants, paper (or Workbook) and a pen or pencil.

- 1** Go outside and find two different plants. Try to find ones with **flowers**.
- 2** If you can dig them up, then do it carefully and take the plants back to class.



- a** **Observe** them carefully.
- b** **Record** your **observations** of all the parts you can see in drawings.
- c** Write the names of the parts on the drawings too.

Look at the examples shown here. These are just some of the plant's parts that you can label on your drawings.



petal stem sepal flower root leaf fruit

Continue over the page



3 If you cannot dig up two plants where they are growing, make drawings of them. Label the parts you can see.

4 **Compare** the two plants and compare your two drawings.

a Look for **similarities** and **differences**.

b Make lists of the similarities and differences.



5 **Display** your drawings and lists for the class to see. Look at what others have done.



Some types of stems

Each part of a plant has a special job to do. We call this its **function**.

Tell the class what you think are the functions of the **leaves**, the **roots** and the **stems**.

What plants need to grow: water and light



Plants grow in many different places.



Activity 3

You will need: some seedlings, paper (or Workbook) and a pen or pencil.

1 What **evidence** could you collect to show that plants need water and light to grow well?



- a** Discuss ideas with your group. Try to plan a **fair test**.
- b** Write down the group's plan and show it to your teacher.
- c** Collect the things you will need.

2 Decide what evidence you will collect and how you will record it. If you want to use a **table** or a **bar chart**, ask your teacher for help.

Remember, you are looking for differences in the **growth** of the plants. This means you are expecting to see changes.

Continue over the page



3 Write down your own **predictions** about what will happen.



4 Share your plan and predictions with the class, and listen to the other groups.

- a Compare their ideas with yours.
- b Do you need to change anything about your test before you start?



5 Set up your test.

Remember to make it a fair test by changing only one thing (or **factor**) at a time.



6 Drawings or measurements are suitable ways of recording change.

- a Make a record of your observations at the time the test begins.
- b Record the time and date of your observations.



7 Make regular observations and record them. Continue until you can see no more change.

8 Compare your **results** with your predictions.

- a Were your predictions correct?
- b Look at your results and use them to make **conclusions** about the idea you were testing.
- c Write down the group's conclusions.



Remember, results show what happened. A conclusion is what you found out from your **investigation**.

9 Present your results and conclusions in a display.

- a Look at the other groups' results. Compare them with yours.
- b **Explain** your results and conclusions and ask other groups to explain theirs.



Look at the test information in the table below.

FACTOR	Plant 1	Plant 2	Plant 3	Plant 4
X	no	no	yes	yes
Y	no	yes	no	yes
RESULT	a	b	c	d

Write down the letters **a** to **d** and match the test results to the letters.

- alive and growing
- died quickly – first one dead
- died slowly
- died quickly – second one dead.

What is factor X in the test?

What is factor Y in the test?



The quickest way to stop a plant growing is to stop giving it water and light.

Life depends on water

All living things need water if they are to grow. If a plant has no water it dies because it cannot carry out the **processes of life** (see Chapter 2). If the **climate** is hot the plant dies quickly.

What needs light?

Plants need light if they are to grow. This is not true for animals and other living things.

Only plants depend on light. They use it to make their food. If they are kept in the dark, they die. This happens more slowly, as they use up their store of food first. So the plant can survive for some days.



How water is taken in and transported

Plant roots have two functions, or jobs, to do.

One function is to **anchor** the plant in the soil. This stops the plant from being blown down or uprooted easily by heavy rain or floods.

The second function is to collect water and **minerals** from the soil and **transport** them up into the stem of the plant.

Roots spread out in the soil where they are growing.

As plants grow, they need more and more water and minerals to stay alive and grow. The roots need to keep growing too. Larger roots can collect more water.



Activity 4: Exploring the function of roots

You will need: a small plant, water, a container, a plastic bag, string, drawing paper (or Workbook) and a pen or pencil.

- 1** Put water into the container and fill it to the top. Carefully dig up a small plant, taking care not to break off its roots.
- 2** Lower the plant into the container and allow water to overflow.
 - a** Wrap the plastic bag around the container.
 - b** Use the string to close the bag tightly around the stem of the plant. This should hold the stem above the water level.





- 3** Draw a table like this one. Use it to record the water level each day, over at least a week.

Day	Height of water (mm)
Monday	
Tuesday	

- a** **Measure** the height of the water in the container in millimetres.
- b** Record the height in the table.

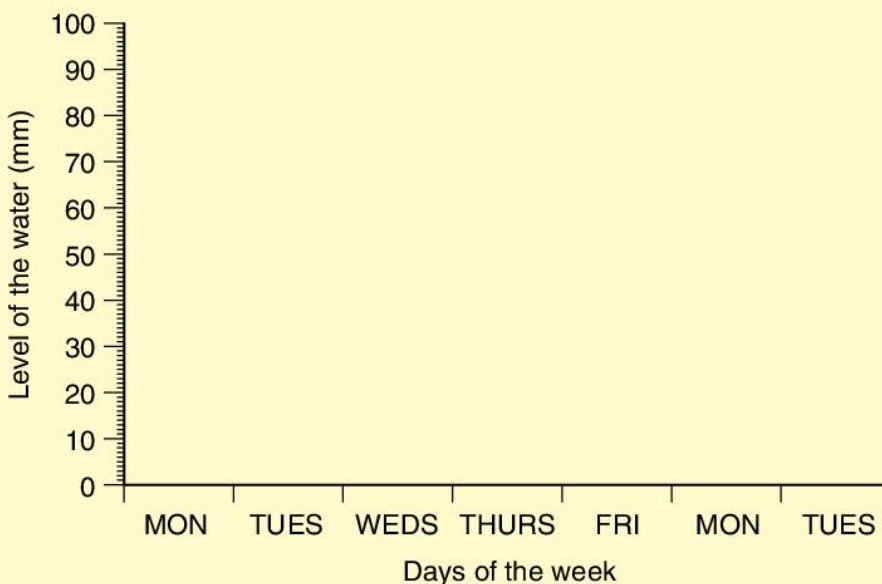


- 4** Repeat the measurement and recording each day.



- 5** When the period of measuring is over, use the measurements you have recorded to make a bar chart showing what happened to the water level.

The **horizontal axis** should show the days of the week, and the **vertical axis** should show the level of the water.



Continue over the page



6 Write a **report** of what you did in the investigation.



7 Look at your bar chart. What does it show about the function of the roots?



a Write down your ideas.

b Share your conclusions with the class.



c Discuss the conclusions that different learners have.

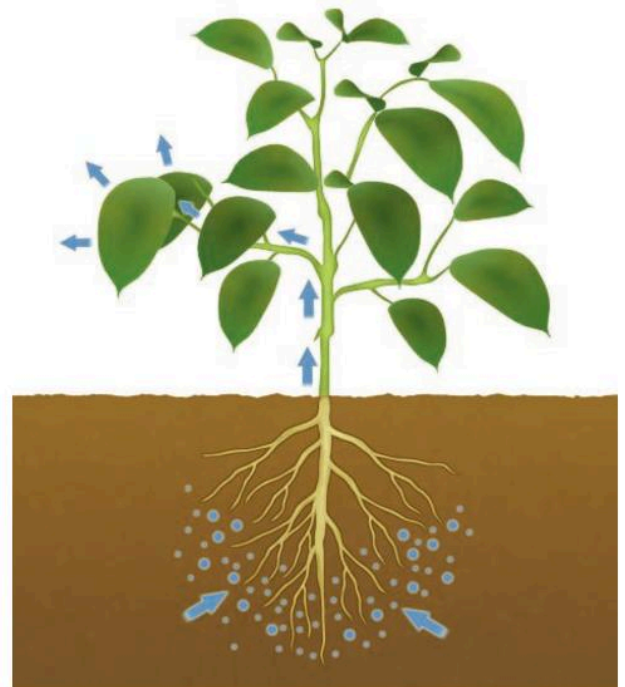
8 Try to answer these questions:

a Why was the top of the container covered with a plastic bag and closed around the stem?

b Why did the level of the water change?

c What would have happened if the roots had been cut off before the plant was put in the container?

Roots collect water. The water is transported up through the stem to the leaves. The leaves must have water because they use it to make food. Some water escapes from small holes in the leaves. This helps the plant to pull the water up through the stem, from the roots.








Plant A

Plant B

Activity 5

You will need: paper (or Workbook) and a pen or pencil.

-  **1** Look at the two plants in the pictures.
-  **2** Compare them and make a list of the differences you can see.
-  **3** Discuss your list with others in your group.
- 4** Try to explain the differences you have observed.

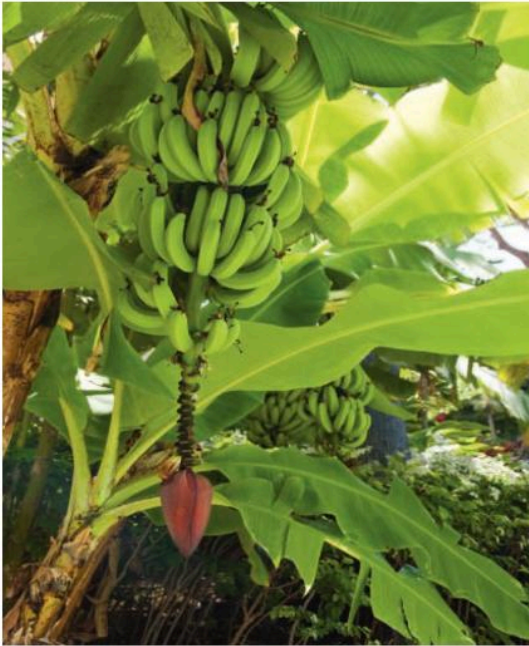
Chapter 1: Plants

Healthy plants must have healthy roots, to collect the water and the minerals that the plant needs.

Healthy plants must have healthy stems to allow water and minerals to travel from the roots to the leaves.

Healthy plants must have healthy leaves to make the food that the plant uses for growth.

Plants need all these things to grow well.





Look at the two plants in the pictures.






One has been growing in a colder place than the other. Compare them and discuss your ideas.

Which one was kept colder? How can you tell?

Share your conclusions with the class.

Activity 6: Investigate if plant growth is affected by temperature

You will need: paper (or Workbook) and a pen or pencil.

