

# CAMBRIDGE PRIMARY Science

Teacher's Resource

4



Fiona Baxter, Liz Dilley and Alan Cross

with  
CD-ROM

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SAMPLE

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Fiona Baxter, Liz Dilley and Alan Cross

 **CAMBRIDGE**  
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# Introduction

The *Cambridge Primary Science* series has been developed to match the Cambridge International Examinations Primary Science curriculum framework. It is a fun, flexible and easy to use course that gives both learners and teachers the support they need. In keeping with the aims of the curriculum itself, it encourages learners to be actively engaged with the content, and develop enquiry skills as well as subject knowledge.

This Teacher's Resource for Stage 4 gives extensive support for teaching Stage 4 of the curriculum framework. It frequently references the Learner's Book, ISBN 978-1-107-67450-9, and Activity Book, 978-1-107-65665-9, for Stage 4, offering guidance on how to get the best out of using those products. There are also many additional teaching ideas for you to choose from.

The main sections in this Teacher's Resource are:

*Teaching ideas.* These give you a whole range of ideas for how to present the topics in the classroom. This includes ideas for classroom activities, assessment and differentiation, and suggestions for ICT resources. References to the Learner's Book and Activity Book are provided throughout, including guidance notes on the activities suggested in the Learner's Book. The Teaching ideas are also available in editable format on the CD-ROM included with this Teacher's Resource, so that you can include your own notes.

*Worksheets.* A large collection of worksheets offers further activity and exercise ideas in addition to those included in the Learner's Book and Activity Book, while some of the worksheets are intended to support the Learner's Book activities. The worksheets are also available in editable format on the CD-ROM included with this Teacher's Resource, so that you can adapt them to your own needs.

*Answers to questions.* Answers to all the questions from the Learner's Book, the exercises in the Activity Book and the worksheets in this resource are provided.

We hope you enjoy using this series.

With best wishes,  
the Cambridge Primary Science team.

## Teaching sequence

Throughout the *Cambridge Primary Science* series, the units are presented in the same order as in the Cambridge International Examinations Primary Science curriculum framework, for easy navigation, and to help you ensure that the curriculum is covered. However, this is not necessarily the best sequence in which to teach the material. For example, all the biology topics would be taught in one large block, whereas you may prefer to present a more balanced and varied route through the different areas of science.

When planning your teaching sequence, it is advisable to think about how the science topics fit in with the other subjects you teach. You should also consider topics within the science curriculum that are best taught at a particular time of year. For example, Unit 2, *Living things in their environment*, is best taught at a time of year when the weather is suitable for outdoor fieldwork. The best time of year to teach this unit will therefore depend on where you are in the world.

We suggest beginning the year with Unit 1, *Humans and animals*, as children always enjoy learning about themselves and it is sound teaching practice to start with content that is known and familiar.

We advise teaching Unit 3 before Units 4 and 5. Unit 3, *Solids, liquids and gases*, provides conceptual background about the composition and behaviour of the states of matter, which helps learners understand what sound is and how it travels in Unit 4, *Sound*. The concept of the particle nature of matter covered in Unit 3 also assists in the understanding of the movement of electric current in Unit 5, *Electricity and magnetism*.

These are two alternative sequences you might consider, depending on your geographic location. Alternatively, you may develop a different teaching sequence which suits you better. In the suggested sequences the following colour code is used: Biology units are dark grey, Chemistry units light grey and Physics units white.

Sequence 1:

|                                 |  |                 |  |  |
|---------------------------------|--|-----------------|--|--|
| Unit 1<br>Humans and<br>animals | Unit 3<br>Solids, liquids<br>and gases | Unit 4<br>Sound | Unit 5<br>Electricity and<br>magnetism | Unit 2<br>Living things<br>in their<br>environment |
|---------------------------------|--|-----------------|--|--|

Sequence 2:

|                                 |  |  |  |                 |
|---------------------------------|--|--|--|-----------------|
| Unit 1<br>Humans and<br>animals | Unit 3<br>Solids, liquids<br>and gases | Unit 2<br>Living things<br>in their<br>environment | Unit 5<br>Electricity and<br>magnetism | Unit 4<br>Sound |
|---------------------------------|--|--|--|-----------------|

## Scientific enquiry

Scientific enquiry is about how scientific ideas come about, supported by investigations and evaluating the data and other evidence that are produced through those investigations. The ideas underpin all areas of science. Therefore, the scientific enquiry section of the curriculum framework is not included as a separate teaching unit in the teaching sequences suggested above. Rather, scientific enquiry should be taught in an integrated fashion, alongside teaching of the other content areas.



*Cambridge Primary Science* has been written to support this way of working. By allowing learners to carry out the activities in the Learner's Book you will cover all the scientific enquiry objectives in the curriculum framework. These activities can be supported by further activities suggested in the Teaching ideas and Worksheets in this Teacher's Resource, and through the exercises focused on planning investigations and evaluating data in the Activity Book. There is a 'Reference' section in the Learner's Book. This contains skills that should be taught as part of the activities within these resources. This section can be used to support learners when needed.

Here, we give a further introduction to the scientific enquiry objectives listed in the Cambridge Primary Science curriculum framework for Stage 4. For each framework statement, some background information is given on the level that learners are expected to achieve at this stage. Also, some specific examples are given of activities suggested in this series that can be used to help learners develop each skill.

## Ideas and evidence

*Collect evidence in a variety of contexts.*

Learners should gather evidence, including data from simple practical investigations, and from research using age-appropriate books, websites or from people. They should be able to do this working in small groups or individually. This will include making visual, auditory or tactile observations, measuring in standard and non-standard units, and finding information from different sources. Learners may need support and guidance in dealing with evidence, for example sifting relevant information.

The skill of collecting evidence should be developed across the whole stage, but examples could include:

- Learner's Book Activity 2.1: observing birds
- Learner's Book Activity 4.2: listening to the loudness of sound passing through different materials
- Worksheet 4.3: observing vibrations and listening to sounds made
- Learner's Book Activity 5.7: visually observing which objects are attracted by magnets
- Learner's Book Activity 1.3a: measuring bone lengths
- Learner's Book Activity 3.4: measuring temperature
- Learner's Book Activity 1.5: collecting information from family members
- Worksheet 4.6: finding information from people, books and the internet

Teachers should model these skills and organise opportunities for shared writing and discussion of evidence. For example, after completing an investigation, ask learners to discuss whether the evidence collected can be used to answer the initial question or prediction.


*Test an idea or prediction based on scientific knowledge.*

As learners' scientific knowledge increases, they should be able to make predictions based less on intuition and more on evidence, identifying patterns and scientific understanding, for example, predicting and testing the length of a teenager's bones after measuring their own and an adult's bone lengths in Learner's Book Activity 1.3a. They should also be able to test predictions in simple investigations, such as in Learner's Book Activity 4.3 in which learners predict and test the effects of clapping hands on the movement of rice grains.

## Plan investigative work

*Suggest questions that can be tested and make predictions; communicate these.*

Learners should be able to think of simple questions that can be tested, based on their scientific knowledge. For example, in Worksheet 4.1 learners suggest a question to investigate based on an observation. These skills can be developed in units that involve a lot of investigative work, such as the topic of solids, liquids and gases in Unit 3 and sound in Unit 4. For example, when learners have completed Learner's Book Activity 3.4 you might get them to think about how quickly other solids, for example, candle wax or ice cream, melt. They can suggest a question to investigate,



make a prediction which they write down, and carry out the investigation. In Learner's Book Activity 4.4b, learners think of questions about loud and soft sounds that they can investigate. As teacher, you should design many opportunities for learners to discuss their progress and thoughts while planning the investigation, carrying it out, and considering the results.

*Design a fair test and plan how to collect sufficient evidence.*

Learners should be able to design simple fair tests in which they change one factor or variable and keep all the others the same. They should be able to plan different ways to collect evidence, for example by setting up a test, making observations, taking measurements, reading or asking someone. Different ways of collecting evidence can be introduced. For example in Unit 1, learners obtain evidence by feeling changes in their muscles, measuring bone length, surveying family members and finding out information about taking medicines safely from books, the internet or other people. In later units ask learners, at intervals, how they might collect evidence to answer a question.

Learners should be familiar with the concept of fair testing. There are several opportunities across the units for you to reinforce the concept. You could ask learners to think about fair testing when carrying out investigations such as in Learner's Book Activity 3.5 and Activity 4.2, and to explain why the test is fair or not, as in Question 3 in Topic 4.2. You can then test their understanding with questions, for example, about the amounts of ice, chocolate and butter used in Learner's Book Activity 3.5, and whether the hot plates all give off the same amount of heat. They should think about how to make tests fair when they are planning investigations such as in Question 2 in Topic 1.4 and Learner's Book Activity 4.4b.

*Choose apparatus and decide what to measure.*

Learners should be able to choose apparatus and decide which variables to measure based on previous activities and investigations. At this level, you should not expect learners to be able to suggest new types of tests and apparatus that they are not familiar with. For example, in Question 2 in Topic 1.4, they should be able to suggest simple apparatus such as a plastic bag filled with sand, a school bag or a pile of books and a tape measure or ruler. The variable they measure is how high each person can lift the weight. In Learner's Book Activity 2.2, learners choose materials to design a habitat for a snail. They then observe and record the snail's preferences for the different types of habitats created. In Worksheet 4.1, learners should be able to choose material for making a paper cup telephone based on the materials used for the tin can telephone. They would measure qualitatively how well sound travels through both telephones.

## Obtain and present evidence

*Make relevant observations and comparisons in a variety of contexts.*

When learners make observations and comparisons, they should be able to talk about the similarities and differences they observe. Be aware that learners often find differences easier to identify than similarities. Make them aware that when they compare things, they must compare like aspects, for example the brightness of light bulbs in Learner's Book Activity 5.4, or the comparison of pitch in tightly and loosely stretched guitar strings.

*Measure temperature, time, length and force.*

Measuring is a quantitative way of collecting evidence. Learners will use simple measuring instruments and methods in Stage 4 to measure length, time and temperature. Learners have the opportunity to measure length in Unit 1 when they compare bone lengths. Demonstrate how the measurements should be made. In Topic 3.4, learners measure the temperature of water. Refer to the Reference section on page 94 of the Learner's Book to show learners how to use a thermometer.

Time is measured in Learner's Book Activity 3.5, which compares the melting times of different solids.

Force is not covered in Stage 4. However, if you have forcemeters, you could get learners to measure the force required to lift a weight, such as a school bag, in Learner's Book Activity 1.4.

Learners should be familiar with the use of forcemeters from Stage 3.

If you have the resources, you can introduce other measuring equipment. For example, in Unit 4 learners could use a sound level meter to measure the volume of different sounds in Topics 4.5 and 4.6. Using many different types of measuring devices reinforces measuring as a general skill, rather than a skill only associated with a small number of specific pieces of equipment.

*Begin to think about the need for repeated measurements of, for example, length.*

You can explain to learners that sometimes we need to repeat measurements to make sure that they are correct. For example, if we use a measuring instrument such as a thermometer incorrectly, the measurements will not be accurate. However, the main reason for repeating measurements is to make sure they are reliable and will apply each time an investigation is repeated. Learners do this in Learner's Book Activity 5.9, for example, where they repeat measurements of the distance at which a paper clip is attracted to a magnet. The more times the measurements are repeated, the more reliable they are.

It is also valuable to repeat qualitative tests that do not involve measurements in order to establish their validity, and be reasonably sure that the observations made are caused by the experimental conditions. For example, in order to be sure of the habitat conditions most favoured by snails, learners repeat their tests in Learner's Book Activity 2.2.

*Present results in drawings, bar charts and tables.*

Where learners are making qualitative judgements, for example, describing the loudness of sounds in Unit 4, they will often record findings with words or symbols. However, learners should be encouraged to use drawings to record visual observations. Many learners at this level do not have well-developed writing skills. A labelled drawing can convey as much, or sometimes more, information than a written description. For example, in Activity Book Exercise 4.3, learners make labelled drawings to show the results of an investigation. It is important that learners understand that they do not need to be good artists to record results in drawings. A good scientific drawing is one that shows the results clearly; it does not need to be 'pretty'. However, drawings should be fully and clearly labelled to indicate the relevant parts of an object, or to show changes that have occurred in an investigation, such as the movement of rice grains when the jar is tapped in Activity Book Exercise 4.3. Learners should draw a straight line from each label to the part or object it describes. Make sure that these lines do not cross or overlap. The labels should name the part pointed to, for example, jar, or give a brief description of the process taking place, for example, rice grains jump a lot.

At this stage, learners should also increasingly be making measurements and presenting numerical or quantitative data in tables and bar charts. Tables can also be used to record qualitative comparison data, for example the brightness of light bulbs. At this level, learners would be provided with blank tables and charts on which to record their results. A number of Worksheets and Activity Book exercises are provided to support the activities in the Learner's Book in this way. More able learners might be encouraged to construct their own.

## Consider evidence and approach

*Identify simple trends and patterns in results and suggest explanations for some of these.*

Having gathered evidence, learners should consider it and identify whether patterns exist. They should consider whether their results would be likely to help them predict what might happen in a new investigation, or in the real world. Identifying trends and patterns is a skill that will help learners to formulate general rules about scientific phenomena, such as which medium sound travels through best in Topic 4.2. Such a rule or law might be the basis for further experiments. They should also start to suggest explanations for the trends, such as in Topic 1.3, where they observe that bone length increases with age, and explain that this is because, as we get older, our bones grow to make us bigger.



You will need to provide time and the opportunity for learners to consider links between what they know and what they have found. This skill of using our science to explain what we observe is perhaps the most challenging part of science for primary learners. You may find that links, which are obvious to you, are not so obvious to them.

*Explain what the evidence shows and whether it supports predictions. Communicate this clearly to others.* Learners need to be able to interpret the evidence they obtain and explain it in terms of their scientific knowledge in order to recognise whether or not it supports their predictions. In other words, they should know what sort of results to expect, and why. For example, if learners predicted that a teenager's arm bones would be longer than those of a child but shorter than those of an adult, and obtained evidence to support the prediction, they can explain that this is because the teenager is still growing but has not reached his or her maximum adult bone length.

*Link evidence to scientific knowledge and understanding in some contexts.*

Learners should start to be able to apply their scientific knowledge and understanding to link evidence obtained to what they already know. For example, in Activity Book Exercise 2.2, learners explain results of where snails are found based on their knowledge of snails' preferred habitat conditions. They also use their existing knowledge to make a prediction. In Worksheet 3.3b, learners link their knowledge of the particle model of matter to understand the observation that air is easier to compress than water or a solid. You can challenge higher achieving learners to apply this knowledge in a different context to explain how a bicycle pump works to make tyres hard.

