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Moving and growing

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Peter Riley

Curriculum Visions

A CVP Teacher's Resources
Interactive PDF

First published in 2002

ISBN 978 1 86214 759 1

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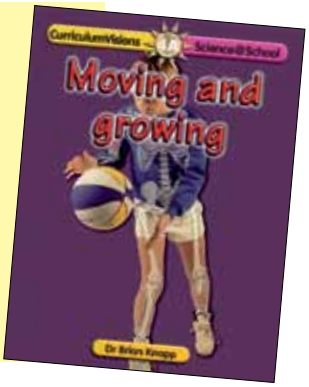
Designed and produced by
Atlantic Europe Publishing Limited

Contents

Section 1: Resources

Welcome to the Teacher's Resources for *Moving and growing*. The resources we provide are in a number of media:

1 The Moving and growing pupil book is the full-colour paperback book that introduces the principles of moving and growing, and examines the way the shape and construction of the skeleton affects the rest of the body – all in simple, easy-to-follow units making it accessible to a wide range of abilities.



3 You can buy various Science @School sets, for example Year 3 set, KS2 class book set, KS2 TG set or the complete Book Box set.

2 Our Learning Centre at

www.curriculumvisions.com

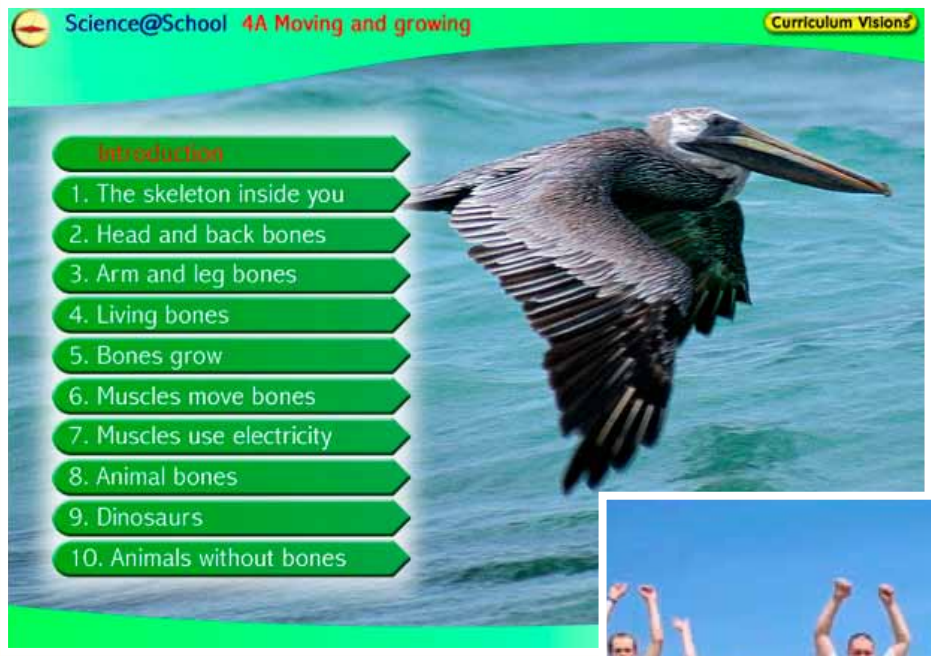
has almost everything you need to teach your primary curriculum in one convenient Virtual Learning Environment.

You can use support videos, e-books, picture and video galleries, plus additional Creative Topic books, graphic books called Storyboards, and workbooks. Together they cover all major curriculum areas.

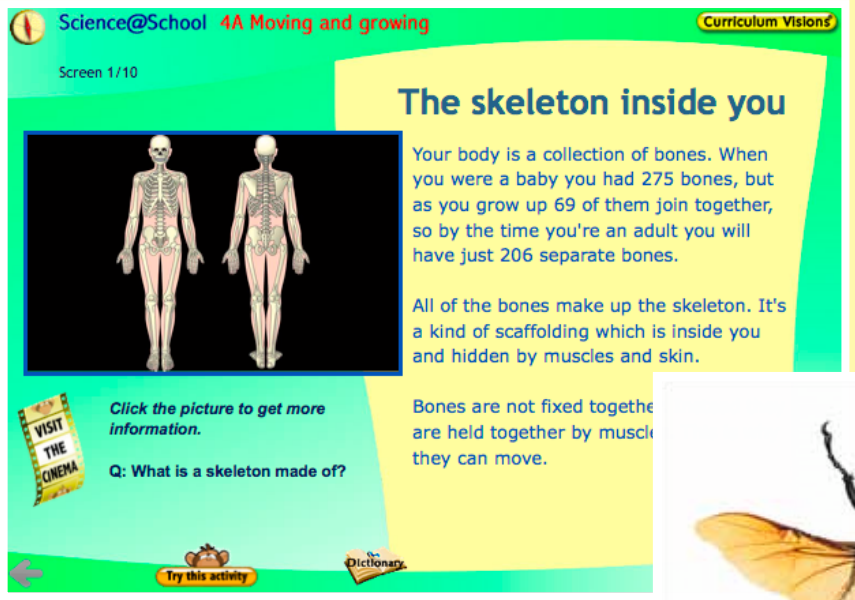
All topics are easily accessible, and there is a built-in context search across all media.

You can also use our printed student books online as part of your subscription to the Learning Centre. There page-turning versions of every printed Curriculum Visions book for use on your whiteboard.

▼ The Moving and growing home screen



▲ 'Classroom cinema' video

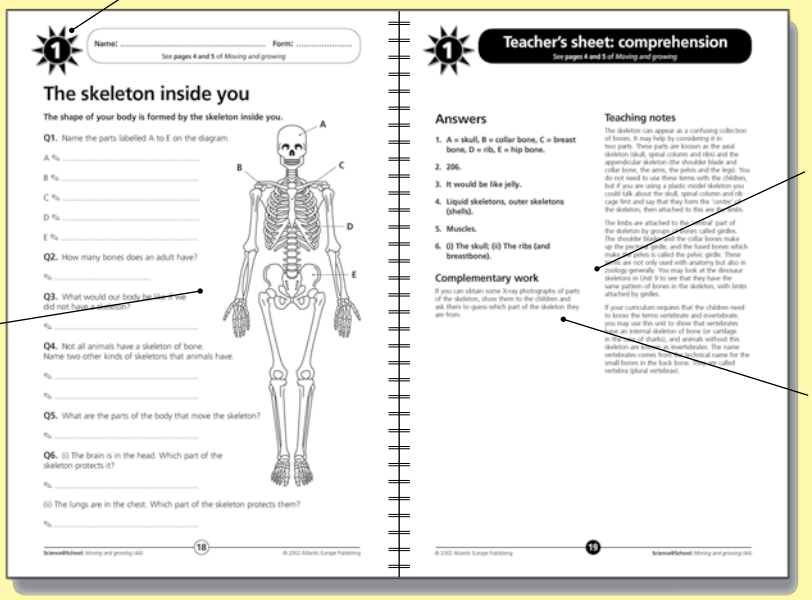


▲ Web site page

▶ Web site caption

▼ ***Each unit has one comprehension worksheet and one activity worksheet, each with a teacher's sheet.***

▶ ***The photocopiable comprehension worksheet and supporting teacher's sheet.***

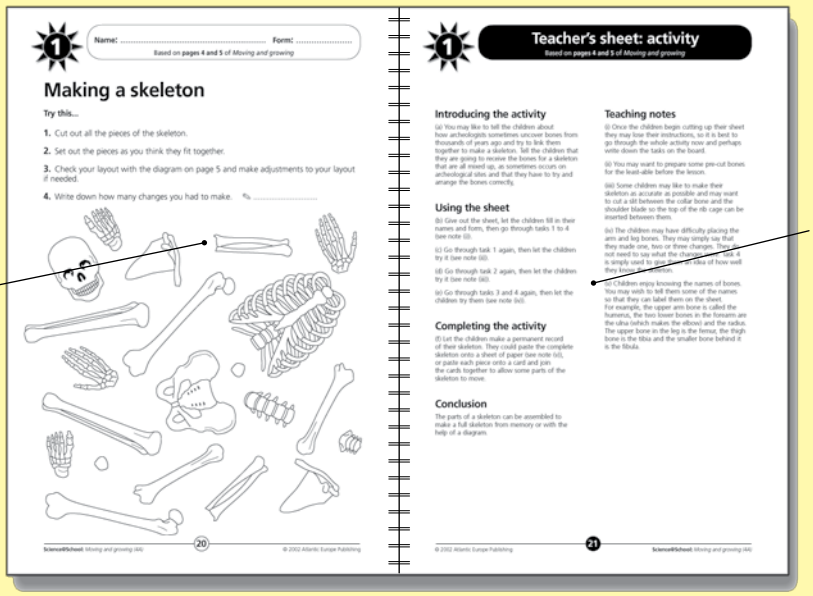


Left hand page is to photocopy and hand out to pupils.