-  **1** Discuss with your group how to test this.
-  **2** Write down the question you will try to answer.
- 3** Make a plan for a fair test of your idea.
 - a** Change only one factor and keep all the others unchanged.
 - b** Show the plan to your teacher.
-  **4** Write down your prediction of what you expect to happen.
-  **5** Collect the things you need.
Decide what you will observe and how you will record your observations.
- 6** Carry out the test until you have an answer to your question.
- 7** What did you conclude from your results?
 - a** Write down your conclusions.
 - b** Compare the results with your prediction. What was the difference, if any?
-  **8** Present your results and conclusions. Try to explain what you have found.

Temperature has an effect on the rate of some life processes. Growth is one of them. Cold conditions slow down growth, so stems are shorter and leaves are fewer and smaller. As the temperature rises, the rate of growth speeds up. Stems and leaves (and roots) increase faster in size and there are more of them.



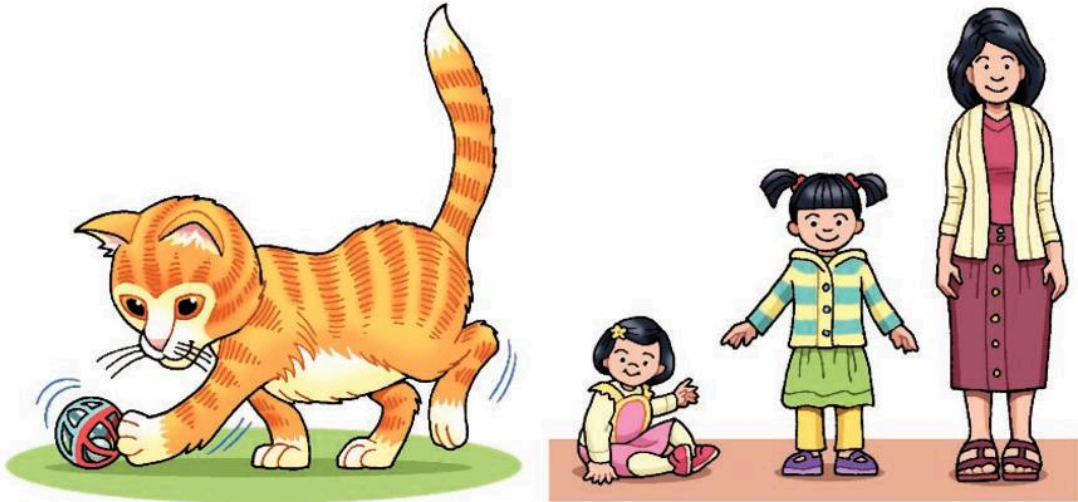
Crops are grown faster in greenhouses, where the temperature can be kept higher

Chapter 2: Humans and animals



Life processes

Here are some **life processes** common to all animals and people.



Activity 1

You will need: paper (or Workbook) and a pen or pencil.

- 1 Here are the names of three life processes. The letters have been jumbled up. Can you sort them out?

tghorw

tonniurt

temomevn

Humans and animals all carry out these processes. They are vital for life.

Eating food and drinking water are both part of the process of **nutrition**.

Different foods are eaten by different animals.

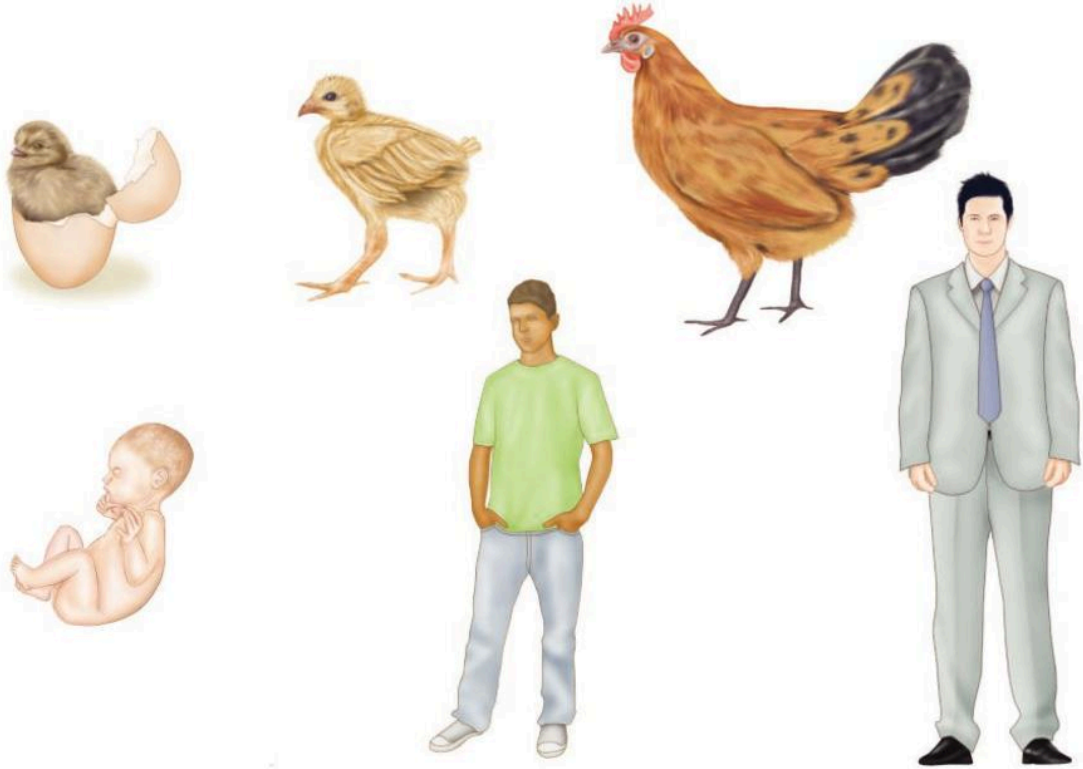
Humans eat a great variety of different foods – some from plants and some from animals. The functions of food are the same for humans and animals.

- Food is used by the bodies of animals and humans to provide **energy**.
- Food helps **protect** against diseases.
- It helps animal and human growth and **repair**.



One of the uses of food is to allow the body to grow

Growth is common to animals and humans. They all start smaller as young creatures and grow to become larger adult animals and people. The process may take only a few days or it can take many years. Animals and humans do not all grow at the same speed, but they all grow.



Animals and humans all grow

Animals and humans move their whole bodies and parts of their bodies.

Some animals do not move from place to place, but they move body parts. This can be to catch food, to defend themselves, or to find a partner. **Movement** from place to place can be done in many different ways – such as running, swimming, flying, walking, jumping and sliding.



Animals and humans all get old and die.

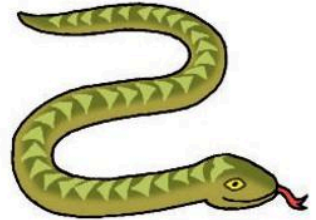
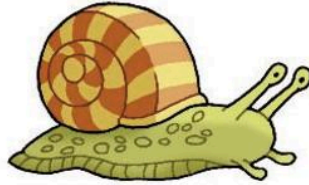
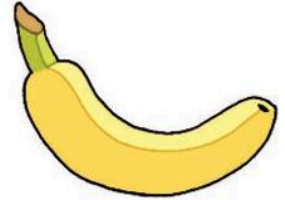
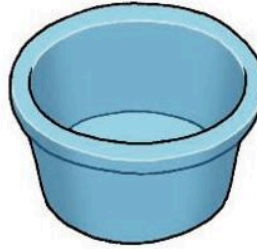
New animals and humans are needed to take the place of those who die. The process of making new animals and humans is called **reproduction**. This process is carried out in many ways, but its purpose is to make new, baby individuals to replace those who get old and die.



All animals reproduce



Comparing living and non-living things



Activity 2

You will need: paper (or Workbook) and a pen or pencil.



1 Look at the pictures and sort the things into two groups:

- a** living things
- b** non-living things.



2 Write down your two lists.



- 3** For each of the two groups of things, write at least three sentences that describe their common features (**characteristics**).

For example:

All the living things _____

The non-living things cannot _____



- 4** Go outside and collect at least four examples of each group.

- 5** Back in the classroom, arrange your two groups for the class to see.

- 6** Look at the groups made by others in the class.

All living things have certain characteristics. We can look for these characteristics when we are trying to decide if something is living.

Activity 3

You will need: your classmates.

- 1** Choose three characteristics of living things to perform in a mime or role play.
- 2** Prepare your performance with your group.
- 3** When it is ready, perform it for the class.
Do not tell them which characteristics you are showing.
- 4** Ask the class to identify the characteristics you have shown.



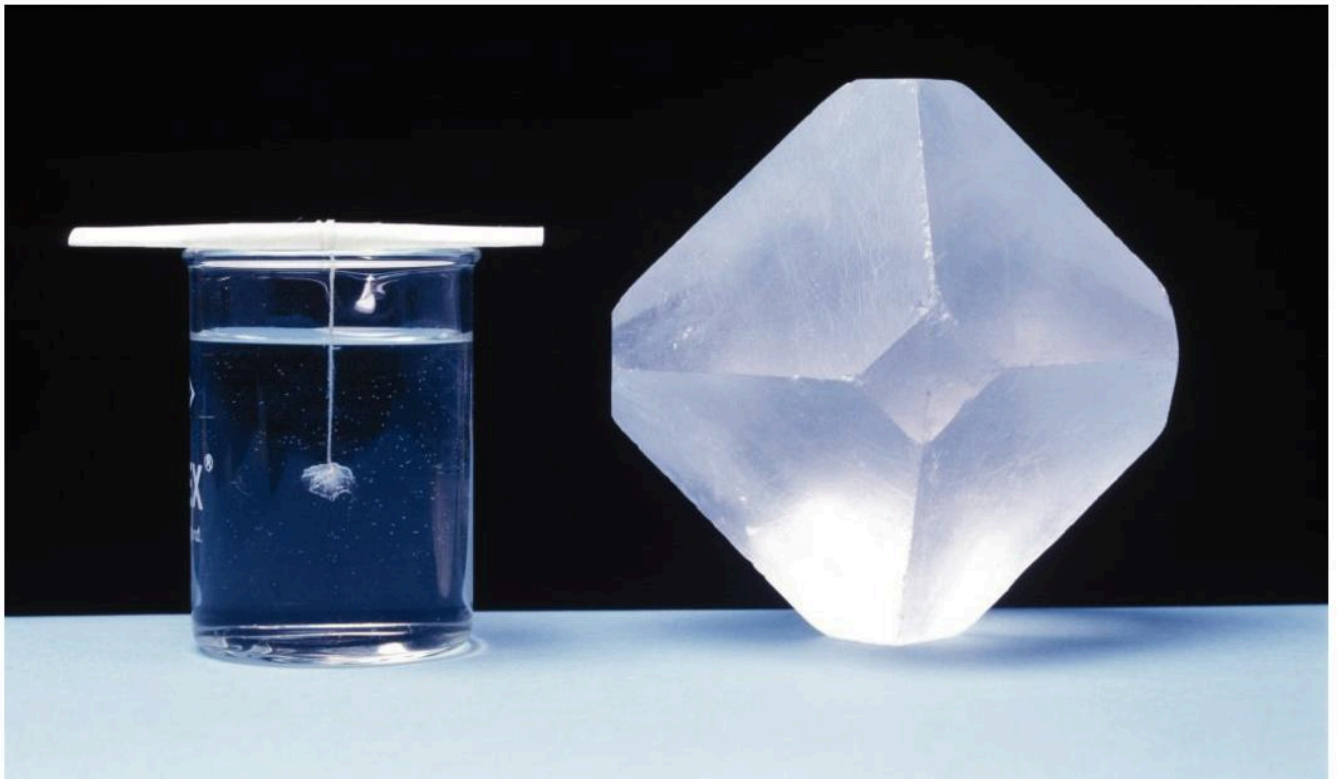
Characteristics of living things – the life processes