The following table gives an overview of which resources are available in the Stage 4 products in this series to support each scientific enquiry objective.

| Framework statement  | Learner's Book   | Activity Book | Teacher's Resource                            |
|--|--|---------------|---|
| <b>Ideas and evidence</b>  |  |               |   |
| <b>Collect evidence in a variety of contexts.</b>                                    | Activities 1.1, 1.3a, 1.4, 1.5, 2.1, 2.3a, 2.5, 2.7b, 3.1b, 3.1, 3.3b, 3.4a, 3.4b, 3.5, 3.6, 4.1, 4.2, 4.3, 4.4a, 4.6, 4.9, 5.1, 5.2, 5.3b, 5.4, 5.5, 5.7, 5.8a, 5.8b, 5.9, 5.10 |               | Worksheets 2.3, 3.2, 3.3a, 3.4, 4.3, 4.6, 4.8 |
| <b>Test an idea or prediction based on scientific knowledge and understanding.</b>   | Activities 2.2, 4.3, 4.5, 4.9, 5.1, 5.2, 5.3b, 5.4, 5.10   |               | Worksheet 2.8b, 4.1                           |
| <b>Plan investigative work</b>   |  |               |   |
| <b>Suggest questions that can be tested and make predictions; communicate these.</b> | Activity 4.4b  |               | Worksheets 4.1, 5.5                           |
| <b>Design a fair test and plan how to collect sufficient evidence.</b>               | Activities 2.2, 4.4b, 4.5; Topic 1.4 Question 2; Unit 3 Check your progress Question 5   | Exercise 4.6  | Worksheets 4.1, 4.8, 5.9b                     |
| <b>Choose apparatus and decide what to measure.</b>                                  | Activities 2.2, 3.3a, 4.4b   | Exercise 4.6  | Worksheets 4.1, 5.5                           |

| Framework statement   | Learner's Book  | Activity Book                 | Teacher's Resource   |
|---|---|-------------------------------|--|
| <b>Obtain and present evidence</b>  |   |                               |  |
| <b>Make relevant observations and comparisons in a variety of contexts.</b>                                     | Activities 1.3a, 1.5, 2.3a, 2.8a, 3.2, 4.4b, 5.2, 5.4, 5.7  | Exercise 1.3                  | Worksheets 3.4, 4.4b, 5.1, 5.9b                                  |
| <b>Measure temperature, time, force and length.</b>   | Activities 1.3a, 3.5, 3.6, 5.9  |                               | Worksheet 5.9b   |
| <b>Begin to think about the need for repeated measurements of, for example, length.</b>                         | Activities 2.2, 5.8a, 5.9   |                               | Worksheet 5.9b   |
| <b>Present results in drawings bar charts and tables.</b>   | Activities 2.2, 2.3a, 3.5, 4.2, 4.5, 4.8, 5.8b, 5.9   | Exercises 3.6, 4.3, 4.5, 5.10 | Worksheets 1.3, 2.8b, 3.5, 3.6, 4.2, 4.5a, 4.5b, 5.7, 5.9a, 5.10 |
| <b>Consider evidence and approach</b>   |   |                               |  |
| <b>Identify simple trends and patterns in results and suggest explanations for some of these.</b>               | Unit 1 Check your progress Question 4, Unit 2 Check your progress Question 4; Activities 2.2, 2.3a, 5.9 |                               | Worksheets 1.3, 1.4, 5.9b  |
| <b>Explain what the evidence shows and whether it supports predictions, communicate this clearly to others.</b> | Activities 1.3a, 2.3a, 3.5, 4.3, 4.5, 4.6, 4.7, 4.9, 5.10; Topic 5.4 Questions 1, 2                     | Exercise 1.3                  | Worksheets 4.8, 5.5, 5.9b  |
| <b>Link evidence to scientific knowledge and understanding in some contexts.</b>                                | Activities 5.2, 5.10  | Exercises 2.2, 2.3, 5.9       | Worksheets 1.4, 2.3, 3.3b, 3.4, 4.5, 5.5, 5.9b                   |



# Unit 1

## Teaching ideas

### Background knowledge

There are two main topics in this unit, so we will look at some background information about each in turn.

#### Skeletons

The first animals to evolve lived in the sea. They were small, simple invertebrates (animals without backbones). Like jellyfish, their bodies were supported by the seawater. Water exerted pressure on the outside of the body, helping to keep it upright and maintain its shape.

As the invertebrates evolved and moved from the water to habitats on land, they developed a support structure to keep them upright and firm outside the water. As organisms have evolved and become larger, they have developed a variety of different support structures.

Soft-bodied invertebrates such as jellyfish, sea anemones, worms and slugs, are supported by fluid inside their bodies. This type of support is known as a hydrostatic skeleton. The fluid fills the body cells and cavities in the body. The muscles contract against the fluid, which sets up a pressure. (If you squeeze a plastic bag full of water you will see how this works.) Fluid, which is not easy to compress or squash, provides excellent support. However, fluid has no shape. A fluid takes on the shape of its container. So these animals rely on muscles in the body wall to determine their shape.

Some invertebrates have exoskeletons. Exoskeletons are hard outside, or external, skeletons that cover the bodies of arthropods such as spiders, crustaceans such as crabs and crayfish, and insects. The exoskeleton is made up of chitin, which is a hard, tough substance. The chitin forms body plates with flexible joints.

The animal's muscles attach to the exoskeleton and allow for controlled movement. Insects have also developed wings and the ability to fly. As a group, they are very successful. There are more types of insects than of any other group of animal.

Endoskeletons are skeletons inside the body. Endoskeletons are found in vertebrates. Most vertebrates have skeletons made of bone but the cartilaginous fish (sharks, skates, rays) have skeletons made of cartilage. Cartilage is softer and more flexible than bone.

The main advantages of endoskeletons include:

- The development of joints at the ends of bones which makes the body flexible.
- Animals with endoskeletons can grow to a much larger size than those with exoskeletons because the tissues of the skeleton grow as the animal grows.
- The endoskeleton protects internal organs from injury. For example, the skull protects the brain and the ribs protect the heart and lungs.
- Endoskeletons provide more structural support than exoskeletons do because they form a frame inside the body.
- Endoskeletons provide more positions for muscle attachment, which greatly improves the power of the muscles. This is because there can be more muscles. There is also a greater range and control of movement.

## Drugs as medicines

A drug is a chemical substance that affects the body in some way. The effects may be medicinal, mood or behaviour changing, or performance enhancing.

Medicinal drugs are produced by pharmaceutical companies and are usually thoroughly tested for effectiveness and safety before they are approved. These drugs may, however, have undesirable effects (especially if they are not correctly prescribed or administered).

In most countries some non-medicinal drugs such as marijuana, cocaine and heroin are illegal. Legal non-medicinal drugs in many countries include tobacco and alcohol. Alcohol use is not allowed in any Islamic states for religious reasons. Both tobacco and alcohol can be harmful to our health. Tobacco has been strongly linked with lung disease. Alcohol use can lead to liver disease, higher risk of heart disease and certain cancers, as well mental and emotional problems such as anxiety, depression, memory loss and behavioural changes.

Over-the-counter medicines, which are available in pharmacies without a prescription from a doctor, include headache tablets, cough mixtures and diet pills. Because they are available without a prescription, it is often assumed that these medicines are safe. However, incorrect administration can be harmful. For example, taking too many headache tablets can damage the kidneys. Some medicines, such as cough mixture, cause drowsiness, while others, such as diet pills, are stimulants. Diet pills can cause behavioural changes. These changes may include being very active all the time and unable to relax, as well as feeling anxious. All of these medicines can lead to death if they are taken in very large quantities.

## Unit overview

| Topic                          | Number of lessons | Outline of lesson content   | Resources in Learner's Book                            | Resources in Activity Book | Resources in Teacher's Resource              |
|--------------------------------|-------------------|---|--|----------------------------|--|
| 1.1 Skeletons                  | 1                 | Skeletons made of bone support the body from the inside.              | Activity 1.1<br>SE<br>Questions 1, 2, 3, 4, 5<br>Ex    | Exercise 1.1               |  |
| 1.2 The human skeleton         | 1                 | The human skeleton is made up of bones of different shapes and sizes. | Activity 1.2<br>SE<br>Questions 1, 2, 3, 4, 5, 6<br>Ex | Exercise 1.2               | Worksheet 1.2                                |
| 1.3 Why do we need a skeleton? | 2                 | Skeletons grow and support and protect the body.                      | Activity 1.3<br>SE<br>Questions 1, 2                   | Exercise 1.3<br>SE         | Worksheet 1.3a<br>SE<br>Worksheet 1.3b<br>SE |
| 1.4 Skeletons and movement     | 1                 | Muscles work in pairs to make bones move.                             | Activity 1.4<br>SE<br>Questions 1, 2                   | Exercise 1.4<br>Ex         | Worksheet 1.4<br>SE                          |
| 1.5 Drugs as medicines         | 1                 | Medicines are drugs that make our bodies better when we are ill.      | Activity 1.5<br>SE<br>Questions 1, 2, 3                | Exercise 1.5<br>L          | Worksheet 1.5<br>SE                          |



## Unit 1 Teaching ideas

|                        |   |   |   |                             |  |
|------------------------|---|---|---|-----------------------------|--|
| 1.6 How medicines work | 1 | Medicines cure symptoms of illnesses. Medicines must be taken safely. | Activity 1.6<br>Question 1<br><b>SE</b> | Exercise 1.6                |  |
| Check your progress    | 1 |   | Questions 1, 2<br><b>L</b> , 3, 4, 5    | Language review<br><b>L</b> |  |

**Ex** Extension   **L** Language   **SE** Scientific enquiry   **Su** Support

## Resources

- different shapes of pasta
- black construction paper
- paper glue
- a tape measure
- a weight such as a heavy book or a school bag

## Topic 1.1 Skeletons

The key concept explored in this topic is that many animals have skeletons made of bone that support their bodies from the inside. Learners should already know from Stage 3 that living organisms grow. This topic explains the role of the skeleton in growth.

## Learning objectives

- Know that humans and some animals have bony skeletons inside their bodies.
- Make relevant observations.
- Collect evidence.

## Ideas for the lesson

- Show the class a life-sized paper outline drawing of a Stage 4 learner. (You can make one by asking a learner to lie on a piece of paper and draw round the outline of the learner. Be aware of cultural sensitivities when doing this though.) Ask learners to suggest which body parts should be added to the outline, and where they should be placed. Continue until learners suggest bones or the need for a skeleton. Ask them about other skeletons they know about, such as exhibits in museums or in TV programmes they have seen.
- Ask why we need a skeleton. Hold up the paper outline and then let it go. Tell the

class that, without our skeleton, we would be floppy like the outline.

- Ask learners to think about buildings that they have seen being built covered in scaffolding or buildings that have frames for support, such as traditional homes in Thailand and Japan.
- Before learners do Activity 1.1, tell them that if they move their fingers down the centre of their backs, they will feel the 26 vertebrae that make up their backbone. Demonstrate that when you bend forward at the waist, you can feel the bones adjust as you move. You can think of each individual vertebra as a bead on a string. Just as a beaded necklace is flexible and able to bend, so too is your backbone. If your backbone were just one bone, you would not be able to bend or twist. The observation made from this demonstration will show learners that humans have bony skeletons inside their bodies. Show the learners pictures of animal skeletons to show them that some animals also have bony skeletons.
- Be sensitive to learners who are overweight and may have difficulty in feeling their ribs. They will be able to feel the rib bones with their fingers, but not as easily as thinner learners. It might be easiest for them to feel the ribs by stretching up one arm and then using the opposite hand to feel the ribs on the stretched side. Demonstrate this action, and suggest that the whole class feel their ribs in this way. Tell them to push firmly on their skin until they feel the rib bones.
- Ask learners to feel the bones beneath the skin in one of their hands, then draw a picture of what they think the bones look like. Have learners brainstorm what they know or think they know about bones.

- Once learners have completed Activity 1.1, discuss the observations that the skeleton is made of many bones of different shapes and sizes. Discuss the reason for this after learners have completed Question 3.
- Exercise 1.1 in the Activity Book could be used to extend learners' knowledge of skeletons.

## Notes on practical activities

### Activity 1.1

The skull should feel like a single bone, but it is made of several bones fused together.

Learners will not be able to feel all 12 pairs of ribs, but should feel at least six or seven.

The hands need many bones (as well as muscles and joints) in order to make many fine movements such as holding a pen and picking up small things.

The bones are different shapes and sizes.

### Internet and ICT

- The website: <http://www.hants.gov.uk/museum/exhibitions/bones/index.html> gives a useful introduction to bones and skeletons.
- You will find interactive games on the website: <http://www.bonesandharry.co.uk/main/main.html>.
- Learners can compare animal and human skeletons at: <http://www.sciencekids.co.nz/gamesactivities/movinggrowing.html>.

### Assessment

- Learners can check each another's answers to Exercise 1.1 in which they match pictures of skeletons with the animals they come from, and identify some of their bones.

### Differentiation

- Lower achieving learners could be supported by getting them to work in pairs and point out the bones of the skull, ribs, spine and hips to one another.
- Higher achieving learners could do Questions 3 and 4 in the Learner's Book.

### Talk about it!

The answer to this question is that not all skeletons are made of bones. Some animals such as sharks, skates and rays have skeletons made of cartilage, which is softer and more flexible (rubbery) than bone. Explain that we have cartilage at the ends of our bones and that the outer ears and nose are made of cartilage.

### Common misunderstandings and misconceptions

- Learners at this level often think that bones are made of non-living material or non-living parts of the body. This is not true. The fact that bones can grow demonstrates that they are living. They may also think that bones are very heavy, but bones make up only 30–40% of the human body mass and support the remaining 60–70% of our mass.

### Homework ideas

- Exercise 1.1 in the Activity Book.

### Answers to Learner's Book questions

- 1 bone
- 2 To support our bodies.
- 3 Because they are in different parts of the body that do different things, for example: legs for walking, hand for writing, skull for protecting the brain.
- 4 Light bones make it easier for the animal to move its body.
- 5 You should be looking for a drawing of a human blob of jelly.

### Answers to Activity Book exercise

#### Exercise 1.1

1

| Animal    | Skeleton |
|-----------|----------|
| bird      | C        |
| rabbit    | D        |
| frog      | B        |
| crocodile | A        |

## Unit 1 Teaching ideas

- 2 W is the skull  
X is the ribs  
Y is the spine  
Z is the hip

### Topic 1.2 The human skeleton

In this topic, learners explore further the idea that skeletons are made of bones of different shapes and sizes. Learners have the opportunity to familiarise themselves with the basic structure of the human skeleton and recognise bones of different shapes.

#### Learning objectives

- Observe that bones have different shapes and sizes.
- Understand that bones are joined together to form the skeleton.
- Link evidence to scientific knowledge and understanding in some contexts.

#### Ideas for the lesson

- Begin the lesson by reminding the class about the conclusion from Activity 1.1: that skeletons are made up of many bones that have different shapes and sizes. You can ask them which bones they think are the biggest and the smallest in the body.
- Talk about the number of bones in the body. Adults have 206 bones in their skeletons but newborn babies have about 275 bones. As a baby grows, some of the bones in the body fuse (join) together. For example, as we grow, some of the bones in our skull fuse together.
- Look at the picture on page 9 of the Learner's Book, or a life-sized skeleton model. You may be able to borrow one from a local secondary school or doctors' surgery. Did learners realise that there are pairs of bones in the lower arms and legs? Also count the ribs on the drawing or model (there should be 12 pairs). Ask learners if the bones are all the same size and shape or if they have different sizes and shapes. Ask learners if they noticed that the bones in the skeleton are in some way connected to the backbone. Point out that the bones are joined together to form the skeleton.

- Learners should do Activity 1.2 in the Learner's Book.
- Worksheet 1.2 and Exercise 1.2 in the Activity Book will help to consolidate the learning in this topic and help learners to link evidence to scientific knowledge.

#### Notes on practical activities

##### Activity 1.2

Each pair or group will need:

- different shapes of pasta
- black construction paper
- paper glue.

Learners should arrange the pasta shapes to make the form of a human skeleton. It need not be accurate, but it should show the general body form with a skull, spine, ribs, arms, legs and hips. See the example in the Learner's Book, page 9.