Right hand page is the teacher's sheet and provides answers, suggestions for complementary work and teaching notes.

Resources needed to support the complementary work are shown in List 2 on page 15 of this Teacher's Guide.

▶ ***The photocopiable activity worksheet and supporting teacher's sheet.***



Left hand page is to photocopy and hand out to pupils. For some activities, pupils will also require additional sheets of paper.

Right hand page is the teacher's sheet and provides a detailed activity plan, conclusion and teaching notes. *Resources needed to support the activity worksheet are shown in List 3 on page 15 of this Teacher's Guide.*

Matching the curriculum

This book covers the moving and growing component of the curriculum in a way that is highly relevant to work in the lower junior classes at primary school. It complements the work done in *3A Food, teeth and eating* and provides a firm foundation for further work on body structures in *5A Keeping healthy*, *5B Life cycles* and *6A Adapting and surviving*. The book provides a wealth of information about the human skeleton, and also looks at how the bones are connected through joints and the role of ligaments and cartilage.

While covering the subject matter of the curriculum, *Moving and growing* also facilitates the development of investigative skills both in the pupil book and the *Teacher's Guide*.

The pack is fundamentally built around the idea that bone is a living material inside the body which provides a framework to support the body, protect some of its parts and facilitate movement.

Section 2: The pupil book explained unit by unit

Although the pupil book – *Moving and growing* – is clear and simple, a great deal of care and thought has been given to the structure and the content of each double page spread or unit. The worksheets and activities in this *Teacher's Guide* also link directly to the pages in *Moving and growing*.

It is possible to use *Moving and growing*, and the worksheets and activities, without reading this section, but we would strongly recommend that you take a short time to familiarise yourself with the construction of the pupil book.

The units are arranged in sequence, to help you with your lesson planning. In this section, a brief description of the content of each unit is given, together with hints on how to start or support it. List 1 (Starting a unit with a demonstration) on page 15 sets out the resources that you could use to do the demonstrations where suggested. The activity associated with each unit is also briefly described to help you see how the unit and activity work together.

Title page

The book begins on the title page (page 1). Here you will find information about science and technology in the form of a clock. You may want to use this to set the scene for the study of the book's contents. You may choose to focus on an event which ties in with your work in history, before moving onto the rest of the book. Alternatively, you may wish to skip over this page and return to it later. It is not a core part of the book, but helps the children see how the work they are doing now fits in with the work of scientists and engineers in the past. It may also be used to stimulate more able pupils to research the people and events that are described here.

A time clock giving additional historical information about the topic.

This picture shows the skeletons of *Stegosaurus* and *Tyrannosaurus*.

Word list and contents

The core content of the book begins with a word list on page 2. This is a glossary, brought to the front for the pupils' attention. Pupils could be encouraged to look at the list and see how many of the words they already recognise.

One of the important things about science is the precision with which words are used. However, many scientific words are also common words, often used in a slightly different way from how they would be used in science. The word list presents the opportunity for pupils to consider the words they already know, and the meanings they are familiar with.

When your teaching unit has been completed, you may want to invite pupils to revisit this list and see if their understanding of the words has been enhanced or changed in any way. A visual dictionary is also given on the CD.

The entire contents are shown on page 3. It shows that the book is organised into double page spreads. Each double page spread covers one unit.

The units

Heading and introduction

Each unit has a heading, below which is an introductory sentence that sets the scene and draws out the most important theme of the unit.

Body

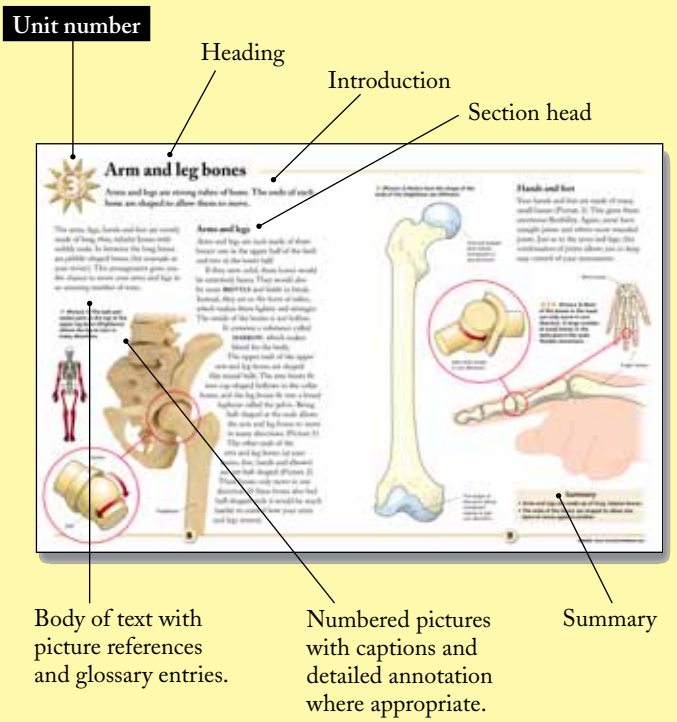
The main text of the page then follows in a straightforward, easy-to-follow, double column format.

Words highlighted in bold capitals in the pupil book are defined in the word list on page 2. A visual dictionary is also given on the CD.

The glossary words are highlighted on the first page on which they occur. They may be highlighted again on subsequent pages if they are regarded as particularly important to that unit.

Summary

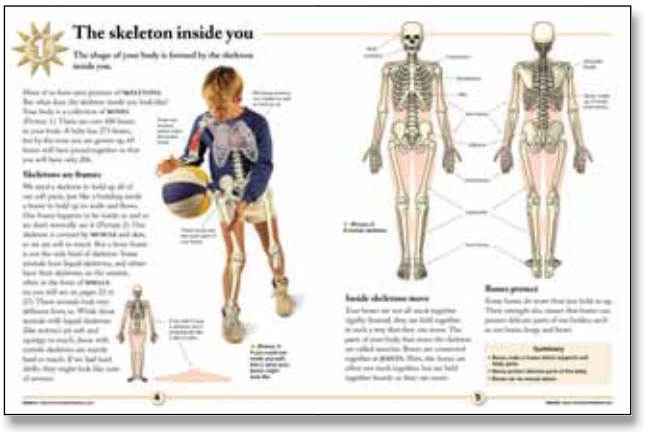
Each unit concludes with a summary, highlighting and reinforcing the main teaching objectives of the unit.



1 The skeleton inside you

You may like to begin by showing the class a pile of blocks and a lightweight cloth about the size of a tea towel. Tell the children that you would like to support the cloth so that it stands up, and ask them how they could use the blocks to do this. Steer the discussion into building columns of blocks close together so that the cloth could be hung over them. Let a group of children make the towers, then carefully lower the cloth over them. Tell the class that the blocks are behaving a little like the bones in your body. They are giving support to the cloth just as your bones give support to your body. Ask the class what would happen if the columns were removed, then let a child knock the columns down. Ask the children how they think they would look without a skeleton and turn to page 4 for the answer.

The unit opens with an intriguing illustration showing how the skeleton might look inside a boy playing basketball. The text describes how the 275 bones of a baby become 206 bones in an adult, then moves on to discuss how skeletons form a supporting framework. This is illustrated by showing how a human body would look without a skeleton.



The concepts of a liquid skeleton and an outer skeleton are introduced in preparation for Unit 10. The unit ends by considering how the skeleton helps provide for movement and protection, and muscles are introduced in readiness for Unit 6.

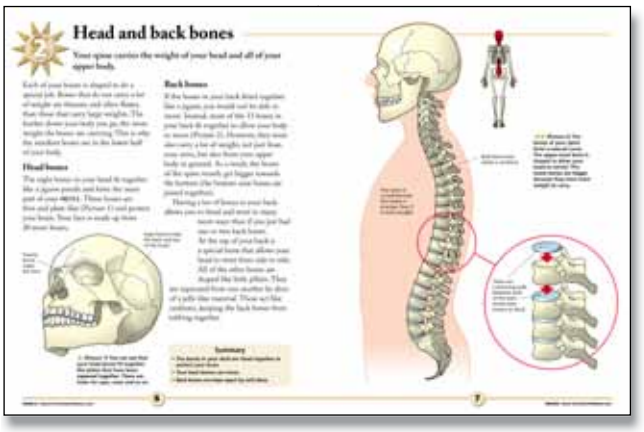
In the complementary work, the children could examine X-ray photographs. In the activity, the children assemble a paper skeleton.