There are seven life processes:

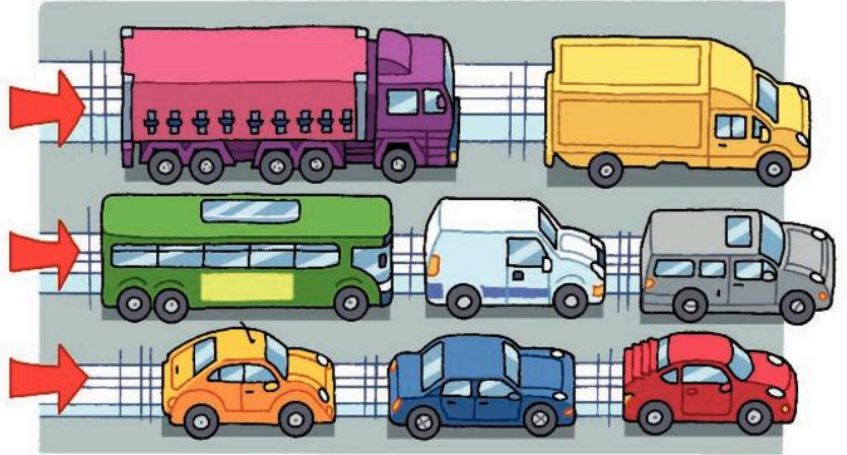
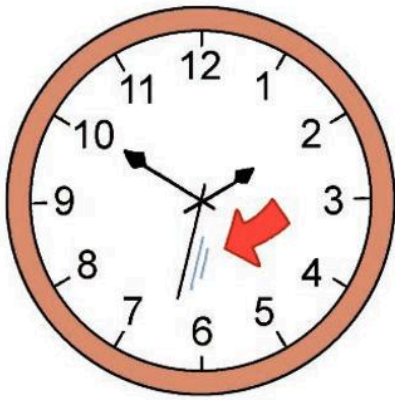
- **movement** – including being able to move from place to place
- **respiration** – using **oxygen** and making **carbon dioxide**
- **sensitivity** – reacting to **stimuli**; being sensitive to what is happening
- **growth** – increasing in size and/or **complexity**
- **reproduction** – being able to make new, young copies of themselves
- **excretion** – getting rid of waste products
- **nutrition** (feeding) – taking in materials from the environment, to stay alive.

Some non-living things have one or more of these characteristics.

For example, crystals 'grow'...



And machines move...



All these things are moving because some **force** is driving them. They cannot move on their own.

Chapter 2: Humans and animals

Living things move themselves.

Some, like plants, do not move from place to place. They move their leaves, stems, roots and flowers very slowly. For example, some flowers open and close each day, so we can easily tell that there is movement.



Non-living things do not move themselves.

Because they are not alive, non-living things do not need air (respiration) or food (feeding).

They do not produce wastes through living processes (such as excretion), or reproduce by making young.



The events going on around them, like the weather, may have effects on them, but they cannot respond (reaction to stimuli).

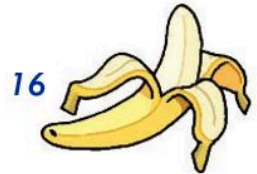
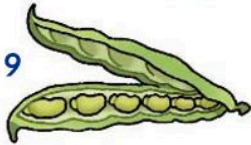
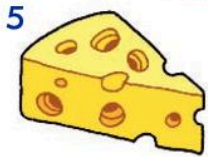
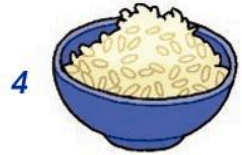


Healthy diets and exercise

Our bodies need to be cared for every day if they are to grow in a healthy way.

Food and drink – our **diet** – is one of the important factors in healthy growth. We need a **balanced diet**, containing enough foods of all six food types.

There are different ways of grouping foods and the picture shows foods of six types.



Activity 4: What makes a meal healthy or unhealthy?

You will need: paper (or Workbook) and a pen or pencil.



1 Look at the food types shown in the picture. Match the names of each food to the groups listed below:

fruits **fats and oils** **vegetables**
staple foods **foods from animals** **legumes**

Continue over the page



2 Choose foods to plan a meal that is *healthy*.
Draw a picture of the meal.



3 Choose foods to plan an *unhealthy* meal.
Draw a picture of the meal.



4 What food groups did you use?

- a** Under each drawing, list each food and its group used in that meal.
- b** Display your drawings.



5 Explain why the meals are healthy or unhealthy.



Look at these pictures.

One meal is healthy and *balanced*.

One meal is unhealthy and *unbalanced*.

Which meal is which? Tell the class what you think.

Our bodies need many different foods.

We need some foods to help us 'go'. For example, sugar, rice, potatoes, fat and bread all give us energy. This helps us move, keep warm and stay alive.

We need some foods to help us grow. For example, meat, fish, eggs, milk, beans and nuts. We use these to make new muscles, bones and other parts of our bodies.

We also need some foods to help protect us from germs and keep us strong and fit. For example, fresh **fruits** and vegetables, milk, nuts and oil.

If we have a varied diet we will have all the different foods we need. Our diet will be balanced.

If we eat only a small number of foods, our diet may be unbalanced. Then our bodies will not get all the things they need to be healthy. We may not grow properly. We may not be as active as we should be. We may often be sick. We may be weak.

A healthy diet has foods from all food groups.

Sleep, rest, **exercise** and play are also important for mind and spirit, as well as the body.



We can exercise our bodies in many ways.

Activity 5: Why do people exercise?

You will need: paper (or Workbook) and a pen or pencil.

1 Collect as many sources of information about exercise and people who are athletes and sports players as you can.



2 Use the materials to make notes about *why* people exercise.



3 Discuss with your group the advantages of taking exercise.



4 Draw a table like this one to record your group's ideas.

Advantages of exercising	Disadvantages of not exercising
Heart is kept healthy	Muscles are weakened



5 Share the group's ideas with the class.

Exercise keeps our muscles in good condition. It also strengthens them.

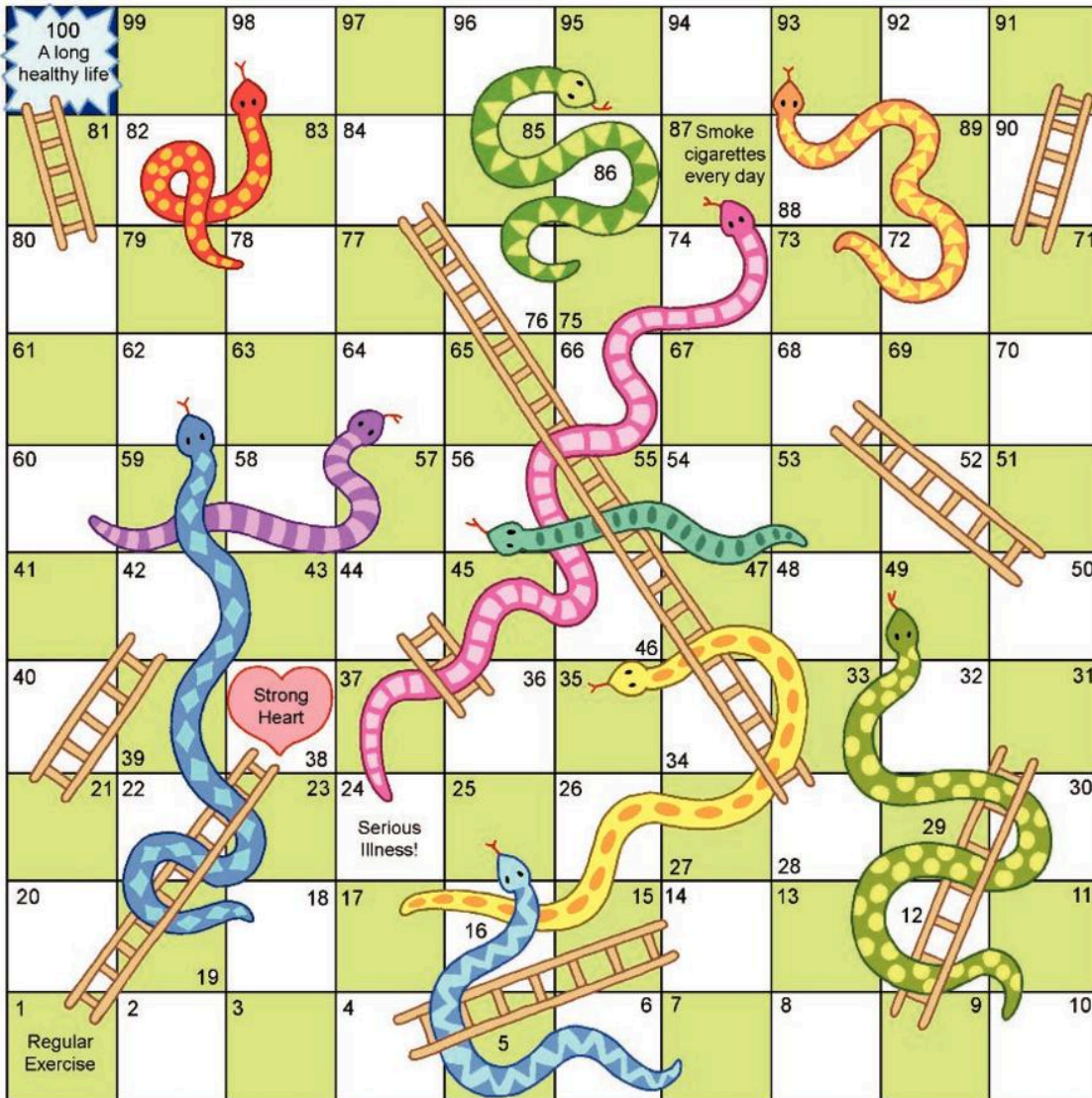
Our heart and lungs also benefit from regular exercise. They can do their work better if we regularly make them work harder than normal.