#### Internet and ICT

- Look at: [www.bbc.co.uk/bitesize/ks2/science/living\\_things/skeletons\\_muscles/read/1/](http://www.bbc.co.uk/bitesize/ks2/science/living_things/skeletons_muscles/read/1/) for a summary of the topic.
- The website: [www.everschool.co.uk/science-key-stage-2-ourselves-2.html](http://www.everschool.co.uk/science-key-stage-2-ourselves-2.html) has a bone labelling activity and provides a link to interactive games about the skeleton.
- The website: [www.ehow.com/how\\_12039762\\_make-human-skeleton-model-using-pasta.html](http://www.ehow.com/how_12039762_make-human-skeleton-model-using-pasta.html) explains how to make a pasta skeleton.

#### Assessment

- Learners can check one another's answers to Worksheet 1.2 to see if they have grasped the concept that different bones are joined together to form the skeleton.

#### Differentiation

- Lower achieving learners can do Exercise 1.2 in the Activity Book, in which they arrange bones to make a simple paper skeleton. They can also answer Questions 1, 3 and 4 in the Learner's Book.



- Higher achieving learners could answer Questions 2, 3, 5 and 6 in the Learner's Book. They could also find out the scientific names of the bones of the skeleton they have learnt about in the topic.

### Talk about it!

Giraffes also have seven neck bones. The bones are much bigger than the neck vertebrae of humans.

### Common misunderstandings and misconceptions

- Learners often think that bigger animals have more bones in their skeletons than smaller animals. Often, it is the size of the bones that is different but the number of bones in the bodies of most mammals, for example, is similar.

### Homework ideas

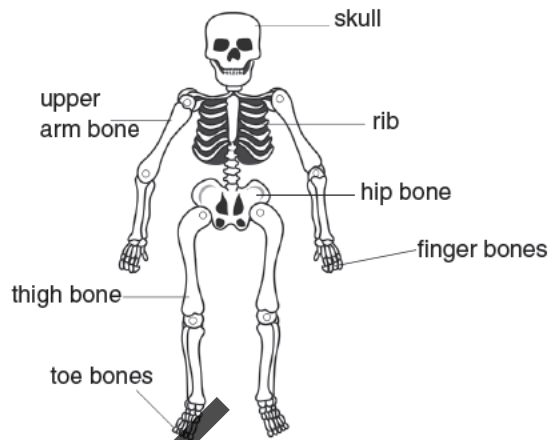
- Worksheet 1.2.

### Answers to Learner's Book questions

- It is made of many bones joined together.
- The skull protects the brain and sense organs (eyes, ears, tongue).
- Thigh bone. It supports the all weight of the upper body.
- Ear bones.
- Ribs surround heart and lungs to protect them.
- Women have babies. Their hips are wider to allow the baby to grow inside the mother's body and to be born.

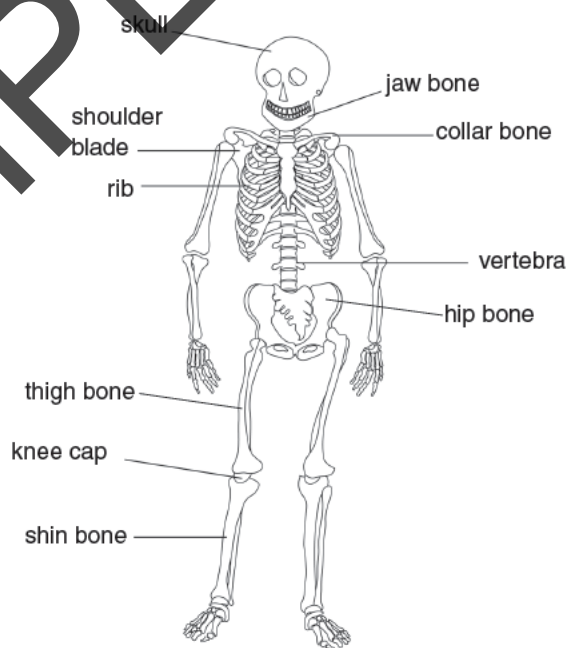
### Answers to Activity Book exercise

#### Exercise 1.2



### Answers to Worksheets

#### Worksheet 1.2



## Topic 1.3 Why do we need a skeleton?

The key idea explored in this topic is that skeletons allow us to grow. They also support and protect other body parts. Learners should already know about sense organs from Stage 3. You can link this prior knowledge with the protective role of the skull. The skull protects the brain. The brain controls sense organs.

### Learning objectives

- Know how skeletons grow as humans grow and support and protect the body.
- Measure length.
- Record results in a table.
- Present results in a bar chart.
- Identify simple trends and patterns in results and suggest explanations for some of these.

### Curriculum links

- In Activity 1.3, learners measure bone length which links with Mathematics. Remind learners about how to measure length with their rulers.
- Exercise 1.3 and Worksheet 1.3 require graphing skills which are also links with Mathematics. You could ask learners what they remember about drawing bar charts from their lessons in Mathematics. For example, how they label bars, how they decide how long the bars should be.

### Ideas for the lesson

- Begin the lesson by asking learners why children are small and adults are big. Ask for their ideas about how we get bigger as we get older. Then let the learners do Activity 1.3, in which they measure and compare bone lengths. They will also record measurements in a table and make a prediction based on the evidence collected.
- In Worksheet 1.3, learners draw a bar chart of results, identify a pattern in the results and suggest reasons for the pattern.

- In Exercise 1.3, learners obtain information about bone length from a bar chart and make deductions from the results.
- Remind learners that we need a skeleton to support our bodies. Discuss body support in soft-bodied invertebrates such as worms and snails. If possible, observe some of these animals in the classroom.
- Ask the class if they have seen cyclists and motorcyclists wearing helmets. Ask the learners to explain why cyclists and motorcyclists need a helmet. Point out how the skull acts like a helmet and provides protection for the brain. You can also ask learners which sense organs are housed in and protected by the skull as revision of Stage 3 work. Ask them which other parts of the skeleton protect our inside parts. Discuss the rib cage and how it protects the lungs and heart.
- If possible, bring some X-rays (or find photos of X-rays) to class for learners to examine and find the fracture.

### Notes on practical activities

#### Activity 1.3

Each group will need:

- a tape measure.

Learners should work in groups of 4 or 5.

Demonstrate how to use the tape measure by measuring the length of your own *femur* (thigh bone). Learners can record the measurement in their data tables.

Remember that the measurements will not be completely accurate as you will not be able to measure to the very ends of the femur, which are enclosed in the joint capsules at the hip and knee. It is easier to measure from the knee upwards. You will feel the ends of the bone on either side of the knee cap. Measure up the outer side of the leg to the point at the top of the leg at which the leg bends and lifts. If all measurements are taken in the same way, then you will get a fair comparison of femur lengths.

It may best for learners to measure the bone lengths of learners of their own gender within the group. This will avoid overstepping any cultural or religious boundaries regarding contact between males and females.

If you do not have enough tape measures for each group, they can use 30 cm rulers to measure the length of the *humerus* (upper arm bone) and *tibia* (shin) bones. They will need to take turns using the tape measures in order to measure the femur (thigh bone) length, which is likely to be longer than 30 cm.

Typical measurements are as follows.

| Bone           | Length in cm |         |
|----------------|--------------|---------|
|                | Me           | Teacher |
| upper arm bone | 25           | 30      |
| thigh bone     | 31           | 37      |
| shin bone      | 26           | 32      |

The teacher's bones are longer.

A teenager's bones will be longer than an 8-year-old's bones but shorter than an adult's. Teenagers' skeletons are still growing but are not fully grown.

### Internet and ICT

- Look at: [www.chiff.com/health/skeleton.htm](http://www.chiff.com/health/skeleton.htm) for basic information on the functions of the skeleton.
- For a video clip on body support in invertebrates look at: [www.bbc.co.uk/learningzone/clips/invertebrate-skeletons/2304.html](http://www.bbc.co.uk/learningzone/clips/invertebrate-skeletons/2304.html).
- The website: [www.kidport.com/reflib/science/animals/animalindexinv.htm](http://www.kidport.com/reflib/science/animals/animalindexinv.htm) is an interactive webpage about invertebrates.
- This site has good images of broken bones: [http://orthopedics.about.com/cs/brokenbones/l/blxray\\_aptibfib.htm](http://orthopedics.about.com/cs/brokenbones/l/blxray_aptibfib.htm).

### Assessment

- Assess learners' skills in drawing bar charts by getting them to draw bar charts of the bone length measurements taken in Activity 1.3. Worksheet 1.3a provides a table for learners to record results, and a set of axes on which they can draw their bar charts. Use these criteria in the following table:

| Question  | Marks          |
|---|----------------|
| Does the chart have a heading?                                | 1              |
| Are the bars correctly plotted and spaced on the set of axes? | 2              |
| Are the bars the correct height?                              | 4              |
| Are the bars correctly labelled?                              | 2              |
| Is the chart neatly drawn using a ruler?                      | 1              |
|   | Total 10 marks |

### Differentiation

- Lower achieving learners should be able to answer Questions 1 and 2 in the Learner's Book.
- Higher achieving learners can complete Worksheet 1.3b in which they draw a bar chart of the results and identify patterns in the results.
- Ask the learners to do some research to answer the question 'How does an X-ray let us see inside our bodies?'. The research should reveal the following: X-rays work by a beam of very high energy radiation passing through the body. The beam travels until it comes in contact with body tissue. In our body, soft tissue cannot absorb the high energy ray and it passes straight through. Bone absorbs the rays. The rays that pass through the body hit a sheet of metallic film positioned behind the patient, which stops the beam. The black areas on the X-ray are the areas on the film that absorb the rays that passed through the soft tissue. The white areas are the unexposed areas, where the rays are not absorbed by tissue. The white areas show the bones.

### Talk about it!

Children are still growing whereas old people are not. This means that their bones grow much faster and can heal much quicker than an older person's bones.

### Common misunderstandings and misconceptions

- Tell the learners that fractures are always painful. Some very small fractures may not be hurt at first, but eventually you will feel some pain.

## Unit 1 Teaching ideas

- Learners may think that when a fracture heals, the bone is stronger than before the break. This is not so. The bone will be as strong as it was before, especially in young people, but not stronger. In older people, the healed bone may be weaker.

### Homework ideas

- Exercise 1.3 in the Activity Book.

### Answers to Learner's Book questions

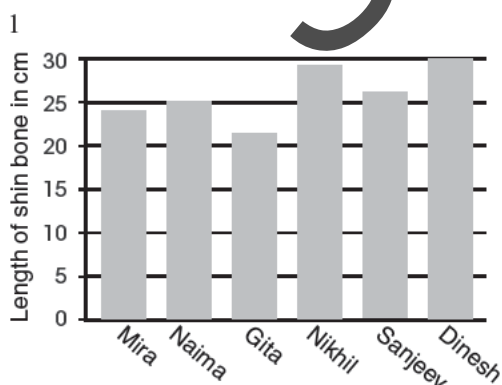
- 1 The baby will stay small and will not grow into a child.
- 2 The ends of the broken bone grow back together again.

### Answers to Activity Book exercise

- 1 Meshack
- 2 14 cm
- 3 Ali is the oldest. His upper bone is longer than Ahmed's. Our bones get longer as we get older.
- 4 Ali, Nasreen, Ahmed. Ali has the longest upper arm bone, Ahmed has the shortest.
- 5 a Fatima and Meshack  
b They have the longest upper arm bones.
- 6 33 cm. Meschack will be a similar height to his father. His father maybe a little shorter.

### Answers to Worksheets

#### Worksheet 1.3b



- 2 a Dinesh's  
b Gita's  
c The boys have longer shin bones than the girls. This could be because boys of

that age grow faster than girls, or any other reasonable suggestion.

## Topic 1.4 Skeletons and movement

The key concept explored in this topic is that muscles, which are joined to the bones of skeletons, act in antagonistic (opposite) pairs to allow us to move. Learners also have the opportunity to plan an investigation on muscle strength.

### Learning objectives

- Know that animals with skeletons have muscles attached to the bones.
- Understand that muscles work in pairs to help us move.
- Know how a muscle has to contract (shorten) to make a bone move.
- Design a fair test and plan how to collect sufficient evidence.
- Choose apparatus and decide what to measure.
- Measure length.
- Present results as a drawing.

### Curriculum links

- This topic can be linked with Physical Education (P.E.) and the benefits and effects of using muscles when we exercise.
- In Worksheet 1.4, learners have to measure length which is a link with measurement in Mathematics.

### Ideas for the lesson

- Muscles enable us to move our bones, because they are attached to the ends of the bones and can shorten or lengthen. When muscles contract (shorten) they allow us to move.
- Ask the class to demonstrate different movements they can make, such as bending, twisting their bodies, walking, picking up a pencil, and so on. Tell them that, when any part of our body moves, muscles are working. Ask them to look closely at their



upper arm as they curl their arm towards their chest from their side; the muscle gets fatter and bulges. As the arm is raised the biceps (on the front of the arm) contracts, at the same time a muscle on the back of the arm, the triceps, relaxes. The two muscles work together to control the lifting arm. As the arm is lowered the opposite happens, the biceps relax and the triceps contract. Tell the class that muscles act in pairs and can only pull. They cannot push. Then ask them to do Activity 1.4.

- Explain that, often, many muscles work together to create a single movement or effect. For example, it takes 17 pairs of muscles to smile and 43 pairs to frown. Get learners to make different faces such as anger, sadness, surprise, happiness. Ask them to feel their face for each expression they make. Which muscles are hard (contracted) and which are soft (relaxed)?
- Tell learners that they are going to make a model of their arm to show how two muscles of the upper arm work as a pair when the arm moves at the elbow. Then get learners to do Worksheet 1.4 in which they will have to measure card, and cut it to length. The model can demonstrate to learners why, if muscles can only pull and not push, two muscles are needed to move a bone. They could use their models to explain to one another how muscles work to produce movement. Learners can consolidate their understanding of muscle action by designing a fair test in Question 1. They will have to decide which apparatus to use and what to measure. Remind them that that only one factor must be changed and everything else must be kept the same.
- Exercise 1.4 in the Activity Book can be set as a homework task in which learners make drawing of how muscles work.

## Notes on practical activities

### Activity 1.4

Each group will need:

- a weight such as a heavy book or a school bag.

Learners should work in groups of 4 or 5.

Learners should hold their arms quite firmly

in order to feel the change in the muscles. Contraction and relaxation of the muscles are more easily observed in well-developed muscles.

Learners should observe that: the muscle at the front gets shorter and fatter; the muscle at the back gets longer and thinner; the muscle at the back gets shorter and fatter; and the muscle at the front gets longer and thinner.

### Worksheet 1.4

Each group will need:

- a piece of thick card
- two elastic bands (one longer than the other)
- a ruler
- scissors
- a paper fastener (split pin)
- a stapler and staples
- a piece of sticky tack or Plasticine®.

Learners should work in groups of 4 or 5.

It is important that the paper fastener is inserted at least 5 cm from the ends of the lengths of cardboard. This allows the antagonistic (opposite) action of the elastic band 'muscles' to be demonstrated clearly.

If the elastic bands are pulled too tight, then the learners will not be able to demonstrate muscle action as their elastic band 'muscles' will be fixed in a contracted position.

### Internet and ICT

- The website: [http://www.bbc.co.uk/science/humanbody/body/factfiles/workinpairs/biceps\\_animation.shtml](http://www.bbc.co.uk/science/humanbody/body/factfiles/workinpairs/biceps_animation.shtml) provides an explanation and animation of muscle action. There is also an interactive game on body muscles which may be suitable for higher ability learners.
- The website: <http://www.bbc.co.uk/learningzone/clips/muscles-and-movement/2305.html> is very useful for showing how muscles work to allow body movement.
- The website: [http://www.kidshealth.org/kid/body/muscles\\_noSW.html](http://www.kidshealth.org/kid/body/muscles_noSW.html) helps learners to find out more about how muscles and joints help us move.