2 Head and back bones

Tell the children that they can nod their heads because of the way the skull forms a joint with the top bone of the spinal column. Ask the children to try and move their heads as if they did not have this joint. Tell the children they also have a pivot joint which allows them to turn their skulls from side to side. Ask them to try and move their heads as if they did not have this pivot. Finally let each child feel their own backbone by bending slightly forward and rubbing their thumb down the middle of their back.

This unit follows on from Unit 1 by taking a closer look at the 'central' part of the skeleton. It deals with the main supporting structure and paves the way for the study of the limbs in the next unit.

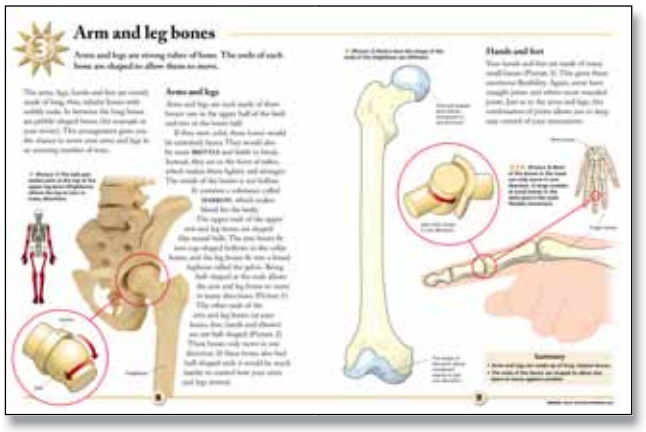
The unit begins by making the important statement that each bone is shaped to do a special job, and goes on to explain why the sturdiest bones are found in the lower half of the body. A fine illustration of the skull is accompanied by text which describes how the face is made from 20 bones while the brain is enclosed in a case made up of eight bones. The text moves on to describe the structure of the backbone



in detail, and this is accompanied by illustrations showing the front and side view of the spinal column, the arrangement of the pivot at the top of the spine and the discs between the back bones that prevent them rubbing together.

In the complementary work, the children could measure the size of their skulls and make charts from their data. In the activity, the children make model spines and measure how well they bend.

3 Arm and leg bones

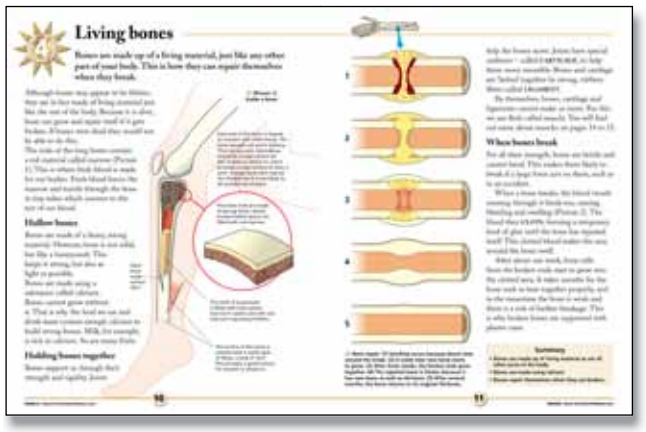


You may like to begin by asking the children to feel the bones in their fingers, then the palm of their hand, and ask them to describe what they feel. They should say that they feel short, hard objects under the skin, which are bones, and that the bones in the palm of the hand are more difficult to feel. Now ask them to feel the bones in their lower and upper arm. They should say they can feel two bones in the lower arm and one in the upper arm. Tell the children that the places where the bones meet are called joints, and that they allow movement. Now ask the children to straighten their fingers and arms and hold them straight as if they had no joints in them. Ask the children how it would affect them if they had no limb joints. This will help them realise how important joints are.

This unit builds on the study of the 'central' part of the skeleton in the previous unit by considering the structure of the limbs. It begins by introducing the limbs as made from long, thin bones in the arms and legs, and pebble-like bones in the wrists and ankles. The text moves on to explain how the structure of bones makes them both strong and lightweight, then looks at how the ball and socket joint and hinge joint provide movement. This section is illustrated with large, clear diagrams to show how the bones move in the joints. The unit ends by considering the arrangement of the bones in the wrist and the flexibility this gives the hand.

In the complementary work, the children investigate their skeletons. In the activity, the children plan and carry out an investigation linking leg length to the length of stride.

4 Living bones



Before this lesson you may like to prepare some chicken bones by following your school's policy on the preparation of animal material. Remind the children of their work on healthy eating, and ask them if there were any special foods that they must eat to help their bones grow. You may also ask them what they know about calcium, and then tell them you are going to find out what happens if a bone does not have enough calcium in it. Take one chicken bone and place it in some vinegar. Place a second chicken bone in an empty jar, or on a plate. Return to the bones during the study of this unit and let the children compare them by tapping them both with a fork. They should find that the bone in vinegar becomes softer. Tell the children that the vinegar removes calcium and that bones only have calcium in them because they are living parts of the body and take up the calcium that we eat in our food.

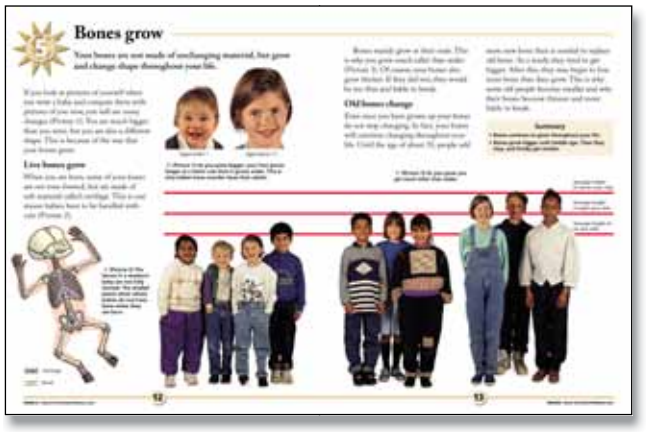
This unit builds on the previous unit by taking a look inside bones, and letting the children discover that bones are living parts of the body. This may come as a surprise to them, as skeletons are not usually associated with life. The honeycomb structure and the marrow inside the bones are clearly described and illustrated. The relationship between bone, cartilage and ligaments is explained, and the unit ends by considering the changes that take place when a bone breaks and is repaired by the body.

In the complementary work, the children can find out the weight of their skeletons. In the activity, the children examine the structure and strength of bones.

5 Bones grow

Before the lesson, collect baby photographs of six members of staff. They should include office staff, dinner ladies, classroom assistants, caretakers and cleaners. Put the photographs on display and challenge the children to identify them. The children should write down their answers, and when they have finished you should identify the photographs for them. Do not develop this activity further, as this is done in *5B Life cycles*. The children should describe how, even though the shape of the face changes as a person grows older, some features such as the shape of the eye or the nose may remain similar.

This unit extends the concept of living bone by considering how bones grow and change throughout life, and how these changes affect the shape of the body. The unit opens by inviting the reader to look at their baby photographs and compare the structure of their baby faces, with the structure of their face now. An illustration shows how the skeleton of a newborn baby is made from large amounts of cartilage, then the text moves on to describe how bones grow. The change in head and body shape



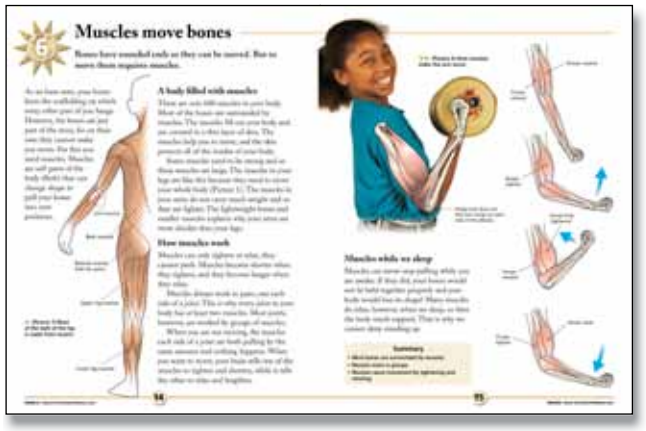
can be seen in the photographs of three groups of children aged six, eight and eleven. The unit ends by describing how bones change as people become older, and explains why old people have a greater risk of breaking their bones.

In the complementary work, the children could find out about shoes and foot care. In the activity, the children plan and carry out a whole investigation into the growth of the forearm.

6 Muscles move bones

You could begin by asking the children to feel the flesh behind their knees as they sit with their legs bent. They should tell you that they have some structures that feel like cords. These are tendons. Ask the children to feel the flesh on their thighs. It should be soft. Now tell the children to straighten their legs but remain seated. They should feel the flesh become harder, due to the muscles tightening as they pull up the bones in the lower leg. Ask a child to hold up a long pole and keep very still. The child should hold the pole close to the child's chest, but the top of the pole should raise a couple of metres above the child's head. The class should see the top of the pole moving slightly, even though the child is standing still. This movement is due to the body muscles constantly working to hold the body upright.