Exercise reduces the amount of fat in our blood. This makes it less likely that we will have serious heart disease.

Regular exercise can help us control our weight or lose weight.

Regular exercise also helps our bones to grow strong.

Exercise also has a general effect on us. It helps us to relax, feel 'good' and forget about things that may be worrying us.



This game of 'snakes and ladders' is all about living in a healthy way. If the behaviour is good for health, the player climbs the ladder towards the final square: 'A long healthy life'. If the behaviour is bad for health, the player slides down the snake.

Two examples are filled in, but all the others are blank. You should choose what good and bad behaviours to add to the game.

Activity 6

You will need: a ruler, card or paper (or Workbook) and a pen or pencil.



- 1** Use the game shown on page 31, or copy it onto another piece of card or paper. Draw the squares first. Then put in the ladders and snakes.
- 2** Decide what the good, healthy behaviours will be. Put one at the *bottom* of each ladder.
- 3** Decide what the bad, unhealthy behaviours will be. Put one at the *top* of each snake.
- 4** Colour the snakes and ladders to make the game more interesting and fun.
- 5** Play the game with your group.

We can be taught good habits at home and at school to help us keep our bodies healthy. These are some of the most important habits:

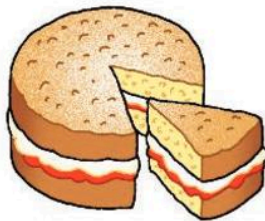
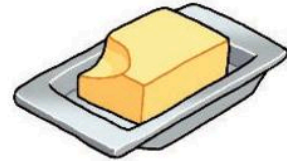
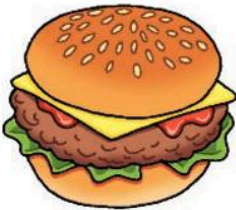
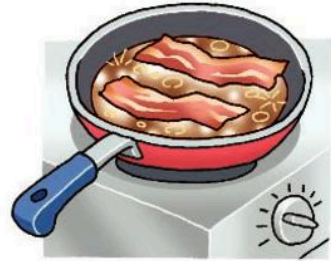
- eating a balanced diet
- taking exercise and playing games
- sleeping and resting
- cleaning our teeth
- washing our bodies
- changing and washing our clothes
- washing our hands after going to the toilet.

Can you think of any more?



Foods that damage health

Look at the foods in the picture and discuss them.
Try to sort them into two groups 'fats' and 'sugars'.



Too much of these foods can damage our health

Fats are needed by our body, but some fats are more healthy than others.

Too much animal fat is bad for our heart and blood vessels. It also increases our risk of adding weight to our bodies, making us overweight or **obese**. A diet with too many fatty foods is dangerous for our health.

Sugars are also useful for our bodies, but too much sucrose, or sugar, is bad for our health.

Sugar can lead to tooth damage and loss of teeth. It can also add to our weight, as the body will store sugar that it does not need, in the form of fat. Eating too much sugar also increases our risk of developing the serious disease called **diabetes**.

Activity 7: Investigate the nutrition information on packaged foods

You will need: food packaging, paper (or Workbook) and a pen or pencil.



1 Collect packaging from a variety of foods.

- a Look at the nutrition information on the packaging.
- b Use the information to sort the items into four groups:
 - i low in fat
 - ii low in sugar
 - iii high in fat
 - iv high in sugar

2 Display your groups of packaging.



- a Discuss your groups with the people you are working with.
- b Record what you have found.

3 Share your findings with the class and look at what your other classmates have found.

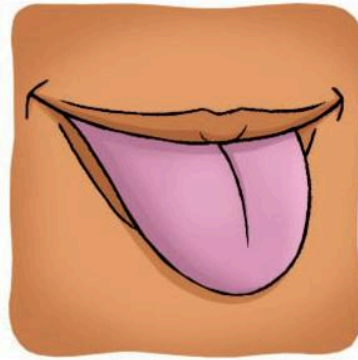
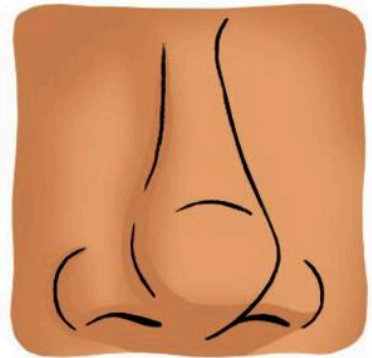
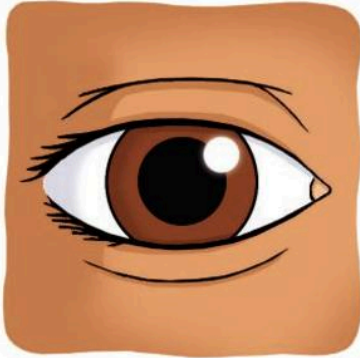
If we choose foods with a low-fat and low-sugar content, then our health will be better and we will be fitter and more active.



Senses



Name the body parts in the pictures.



Your whole body is covered with _ _ _ _ .

Your eyes, ears, nose, tongue and skin all do special work.

They are called your **sense organs**.

They tell you about the world around you.

Sense organ

Eyes

Ears

Nose

Tongue

Skin

Sense

Touch

Smell

Sight

Hearing

Taste

Copy these words and draw lines to match the sense organs to the **senses**.

The first one has been done for you.

Each sense organ is sensitive to a particular type of **stimulus**. You know that your eyes cannot hear the dog barking, and your ears cannot see the colours of your clothes. Eyes respond to light and ears respond to sounds.

Tell other learners in your class what you think the stimuli are for all five of your sense organs.

Activity 8: Investigate the senses

You will need: paper (or Workbook), a pen or pencil, three different foods, three different objects, a bag or a cloth, three plastic pots or jars, elastic bands, three materials that smell and a blindfold.

- 1** Prepare tests for the other groups in the class. To find the answers to each test, they will have to use one of their sense organs.

One test is for the nose.

One test is for the tongue.

One test is for the skin.

- 2** **Test A:** Put the objects inside the bag, or on a desk covered by the cloth.



- Which test does your group think this one is?
- Discuss with your group.

- 3 Test B:** Keep the foods separate and cut them up into small pieces, on pieces of paper.

Use the blindfold to cover the eyes of learners doing this test.



- a** Which test does your group think this one is?



- b** Discuss with your group.

- 4 Test C:** Put a small amount of a **material** in a pot or jar and cover it with a paper lid. Keep the paper in place with an elastic band. Make small holes in the paper with your pencil point. If the jar is **transparent**, cover it completely with paper so that the contents cannot be seen. Do the same for each of the three materials you have. Label the pots 1, 2 and 3.



- a** Which test does your group think this one is?



- b** Tell your group what you think.

Continue over the page



5 Invite learners from other groups to try your tests.

- a In each test, they have to use *one* sense to identify the objects, foods and materials.
- b Keep a record of their answers for each of the tests.
- c Compare the results and find out which are the easiest parts and the hardest parts of your tests.



6 Visit another group and do their tests.



7 Record your answers in a table, like this one:

Test	Object/material	Organ	Sense
A			
A			
A			
B			
B			
B			
C			
C			
C			



8 Compare your results with others in the group.

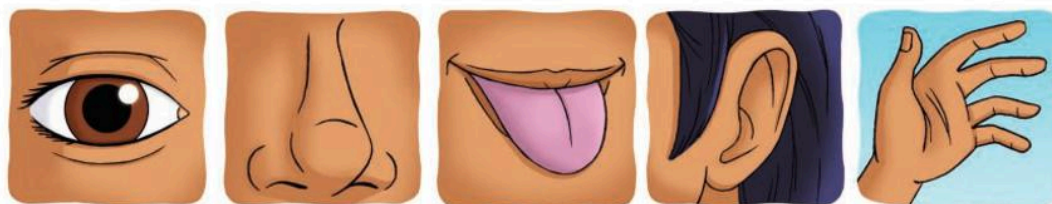
- a Which was the hardest thing to identify? Why?
- b Which was the easiest thing to identify? Why?

The individual sense organs each provide one sense, but normally we use them together and this makes it easier for us to identify things.

Why were the objects in Test A in a bag or covered with a cloth? The hands do not normally work alone to tell us what we are touching.

Why were the materials in Test B given to people wearing a blindfold? Our tongue does not normally have to identify what we are eating without help from other sense organs.

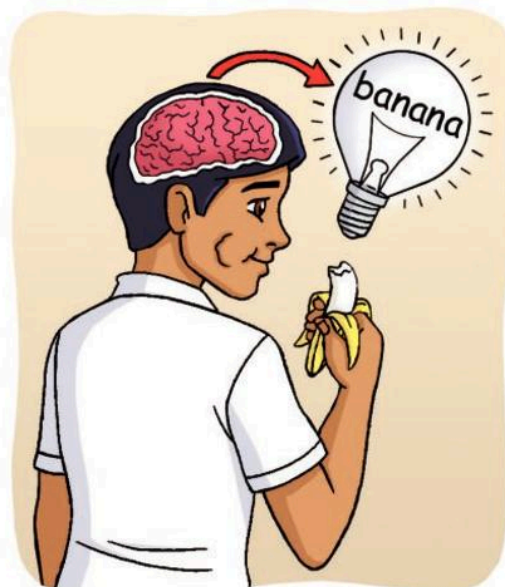
Why were the materials in Test C covered inside pots and only tiny holes made in the lids? Our nose does not always work alone to identify materials.



Very often, the sense organs work together to send information to the brain:

- **images** detected by the eyes
- smells detected by the nose
- tastes detected by the tongue
- sounds detected by the ears, and
- **textures** and temperatures detected by the skin.

Our brains can combine all these different messages and use them to identify things.



Food is a good example of this combined work of the sense organs. We see food, we smell food, we taste food, we hear the sounds of food being eaten, and we feel the texture and temperature of the food inside our mouth. All these sensations tell us what we are eating.

Activity 9: How do the senses protect the body?

You will need: your classmates.



1 Discuss with your group how you will use a role play to show how the senses help to protect the body.

You can choose just one sense, or your role play can include more than one sense, working together to keep the body safe.