## Unit 1 Teaching ideas

### Assessment

- Learners could check their own answers to Exercise 1.4 to self-assess their understanding of how muscles work in pairs.

### Differentiation

- Lower achieving learners should be able to answer Question 1. Some learners may struggle to grasp the concept of antagonistic movement in muscle pairs and how one muscle contracts while the other relaxes. Use the model made in Activity 1.4 to demonstrate these concepts visually.
- Higher achieving learners should be able to answer Questions 2 and 3.

### Talk about it!

When movement is repeated over and over again, the body creates more muscle to help make the movement easier. In this way, sports and other keep-fit activities help build muscles.

### Common misunderstandings and misconceptions

- A common misunderstanding is that muscles work by pulling and pushing. Muscles cannot push. They only pull on bones to allow movement. This is why muscles act in pairs. One muscle pulls the bone in one direction and another muscle pulls it in the opposite direction.
- Learners may think that muscles can make themselves longer. They may say that the muscle 'expands', which is incorrect. Encourage them to use the terms 'contract' and 'relax'.
- In English, the term 'biceps' is a singular term; one biceps. There is no such word as 'bicep'. The same is true for triceps.

### Homework ideas

- Exercise 1.4 in the Activity Book.

### Answers to Learner's Book questions

- To test the strength of arm muscles, the learners can use different weights, such as

bags containing different numbers of books, and a measuring tape.

They can measure how high they can lift the weight off the ground.

Results can be recorded in a table, for example:

| Number of books | Height the weight was lifted in cm |
|-----------------|------------------------------------|
|                 |                                    |

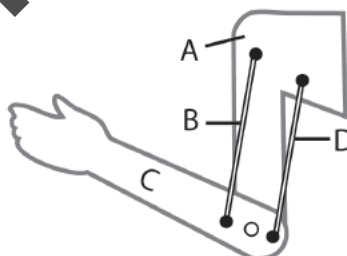
They could also draw a bar chart of the results.

To be a fair test, the same person must lift the different weights in the same way. The only variable that changes is the number of books or size of weight lifted.

- The heart is not involved in moving the body. It therefore does not need to be joined to the skeleton.

### Answers to Activity Book exercise

- A upper arm bone  
B biceps muscle  
C lower arm bone  
D triceps muscle
- a Part C lifts  
b



- Part B relaxes/contracts and gets shorter/longer. Part B pulls/pushes on part C and makes it drop/lift.

### Answers to Worksheets

#### Worksheet 1.4

- The lower card arm lifts.
- The lower card arm drops.
- The elastic bands get shorter when you pull on them, like muscles contracting. When you pull on the long elastic band on the inside of the card arm, it gets shorter and pulls the lower part of the arm up. When you pull on the short elastic band on the outside of the card arm, it gets shorter and pulls the lower part of the arm down.

- 4 The long elastic band represents the biceps.  
The short elastic band represents the triceps.

## Topic 1.5 Drugs as medicines

In this topic, learners find out the difference between drugs and medicines, why we take medicines, and the various forms in which medicines are taken. Learners also plan and carry out an investigation on the ways people in their families take medicines.

### Learning objectives

- Explain the role of drugs as medicines.
- Understand that medicines prevent, cure or alleviate symptoms of illness.
- Identify ways in which medicines are taken.
- Plan an investigation and decide how to collect evidence.
- Suggest how to present results.
- Identify simple trends and patterns and suggest an explanation for these.

### Curriculum links

- The word square activity in Exercise 1.5 is a link with English Language. Remind learners that knowing how to spell the words will help them find the words more easily.

### Ideas for the lesson

- Begin the lesson by asking learners what drugs are. Would they take drugs? If not, why not? Then ask if any learners take medicines. Explain the difference between drugs and medicines.
- Show the learners some different types of medicines in class. You could show, for example, medicines in different forms, such as mixtures, tablets, powders, creams, and inhalers. What types of medicines do learners take? Why do they need the medicines? Then discuss how medicines help us and the different forms in which we take them. When discussing medicines, please be aware that some learners may be sensitive with regards to their own health issues.
- Allow some lesson time for learners to start planning their investigation for Activity 1.5. They will have to think about how to

collect information and how to present their findings. Explain that we can find out information from people by doing surveys in which we ask questions about what we want to find out. Allow about a week for learners to complete the investigation. Carry on with the next topic in the meantime.

- To finish the lesson, learners can complete Exercise 1.5 and Worksheet 1.5.

### Notes on practical activities

#### Activity 1.5

Each group will need:

- paper
- pencils.

Learners should plan a survey with questions to collect information about the ways people take medicines. Guide the class about the type of questions they should ask. Questions should be short, clear and easy to read or understand. Questions must also be written down so that everyone answers the same questions. Learners need to analyse the data collected and count how many people take or use each form of medicine. They can present their results in the form of a bar chart with bars for the different ways or forms in which medicines are taken.

### Internet and ICT

- The website: [http://kidshealth.org/kid/feel\\_better/things/kidmedic.html](http://kidshealth.org/kid/feel_better/things/kidmedic.html) provides a comprehensive overview of how medicines work, the ways in which medicines can be taken and how to take them safely.
- The website: <http://kidshealth.org/classroom/3to5/problems/drugs/drugs.pdf> is a site for teachers that addresses the use of drugs and related issues such as peer pressure.
- The website: [www.everyschool.co.uk/science-key-stage-2-ourselves-2.html](http://www.everyschool.co.uk/science-key-stage-2-ourselves-2.html) provides a link for teachers to an online lesson plan on medicines and drugs.
- The website: [www.ehow.com/how\\_7393779\\_conduct-survey-school-project.html](http://www.ehow.com/how_7393779_conduct-survey-school-project.html) has some useful tips on doing surveys.



## Unit 1 Teaching ideas

### Assessment

- Discuss answers to Questions 1 to 3 in class. Allow learners to check their own answers for self-assessment.

### Differentiation

- Lower achieving learners should be able to complete Exercise 1.5.
- Higher achieving learners should be able to complete Worksheet 1.5.

### Talk about it!

Inhalers spray a medicine into the air passages that make them open up so more air can get to the lungs.

### Common misunderstandings and misconceptions

- Learners may think that all drugs are harmful. This is a result of the common use of the term 'drug' as an illegal substance that is harmful. Drugs are all chemical substances we take that have an effect on the way the body works. Medicines are drugs that benefit the body but point out that if we do not take medicines correctly they can also be harmful.

### Homework ideas

- Questions 1 to 3 in the Learner's Book.

### Answers to Learner's Book questions

- 1 Because medicines are drugs that, if taken according to instructions, make us better; but some drugs are harmful and therefore are not medicines.
- 2 No. Creams treat skin problems not illnesses inside the body such as a sore throat.
- 3 Because the blood carries medicines very quickly around the body and because people in hospital may be too ill to swallow tablets or mixtures.

### Challenge

Learners should find out the following.

Cigarettes are made from tobacco, which is a drug. Tobacco burns when it is smoked and

gives off harmful chemicals in the smoke. People breathe in the smoke from the cigarette. The chemicals can damage the lungs and make it hard for people to breathe. People who smoke get more chest illnesses such as bronchitis. The chemicals in the cigarette smoke also cause serious diseases such as lung cancer.

### Answers to Activity Book exercise

#### Exercise 1.5

- 1 a Drugs are substances that make your body change in some way. ✓  
b Medicines make us better when we are sick. ✓  
c Medicines are the same as drugs. ✗  
d Medicines cannot stop us from getting illnesses. ✓

2

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| i | n | j | e | c | t | i | o | n | t |
| n | w | e | r | t | y | n | i | o | a |
| n | a | s | d | f | g | h | n | i | b |
| a | e | b | i | u | n | i | t | h | i |
| l | e | d | b | n | t | m | m | d | e |
| e | v | f | p | o | w | d | e | r | t |
| r | u | r | k | l | g | o | n | i | u |
| m | i | x | t | u | r | e | t | p | m |

- 3 Possible answers are:

| Medicine           | What the medicine is used for   |
|--------------------|---------------------------------|
| cough mixture      | stops you coughing              |
| cream              | stops insect bites from itching |
| pain-relief tablet | stops headache or body pain     |

### Answers to Worksheets

#### Worksheet 1.5

- 1 a country B  
b 800 000 people
- 2 a country A  
b 600 000 people

- 3 The number of people who smoked in country A increased between 2006 and 2014. The number of people who smoked in country B decreased between 2006 and 2014.
  - 4 Suggestions could include:  
Have more laws to control smoking.  
Make cigarettes very expensive to buy.  
Start education programmes to teach people about the dangers of smoking.  
Ban the sale of cigarettes and fine people who are caught smoking.
  - 5
    - a tobacco
    - b Tobacco smoke can damage the lungs and make it hard for people to breathe. People who smoke get more chest illnesses such as bronchitis. The chemicals in the cigarette smoke also cause serious diseases such as lung cancer.
- Not all illnesses are caused by germs. When someone has diabetes (say: dye-uh-be-tees), the body cannot make enough of an important substance called insulin. The body needs insulin to stay healthy. Medicines can replace the missing substance, like insulin.
  - Discuss the procedures at school for taking/ administering medicines.
  - Learners can role play the statements about taking medicines on page 17 of the Learner's Book. Then get them to do Activity 1.6. This activity is best done in pairs or small groups.
  - End the lesson by getting learners to answer Question 1.
  - Set Exercise 1.6 as homework task to consolidate the new vocabulary introduced in the topic.

## Topic 1.6 How medicines work

In this topic, learners find out the different ways in which medicines act to make us better. They write an information sheet on how to take medicines safely.

### Learning objectives

- Understand that medicines work by killing germs or by replacing missing substances in the body.
- Identify, and write about, safe ways to take medicines.
- Make a prediction.

### Curriculum links

- The matching terms with meanings in Question 1 in Exercise 1.6 is a link with English.

### Ideas for the lesson

- Begin the lesson by asking how learners know when they are ill. Write down the symptoms they name and then explain that the symptoms are signs of illness.
- Ask learners why we become ill. You could then discuss the role of germs in illness. If any learners are diabetic, you can ask them to tell the class about their condition and why they have to take insulin.

### Notes on practical activities

#### Activity 1.6

The information sheet should include the following points:

- Only take medicines meant for you.
- Only take medicines meant for the illness you have.
- Always take the amount of medicine that the instructions tell you to take.
- Take the medicine for as long as the doctor tells you to.
- Remember to take the medicine at the correct time. Don't take more the next time if you have forgotten.
- Follow the instructions about how to take the medicine, for example with food.
- Never take old medicines that have passed their expiry (best before) date.
- Ask an adult to help you take medicines.

### Internet and ICT

- The website: [http://kidshealth.org/kid/feel\\_better/things/kidmedic.html](http://kidshealth.org/kid/feel_better/things/kidmedic.html) provides a comprehensive overview of how medicines work, the ways in which medicines can be taken and how to take them safely.

## Unit 1 Teaching ideas

- The website: [http://kidshealth.org/parent/system/medicine/medication\\_safety.html](http://kidshealth.org/parent/system/medicine/medication_safety.html) is aimed at educating parents about the safe administration of medicines to children, but is also useful for teachers.

## Assessment

- You could use Activity 1.6 for formal assessment purposes to assess if learners can identify, and write about, safe ways to take medicines. Allocate 8 marks for correct information and 2 marks for neat and clear layout and presentation.

## Differentiation

- Lower achieving learners should be able to answer the question in the Learner's Book.
- Higher achieving learners could find out about the symptoms, causes of, and medicines used to treat, diseases such as malaria or tuberculosis.

## Talk about it!

A doctor understands the good and harmful effects of the medicines. Medicines can be dangerous if they are not taken correctly.

## Common misunderstandings and misconceptions

- Many people believe that antibiotics such as penicillin cure all infections. Antibiotics cure bacterial infections, not viral infections such as: runny noses, colds or flu, most coughs and bronchitis and sore throats not caused by the *Streptococcus* bacteria. Taking antibiotics for viral infections will not cure the infection, keep others from catching the illness and help you feel better.
- People believe that it is okay to stop taking prescription antibiotic medication when they start to feel better. This can be dangerous because not all the disease-causing organisms are killed. They become resistant to the medicine which means that the medication is no longer effective.
- Another popular belief is that natural or herbal remedies are safer than prescription medicines. Natural or herbal remedies are not tested for safety in the same way that

other medicines are tested. Many of these medicines can cause harm if taken together with other medications. If you are taking prescription medicines, you should always check with a doctor before taking any other medication.

## Homework ideas

- Exercise 1.6 in the Activity Book.

## Answers to Learner's Book questions

- 1 You would not get better or might not get better as quickly.

## Answers to Activity Book exercise

### Exercise 1.6

- 1 symptoms – signs of an illness  
fever – a very high body temperature  
cure – something that make an illness go away  
germs – very small living things that make us sick  
prescribe – when a doctor says what medicine a sick person must have
- 2 He took medicine meant for someone else. He did not check to see how much of the medicine he should take. He did not check that the tablets were meant for headaches. He did not ask an adult to help him take the medicine.

## Topic 1.7 Check your progress

### Learning objectives

- Review the learning for this unit.

### Ideas for the lesson

- Ask learners to answer the questions on the 'Check your progress' pages of the Learner's Book (pages 18–19) and the 'Language review' on page 16 of the Activity Book.

## Answers to Learner's Book questions

- 1
  - a skeleton
  - b vertebra
  - c skull
  - d invertebrates
  - e muscles
- 2
  - a any one of the following: shoulder blade, skull
  - b any one of the following: thigh, shin, arm bones
  - c any one of the following: finger bones, toe bones, wrist bones, ankle bones
  - d vertebrae/spine bones
- 3
  - a muscle 1
  - b Muscle 1 contracts and get shorter and fatter. It pulls on the arm bone it is joined to. This makes the arm bone lift.
  - c It relaxes.
- 4
  - a Yasmin
  - b Luisa
  - c Josie
  - d Our bones grow as we get older. Children have the shortest bones. Adults have the longest bones. Teenagers' bones are longer than children's bones but not as long as adults' bones.
  - e bar chart
  - f a ruler or measuring tape
  - g Use the same ruler or measuring tape the same person should do the measuring. Measure the bones in exactly the same way.
- 5
  - a To make us better when we are ill. To prevent us from getting ill.
  - b A: true  
B: false  
C: true  
D: true  
E: false

## Answers to Activity Book exercise

### Language review

- 1
 

|          |   |
|----------|---|
| skeleton | – hard, strong frame that supports our body           |
| bones    | – hard parts that form the skeleton                   |
| skull    | – the bones of the head                               |
| ribs     | – the bones in your chest                             |
| vertebra | – a bone of the spine                                 |
| hip      | – the part between the top of your leg and your waist |
| thigh    | – the top part of the leg                             |
| shin     | – front of the lower part of the leg                  |
- 2 When we are ill, we take **medicines**. They can also **prevent** us from getting ill. Sometimes we take these drugs as **powders**. If we are very ill in hospital, we may need a **drip**.