This unit develops the points made in Units 1 and 4 that bones are moved by muscles. The control of muscles by the nerves is considered in the following unit. This unit begins with an illustration showing the distribution of muscles in the back, arm and leg. The simple pulling action the muscles use to move bones is described, and the size and strength of arm and leg



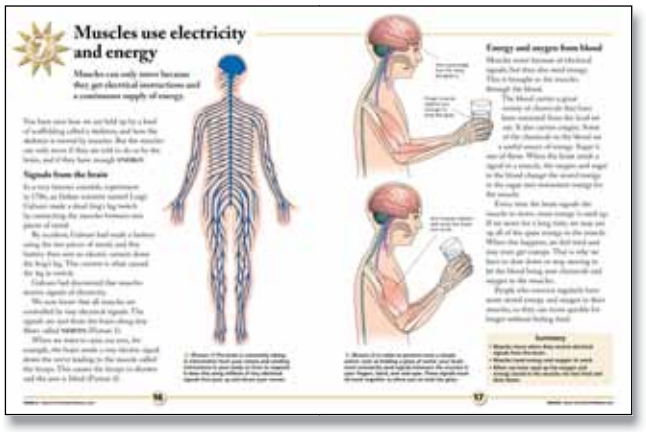
muscles are compared. The text moves on to consider muscle action in more detail by stating that muscles tighten and relax and are arranged in pairs around joints. The actions of the muscles in the upper arm are comprehensively illustrated, and the unit ends by considering what happens to muscles when we sleep.

In the complementary work, the children can examine the strength of their leg muscles and find out how much of their body is made of muscle. In the activity, the children observe their arm muscles.

7 Muscles use electricity and energy

You could begin by raising your hand, then closing and opening it quickly. Ask the children to do the same, so everyone appears to be waving. In a short time the children's hands may start to ache slightly. When this happens, tell everyone to stop waving. Tell them that the muscles operating the hand were getting signals from your brain and energy from your blood. The ache was due to the muscles running out of energy because the blood could not travel up the arm fast enough to supply them. If the muscles worked more slowly, the energy needs could be met by the blood and their hands would not ache as quickly. Tell the children that this experiment shows that you need both a signal from the brain and a supply of energy to make muscles work.

This unit builds on the previous one by showing how muscles are controlled, and where they get their source of power. The unit opens by stating that muscles can only move because they receive instructions from the brain, and that they also possess energy. This is supported by a diagram showing how the nerves spread out around the body from the brain and spinal cord. The text moves on



to describe an experiment by Luigi Galvani, in the eighteenth century, which showed that electricity is important in making muscles move. The relationship between the brain, nerves and arm muscles is clearly illustrated, and the unit ends by describing how energy for movement is obtained from food and oxygen in the blood.

In the complementary work, the children could investigate how they balance. In the activity, they find out how fast signals travel from the brain.

8 Animal bones

You may begin by asking some of the more theatrically inclined children to mime being a group of hopping rabbits. After they have entertained the class, ask them how comfortable it felt, and look for an answer saying that it was not really comfortable. Tell the class that the actors felt uncomfortable because they did not have a rabbit skeleton. If possible, show the class a skeleton of a rabbit or a large picture of a rabbit skeleton and ask them to describe how it is different from a human skeleton. Tell the children the differences are because a rabbit's skeleton is designed to meet the needs of the rabbit's way of life.

This unit extends the work in the previous units by showing how bones and muscles are arranged in other members of the Animal Kingdom. The unit begins by stating that the bones of animals are different from our bones because they live in a different way to us. The text then moves on to describe how birds fly. This is supported by photographs of a bird skeleton and the interior of a bird bone. The section is completed by a large, clear

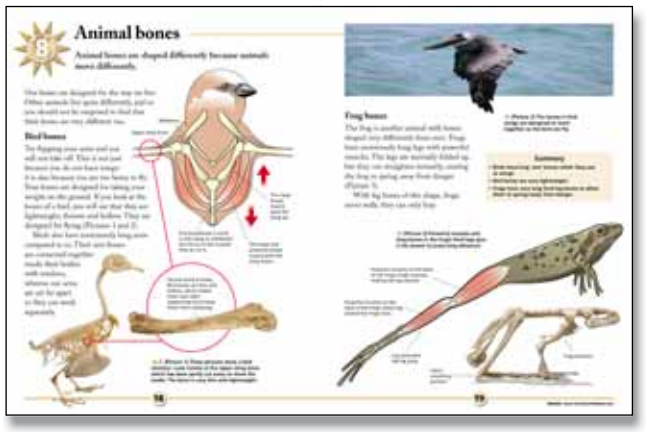


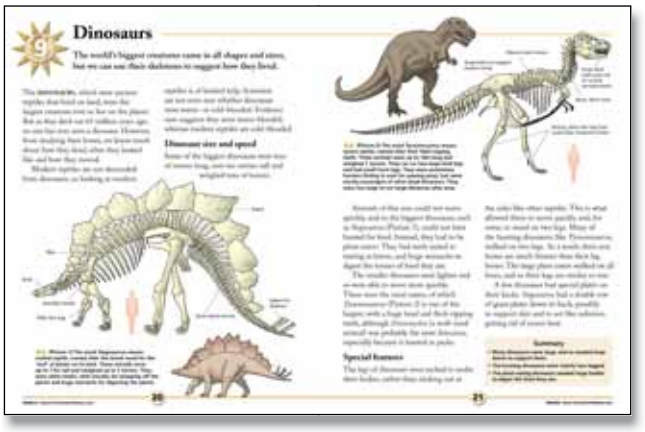
illustration showing how a bird's muscles make its wings flap. This is followed by a description of frog bones. The text here is supported by a photograph of a frog skeleton and an illustration showing how the muscles in a frog's legs help the frog to hop.

In the complementary work, the children can try to leap as far as a frog and examine the bones in owl pellets. In the activity, the children make a skeleton of an imaginary animal.

Dinosaurs

You may like to begin by telling the children they are going to be lizards. Get the children to lay face down on the floor and stick their arms out at their sides. Ask the children to raise up their bodies on their arms as if they were doing a press-up. They should hold the position for a while and discover it is tiring. Now tell the children that they are going to be dinosaurs. Get them to lay down again, but this time they support their bodies by putting their arms straight below them. The children should find this much less tiring. Tell the children that the big difference between other reptiles and dinosaurs is the way dinosaurs used their legs to support them.

This unit builds on the previous unit by showing how the study of dinosaur bones can lead to deductions about how dinosaurs lived. The unit opens by establishing that dinosaurs were reptiles that died out 65 million years ago. The text moves on to explain that by constructing skeletons from the bones they left behind, we can find out a great deal about how dinosaurs lived. The text makes the point that



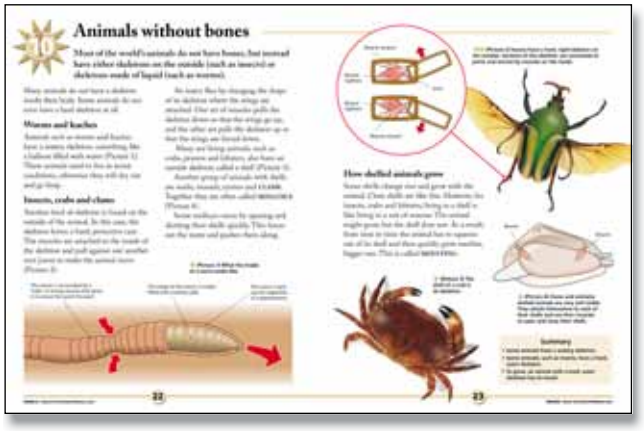
modern reptiles are not directly related to dinosaurs and cannot provide as much information about them as might be expected. The *Stegosaurus* and *Tyrannosaurus* are superbly illustrated, and the text draws out comparisons between them.

In the complementary work, the children use secondary sources to find out about dinosaurs and how they walked. In the activity, the children compare dinosaur bones like dinosaur hunters.

Animals without bones

If the children made a model animal in the activity in Unit 8, you may like to remind them of it and tell them that you are going to make some more animal models. Take a long balloon and fill it with water. Ask the children to think what the animal could be and write it down. Next, fill a round balloon and put a paper cone on top of it. Again, ask the children to write down their ideas. Continue the activity by half-filling a rounded balloon and placing it between two paper plates. Finally, take a closed box and stick cardboard tubes to it. The children should find the models a little bizarre compared to their model of a skeleton but you can then take their answers and look for worm or slug, snail, clam, mussel, oyster and insect.