2 Prepare a scene that involves someone using their sense/s to avoid danger.

- a** Practise the role play, ready to perform it for the class.
- b** Share your role play with the class. Do not tell them which sense/s you have chosen to include – the others in the class have to watch carefully and work it out for themselves.

3 When you have finished, ask the class to tell you which sense/s you had included.



We depend on our senses to keep us aware of dangers in our environment.

When our brains receive information about dangers, we respond in ways that help to keep us safe.

Our **response** is often an *action* of some kind:

- we run away
- we shout
- we drop the object
- we cough
- we hold our nose.

All our senses have limitations. There are sounds that our ears cannot hear. There are objects that are too small for our eyes to see. Some smells and flavours are too faint for our nose or tongue to detect. Our skin can also fail to give us correct information.



Grouping living things

Human beings like to group things. It helps us to identify and recognise things. It is a very useful skill.

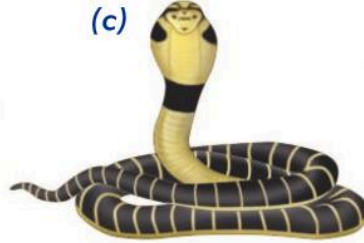
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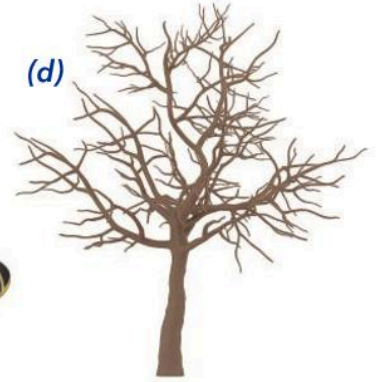
(b)



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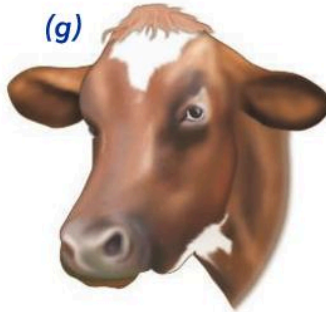
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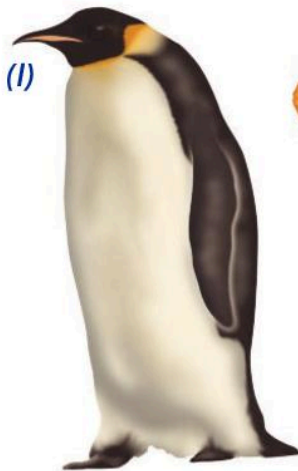
(j)



(k)



(l)



(m)



(n)



Activity 10

You will need: paper (or Workbook) and a pen or pencil.



1 Look at the pictures of living things on page 42.



a Discuss with the people you are working with how you will sort them into groups.



b Record your groups using the letters **a** to **n** to identify the members of the groups.

c Choose a name for each of the groups.



2 Discuss with the people you are working with how you will explain the way you sort and name the groups.



3 Share your results with the class.

a Explain what you have done.

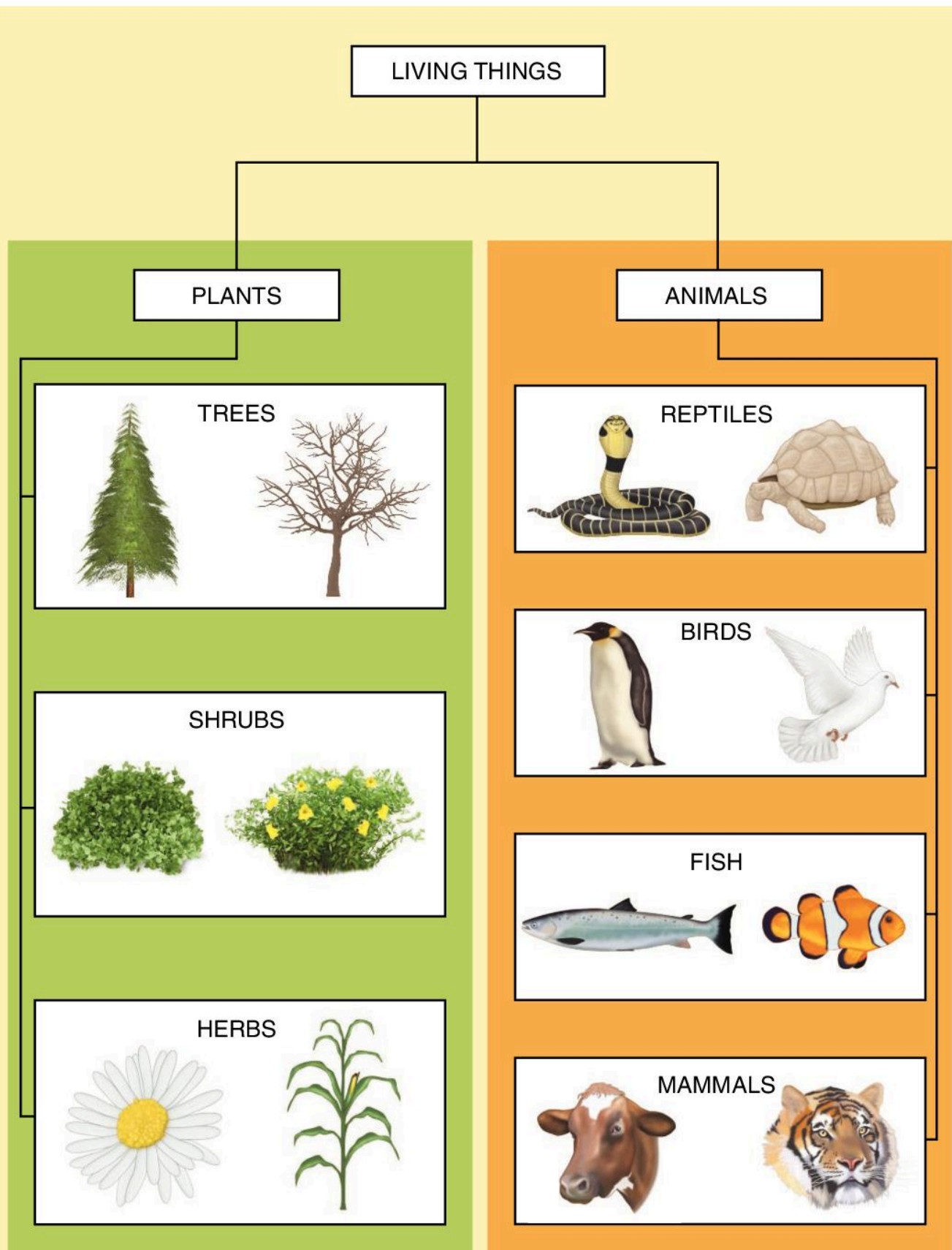
b Listen to the answers from your classmates and ask them for **explanations**.

Here are the jumbled names of some groups of living things for you to sort.

esrtpeil sbehr brhuss laammms
sifh ertse isbrd

When scientists sort living things using their visible features, they **classify** them.

The basic classification is into the two main groups: plants and animals. There are other smaller groups of living things (such as fungi, bacteria and viruses), which you will learn about later in your study of biology.



The classification of plants and animals

Grouping animal features

We can group animals by looking at their different features.

Feathers

- Only birds have feathers, so any animal with feathers is identified as a bird.

Fur

- Only **mammals** have hair or fur, so any animal with hair growing from its skin is identified as a mammal.

Gills

Only fish use gills to breathe under water.

- Their scales are wet.
- They lay their eggs in water.

So animals that have these three features are identified as fish.

Scales

Reptiles and fish both have scales, but they are not sorted into the same group.

Reptiles	Fish
Dry scales	Wet scales
Live on land	Live under water
Lay eggs on land	Lay eggs in water

You can also look at what kind of young different animals have.

- Do they lay eggs?
- Do they produce live young?

Reptiles and birds

Reptiles and birds both lay eggs first. Their young gets ready to come out inside the egg.

Mammals

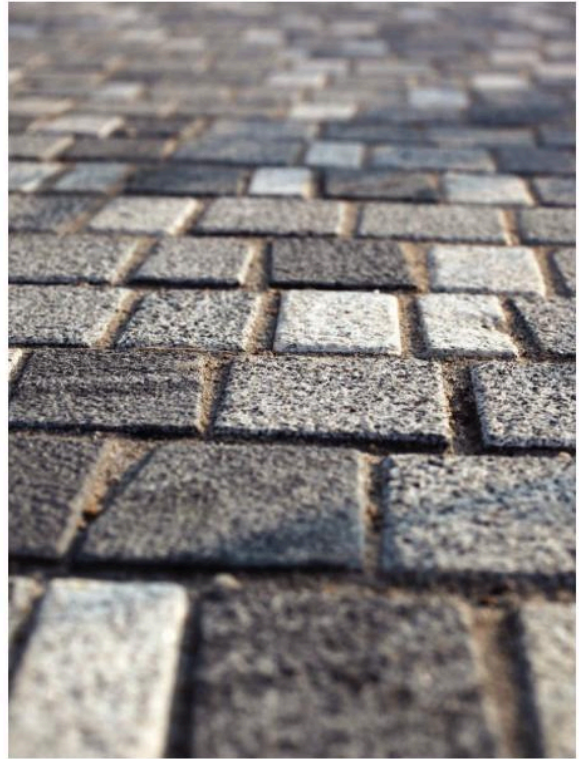
Mammals are 'warm blooded' animals that produce live young. Their young are born with everything they need.

Chapter 3: Material properties



Exploring properties

Materials all have specific **properties**. They can be **strong**, soft, elastic, **flexible** or **hard**.



Activity 1: Find out about the properties of materials

You will need: objects from your classroom, paper (or Workbook) and a pen or pencil.

1 Walk around the classroom and find five objects made of *different materials*.



2 Take the objects to your desk and observe each one carefully.

a Look at them, feel them, smell them.

b Think of words to describe the properties of the materials.



3 Record the names of the materials and the properties you have found.


4 Display your materials and your record for the class to see. Look at what other learners have found.

Size and shape are not properties of materials. They are words we use to describe objects, for example: a *big* piece of wood, a *cube* of sugar, a *tiny* pin, a *flat* sheet of glass.

Chapter 3: Material properties

The same material can often be used to make objects of different sizes and shapes. For example, wood (the material) can be made into matchsticks, spoons, boats, flag poles and shoes.

Properties	Materials
Elastic	Glass
Hard	Stone
Shiny	Rubber
Soft	Milk
Wet	Gold



Copy these words and match the properties to the materials. Draw arrows to connect them. The same property can match more than one material.