# Worksheet 1.2

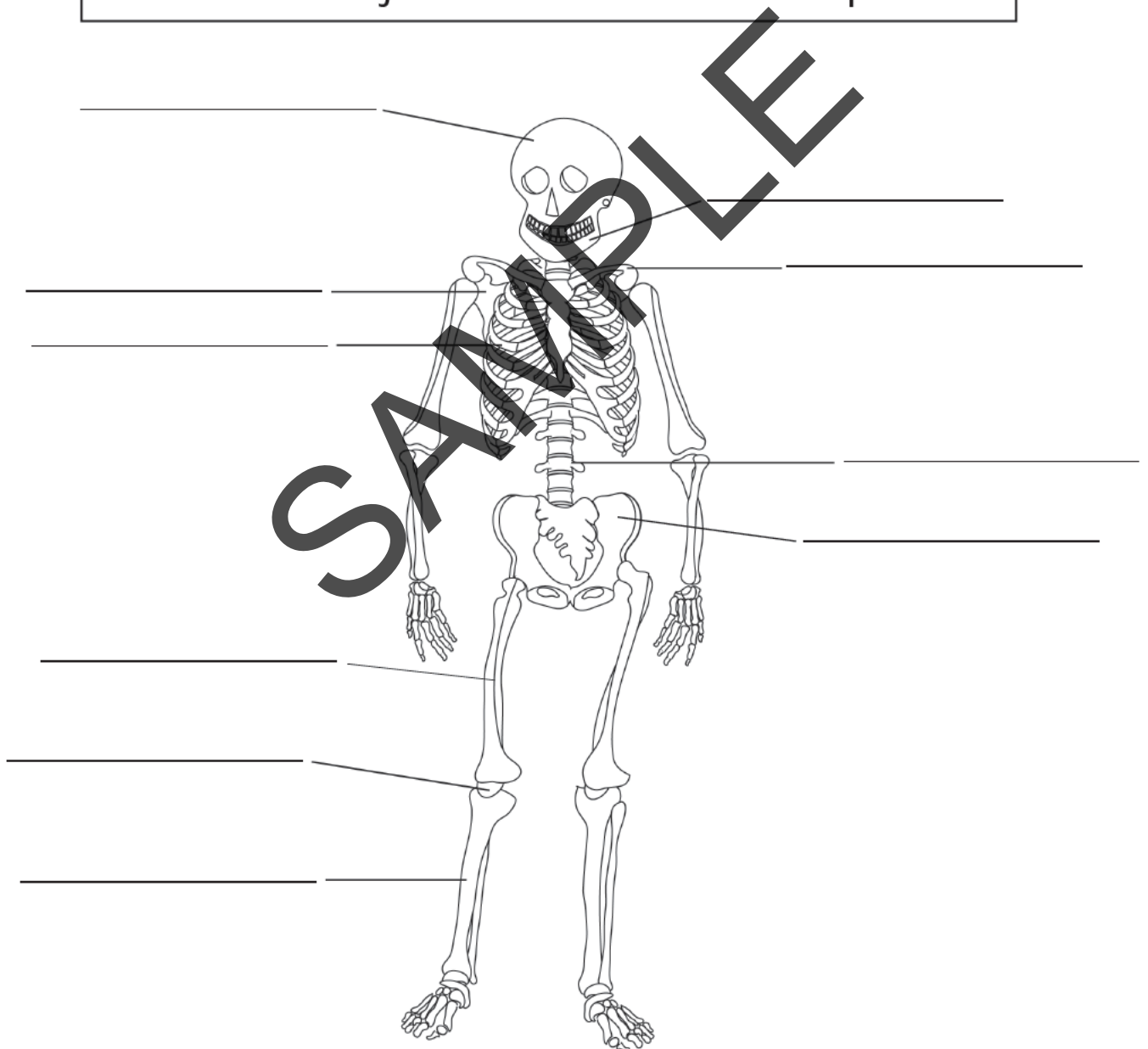
## Label a skeleton

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Use the names of the bones in the word box to label the different parts of the human skeleton.

|          |            |                |             |           |
|----------|------------|----------------|-------------|-----------|
| jaw bone | hip        | shoulder blade | collar bone | shin bone |
| skull    | thigh bone | rib            | vertebra    | knee cap  |



# Worksheet 1.3a

## Measuring bones

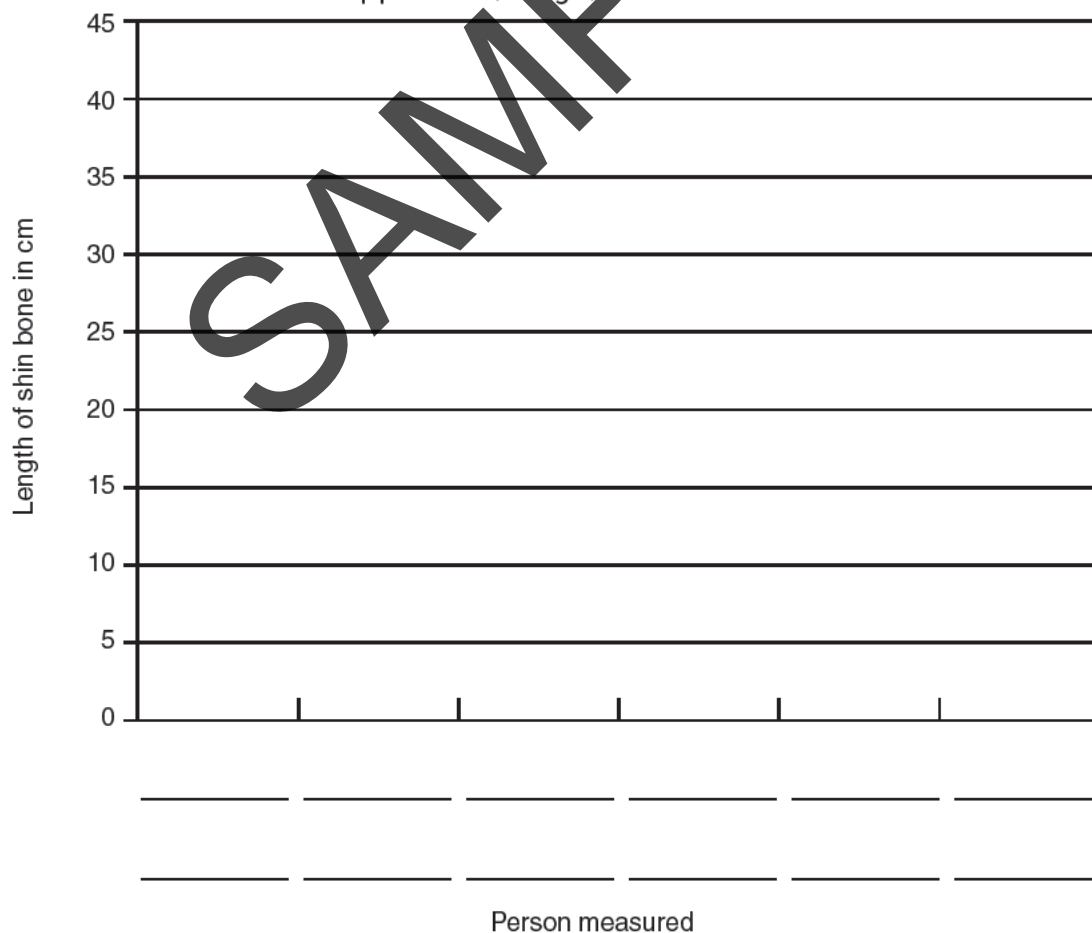
Name: \_\_\_\_\_

Date: \_\_\_\_\_

Record your bone measurements in this table.

| Bone           | Length in cm |         |
|----------------|--------------|---------|
|                | Me           | Teacher |
| upper arm bone |              |         |
| thigh bone     |              |         |
| shin bone      |              |         |

Use this grid to draw a bar chart to show your results. Draw a bar for each bone that you measured. Label each bar with the person (me or teacher) and the bone (upper arm, thigh, shin).



# Worksheet 1.3b

## Draw a bar chart of bone size

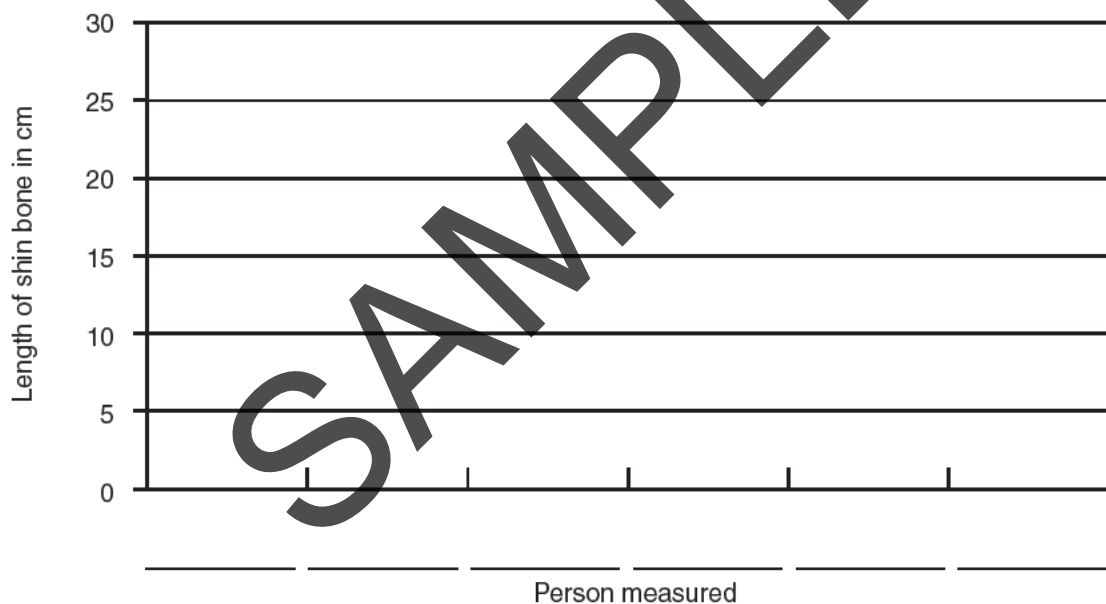
Name: \_\_\_\_\_

Date: \_\_\_\_\_

Virat measured the lengths of the shin bones of some people in his class.  
These are his results.

| Girls | Length of bone in cm | Boys    | Length of bone in cm |
|-------|----------------------|---------|----------------------|
| Mira  | 24                   | Nikhil  | 29                   |
| Naima | 25                   | Sanjeev | 27                   |
| Gita  | 22                   | Dinesh  | 30                   |

1 Draw a bar chart of Virat's results.



2 a Whose shin bone was longest? \_\_\_\_\_

b Whose shin bone was shortest? \_\_\_\_\_

c What pattern can you see in the results that Virat obtained? Suggest a reason for the pattern. \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

# Worksheet 1.4

## Make a model of arm muscles

Name: \_\_\_\_\_

Date: \_\_\_\_\_

In this activity, you will make a model to show how the muscles of the arms work in pairs.

Cut two lengths of card, each about 20 cm long.

Make a hole about 5 cm away from one end of each piece of card with the point of the scissors. Place a piece of sticky tack or Plasticine® behind the card to push the scissors into.

Put the card pieces on top of each other with the holes lined up. Push the paper fastener through holes to join the two pieces of card. This is your arm.

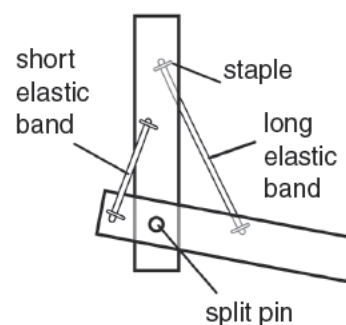
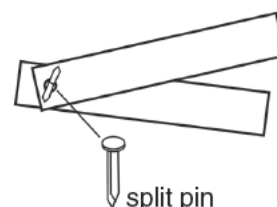
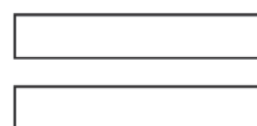
Staple the longer elastic band to the inside of the upper and lower 'bones' of the card arm.

Staple the shorter elastic band to the outside of the upper and lower 'bones' of the card arm. The elastic bands should be tight but not pulling.

You will need:

- a piece of thick card
- two elastic bands (one longer than the other)
- scissors
- a paper fastener (split pin)
- a ruler
- a stapler and staples
- a piece of sticky tack or Plasticine®.

card lengths





1 What happens to the card arm when you pull on the longer elastic band?

\_\_\_\_\_

2 What happens to the card arm when you pull on the shorter elastic band?

\_\_\_\_\_

3 Explain how the two elastic bands act like the muscles in the body that lift and lower the arm.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4 Which body muscles do the elastic bands represent?

\_\_\_\_\_

# Worksheet 1.5

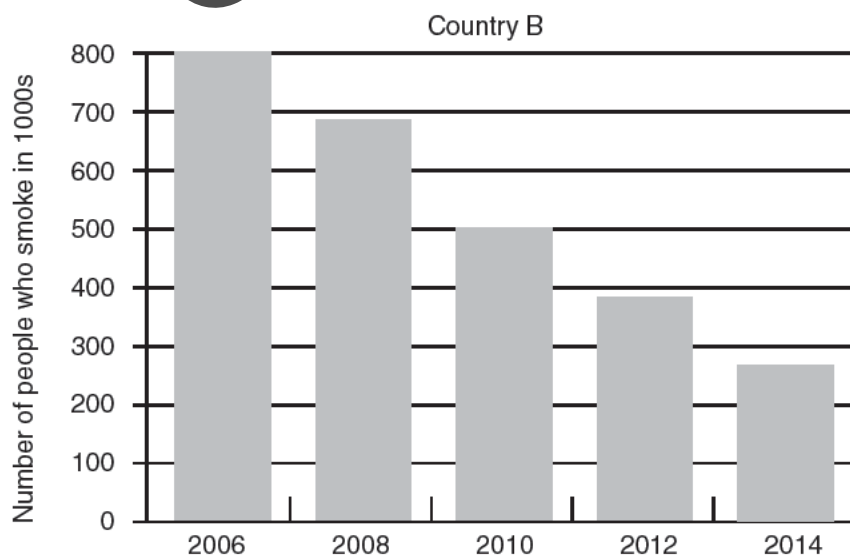
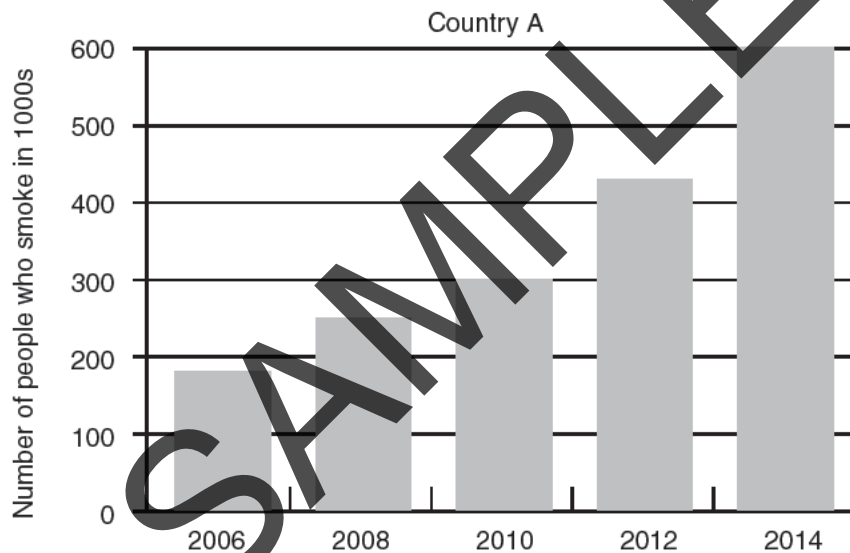
## Analyse data on smoking

Name: \_\_\_\_\_

Date: \_\_\_\_\_

In this activity, you will find information from bar charts and identify trends.