This unit complements Units 8 and 9. It begins by establishing that many animals do not have a skeleton made from bone, and then moves on to discuss the watery skeleton in worms and leaches. The insect skeleton is shown to be on the outside of the body, and



the way that insects move is explained and illustrated. The moulting process in insects and crabs is compared with the steady growth of the shell in clams.

In the complementary work, the children can identify shells and find out about the animals that made them. In the activity, the children investigate how an earthworm moves.

Index

There is an index on page 24.

Section 3: Using the pupil book and photocopiable worksheets

Introduction

There is a wealth of material to support the topic of moving and growing in the pupil book and in the *Teacher's Guide*. On this and the following three pages, suggestions are made on how to use the worksheets and their associated teacher's sheets on pages 18 to 57, and how to integrate them for lesson planning. On the page opposite you will find the resource lists for introductory demonstrations, the complementary work and the activity worksheets. The learning objectives are shown on pages 16 and 17.

Starting a unit

Each unit in the pupil book forms the basis for a lesson. You may like to start by reading it with the class, or begin with a demonstration (see pages 7 to 13 and List 1 on page 15). Always begin the unit by reading the introductory sentences in bold type. This helps focus the class on the content of the unit and to prepare them for the work.

The first part of the main text introduces the content, which is then developed in the headed sections. The illustrations are closely keyed to the main text, and the captions of the illustrations develop the main text content (*see* 'The units' at the bottom of page 8).

With less skilled readers, you may prefer to keep to the main text and discuss the illustrations when they are mentioned. With more skilled readers, you may want to let them read the captions for themselves. Each unit ends with a summary. The children can use this for revision work. They can also use it to test their understanding by trying to explain the points made in the summary.

You can find the learning objectives for each unit on pages 16 and 17 of this *Teacher's Guide*.

The style and content of the unit also make it suitable for use in literacy work, where the needs of both English and science are met. You may wish to use the unit as a topic study in literacy work, or you may want to perform an activity in science time and follow it up with a study of the unit during literacy work.

Using the comprehension worksheets

Each unit in the pupil book has one photocopiable comprehension worksheet in this *Teacher's Guide* to provide a test. The learning objectives on page 16 are for these comprehension worksheets and relate directly to the knowledge and understanding component of the science curriculum.

The comprehension worksheets begin with simple questions and have harder questions towards the end.

The worksheets may be used singly, after each unit has been studied, or they may be used along with other worksheets to extend the study.

The teacher's sheet, which is opposite the comprehension worksheet, shows the answers and background information to the unit. This teacher's sheet also carries a section on work complementary to the study topic. This work may feature research using other sources. It may also have value in literacy work.

Using the activity worksheets

The activities are designed to develop skills in scientific enquiry. The learning objectives for practical skills associated with each unit are given on page 17. The activities may be small experiments, may focus on data handling or comprise a whole investigation.

Each activity section is a double page spread in this *Teacher's Guide*. On the left hand page is a photocopiable activity worksheet to help the children in practical work, or it may contain data for the children to use or interpret. The page opposite the worksheet is a teacher's sheet providing a step-by-step activity plan to help you organise your work. Each plan has a set of notes which provide hints on teaching or on the use of resources. The activity plan ends with a conclusion, which you may like to read first, to help you focus on the activity in your lesson planning.

Planning to use a unit

The materials in this pack are very flexible and can be used in a variety of ways. First, look at the unit and activity objectives on pages 16 and 17. Next, read the unit in the pupil book, and the associated worksheet and activity units in this *Teacher's Guide*. Finally, plan how you will integrate the material to make one or more lessons. You may wish to add more objectives, or replace some of the activity objectives with some of your own.

Safety

The practical activities feature equipment made from everyday materials or available from educational suppliers. However, make sure you carry out a risk assessment, following the guidelines of your employer, before you do any of the practical activities in either the pupil's book or the *Teacher's Guide*.

Resources

The three lists below show the resources needed to support the photocopiable worksheets.

- List 1 shows resources for demonstrations suggested for starting a unit.
- List 2 gives resources needed for the complementary work featured on the teacher's sheet associated with each comprehension worksheet.
- List 3 details those resources needed for the 10 activity worksheets.

List 1 (Starting a unit with a demonstration)

▼ UNIT

1. Blocks of wood to make three columns about seven or eight blocks high, a light cloth about the size of a tea towel.
2. –
3. –
4. Two chicken bones (cleaned in accordance with your school's safety policy), a bowl of vinegar, a safe place to keep the bowl.
5. Baby photographs of six members of staff (teachers, teaching assistants, office staff, dinner ladies, caretakers, cleaners, etc).
6. Long pole, such as the one used for opening high windows.
7. –
8. Rabbit skeleton (from a museum loan service or a secondary school) or a large picture of a rabbit skeleton.
9. –
10. A long balloon, two rounded balloons, a jug of water, a paper cone, two paper plates, a cardboard box, six cardboard tubes (such as used for kitchen roll), sticky tape.

List 2 (Complementary work)

Each group will need the following items:

▼ UNIT

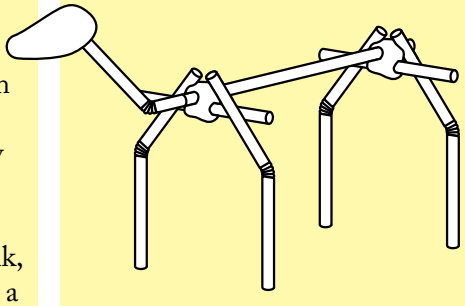
1. X-ray photographs.
2. A tape measure or string and ruler.
3. Tape measure or ruler and string.
4. Bathroom scales (optional), bags of flour or sugar which weigh 4.5kg.
5. Secondary sources about foot care and the dangers of wearing ill-fitting shoes.
6. (a) Bathroom scales; (b) bags of flour or sugar weighing 13.5kg.
7. –
8. (a) A space at least 7 metres wide to show how far a frog can jump, a tape measure or metre rule; (b) Owl pellets treated in accordance with your school's policy, for example, sterilised by placing in a pressure cooker for 15 minutes, forceps to pick bones from the pellets.
9. (a) Secondary sources about dinosaurs featuring dinosaurs from the Triassic, Jurassic and Cretaceous periods; (b) Secondary sources about dinosaur tracks and how dinosaurs walked.
10. A collection of shells such as whelk, periwinkle, scallop, oyster, mussel, a secondary source for identifying the shells. Secondary sources about the animals that made the shells.

List 3 (Activity worksheets)

Each group will need the following items:

▼ UNIT

1. Scissors, sheet of paper, glue, cardboard and means of fastening cardboard together (optional).
2. Four pipe cleaners, four plastic straws, scissors.
3. A metre rule or tape measure.
4. A bone such as a chicken leg bone (cleaned in accordance with your school's safety policy), two wooden blocks, a sheet of paper, sticky paper, coins or Plasticine weights.
5. Tape measure or string and ruler. Access to other classes in school to measure the children in that class.
6. –
7. Ruler 30cm long.
8. Five bendy plastic straws, one non-bendy straw or a straw with the non-bendy length cut off, sticky tape, Plasticine lump 2cm long, 1cm wide and 1cm high, pipe cleaner.
9. –
10. Large earthworm, paper towel, magnifying glass. (Earthworms will rise to the ground surface when the ground is tapped or sprinkled with water. They should be kept in a pot of soil before the lesson.)



▲ *Make an animal skeleton from bendy plastic straws and a pipe cleaner for Unit 8.*

Learning objectives

Comprehension worksheets

The table below shows the learning objectives for knowledge and understanding associated with each unit in the pupil book, using the comprehension worksheets in this *Teacher's Guide*:

Unit 1

- There are different kinds of skeletons in the Animal Kingdom.
- A skeleton provides support.
- A skeleton helps in providing for movement.
- Bones are moved by muscles.
- A skeleton can protect parts of the body.

Unit 2

- The bones of the skull are fixed together to create a protective structure for the brain.
- The bones of the spinal column provide support and flexibility.
- Soft discs between the backbones prevent them from rubbing together.

Unit 3

- The bones of the arms and legs are long and tubular.
- The ends of the bones meet to form joints.
- There are different kinds of joints which allow different kinds of movement.

Unit 4

- Bones are living parts of the body.
- Bones make blood.
- Bones need calcium.
- Broken bones can repair themselves.

Unit 5

- Bones form from cartilage.
- The growth of bone causes the body to increase in size and change shape.
- Bones change throughout life.

Unit 6

- Muscles provide the power to move bones.
- Muscles provide movement by creating a pulling force.
- Muscles are arranged in pairs around a joint to provide movement.

Unit 7

- The brain sends electrical signals along nerves to the muscles.
- The signals make the muscles work.
- Food and oxygen provide the energy for muscle action.