The first one has been done for you.

Materials	Objects
Glass	
Stone	
Rubber	
Milk	
Gold	

Copy this table. Name an object that can be made from each of the materials and write them in the table.



Sorting materials

You can also sort non-living materials into groups using their properties.



Activity 2: Which materials have common properties?

You will need: materials in and around your classroom, paper (or Workbook) and a pen or pencil.



1 Look at the objects shown in the pictures.

- a Sort them into groups based on the *properties* of their *materials*.
- b Record your groups.

Continue over the page

2 Share your groups with the class.

a Explain why you have sorted the objects that way. What characteristics (properties) did you look for when sorting the objects?



b Ask others to explain their groups.



3 Move around the classroom and outside looking for different materials.



a Draw what you find and write down their names.

b Share your findings with the class. Make a display for the others to look at.



4 What characteristics do the different materials have? Tell the class what you think.



The magnet is pulling the paper clips

Activity 3: What materials are magnetic?

You will need: paper (or Workbook) and a pen or pencil.

1 Plan with your group how you will find **magnetic** materials in your classroom and outside.



2 Write down your plan.

- a** Decide how you will do a fair test and how you will record your results.
- b** Record your predictions of which materials will be magnetic and which will not.

Continue over the page

3 Show your plan and predictions to your teacher.

4 Collect the things you need for your test.

a Test at least four different materials in the room and four others outside.



b Record the test results each time.



5 Look at your results. If you find any **patterns**, try to explain them.

a Compare your results with your predictions. Try to explain why your predictions were not always correct.



b Come to a conclusion about magnetic materials and write it down.

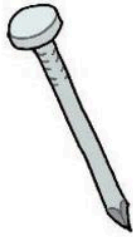


6 Share your results, conclusion and explanation with the class.

7 Listen to the other groups and try to make a **generalisation** about the class results.



1 a 'copper' coin



2 an iron nail



3 a drinking glass



4 a wooden spoon



5 a steel spoon



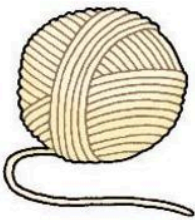
6 a woollen hat



7 a cotton sock



8 a plastic bag



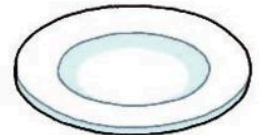
9 a ball of string



10 a stone



11 a shell



12 a ceramic plate



13 A gold ring



14 a metal gate



15 an iron cooking pot



16 a metal mug

Can you find the magnetic items?

Activity 4: Identify which materials are magnetic

You will need: paper (or Workbook) and a pen or pencil.

- Here are some pictures of some objects. Read their names and think about what you have found out about magnetic materials.

Continue over the page



2 Choose the objects you are *sure* are magnetic. Write down their names and numbers.



3 Choose the objects you are *sure* are not magnetic. Write down their names and numbers.



4 Make a list of all the objects left that you are not sure about. Can you explain why you are not sure about them?

5 Identify eight metal objects in the classroom.



- a** Now test them to find out which ones are magnetic metals.
- b** What do you find?

Most materials are *not* magnetic – wood, plastic, fibres, cloth, paper, glass and many others.

Magnetic materials are all **metals**.

There are many kinds of metal but only a few are **attracted** by magnets (magnetic). Most metals are *not* magnetic, for example, gold, silver, copper and aluminium.

The magnetic metals are iron, steel, cobalt and nickel. Iron and steel are the most common magnetic metals and are used to make many everyday objects, like cutlery, cooking pots, cars, gates and nails.



Properties and uses

Metals are very useful. We can use them in many different ways.

Activity 5

You will need: paper (or Workbook) and a pen or pencil.

1 Think of examples of how we use metals.



- a** Write down some of the uses of metal.
- b** Can you think of the names of the metals used in your examples? Write them down too.

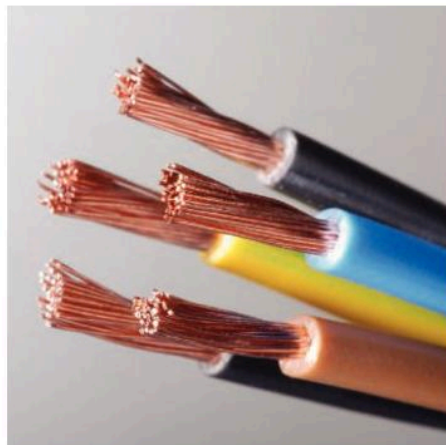


2 Make drawings of three of the examples you have chosen.

3 Display your list and drawings for the class to see. Now have a look at what others have done.



(a) Gold is quite soft and easy to shape and it polishes very well. It is also rare, so valuable items are made from it.



(b) Copper is cheap and easy to pull into thin strands. It is an excellent conductor of electricity, so we use it for wiring.



(c) Aluminium is strong and light, so cans holding fizzy drinks are made from it, and aircraft are built from it.



(d) Steel is a type of iron with other substances mixed in it. It is hard, strong and easy to melt and mould into rails and many other things.

(e) Brass is an **alloy** of copper and other metals. It is hard and produces a loud, clear ringing sound when formed into bells. Tubes can be used to produce musical sounds, as in brass instruments.



(f) Zinc is added to the outside of iron objects, such as buckets, to stop them rusting. It is a hard, non-rusting metal. Zinc forms the case of batteries used in torches, etc.



(g) Iron is used to make pots. It is hard wearing, strong and conducts heat very well.

We also use other materials in a great many different ways, depending on their physical properties.



Activity 6: Think about which properties are useful in materials and why

You will need: paper (or Workbook) and a pen or pencil.



1 Look at the pictures on page 57, which show five materials used in many different ways.



a Discuss with your group what you think the five materials are.



b Write them down at the top of five columns in a table, like this one.

Materials and their uses

Uses	Material 1	Material 2	Material 3	Material 4	Material 5
1					
2					

2 List all the uses of the materials you can see in each of the five columns.

3 Share your lists with the class. Add to your lists if you missed anything out.

4 Take one example from each list and try to explain why the material is used in that way. For example:

The boat is made of _ _ _ _ because

_____.

_____ wires are covered in

_____ because _____.



5 Share your sentences with the class.

- 6** Here are some terms describing some physical properties of the materials:

transparent insulating waterproof
strong mouldable hard easily shaped
flexible lightweight smooth



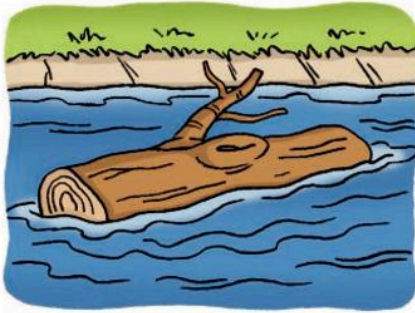
- a** Copy the words one under another to make a list.
- b** Beside each word write the names of the materials that you think the words describe.
- c** Share your lists with the class.

Chapter 4: Forces and motion



Push and pull

A **force** is either a **push** or a **pull**. Sometimes both types of force act together.



(a)



(b)



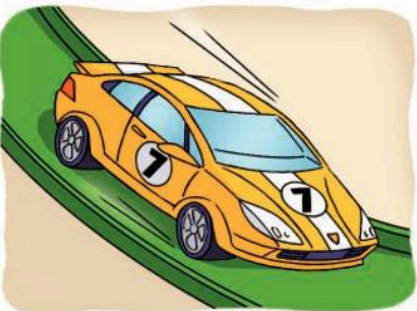
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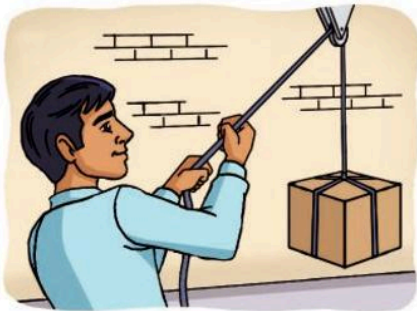
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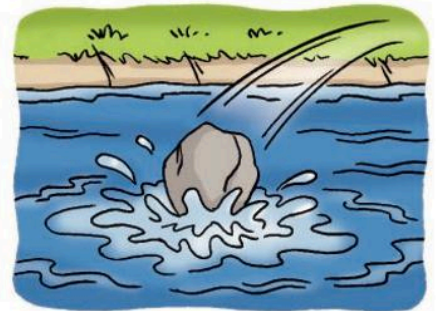
(h)



(i)



(j)



(k)

Activity 1

You will need: paper (or Workbook) and a pen or pencil.



1 Look at the situations shown in the pictures on page 60. Sort them into three groups:

- a** those that show a push
- b** those that show a pull
- c** those that show both a push and a pull.



2 Write down the three groups using the letters below the pictures.



3 Share your groups with the class.

In some situations we can see that a force is being **applied** to make something happen. For example:

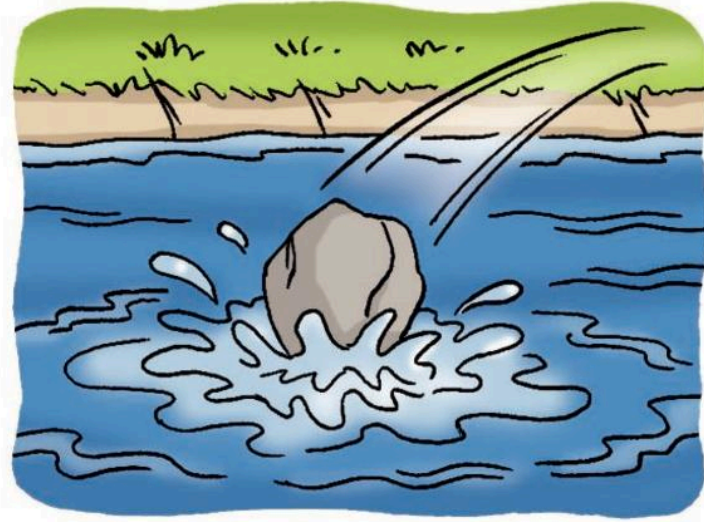
- The foot kicks the ball.
- The man pulls down on the rope.
- The jaws close and the teeth bite the food.
- The fingers grip the bottle top.
- The hand holds the knife and cuts the bread.



Chapter 4: Forces and motion

In other situations it is not possible to see how the force is being applied or where it comes from. For example:

- The leaf falls.
- The stone falls in the water.
- The toy rolls down the slope.