Smoking cigarettes can cause health problems. Many countries are trying to get people to stop smoking. The bar charts show information about how many people smoke in country A and country B.



1 a In which country did more people smoke in 2006?

\_\_\_\_\_

b How many people in that country smoked then?

\_\_\_\_\_

2 a In which country did more people smoke in 2014?

\_\_\_\_\_

b How many people in that country smoked then?

\_\_\_\_\_

3 What pattern can you see in the bar charts?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4 Suggest **two** ways in which the government of a country can help fewer people to smoke.

\_\_\_\_\_

\_\_\_\_\_

5 a Name the drug found in cigarettes. \_\_\_\_\_

b Explain how this drug can harm people.

\_\_\_\_\_

\_\_\_\_\_



# Unit 2

## Teaching ideas

### Background knowledge

A habitat is a place in which an organism lives. A shore crab's habitat might be a small bay on the coast; a golden eagle's habitat may be large areas of upland. Think about how you might describe the habitat of a frog, or a whale, or a rabbit. A frog's habitat needs to include water. A whale lives exclusively in water but the water in which it lives must also be the habitat for the food the whale needs. A rabbit's habitat needs to include areas of grass and other vegetation for it to eat. It must also provide shelter from the weather and from animals for which the rabbit is food. Most habitats are home to a range of organisms. A large tree may be a habitat to other plants, for example, ferns, and to invertebrates such as caterpillars. A tree is also a habitat for birds.

The Earth is a special place. The organisms on Earth have developed over many years and become dependent on its habitats, and on one another. There are many examples of interdependence between organisms. One is the way in which animals and plants are dependent on micro-organisms and fungi to decompose excreta and the bodies of dead organisms.

Humans have all sorts of effects on the environment. Positive effects include care of endangered species and protection of habitats. Negative effects include pollution of the air and water by vehicles and industry, and felling of rainforests, which destroys the habitat for many species.

Almost every product or service has had multiple effects on the environment. For example, a plastic bottle requires a container made from oil, the product is shipped in vehicles, the factory making the bottles may be polluting, and the empty bottles may contribute to littering and pollution of the oceans.

We can have a positive influence on the environment by recycling waste. Metals, glass and paper are often recycled. For example, old newspapers can be processed to make new paper. This means that fewer trees have to be cut down to provide the raw material for making new paper. Another example is the way we can recycle lead found in cells (batteries). These are taken apart so that the toxic, but valuable, lead can be recycled, and not put in landfill.

Products can also be reused. Goods such as clothes and toys can be passed or sold to new users. This reuse is often cheap to do and good for the environment because it does not use new resources.

### Unit overview

| Topic             | Number of lessons | Outline of lesson content  | Resources in Learner's Book                     | Resources in Activity Book | Resources in Teacher's Resource                |
|-------------------|-------------------|--|---|----------------------------|--|
| 2.1 Amazing birds | 2                 | How birds are suited to their habitat, and how we might record our observations. | Activity 2.1<br>SE L<br>Ex<br>Questions 1, 2, 3 | Exercise 2.1<br>L Su       | Worksheet 2.1a<br>L Su<br>Worksheet 2.1b<br>Su |



## Unit 2 Teaching ideas

|                                   |   |  |   |                       |                              |
|-----------------------------------|---|--|---|-----------------------|------------------------------|
| 2.2 A habitat for snails          | 2 | Snails are examined as a familiar animal. They are observed when given a choice of habitat.  | Activity 2.2<br>SE L<br>Ex<br>Questions 1, 2                              | Exercise 2.2<br>SE L  | Worksheet 2.2<br>Su L        |
| 2.3 Animals in local habitats     | 2 | Observation and consideration of animals in local habitats.  | Activity 2.3<br>SE L<br>Su<br>Questions 1, 2                              | Exercise 2.3<br>SE Su | Worksheet 2.3<br>SE          |
| 2.4 Identification keys           | 2 | The use of simple identification keys.   | Activity 2.4<br>SE L<br>Ex<br>Questions 1, 2, 3, 4                        | Exercise 2.4<br>SE    | Worksheet 2.4a<br>SE Ex<br>L |
| 2.5 Identifying invertebrates     | 2 | Observing invertebrates and then considering a suitable habitat for them. The topic considers a key for identifying invertebrates. | Activity 2.5a<br>SE L<br>Activity 2.5b<br>SE L<br>Ex<br>Questions 1, 2, 3 | Exercise 2.5<br>SE    | Worksheet 2.5<br>L Ex<br>SE  |
| 2.6 How we affect the environment | 2 | Ways that humans affect the environment.   | Activity 2.6<br>L Su<br>SE<br>Questions 1, 2, 3                           | Exercise 2.6<br>L Su  |                              |
| 2.7 Wonderful water               | 2 | Ways in which humans interact with water resources.  | Activity 2.7a<br>L Su<br>Activity 2.7b<br>SE L<br>Ex<br>Questions 1, 2, 3 | Exercise 2.7<br>SE    | Worksheet 2.7<br>L Ex        |
| 2.8 Recycling can save the Earth! | 2 | How can waste be dealt with in ways which protect the environment?   | Activity 2.8a<br>L SE<br>Activity 2.8b<br>L Ex<br>Questions 1, 2          | Exercise 2.8<br>L     |                              |
| Check your progress               | 1 |  | Questions 1, 2, 3, 4  | Language review<br>L  |                              |

Ex Extension    L Language    SE Scientific enquiry    Su Support

## Resources

- a tray
- some leaves
- some dry stones
- some sand
- some small sticks
- three snails
- paper
- pencils
- a large sheet of paper
- some pooters
- a magnifying glass
- some small rocks
- some bricks
- some bamboo canes
- some small logs
- some short wooden planks
- some small wooden boxes
- some cardboard
- some soil
- some colouring pens
- some beakers
- a funnel
- some filter paper
- some plastic gloves
- some plant stems
- some apple cores
- a plastic bag or a jar with a lid
- access to the internet or books about sea life and pollution

## Topic 2.1 Amazing birds

This unit uses birds to show that animals need food, air, water, space and warmth, and that they need a suitable habitat. It shows that different birds are suited to particular habitats. Learners are encouraged to think about how they would observe and record their observations of birds.

## Learning objectives

- Investigate how different animals are found in different habitats and are suited to the environment in which they are found.
- Collect evidence from different contexts.
- Make relevant observations and comparisons in a variety of contexts.

## Curriculum links

- The study of local habitats could be linked to the study of places and landscapes in Geography. A geographical study of a river, its stages and how it carves its way through a landscape could be complemented by this topic. Learners could look at animals and plants that find their habitat in or alongside the river.
- A link can be made to Environmental Education when you consider recycling and protecting the environment.

## Ideas for the lesson

- Begin by reminding learners what they have learnt in previous topics about animals and their need for air, food, water, warmth and a place to live.
- Find out what learners already know about how living things depend on their environment. Use birds as an example. You might use a video (see *Internet and ICT* section). Learners might research other amazing birds.
- There may be learners who have done some bird watching. They may like to talk about their experiences. All learners should be able to talk about the birds that are seen in your area and further afield. Some learners may have seen birds in a zoo.
- In Activity 2.1, learners are asked to make a plan for watching birds near your school. In this activity, learners should be encouraged to collect evidence. They should also be encouraged to make relevant observations (about the birds they see, and the number of birds they see, for example). They should also be encouraged to make comparisons, either by watching birds in two different locations in the school, or by observing birds at home. Worksheet 2.1a will support this activity.
- Talk to learners about how birds are suited to their habitat. For example, hawks and falcons have good eyesight, which means that they can see prey on the ground below them as they fly, they have powerful talons to pick up their prey and they can fly fast to match the speed of their prey on the ground. Ducks and other water birds have webbed feet so that they can swim in water.

## Unit 2 Teaching ideas

Birds also have different shaped beaks that are suitable for eating different types of food. Exercise 2.1 and Worksheet 2.1b provide opportunities for consolidating this learning about how different birds are adapted for living in their habitats.

- You might want to arrange a visit to a local park, country park or zoo, to observe a wider range of birds.
- If possible, you could arrange for a specialist to come in to talk about birds. Suitable people would be a park ranger or a member of an ornithologists' group.

## Notes on practical activities

### Activity 2.1

Each pair or group will need:

- paper
- a pencil
- some food and water to attract birds.

This activity provides an opportunity for learners to consider how they will make observations. Learners are asked to make a plan for bird watching near your school. They should consider how they will do this and what they will need. Learners should think about whether they will need to attract birds and, if so, how they will do this. They should think about how they will make sure that they do not frighten the birds.

Learners are asked to watch birds at different times of the day. They should notice whether there are any times when they observe more birds.

They need to consider how much time is needed to watch the birds and what records they should make.

Some learners may find it hard to stay still long enough to observe birds. You may consider feeding birds at a particular place on the school site on the run up to this lesson. You may find a spot where birds congregate. For example, if learners have snacks at playtime, birds may appear after playtime each day.

## Internet and ICT

- The video clip: [http://www.bbc.co.uk/nature/life/Emperor\\_Penguin](http://www.bbc.co.uk/nature/life/Emperor_Penguin) shows Emperor penguins.
- The video clip: <http://video.nationalgeographic.com/video/animals/?source=NavAniPhoto> shows a peregrine falcon diving for its prey.

## Assessment

- Can learners talk about different birds and the places they live?
- Can they recognise the ways in which some birds are suited to the places where they live?
- Assess learners' science enquiry skills using the following table.

|   |  |
|---|--|
| Do learners collect evidence?           |  |
| Do learners make relevant observations? |  |
| Do learners make relevant comparisons?  |  |

## Differentiation

- Lower achieving learners may benefit from having each activity broken into smaller steps. This group may also need more support from poster prompts and lists of key words. You may need to draw their attention to specific features. Give this group structured opportunities to use the language of birds and habitats. For example, 'Why do some birds need to live by water?'.
- Higher achieving learners can be given more examples (including less familiar examples) to consider. You can give them more independence by asking them to plan in Activity 2.1 with fewer prompts for things that they should consider.

## Talk about it!

Learners have considered different ways in which birds are adapted to their habitat. For example, beaks shaped for eating particular food, feet webbed for swimming, good eyesight for finding prey, and speed of flight for catching prey.

### Common misunderstandings and misconceptions

- Learners may assume that an animal just lives in a place. They may not realise that, over time, a habitat may change, and the animal may be unable to live there. This might happen, for example, if the food plants die because the habitat no longer provides what they need to survive.

### Homework ideas

- Worksheet 2.1b.
- Exercise 2.1 in the Activity Book.

### Answers to Learner's Book questions

- A bird's beak is shaped to help it eat its food, for example, to break open a seed.
- Some birds need good eyesight to help them to see their prey on the ground below them as they fly.
- Some birds have webbed feet to help them to swim.

### Answers to Activity Book exercise

#### Exercise 2.1

- humming bird – long beak for getting nectar out of plants
- duck – webbed feet for swimming
- penguin – lots of fat under the skin to keep body warm
- bald eagle – skull shape allows eyes to see in front and below
- spoonbill – long flat beak that allows it to shovel small fish from mud and water

### Answers to Worksheets

#### Worksheet 2.1a

Learners may suggest headings such as: colour, size, number seen, food eaten, etc.

#### Worksheet 2.1b

|  |          |
|--|----------|
| This bird cannot fly but is an excellent swimmer. It feeds on fish in the sea. When it is on land or on snow and ice, this bird walks slowly and lives in large groups called rookeries. | penguin  |
| This large, powerful bird nests in tall trees or on high cliffs. It feeds on small animals, which it finds by flying many miles across hills and mountains.                              | eagle    |
| This large bird lives in or beside shallow lakes. It lives in large flocks spending many hours walking in the water and using its large hook-shaped bill to sieve food from the water.   | flamingo |
| This large bird lives on and beside rivers. Its long neck allows it to feed on weeds growing on the bed of the river.  | swan     |

### Topic 2.2 A habitat for snails

This topic allows learners to observe a snail and the habitat that suits it. It allows learners to design and carry out a simple experiment in which they can observe the choices made by snails about habitats.

#### Learning objectives

- Investigate how different animals are found in different habitats and are suited to the environment in which they are found.
- Test an idea or prediction based on scientific knowledge and understanding.
- Design a fair test and plan how to collect sufficient evidence.
- Choose apparatus and decide what to measure.
- Explain what the evidence shows and whether it supports predictions. Communicate these clearly to others.
- Identify simple trends and patterns in results and suggest explanations for these.

#### Curriculum links

- This topic links to Environmental Education. You can emphasise the



## Unit 2 Teaching ideas

importance of small invertebrates in natural cycles. Snails eat plant material, which they then return to the soil. Snails are food for larger animals.

### Ideas for the lesson

- Begin by allowing learners to observe a snail, ideally using magnifying glasses. It will help if you have plastic trays and a little damp plant material for the snail. Can learners observe the snail's eye stalks and the feelers? The feelers also sense smell. Can the learners observe the snail's eyes, skin, foot shell and tail? Ensure that learners wash their hands thoroughly after this observation.
- Learners might carefully place a snail onto a sheet of see-through acetate to observe the snail's foot as it moves. Can they describe the muscular action of the foot which allows movement? Learners must wash their hands thoroughly after handling the snail.
- In Activity 2.2, learners are asked to think about the type of habitat that snails like. Ask them to talk about where they have seen snails outside and places where snails tend not to be observed before they do the activity.
- Exercise 2.2 is an exercise in interpreting data about where snails were found. This is an opportunity for learners to identify simple trends and patterns and to suggest explanations for these. Learners also explain what the evidence shows.
- Worksheet 2.2 asks learners to consider habitats around the school and say why these habitats would be suitable or unsuitable for snails.

### Notes on practical activities

#### Activity 2.2

Each pair or group will need:

- a tray
- some leaves
- sticks
- stones
- sand
- a little water
- paper
- a pencil.

This activity provides an opportunity for learners to test a prediction by carrying out a series of tests with different snails. They also have to think about ways to make the test fair, how to make observations and recordings, and how to present results. Learners might present results on a table or bar chart. They should link the results to the prediction and to what they already know about snails. You may have to instruct learners to repeat the test, say three times.

The test will need to be repeated with several snails. Snails do not always initially make what we would call the 'right' choice. Ask learners about this. Is it because of limited vision, or because snails like to explore/search for food? Is there another reason?

Learners could note where the snail is every minute, or every two minutes, and then record the results to show the snail's preference for one area or another. This could be done on a bar chart showing the choices available on the x-axis and the number of times the snails are observed in that place on the y-axis. If snails tend to spend more time in one area, this will be a trend in the results.

You can add challenge by asking learners to devise a way to measure how far a snail travels in one or more minutes.

Learners might research snails in reference books or on the internet.

### Internet and ICT

- You might ask learners to take digital photographs of the different stages in the activities.
- The website: [http://www.bbc.co.uk/nature/life/Helix\\_aspersap003km3j](http://www.bbc.co.uk/nature/life/Helix_aspersap003km3j) is a BBC video of snail life and movement. The narration uses the term mollusc.
- The website: <http://www.snail-world.com/> has lots of facts and information about snails.
- The website: [http://www.primaryscience.ie/media/gallery/sammy\\_the\\_snail.ppt347,68](http://www.primaryscience.ie/media/gallery/sammy_the_snail.ppt347,68), Slide 68 contains a PowerPoint made by primary learners with lots of facts and ideas for investigations.
- Learners might write a report about the work of the class for your school website.