Unit 8

- Animal bones are shaped to suit their life styles.
- Birds have bones and muscles arranged to provide flight.
- Frogs have leg bones and muscles which allow the frog to hop.

Unit 9

- Dinosaurs are extinct.
- Dinosaur bones can be used to deduce how dinosaurs lived.
- There were many different kinds of dinosaurs.

Unit 10

- Some animals have a watery skeleton.
- Some animals have a hard skeleton on the outside of the body.
- Some animals with hard outside skeletons have to moult to grow.

Learning objectives

Activity worksheets

The table below shows the learning objectives for practical skills associated with each unit in the pupil book, using the activity worksheets in this *Teacher's Guide*:

Unit 1

- Use simple equipment safely.
- Make careful observations.

Unit 2

- Use simple equipment safely.
- Follow instructions.
- Make predictions and test them.
- Compare predictions with results.

Unit 3

- Make measurements.
- Plan and carry out an investigation.
- Check results for their reliability.

Unit 4

- Make careful observations.
- Make an accurate drawing.
- Make a prediction and test it.

Unit 5

- Select an idea to investigate.
- Plan an investigation.
- Make comparisons.
- Draw conclusions from results.

Unit 6

- Follow instructions.
- Make observations using the sense of touch.
- Record observations in written form.

Unit 7

- Make a fair test.
- Record results in a table.
- Draw conclusions from results.

Unit 8

- Use equipment and materials safely.
- Follow instructions.
- Make observations and comparisons.

Unit 9

- Make observations.
- Make comparisons.
- Make deductions.

Unit 10

- Handle a living thing with sensitivity.
- Use simple equipment safely.
- Record observations in written form and on a labelled diagram.

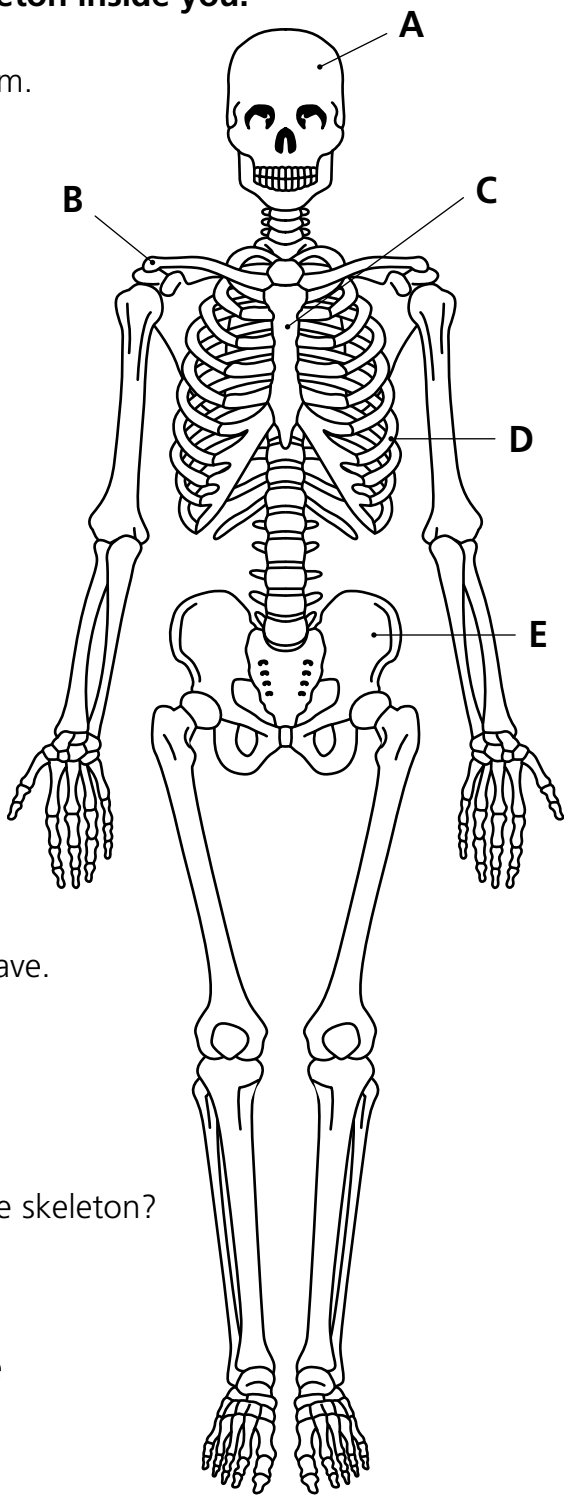
C 1

Name: ..... Form: .....

See **pages 4 and 5** of *Moving and growing*

The skeleton inside you

The shape of your body is formed by the skeleton inside you.



Q1. Name the parts labelled A to E on the diagram.

A ✎.....

B ✎.....

C ✎.....

D ✎.....

E ✎.....

Q2. How many bones does an adult have?

✎.....

Q3. What would our body be like if we did not have a skeleton?

✎.....

Q4. Not all animals have a skeleton of bone. Name two other kinds of skeletons that animals have.

✎.....

✎.....

Q5. What are the parts of the body that move the skeleton?

✎.....

Q6. (i) The brain is in the head. Which part of the skeleton protects it?

✎.....

(ii) The lungs are in the chest. Which part of the skeleton protects them?

✎.....

Teacher's sheet: comprehension

See **pages 4 and 5** of *Moving and growing*

Answers

1. **A = skull, B = collar bone, C = breast bone, D = rib, E = hip bone.**
2. **206.**
3. **It would be like jelly.**
4. **Liquid skeletons, outer skeletons (shells).**
5. **Muscles.**
6. **(i) The skull; (ii) The ribs (and breastbone).**

Complementary work

If you can obtain some X-ray photographs of parts of the skeleton, show them to the children and ask them to guess which part of the skeleton they are from.

Teaching notes

The skeleton can appear as a confusing collection of bones. It may help by considering it in two parts. These parts are known as the axial skeleton (skull, spinal column and ribs) and the appendicular skeleton (the shoulder blade and collar bone, the arms, the pelvis and the legs). You do not need to use these terms with the children, but if you are using a plastic model skeleton you could talk about the skull, spinal column and rib cage first and say that they form the 'centre' of the skeleton, then attached to this are the limbs.

The limbs are attached to the 'central' part of the skeleton by groups of bones called girdles. The shoulder blades and the collar bones make up the pectoral girdle, and the fused bones which make the pelvis is called the pelvic girdle. These terms are not only used with anatomy but also in zoology generally. You may look at the dinosaur skeletons in Unit 9 to see that they have the same pattern of bones in the skeleton, with limbs attached by girdles.

If your curriculum requires that the children need to know the terms vertebrate and invertebrate, you may use this unit to show that vertebrates have an internal skeleton of bone (or cartilage in the case of sharks), and animals without this skeleton are known as invertebrates. The name vertebrates comes from the technical name for the small bones in the back bone. They are called vertebra (plural vertebrae).

C

1

Name: ..... **Form:** .....

Based on **pages 4 and 5** of *Moving and growing*

Making a skeleton

Try this...

1. Cut out all the pieces of the skeleton.

2. Set out the pieces as you think they fit together.

3. Check your layout with the diagram on page 5 and make adjustments to your layout if needed.

4. Write down how many changes you had to make. ✎.....

Teacher's sheet: activity

Based on **pages 4 and 5** of *Moving and growing*

Introducing the activity

(a) You may like to tell the children about how archeologists sometimes uncover bones from thousands of years ago and try to link them together to make a skeleton. Tell the children that they are going to receive the bones for a skeleton that are all mixed up, as sometimes occurs on archeological sites and that they have to try and arrange the bones correctly,

Using the sheet

(b) Give out the sheet, let the children fill in their names and form, then go through tasks 1 to 4 (see note (i)).

(c) Go through task 1 again, then let the children try it (see note (ii)).

(d) Go through task 2 again, then let the children try it (see note (iii)).

(e) Go through tasks 3 and 4 again, then let the children try them (see note (iv)).

Completing the activity

(f) Let the children make a permanent record of their skeleton. They could paste the complete skeleton onto a sheet of paper (see note (v)), or paste each piece onto a card and join the cards together to allow some parts of the skeleton to move.

Conclusion

The parts of a skeleton can be assembled to make a full skeleton from memory or with the help of a diagram.

Teaching notes

(i) Once the children begin cutting up their sheet they may lose their instructions, so it is best to go through the whole activity now and perhaps write down the tasks on the board.

(ii) You may want to prepare some pre-cut bones for the least-able before the lesson.

(iiii) Some children may like to make their skeleton as accurate as possible and may want to cut a slit between the collar bone and the shoulder blade so the top of the rib cage can be inserted between them.