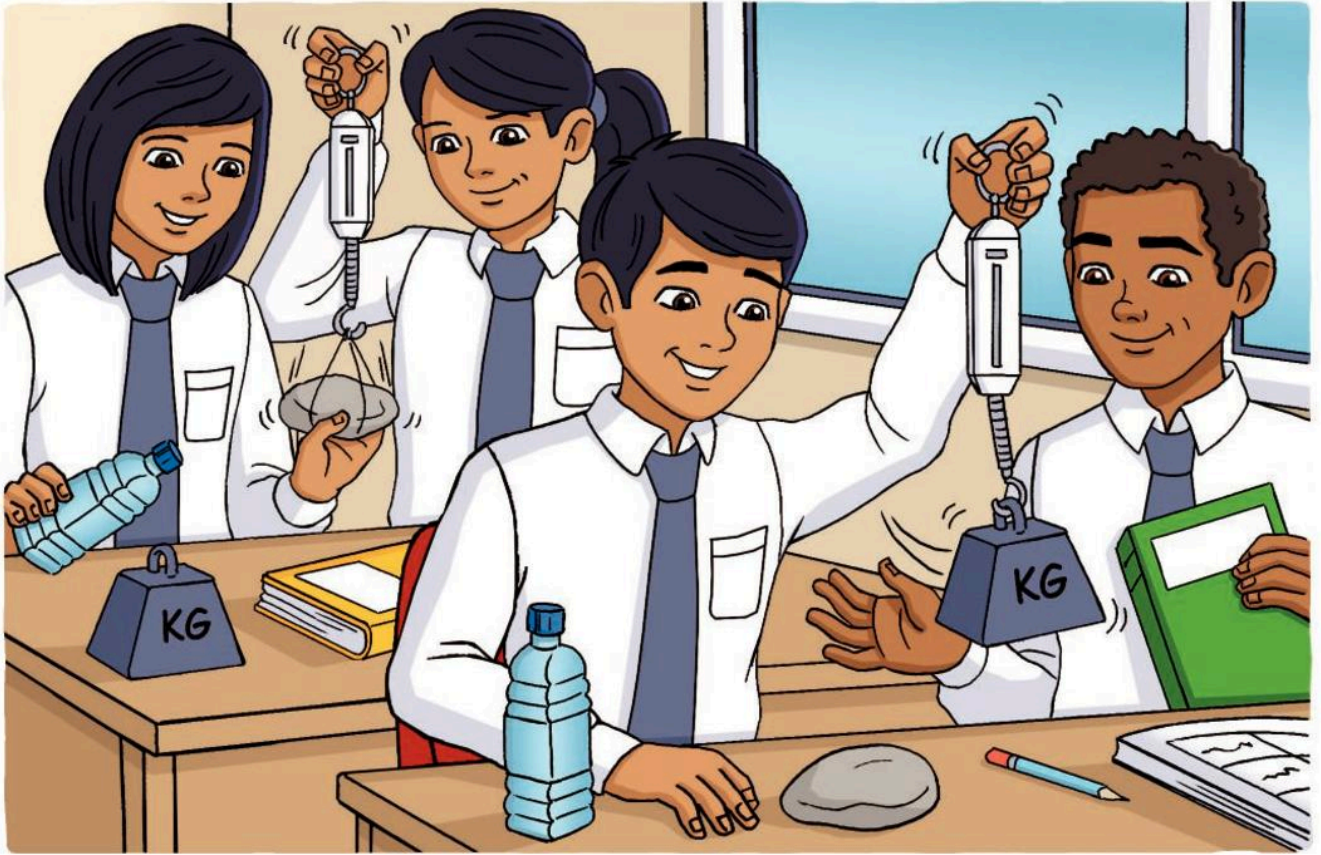


These are all examples of the invisible force called **gravity**. It is a pull that acts on everything on Earth. The pull of gravity holds us and everything else onto the surface of the Earth.



Measuring forces

Forces can be measured using a **force meter**. Here are some learners trying out force meters.



They are using the force meters as they push or pull the objects.

Now it is your turn to try.

Activity 2: How does a force meter work?

You will need: a force meter, paper (or Workbook) and a pen or pencil.

- 1 Collect some objects that your group wants to use for measuring force.
- 2 Can you work out how a force meter works? Have a go.



- 3 Draw a table like this one to record your results.

Table of results

Object names	Push object	Pull object	Force (N)
Stone	No	Yes	5

- 4 Measure the force you use to pull or to push each object that you have chosen to investigate.
 - a Record each time what force you used – a pull or a push.
 - b Record the force meter readings in your table of results.



The unit of the force is the **newton** which has the **symbol N**.



- 5 Share your results with the class. Make a display of all the results.

The spring inside the force meter is pulled by the force acting on the meter. The greater the pull, the longer the spring becomes and the higher the reading in newtons.

The **weight** of an object is a measure of how much the Earth's gravity pulls on it.

As the **mass** increases, the force also increases.

More massive objects have more matter (material) in them and so they have a greater weight.

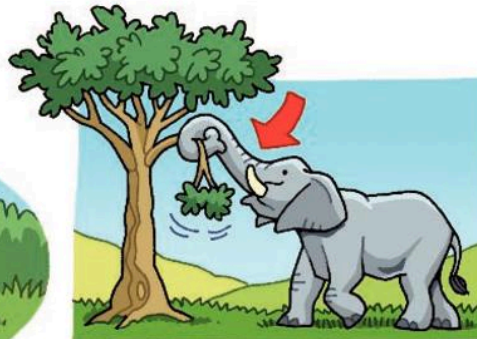
You can use the force meter to measure how much force is used when you do things such as opening a door or lifting a bag of books.



Stopping and starting movements

Look at all the pictures of forces at work.

The arrows tell you something. What do you think they show? Tell the class your idea.



Something is the same in all these situations. What do you think it is? Tell the class your idea.

Forces have various effects on objects. Forces have an effect on the **movement** of objects and on the **shape** of objects.

Find examples of both effects in the pictures. Share your examples with the class.

Movements can be:

- prevented from starting
- started
- speeded up
- slowed down
- stopped
- changed to a different direction.

Activity 3: Exploring how forces can stop or start the movement of a rolling object

You will need: a flat, smooth surface to make a slope (for example, a desk top, table top or wooden plank), a ball or toy with wheels, paper (or Workbook) and a pen or pencil.

- 1** Take a ball, a toy with wheels or some other object that can roll down a slope.
- 2** Use a plank, desk or table top or other flat, smooth surface to make a slope.
- 3** Plan how your group will investigate *two* of the *effects of force* on the movement of your rolling object: *stopping and starting movements*.



- 4** Share your group's plan with the teacher.



- 5** Carry out your exploration of the effects of force on movement. Record the following three things each time:

- a** your prediction of what will happen
- b** what you did
- c** what happened.

Continue over the page



6 If you fail to have the effect you planned and predicted, try another way until you are successful.

You can record results in a table like this:

What we predicted	What we did	What happened	What worked well	What we would do differently next time



7 Share your results with the class. Show the class one way in which you started or stopped the movement of your rolling object.

Pushes and pulls can both start an object moving. They can also both make an object stop moving.

A bicycle moves when the rider *pushes* on the pedals. It stops when the rider *pulls* on the brakes.

A football moves across the ground when the player *pushes* it with a kick. It stops when another player puts a foot on it and *pushes* down on it.

A toy car moves across the floor when it is *pushed*. It stops moving when it reaches a wall, which *pushes* against it.

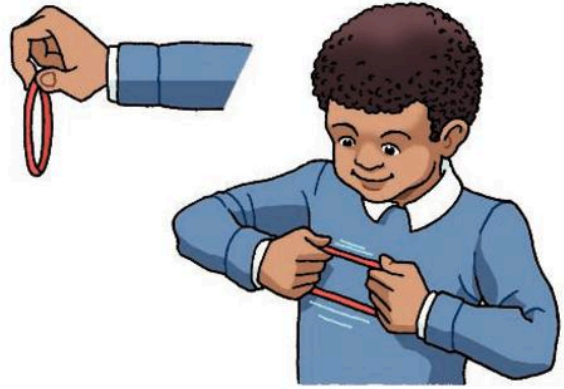


Changing shape

We know that forces can change the shapes of some materials.



(a)



(b)



(c)



(d)

The shape of objects can be changed using forces

Look at the pictures of objects and work out which type of force is being used to change their shapes.

Record your answers in a list like this:

(a) *push*

(b)

(c)

(d)

Share your ideas with the class.

Activity 4: What happens to the shape of objects when you use force?

You will need: objects to experiment on, paper (or Workbook) and a pen or pencil.

- 1** Plan your group's exploration of how objects change shape.
 - a** Choose at least two objects to explore. Try to find objects that are *not* shown in the pictures above.
 - b** Decide which type of force you will use for each one – a pull or a push, or both.



- 2** Make a small drawing of each object to show its shape *before* you try to change its shape.



- 3** Draw a table like this one to record your predictions and the results of your exploration.

Object name and drawing before force used	Force/s used	Prediction	Drawing of object after force used	Was prediction correct?

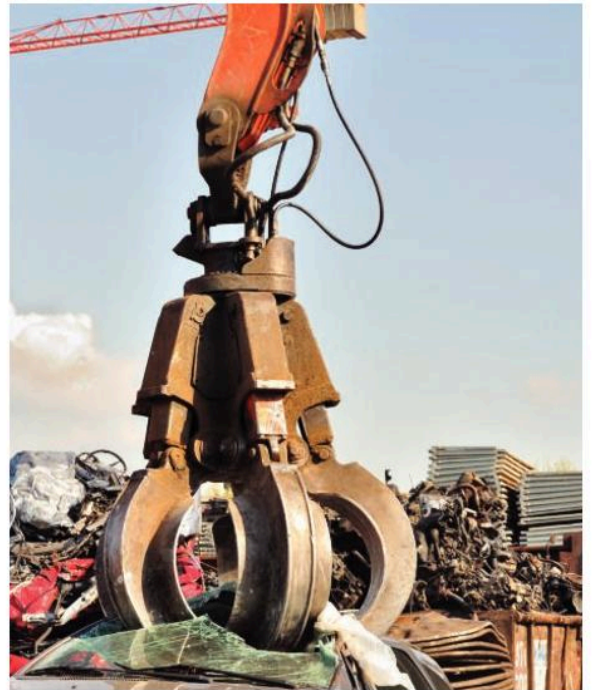
- a** Try to change the shape of each object.
 - b** Record the result in a small drawing. It should show the shape *after* the force was used.
- 4** When all objects have been tested, compare your predictions with your results and fill in the last column with 'yes' or 'no' for each one.