## Assessment

- Ask learners to self-assess by giving them the points below as learning objectives:  
*I can talk about the snails and how they are suited to their environment.*  
*I can suggest how I will go about investigating snails and how they are adapted to their environment.*  
*I can design a fair test and plan how to collect sufficient evidence.*  
*I can choose apparatus and decide what to measure.*  
*I can explain what the evidence shows and say whether it supports my predictions.*

## Differentiation

- Lower achieving learners may need more prompts about what to do in the activity. They may need smaller steps. They may need support to identify a pattern or trends in results. Encourage this group to use the vocabulary of biology and of science enquiry.
- Higher achieving learners should be expected to make more detailed observations. This group should take more control of the planning and carrying out of investigations. They should be encouraged to give explanations, drawing on science vocabulary and knowledge. They should be asked to identify any trend or pattern in results. Ask them why tests should be repeated, say, three times. This group could be challenged to investigate other questions such as, for example, whether larger snails can travel further in one minute.

## Talk about it!

Talk about how snails protect themselves from other animals that eat them. The main defence is the shell, but eyesight and sensitivity to vibrations means that they retreat into the shell when they are threatened.

You can extend this discussion by talking about how the predators (such as birds) are suited to their environment, including how their beaks help them to eat the snails.

## Common misunderstandings and misconceptions

- Learners may be confused because we have land and aquatic snails (pond snails, for example). Each organism is suited to its environment. Aquatic snails cannot survive on dry land and land snails cannot survive in water.
- Learners may think an animal lives in a place because this is its 'home' rather than a suitable habitat.

## Homework ideas

- Exercise 2.2 in the Activity Book.

## Answers to Learner's Book questions

- 1 When the environment is too dry, snails retreat into their shells.
- 2 A bird which eats snails will have good eyesight and a beak which enables it to pick up a snail and eat the snail. (Some birds smash the snail's shell on a stone.)

### Challenge

If the birds could not find an alternative food, they would starve to death.

## Answers to Activity Book exercise

### Exercise 2.2

- 1 under a log
- 2 because it was damp and cool
- 3 on the branch of a tree
- 4 because there is no food there, it is warm and dry, birds would eat them

## Answers to Worksheets

### Worksheet 2.2

Learners can refer to any habitat and say whether they feel it is suitable for snails. Suitable habitats will generally be cool, perhaps damp, and will provide places to shelter; for example, under stones, logs, old paving, etc.

## Topic 2.3 Animals in local habitats

This topic will allow learners to observe where local animals live, and how they are suited to that habitat. It shows learners that habitats are all around them, and that the animals living there depend on their habitats.

### Learning objectives

- Investigate how different animals are found in different habitats and are suited to the environment in which they are found.
- Collect evidence in a variety of contexts.
- Suggest questions that can be tested and make predictions; communicate these.
- Present results in drawings, bar charts and tables.
- Link evidence to scientific knowledge and understanding in some contexts.
- Identify simple trends and patterns in results and suggest explanations for these.

### Curriculum links

- This topic links to Geography because the areas you study as habitats form part of a larger landscape or townscape. Learners might consider the number of buildings in an area, and the effect this has on the number of plants and animals.

### Ideas for the lesson

- Emphasise the word 'habitat' as a place where an animal lives and finds all that it needs. For example, for a small beetle this might be in a corner of a garden, for a mouse this might be the whole school site, a frog's habitat might be a pond, and an eagle's habitat might be many miles of open land.
- On a simple plan of the school site, ask learners to sketch where they have observed animals. In Activity 2.3, learners need to go outside. Tell them to look for signs of animals. Encourage them to suggest and ask questions about living things and habitats. For example, why might an earthworm be found in this habitat?

- Learners might research the food of different animals. They should realise that this food must be found in a particular habitat. They can consider other animals observed in the local environment, and why these animals are well suited to the environment. They should compare three different local habitats. This work could be supported by Worksheet 2.3, which considers earthworms. In this worksheet, learners collect evidence. This could lead to other investigations about the needs of earthworms.
- Learners might use reference books and internet sites to research the needs of less familiar animals.
- Exercise 2.3 provides information about observations of dragonflies in a habitat. Learners are asked to read a bar chart and explain the results.

### Notes on practical activities

#### Activity 2.3

Each pair or group will need:

- an opportunity to observe different parts of the school site or a local environment
- a pencil and some paper for recording results.

This activity allows learners to observe common local animals or their habitats. Learners should look at the ground and what is on it, at plants including bushes and trees to see what habitats are afforded under leaves, in the crevices of bark, and under stones. This activity provides an opportunity for learners to collect evidence. They can also suggest questions that can be tested. For example, 'Will we find more earthworms under a stone or under a log?' Learners should review their observations and notes for any patterns. For example, did cool and/or damp conditions mean that more living things including animals were observed? They can link the evidence to their scientific knowledge and understanding about the needs of animals for shelter and food.

### Internet and ICT

- The website: [http://www.abpiscschools.org.uk/page/modules/human\\_animal\\_habitats/activity.cfm?coSiteNavigation\\_allTopic=1](http://www.abpiscschools.org.uk/page/modules/human_animal_habitats/activity.cfm?coSiteNavigation_allTopic=1) is



a simple habitats game based on several habitats. It could be used as an introduction or for assessment.

- The website: <http://switchzoo.com/games/habitatgame.htm> allows learners to select an animal and then a habitat to suit. This would encourage discussion in a lesson.

## Assessment

- Learners can peer-assess how well they carried out Activity 2.3. Did they suggest suitable questions to ask about the animals? Did they collect appropriate evidence? Are their results presented well? How clearly did they link evidence to their scientific knowledge and understanding?

## Differentiation

- Lower achieving learners will need to be given familiar examples of animals before moving on to others. Give this group adult support, resources and carefully sequenced tasks. Ensure that new language is used. For example, ask questions such as: 'Tell me about the habitat of a frog'.
- Higher achieving learners should be expected to consider a wider range of animals. They might consider the animal's behaviour as well as its body shape. For example, ants tend to run in random paths to confuse a bird which might try to eat them.

## Talk about it!

This is an opportunity to consider how populations affect one another in an environment. It is linked to the idea that animals are dependent on one another. Since many birds eat insects, you might expect the bird population to rise if more insects are in a garden. Another example of interdependence is found between frogs and insects. Frogs need to eat insects, but insects help to recycle the bodies of dead frogs.

## Common misunderstandings and misconceptions

- Some learners may think that some animals do not require a particular habitat. For example, pigeons may appear to be everywhere. It therefore appears that

they do not require a particular habitat. However, pigeons are well-adapted to many habitats. However, point out to learners that they won't survive in every habitat, for example, cold desert, underwater.

- Learners can confuse the terms 'home' and 'habitat'. Sometimes the word 'home' is used

in place of the term 'habitat'; at other times it refers to a nest or a den where the animals sleep.

## Homework ideas

- Ask learners to think about how they could help improve a local habitat for animals.
- Worksheet 2.3 or Exercise 2.3 both introduce another animal.

## Answers to Learner's Book questions

- 1 Learner's own answers.
- 2 Learner's answers depend on the habitat.

## Answers to Activity Book exercise

### Exercise 2.3

- 1 They increase.
- 2 It was cold.
- 3 Perhaps some dragonflies were eaten by other animals.  
Perhaps they could not find food.

## Answers to Worksheets

### Worksheet 2.3

- 1 Field 2 has rich soil, containing lots of food for the earthworms.
- 2 Field 3 is too wet (earthworms like to be moist but not wet).

Questions 3, 4 and 5 refer to digging for worms outside. Learners will write about what they find.

## Topic 2.4 Identification keys

This topic introduces the use of identification keys. It requires learners to observe animals carefully and to think about questions that divide sets into two.



## Unit 2 Teaching ideas

### Learning objectives

- Use simple identification keys.
- Make relevant observations and comparisons in a variety of contexts.
- Link evidence to scientific knowledge and understanding in some contexts.

### Curriculum links

- This topic links to Environmental Studies, in which we teach about the range and diversity of life.
- The idea of grouping and the construction of keys links to Mathematics where you might use an identification key to identify 3D shapes, 2D shapes, or coins.

### Ideas for the lesson

- Begin the lesson by reminding learners about the work that they did on grouping in Stage 3. You could give learners cut out pictures of animals and ask them to group them. The *Internet and ICT* section gives a link for a website that includes a sorting game.
- Revise keys with the learners. Lay out questions on cards or posters on the classroom floor. Move a picture or model of an animal from question to question.
- In Activity 2.4, learners are asked to produce their own key to help them to identify a tiger, a shark, a duck and a goat.
- Worksheet 2.4 provides another opportunity for learners to produce an identification key. It can be used to extend Activity 2.4.
- Exercise 2.4 asks learners to complete a key to identify birds.
- Identification keys are sometimes called branching keys. Can learners say why they are given this name?

### Notes on practical activities

#### Activity 2.4

Each pair or group will need:

- a large sheet of paper
- a pencil.

Learners are asked to draw an identification key that will help them to identify a tiger, a shark, a duck and a goat. The first question could be 'Does it live in or on water?'. This separates the tiger and the goat from the shark and the duck. The duck and the shark can be separated by the question 'Can it live on land?'. The tiger and the goat can be separated by the question 'Does it give us milk?'. Learners may suggest other questions. You may need to prompt lower achieving learners to think of suitable questions by asking about obvious characteristics such as where the animal lives. This activity can be extended using Worksheet 2.4, which is particularly suitable for higher achieving learners.

### Internet and ICT

- This website: [http://primary.naace.co.uk/activities/sorting\\_games/index.htm](http://primary.naace.co.uk/activities/sorting_games/index.htm) has a sorting game. There are two versions. These are 'play a game' (easier) and 'make a game' (harder).
- Learners might set out a key using boxes, questions and arrows using the 'What am I?' game at: <http://www.teachingandlearningresources.co.uk/whatami06.shtml>.
- The website: <http://www.crickweb.co.uk/ks2science.htmlhabitats4b> has a simple sorting activity.

### Assessment

- Learners can self-assess their keys from Activity 2.4 by seeing how easy it is for other learners to identify the animals using their questions.

### Differentiation

- Lower achieving learners need concrete and visual props in grouping and sorting games. Exercise 2.4 in the Activity Book is particularly suitable for this group of learners.
- Higher achieving learners could be asked to add familiar animals to an existing key. Expect them to work more on their own. Worksheet 2.4 is particularly suitable for this group of learners.

### Talk about it!

Talk about the hundreds of thousands of different animals that exist. Explain how we can identify large groups, like insects, within these animals. Within the insects group, there are smaller groups. Scientists construct keys for these smaller groups because it would be very complicated and confusing to write one key for all animals.

You should mention that keys are also used to identify plants.

### Common misunderstandings and misconceptions

- Some learners may find it difficult to understand how every animal and plant discovered has been placed in an identification key. However, new animals and plants are still being discovered and added to identification keys.

### Homework ideas

- Exercise 2.4 in the Activity Book.
- Worksheet 2.4.

### Answers to Learner's Book questions

- 1 Identification keys help us to identify animals.
- 2 yes or no
- 3 Does it have long ears?
- 4 Humans and cats are mammals. Other groups include reptiles and insects.

### Answers to Activity Book exercise

(answers filling in boxes from left to right in order)

swan duck stork swift eagle

### Answers to Worksheets

#### Worksheet 2.4

Correct responses may vary as learners can suggest different questions. Questions should divide the animals.

### Topic 2.5 Identifying invertebrates

This topic is more challenging than the previous topic as the animals are less familiar. More careful observation will be required. Learners will have opportunities to use keys in different formats.

### Learning objectives

- Use simple identification keys.
- Make relevant observations and comparisons in a variety of contexts.
- Link evidence to scientific knowledge and understanding in some contexts.

### Curriculum links

- This topic links to Environmental Studies.
- The construction of keys also links to Mathematics.

### Ideas for the lesson

- Make sure that you define an invertebrate as an animal without a backbone, for example, ant, snail, butterfly, etc. Bring a collection of invertebrates into class. Allow the learners to observe them carefully. Learners should handle invertebrates with great care, usually with a thin strip of paper. Activity 2.5a gives learners the opportunity to collect and observe invertebrates. They should make relevant observations and compare the invertebrates found in different locations.
- Activity 2.5b links learners' knowledge of invertebrates with their earlier knowledge about habitats. They are asked to build a 'hotel' for invertebrates.
- Exercise 2.5 is an exercise in completing a key for invertebrates and would consolidate the learning from this topic.
- Worksheet 2.5 is an example of a key in a different format to the ones learners have met. It would be suitable for higher achieving learners.

## Notes on practical activities

### Activity 2.5a

Each pair or group will need:

- a tray
- some damp leaf material to shelter the animals
- a magnifying glass
- a pooter
- a little water to keep animal moist but not wet.

Learners should begin by predicting where they will find invertebrates. They should then collect invertebrates from each place using a pooter. Teach them to use the pooters. First check that the pooter is clean and that they are going to suck on the correct tube. They should suck gently and take care not to crush the animal with the tube. They will be able to observe the invertebrates. Focus the learners' attention on the main features of the animals: body parts, segments, legs, antennae, colour, etc. Ask them to record their observation in sketches and notes. Encourage them to suggest questions that they could ask about the animals.

### Activity 2.5b

Each pair or group will need:

- small rocks
- stones
- bricks
- sticks
- bamboo canes
- small logs
- short wooden planks
- small wooden boxes
- cardboard
- soil.

This activity provides the opportunity to work outside (although it can be done indoors). Learners are asked to design a habitat for insects. It can be done as a paper exercise, but the Learner's Book suggests making a real habitat which can then be observed every few days. Learners might plan their care of the hotel and the observations they will make following up its construction. They might make several hotel habitats in different spots on the site. They could then make relevant observations about the number and type of invertebrates in each location and make comparisons. They could link the evidence to their understanding of invertebrates and habitats.

## Internet and ICT

- The website: <http://www.teachingandlearningresources.co.uk/key.shtml> shows the simple use of a key.
- The website: <http://rogerfrost.com/animaltree/index.htm> shows the straightforward game 'Think of an animal'. Learners have to think about questions and answers which lead to an animal. They are, in a simple way, teaching the computer.
- You might ask learners to make a key to identify popular characters, for example, the characters from Monsters Inc. ([http://pixar.wikia.com/Category:Monsters,\\_Inc.\\_Characters](http://pixar.wikia.com/Category:Monsters,_Inc._Characters)).
- Use questions about number of eyes, number of legs etc.
- You might introduce a key for rocks such as the one found at: <http://www.bwctc.northants.sch.uk/Learning/Science/Rocks/Key.aspx>.

## Assessment

- Learners can self-assess their work using these criteria:
  - I can identify an animal using a simple identification key.*
  - I can add an animal to a simple key.*

## Differentiation

- Lower achieving learners will benefit from visual props when using keys. Sketch the key out on a poster so that they can move model animals, pictures or labels around the key.
- Higher achieving learners can be challenged by moving to more complex keys, by asking them to add familiar animals to an existing key and by introducing different styles of key. For example, the one on Worksheet 2.5.

## Talk about it!

Questions will ask about the number of wings, the number of legs, and whether it can fly.

## Common misunderstandings and misconceptions

- Some learners find keys rather abstract and therefore difficult.



- Some learners have difficulty constructing questions to which the answer is just yes or no.

### Homework ideas

- Exercise 2.5 in the Activity Book.

### Answers to Learner's Book questions

- 1 An animal with six legs.
- 2 The grouping for animals will depend on the criteria used. For example, if one criterion is 'Has it got fur?' this group will include a bear but not include a whale. If the criterion is 'Is it a mammal?' then this group will include both a bear and a whale.
- 3 Animals do not generally know what group they are in. The exception is humans.