(iv) The children may have difficulty placing the arm and leg bones. They may simply say that they made one, two or three changes. They do not need to say what the changes were. Task 4 is simply used to give them an idea of how well they know the skeleton.

(v) Children enjoy knowing the names of bones. You may wish to tell them some of the names so that they can label them on the sheet.
For example, the upper arm bone is called the humerus, the two lower bones in the forearm are the ulna (which makes the elbow) and the radius. The upper bone in the leg is the femur, the thigh bone is the tibia and the smaller bone behind it is the fibula.

C

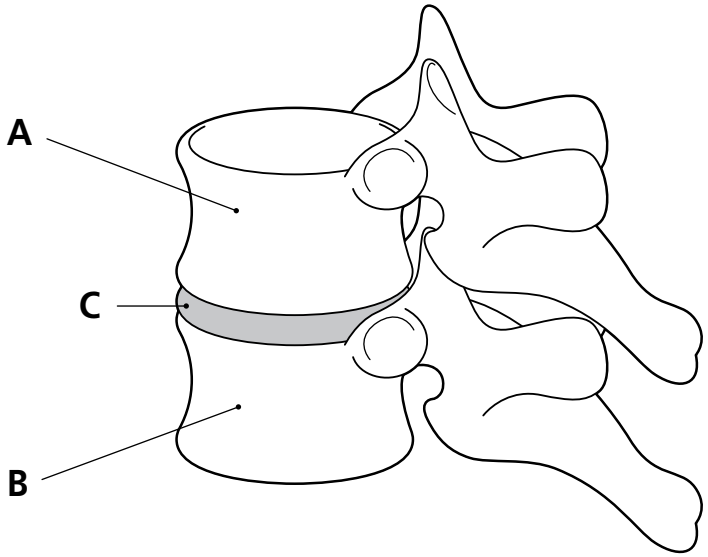
2

Name: ..... Form: .....

See **pages 6 and 7** of *Moving and growing*

Head and back bones

Your spine carries the weight of your head and all of your upper body.



Q1. (i) Where in the skeleton would you find bones A and B?

✎.....

(ii) What is the part labelled C?

✎.....

Q2. Which bones carry the greater weight? (a) Bones near the top of your body; (b) bones lower down your body?

✎.....

Q3. What would happen if the bones in your back fitted together like a jigsaw puzzle?

✎.....

Q4. Why is the spine curved?

✎.....

Q5. Why are there lots of bones in your back instead of just one or two?

✎.....

Q6. What is the purpose of C in the diagram?

✎.....

Teacher's sheet: comprehension

See **pages 6 and 7** of *Moving and growing*

Answers

1. **(i) In the spine; (ii) Pad, cushioning pad or disc.**
2. **(b).**
3. **You would not be able to move.**
4. **It is stronger like this.**
5. **So you can bend and twist better.**
6. **It stops the bones rubbing together.**

Complementary work

(a) You may let the children measure the size of their skulls. They can do this by using either a cloth, tape measure, or a piece of string and ruler. The tape measure or string is placed around the head at the level of the lower forehead.

The children could arrange the skull measurements into size groups and produce bar charts.

(b) The heights of the children could be measured and compared with their skull size to answer the question: Do the tallest people have the largest skulls?

As with all investigations which involve the children measuring themselves, some care and sensitivity may be needed.

Teaching notes

You may use this unit as part of a health and safety programme. You may wish to point out that the brain case is made from thin bones which are rigidly joined together like the pieces in a jigsaw. This forms a strong cover for the brain, but the cover can still be damaged. You can point out the damage that can be caused by violent behaviour, or by falling off a bicycle at speed. The need for helmets when riding a skateboard or bicycle can be emphasised (or when riding a horse).

The spine is also called the spinal column, the vertebral column and the backbone. It is made up of bones called vertebrae (singular vertebra). The spine is divided into the following regions: the neck or cervical region (seven vertebrae); the chest or thoracic region (twelve vertebrae); the waist or lower back, called the lumbar region (five vertebrae); the hip or sacral vertebrae, which are fused to each other and to the pelvis to provide extra strength to the lower part of the torso; the tail vertebrae or coccyx, which is made of three to five bones fused together.

If you look in an anatomy book you will see that most of the vertebrae have a bony section, which provides support, and an arch, which forms a bridge over the spinal cord. You may wish to make a Plasticine model to show the children. In the cervical vertebrae there are also two small holes which carry blood vessels (carotid arteries) to the brain.

A sliced vertebrae is the bone seen in a lamb chop or cutlet.

C 2

Name: ..... Form: .....

Based on **pages 6 and 7** of *Moving and growing*

Making model spines

Try this...

1. Take a plastic straw and push a pipe cleaner into it.

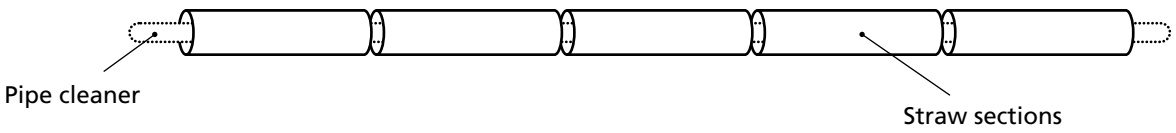
2. Hold the ends of the pipe cleaner and try to bend the straw.

Write down what happens.

✎.....

3. Cut one or two plastic straws into 2.5cm sections.

4. Thread sections of straw onto another pipe cleaner as the diagram shows.



5. Hold the ends of the pipe cleaner and try to bend it.

Write down what happens.

✎.....

6. Predict what would happen if you used 10 sections of straw, each 1cm long.

✎.....

7. Repeat steps 3 to 5, but make the sections 1cm long this time.

Write down what happens.

✎.....

8. Predict what would happen if you used 20 sections of straw, each 0.5cm long.

✎.....

9. Test your prediction.

Write down what happens.

✎.....

Teacher's sheet: activity

Based on **pages 6 and 7** of *Moving and growing*

Introducing the activity

(a) Tell the children that the spine not only has the job of supporting the body, but also helps the body to be flexible and protects a vital part of the body called the spinal cord (see note (i)). When the spine bends, it must not make gaps that leave the spinal cord unprotected. Tell the children they are going to make some spines and see how the spinal cord in them is exposed when the spines are bent.

Using the sheet

(b) Give out the sheet, let the children fill in their names and form, then go through tasks 1 and 2 (see note (ii)).

(c) Let the children try tasks 1 and 2.

(d) Go through tasks 3 to 5, then let the children try them (see note (iii)).

(e) Go through tasks 6 and 7, then let the children try them (see note (iv).

(f) Go through tasks 8 and 9, then let the children try them (see note (v)).

Completing the activity

(g) Let the children compare their results.

(h) Ask the children to compare their predictions with their results.

Conclusion

If a spine is made with large sections, a large amount of the spinal cord (pipe cleaner) is exposed when the spine is bent. As the size of the sections are made smaller, they expose less of the 'spinal cord'.

A spine with a large number of small bones gives better protection to the spinal cord than a spine with a small number of large bones.

A spine with a large number of small bones is also more flexible than a spine with a small number of large bones.

Teaching notes

(i) At this stage the spinal cord can be described as a sort of messenger service which carries messages between the brain and all parts of the body. You can provide more information later in Unit 7.

(ii) Tell the children that the best way to protect the spine is not to have any gaps. This is the situation in the model spine in this part of the activity. They should find that this spine is very difficult to bend.

(iii) This spine can be bent but it is not very flexible.

(iv) Make sure the children understand how to repeat the activity in task 7. This spine is more flexible than the previous ones.

(v) The main change here is that the children have to decide how to make their test in task 9. They should decide to repeat tasks 3 to 5, but make the sections 0.5cm long this time. This spine is more flexible than the previous ones.

C

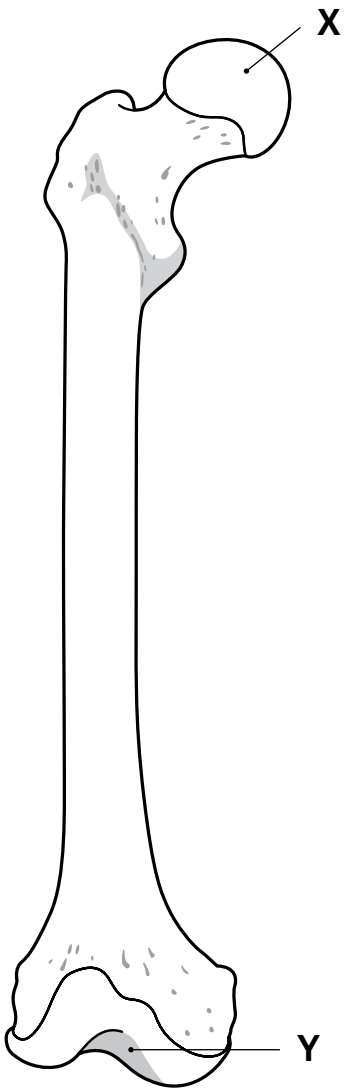
3

Name: ..... Form: .....