It is easy to change the shape of some objects.
Only a small amount of force is needed.

It is hard to change the shape of other objects.
A large amount of force is needed.

It is impossible to change the shape of some objects
using our hands. We cannot produce a large enough
force with our muscles.

Machines and tools can be used to shape things.





Forces speed up, slow down and change the direction of movement

Forces speed up, slow down and change the direction of movement.

Look at the picture of the learners exploring the movement of the block on the slope.



Talk about it in a group. What do you think will happen as the slope is raised more and more?

Try to explain why this happens. Tell the class what your group thinks.

Activity 5: Explore the movement of objects on a slope

You will need: a flat, smooth surface to make a slope (for example, a desk top, table top or wooden plank), paper (or Workbook) and a pen or pencil.

1 Plan your exploration of speeding up and slowing down objects, using a slope.

a Choose three different objects to test.



b Write down your plan and show it to your teacher. You must include the question you are trying to answer, such as:

'What happens if _____?'

or

'How can we make _____?'



2 Draw a table for recording your results, like the one here. Have a column for your predictions. Write them in before you start the exploration.

	Prediction	Result
Object 1		
Object 2		

3 Explore each object one at a time until you have an answer to your question.



a Record what happens as you use forces to speed up the objects.

b Record what happens as you use forces to slow down the objects

Continue over the page



4 Observe what happens when the object moves:

- a off the board and onto the floor
- b off the board and onto the table, or other surface.



5 Record your observations.



6 Look at your results and discuss them with your group.

- a Compare your results with your predictions.
- b Come to conclusions about how movements were speeded up or slowed down.

When two objects are touching, a force called **friction** slows down the movement of one object over the other. To start an object moving, the frictional force must be overcome by a greater force.

Friction can be a very useful force, because we can use it to slow down or stop a moving bicycle, a car, and even our own bodies. Tyres and shoes have patterns on them called the tread and this helps them to 'grip' the surface of the ground. The friction is made greater by the tread.



Friction is also important when the wheels or feet start to move. Without friction, the tyres or shoes would just spin or slip, without the vehicle or the person moving forwards.



Activity 6: Explore changing the direction of moving objects

You will need: paper (or Workbook) and a pen or pencil.



1 Discuss with your group how you can explore changing the direction of moving objects.



2 Plan a fair test and show your plan to your teacher.

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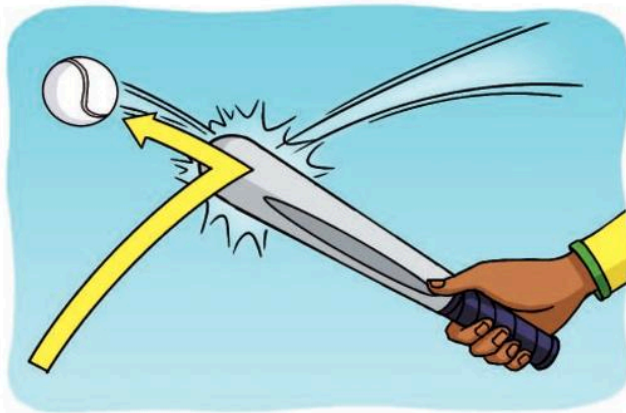
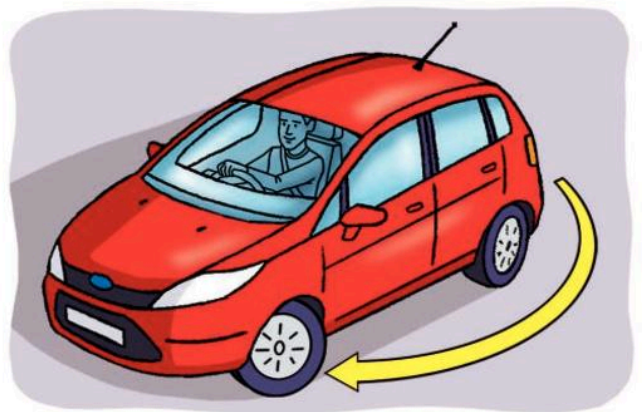
3 Make careful observations and record what you observe.

4 Look at your results and come to some conclusions about how the direction of movement can be changed.



5 Share your results and conclusions with the class.

Look at these four pictures. Explain what they show. Can you identify the force used each time?



Forces are changing the direction of movement

Glossary

A

alloy – a mixture of a metal with other metals or non-metals (for example, bronze or brass).

anchor – to hold something in place.

apply/applied – to use something.

attracted – pulled towards.

B

balanced diet – one that contains some of all the food types the body needs.

bar chart – a way of showing data in bars or blocks, sometimes on a grid of lines.

C

carbon dioxide – a gas in the air, used by plants to make food; we make it in our bodies and we breathe it out.

characteristics – features or properties of what something is like (for example, size, mass or hardness).

classify – to sort into groups based on common features (for example, all birds have feathers).

climate – the weather in a particular place.

compare – to look for differences and similarities in two or more things or events.

complexity – having many different connected parts.

conclusion – a decision or opinion based on evidence.

D

diabetes – a human disease that involves problems with sugar levels in the blood.

diet – all the things we (and animals) eat and drink.

differences – things that are not the same when two things or events are compared.

display – put things on show for others to look at (for example, a display of drawings or collected things)

E

energy – the ability to do things.

evidence – facts, information, proof, clues or data that help us to work something out.

excretion – the process of getting rid of waste products from the body (for example, sweating, urination or breathing out).

exercise – activity of the body for health and fitness

explain/explanation – a way of giving reasons for, telling it like it is

F

factor – something that has an influence or a part to play.

fair test – a test of an idea where everything is kept the same, except the one thing you are testing.

fats – a food type used by the body to provide energy; found in animal fat and plant oils.

flexible – bendy, not rigid.

flower – the part of a plant that can produce a fruit.

force – a push or a pull.

Glossary

force meter – a device used to measure the size of a force (units N = newtons).

friction – a force produced between two surfaces (solid, liquid or gas) that works against the movement of one over the other.

fruit – the part of a plant in which the seeds develop.

function – job, use, work done by something, purpose.

G

generalisation – a statement or idea about all cases based on only a few examples.

gravity – the pulling force of a large mass such as the Earth.

growth – increase in size and/or complexity; a natural process of living things.

H

hard – a characteristic of materials that refers to how difficult it is to cut, dent or scratch them.

horizontal axis – the scale along the bottom of a graph.

I

image – a picture of an object on a screen (such as inside the eye), or the reflection of an object in a mirror.

insulating (electrical) – blocking the flow of an electrical current.

investigate/investigation – searching for evidence to answer a question.

L

leaf/leaves – the green parts of plants where they make their food.

legumes – a family of plants including peas and beans.

life processes – living things all carry out these processes (for example, growth, feeding and reproduction).

M

magnet – a metal bar that attracts certain other metals.

magnetic – behaving as a magnet, attracting certain metals.

mass – the amount of matter in material.

material – stuff, what things are made of.

measure – to find out the size of something (for example, length, time or mass).

metal – a group of natural materials that have certain properties (for example, iron and gold).

minerals – natural materials that form rocks and most of the soil.

mouldable – a characteristic of a material that refers to how easily it can have its shape changed.

movement – the process of moving, changing position or shape.

N

newton (N) – the unit of force.

nutrition – the process of taking in foods to keep the body alive.

Glossary

O

obese – very fat, dangerously overweight.

observation/observe – notice when paying careful attention, using sight, smell, hearing, touch or taste.

oxygen – a gas found in air, needed by all living things; plants make it.

P

pattern – a regular feature, such as a repeated shape, relationship or measurement.

predict/prediction – to tell what will happen before doing something.

process – a series of steps or actions for a particular purpose.

processes of life – living things all carry out these processes (for example, growth, feeding and reproduction).

property/properties – features, characteristics, of what something is like (for example, its size, mass or hardness).

protect – keep safe, stop damage.

pull – a force that moves an object towards the source of the force.

push – a force that moves an object away from the source of the force.

R

record – writing, photos or drawings of what was done or what happened.

repair – mend, put right.

report – a written description of something.

reproduction – the process in living things that produces new individuals.

respiration – breathing in and breathing out; the process in living things that releases energy from food.

response – a reaction to a stimulus.

results – the outcome of an action, test or investigation.

root – the part of a plant which takes water and minerals from the soil

S

sense organs – eyes, ears, tongue, skin and nose. They are sensitive to stimuli from the surroundings.

senses – the main ones are sight, hearing, smell, taste, touch.

shape – the outward form of something, its appearance.

similarities – things that are the same when two or more things or events are compared.

smooth – a surface that is not rough in texture.

sort – put into groups.

staple foods – the main, largest or most common item in a diet (for example, rice).

stem – the part of the plant that joins the roots to the leaves.

stimulus/stimuli – something to which the senses react (for example, light or sound).

strong – a characteristic of materials that refers to how they resist force and pressure.

Glossary

sugars – sweet, soluble food type used by the body to provide energy; mostly found in plants e.g. sucrose, glucose.

symbol – a sign that stands for something. For example, a letter can be used to represent a scientific measurement (newton is represented by N).

T

table – a way of writing things down in columns and rows.

temperature – a measure of how hot a substance is.

test – a way of finding an answer to a question, or trying out an idea.

texture – the feel of something (for example, smooth, rough or soft).

transparent – light passes through and we can see through such material.

transport – carry.

V

vertical axis – the scale up the side of a graph.

W

waterproof – a property of some materials that stops water passing through them (for example, rubber).

weight – a force caused by gravity pulling down on the mass of the object.

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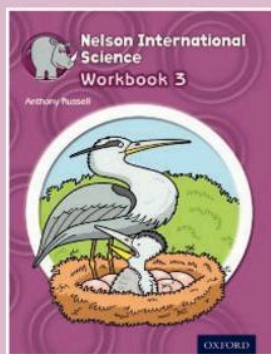
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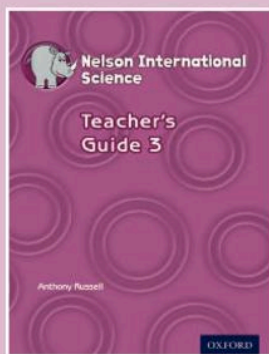
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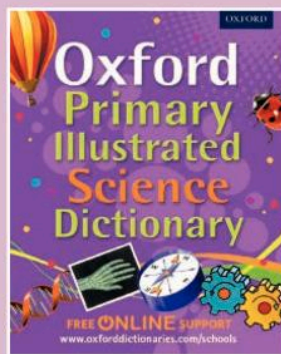
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