### Answers to Activity Book exercise

(Answers filling in boxes from left to right in order.)

ladybird      butterfly      dragonfly      bee  
centipede      worm

### Answers to Worksheets

Learner's own questions and answers. Check that they are sensible and work as a key.

## Topic 2.6 How we affect the environment

This topic gives learners the opportunity to talk about the ways that people affect the environment. It begins with a description of harm caused by human activity. Learners are then asked to think about how they can reduce this damage.

### Learning objectives

- Recognise ways that people affect the environment, for example, river pollution, recycling waste.
- Link evidence to scientific knowledge and understanding in some contexts.
- Present results in drawings, bar charts and tables.

### Curriculum links

- This links to Environmental Studies. Learners might look for ways to help the environment and persuade others to care for it.
- Our relationship with the world and its living things is an important part of Personal and Social Education. Learners might think about how we help animals and other people.

### Ideas for the lesson

- Discuss how people affect the Earth. Make sure that you make the distinction between natural disasters, such as earthquakes, and man-made disasters, such as oil spills.
- Take the class on a litter hunt. Note that, to pick up litter, learners should wear protective gloves. Ask them what the area where you carried out the litter hunt looked like before people arrived. This should lead to a useful discussion about the ways that people affect the environment.
- In Activity 2.6, learners are asked to look around your school and local community. They should look for things that could damage the environment. The Learner's Book gives some starting points for this.
- Learners might research other ways in which the environment is affected by people. You may need to prompt with vehicles, factories, homes, farms, fishing, etc.
- Exercise 2.6 in the Activity Book illustrates ways in which people affect the environment and should be used as consolidation of this topic.

### Notes on practical activities

#### Activity 2.6

Each pair or group will need:

- paper
- pencils
- colouring pens.

This activity shifts the focus to the immediate area and actions that could be taken to reduce negative effects of people's activity. Learners might be asked to sketch food waste from a kitchen, or to sketch ways for dealing with this, for example, posters to encourage learners to eat all the food on the plate, or keeping chickens



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to eat scraps. Encourage learners to alter their behaviour, for example, by not dropping litter and by switching off lights. They could write to the manager of a local factory to suggest changes which would help the environment.

## Internet and ICT

- Take and use digital photographs during the activities.
- The website: <http://www.rainforestfoundationuk.org/congojones> has a simple game about protecting the rainforest, which might help to initiate discussion.
- The website: [http://www.endangeredspeciesinternational.org/?gclid=CJqt\\_Nrl27QCFebLtAodNS0Alw](http://www.endangeredspeciesinternational.org/?gclid=CJqt_Nrl27QCFebLtAodNS0Alw) will help learners to find out about environmental campaigns. Learners might get ideas for actions they might take to protect animals and habitats.
- The website: <http://www.eco-schools.org/> gives details of an Eco-schools awards scheme. Your class might suggest to the school principal that this might lead to a useful award for the school.
- The website: <http://www.chooseclimate.org/flying/mf.html> calculates the pollution caused by any flight. Learners might consider the environmental impact of a holiday flight for a family.

## Assessment

- Learners can self-assess how well they have met the objectives of this topic using the following statements:  
*I can talk about ways that people affect the environment.*  
*I can talk about negative effects.*  
*I can talk about positive effects.*

## Differentiation

- Lower achieving learners will benefit from examples, from demonstrations of activities, from breaking activities into steps, and from prompts and vocabulary lists. Exercise 2.6 provides support that should encourage talking. Ensure that this group gets opportunities to contribute, and look out for learners who perform better than you expect.

- Challenge higher achieving learners to give a range of effects of people on the environment and to explain these. Give them opportunity to lead and support others in the class. Expect them to research ideas and to give explanations.

## Talk about it!

Encourage the learners to appreciate that, if we all change our behaviour and ideas, we have a large combined effect. This is often seen when our friends and family copy us.

## Common misunderstandings and misconceptions

- Individuals will often think that they are powerless as the problems look so big.
- Some learners may think that all the problems are caused by other people and not by themselves. Television is an example to give. In fact, a television set has quite an impact on the environment. The factories that make televisions may make pollution and the lorries and ships that transport televisions pollute the air and the sea. The electricity we use when watching television is often made in power stations that also pollute the air.

## Homework ideas

- Ask learners to list waste that their home creates.
- Exercise 2.6 in the Activity Book.

## Answers to Learner's Book questions

- 1 There are no human activities that do not affect the environment. Some can be good but many are harmful for the environment.
- 2 Learner's own ideas.
- 3 A natural disaster is one that occurs in nature, for example, an earthquake, a tidal wave. A natural disaster is different to a man-made disaster.

## Answers to Activity Book exercise

### Exercise 2.6

Learners should talk about ways to reduce air,

water and land pollution. For example, reducing smoke from chimneys, cutting down fewer trees. Focus on all the harmful activities shown in the picture.

## Topic 2.7 Wonderful water

This topic provides an opportunity to consider the effects of people on a river. This shows how clean fresh water can be polluted in different ways.

### Learning objectives

- Recognise ways that human activity affects the environment: for example, river pollution, recycling waste.
- Make relevant observations and comparisons in a variety of contexts.
- Choose apparatus and decide what to measure.
- Test an idea or prediction based on scientific knowledge and understanding.
- Explain what the evidence shows and whether it supports predictions. Communicate these clearly to others.
- Link evidence to scientific knowledge and understanding in some contexts.
- Ask the learners to list animals and plants that need fresh water. They should soon realise that all living things need fresh water.
- Ask learners if they have seen examples of water pollution. Ask them what happens to waste water from home. What happens to waste water from school?
- By completing Activity 2.7a, learners can discuss the benefits of the clean water in a river and the damaging effects people can have on a river. Examples such as direct pollution can be given. Others, such as the damming of rivers, often appear to have little effect, but dam construction can kill huge numbers of animals and plants.
- Activity 2.7b shows that water can be made cleaner. You should point out that the water company has additional water cleaning methods that are needed before water can be drunk by humans. Water may look clean but still contain pollution such as germs or polluting chemicals.
- Exercise 2.7 gives data from a stream survey and allows learners to think about what the data show and how pollution has influenced the data.
- You could take to class to visit a water/ sewage treatment works or invite a worker to talk about the works.

### Curriculum links

- This links to Environmental Studies. The impact of water on habitats is massive. Ask learners to consider a local habitat which suddenly had 50% or 100% less water. What might happen to animals and plants?
- This topic also links to Geography. In Geography the impact of water on the landscape is dramatic. They might see this locally in lakes ponds and rivers. They might study other world rivers such as the Colorado in the USA, which has carved out the Grand Canyon.
- You could visit a local river or pond, perhaps with a naturalist, and do some pond dipping activities to observe the rich life supported by clean water. Take full safety precautions and make sure that learners wash their hands thoroughly afterwards.
- You could establish an aquarium in class with freshwater pond life. Return the organisms to the pond after a few days.
- Seal a sample of dirty water in a container and leave it to settle for several days. Observe any changes but note that pollution is often invisible.

### Ideas for the lesson

- Ask learners about all the ways we use water. You might use Worksheet 2.7 to illustrate how much clean water we need. Learners can research the amount of water used by people in different countries (in the USA people use much more water than in other countries).

### Notes on practical activities

#### Activity 2.7a

Each pair or group will need:

- large sheets of paper
- pens
- colouring materials.

## Unit 2 Teaching ideas

This activity will allow group work and talking about the features of the river at different points along its path. It might be based on a local river, or features observed in books or on websites. Learners can include rapids, waterfalls and other features. The focus is on outfall into the river. Remember that people and animals drink the water, and farmers use it for irrigation of crops.

### Activity 2.7b

Each pair or group will need:

- some beakers
- a funnel
- some filter paper
- some tap water
- some sand
- a stick for stirring.



Remind the learners not to drink the water in this test.

Learners should observe some fresh, clean tap water. They should stir in some clean sand to pollute the water. Learners should make a note of how the water has changed (it will have gone cloudy). Learners use a funnel and filter paper to filter the sand from the water. They should collect the water from the funnel in a container. This is an opportunity to cover most aspects of scientific enquiry. Ensure that the learners devise a question that they can answer with a test, make a prediction, select how to use the equipment, make observations, repeat the test to check it is reliable and explain what has happened. Increase the challenge by adding other 'pollutants' to water, for example, coffee, milk, salt and oil.

### Internet and ICT

- The website: [http://www.wateraid.org/uk/what\\_we\\_do/the\\_need/207.asp?gclid=COSwy5TT27QCFePHtAodqQEAMQ](http://www.wateraid.org/uk/what_we_do/the_need/207.asp?gclid=COSwy5TT27QCFePHtAodqQEAMQ) gives examples of how some families source unclean water.
- The website: <http://video.nationalgeographic.co.uk/video/environment/environmental-threats-environment/water-pollution> is a short video about water pollution, 'Why care about water?'.

### Assessment

- Learners can peer-assess the outcomes of the activities by saying two things they like about what has been done and one thing that could have been done better. They should explain how this one thing could have been done better.

### Differentiation

- Lower achieving learners can be given prompts for what to do next in activities. You could also give them cards with the vocabulary for this topic. Be prepared to give step-by-step instructions for Activity 2.7b. Prompt with open questions. For example, 'How will you record results?'. Ensure that learners are clear about what the results mean.
- Challenge higher achieving learners to design their own on-screen river for Activity 2.7a (if you have internet access). When filtering water, ask this group to design their own fair tests for a range of pollutants such as sand, flour, tea, etc. Increase the challenge by testing other pollutants, for example, gravel, milk, etc.

### Talk about it!

Start this discussion by talking about the many people worldwide who can't go to a shop and buy cola or water. What are the effects of drinking dirty water? What would be the future for a group of learners in such a place?

### Common misunderstandings and misconceptions

- Many children and adults take clean water and sanitation for granted. However, you can point out that one in eight people don't have safe water. One child dies every 17 seconds because they don't have safe water. 4000 children die each day from diarrhoea caused by dirty drinking water.

### Homework ideas

- Ask family members about all the uses they make of fresh water.



## Answers to Learner's Book questions

- 1 Pollution of rivers is caused by the spilling of dangerous materials into the river. This poisons the life in the river.
- 2 They may get sick, they may not have young or they may die.
- 3 They will get sick and they may die.

## Answers to Activity Book exercise

### Exercise 2.7

- 1 most near the forest, fewest near the factory
- 2 snail and beetle
- 3 There is not enough food for the fish.
- 4 Actions to clean the stream: find out what is polluting the stream at the shops and the factory; talk to the factory owner and shopkeepers to reduce the pollution in the stream.

## Answers to Worksheets

### Worksheet 2.7

In the bubbles around the girl are suggestions about the amounts of water used. These are guesses so reasonable amounts should be accepted. For example:

drinks four to eight litres per day

water in food one to two litres per day

water used for washing four to 50 litres per day

water used for the toilet 20 to 60 litres per day

water used for washing clothes five to 40 litres per day

and any other water she might need

water for pets one litre per day

water for plants one to 10 litres per day

water of sports, for example, swimming 100s litres per day

## Topic 2.8 Recycling can save the Earth!

This topic provides an opportunity for learners to consider the waste that they and others make, and how we might deal with it in a way which will protect the Earth. They will need time to talk and think about the many aspects of our

lives that produce waste, and how that waste can be reduced or recycled and reused.

## Learning objectives

- Recognise ways that human activity affects the environment: for example, river pollution, recycling waste.
- Collect evidence from different contexts.
- Make relevant observations and comparisons in a variety of contexts.
- Test an idea or prediction based on scientific knowledge and understanding.
- Choose apparatus and decide what to measure.
- Present results in drawings, bar charts and tables.
- Explain what the evidence shows and whether it supports predictions. Communicate these clearly to others.
- Link evidence to scientific knowledge and understanding in some contexts.

## Curriculum links

- This work links strongly to Environmental Studies.
- It links to aspects of Personal, Social and Health Education.
- Both subjects stress that we have to accept responsibility for the effect we have on the Earth. Learners can consider the effects of pollution on animals, plants and on humans. They might learn about global warming and how it affects their country.

## Ideas for the lesson

- Begin the lesson by asking learners to draw a home with arrows pointing in and labelled with things we use, for example, water, energy, food, fabrics, paper, etc. Outward arrows can be labelled with waste products, for example, heat, light, food waste, water waste, human waste, etc.
- Introduce the terms 'reuse' and 'recycle' with examples from school. For example, what happens to all the school's paper waste? Ask learners to talk about any recycling they do or have seen. Exercise 2.8

## Unit 2 Teaching ideas

will reinforce ideas about materials being reused and recycled.

- You might talk about and/or research landfill where we bury millions of tonnes of valuable materials. This causes pollution of air, water and land.
- Explain that one form of recycling is to compost plant materials in a compost heap. Activity 2.8a provides an opportunity for learners to make a mini compost heap. In the classroom, you might seal bread in a see-through airtight container, and ask learners to observe how mould begins the decay of the bread. Learners must not take the bread out of the container.
- Activity 2.8b deals with plastic waste and its effects on sea life. Ask learners to explain why plastic waste is so common and why it is often not recycled. (You may need to point out that many plastic items can be recycled but some cannot.)
- Ask the class to discuss materials in school which are, or could be, recycled. Encourage them to plan and take action in their class, in their school and in their lives. Try to model these behaviours yourself.
- Introduce the three Rs: Reduce, Reuse, Recycle. Learners might suggest ways that they could use fewer materials. For example, not waste water, reuse objects and materials (using waste water on outdoor plants) and recycling paper.
- Learners might draw a pathway for paper from a tree, through felling and the pulp mill, to the book manufacturer, to school, to recycling at the pulp mill and round again. Explain that this saves money and trees.
- Learners can make items from used materials and objects. For example, they might make pencil pots from used plastic water bottles.
- Explain what we mean by ground water and that much of this water is drunk by us or by our animals, which we then eat.

## Notes on practical activities

### Activity 2.8a

Each pair or group will need:

- plastic gloves
- leaves
- stems

- an apple core
- a plastic bag or jar with a lid.



As the decaying materials will give off mould spores, keep the containers sealed. Do not allow people to breathe in mould spores.

In this activity, learners make a mini compost heap in a sealable plastic bag or jar. After adding a little water and sealing the container, they will observe changes over the following days. The apple core and leaves will change the most as they dry and begin to decay. Talk about the role of micro-organisms and how these recycle materials from dead plants and animals.

### Activity 2.8b

Each pair or group will need:

- access to books about pollution
- access to the internet.

Learners need to research the effects of plastic waste on marine life and, ultimately, on people. Plastic is made from oil, so learners should also look for information about the pollution caused by oil spills. To get the best out of this activity, include time for learners to discuss this. For example, large companies make money selling fizzy drinks and sea life is suffering from the waste. Should these companies do more? Can the learners write to them? A lot of waste is discarded as litter, but this is something we can reduce.

### Internet and ICT

- The website: <http://kidsforsavingearth.org/index.html> gives activities for learners including composting.
- The website: [http://www.runnymede.gov.uk/portal/site/recycling/Kids\\_learn\\_recycling/](http://www.runnymede.gov.uk/portal/site/recycling/Kids_learn_recycling/) gives activities and information for learners.
- The website: <http://www.sciencekids.co.nz/recycling.html> includes an animated recycling game.
- The website: <http://www.oilierecycles.com/uk/html/recycle.html> has information of recycling specific materials and includes a recycling movie and song.