See **pages 8 and 9** of *Moving and growing*

Arm and leg bones

Arms and legs are strong tubes of bone. The ends of each bone are shaped to allow them to move.



Q1. (i) The bone in the diagram is found in the leg. In which part of the leg is it found: (a) the upper part; (b) the lower part?

✎.....

(ii) Which end of the bone allows the greatest movement: X or Y?

✎.....

Q2. Name two properties bones would have if they were solid?

✎.....

✎.....

Q3. (i) What substance is found inside bones?

✎.....

(ii) What does this substance do?

✎.....

Q4. What bones form cup-shaped hollows for the arms to fit into?

✎.....

Q5. Where would you find a thigh bone?

✎.....

Q6. How are the bones in hands and feet different from the bones in arms and legs?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 8 and 9** of *Moving and growing*

Answers

1. **(i) (a); (ii) X.**
2. **Heavy and more brittle.**
3. **(i) Marrow; (ii) Makes blood.**
4. **Collar bones.**
5. **In the upper part of the leg.**
6. **They are smaller and there are many of them.**

Complementary work

(a) The children could find out how much the length of their legs contributes to their height by making the following investigation. First, they should measure their height. Then they should sit down and measure the height of their torso – the part from the chair seat to the top of their head. When they subtract the second measurement from the first they will find out how long their legs are. This will help them explain why some tall people look much smaller when they are sitting down.

As with all investigations which involve the children measuring themselves some care and sensitivity may be needed.

(b) Ask the children to hold their right palm uppermost and grasp the right wrist gently with the left hand. The right hand should then be turned over and the children should feel how one bone swivels on another in the lower arm to allow this movement.

Teaching notes

Although the children do not need to know the names of the bones in the arms and legs, they often ask and many enjoy learning them.

The bone in the upper arm is the humerus. This is not the 'funny bone'.

The bones in the lower arm are the ulna and radius. The ulna is the bone that forms the part we call the elbow and is the 'funny bone'. The 'funny bone' is so called because there is a nerve which runs over the surface of the bone. If it is struck, it gives a painful, or tingling, sensation. The ulna is larger than the radius.

The upper leg bone is called the femur. This bone is also known as the thigh bone. The lower leg bones are the tibia and fibula. The tibia is more commonly called the shin bone. The tibia is larger than the radius. The knee cap is a bone which protects the knee joint. Its proper name is the patella.

The small bones of the wrist and hand are called the carpels. The small bones of the ankle and foot are called the tarsals. The long bones in the palm of the hand are called the metacarpals. The long bones in the foot are called the metatarsals. The fingers and toes are also called digits.

Most scientists believe that the limbs evolved from the fins of fishes, and this explains why all animals that have evolved from fish (such as amphibians, reptiles, birds and mammals) have a five-digit limb or a modification of it. You may wish to use this information in Unit 8 if the children spot that there are similarities among animal vertebrate limbs.

C

3

Name: ..... Form: .....

Based on **pages 8 and 9** of *Moving and growing*

Investigating your stride

Try this...

1. Think about this sentence: **The stride is the length of a step.**

2. Walk ten steps and measure how far you have travelled.

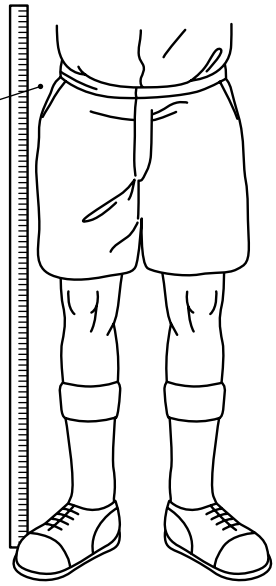
Write the distance here. ✎.....

3. Divide the distance you have travelled by 10 to find out the length of your stride.

Write the length of your stride here. ✎.....

4. Ask a friend or teacher to measure the length of the outside of your leg.

Use the diagram to help you.



Write down the length of your leg. ✎.....

5. Plan an investigation to answer this question: Do people with long legs take longer strides than people with short legs?

Write down your plan here.

✎.....

✎.....

6. Make a table for your results on a separate sheet of paper.

7. Make a prediction about the results of your investigation.

✎.....

8. Show your plan, table and prediction to your teacher. If your teacher approves, try your investigation.

Looking at the results.

9. Write down what your results show on the separate piece of paper.

Teacher's sheet: activity

Based on **pages 8 and 9** of *Moving and growing*

Introducing the activity

(a) Walk around the classroom in a purposeful way and ask the children to describe how you are walking. Search for, or steer the children to use, the word striding. Ask one of the children to take a step, and show the other children the distance covered by the step. This distance is called the stride. Tell the children that when people are measuring their stride, they tend to think about it and stretch as they step to make their stride longer. Ask them how they may get over this problem and look for answers which match tasks 1 to 3 in the activity.

Using the sheet

(b) Give out the sheet and let the children fill in their names and form, then go through tasks 1 to 3 (see note (i)).

(c) Let the children try tasks 1 to 3.

(d) Go though task 4, then let the children try it.

(e) Go through task 5, then let the children try it (see note (ii)).

(f) Go through tasks 6 and 7, then let the children try them (see note (iii)).

(g) Let the children try task 8, and if the plan and table have the features described in notes (ii) and (iii), let them try it.

(h) Let the children try task 9.

Completing the activity

(i) Let the children compare their results.

Conclusion

A person with long legs generally has a longer stride than a person with shorter legs.

Teaching notes

(i) It would be more accurate (but too complicated) to subtract the length of the feet from the distance covered. If children spot this and are capable, let them make the necessary measurements and subtractions. The relationship which the children investigate in their plan is not affected by using the simpler method.

(ii) The plan should include people with different leg lengths. It could also include some people with the same leg lengths to see if they have different strides.

Each child's stride should be tested more than once to check the reliability of the results.

If appropriate, averages could be used.

(iii) The table could have three columns headed 'Person', 'Leg length (cm)' and 'Stride (cm)' as the example below. The children may produce a second table, or use additional rows in their table, in which they double-check the measurement of the leg and the stride.

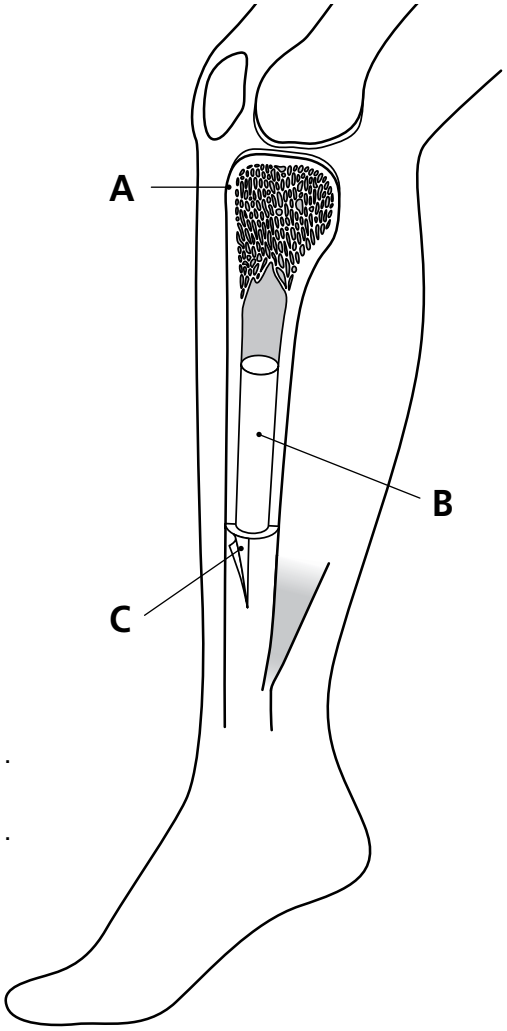
Person	Leg length (cm)	Stride (cm)

Name: ..... Form: .....

See **pages 10 and 11** of *Moving and growing*

Living bones

Bones are made up of a living material, just like any other part of your body. This is how they can repair themselves when they break.



Q1. Use these words to name A, B and C on the diagram – marrow, hard bone, spongy bone.

A ✎.....

B ✎.....

C ✎.....

Q2. Why is bone like a honeycomb?

✎.....

✎.....

Q3. (i) What is the substance the body uses to make bone?

✎.....

(ii) Name a food which is rich in this substance. ✎.....

Q4. What are the special cushions in joints called? ✎.....

Q5. What do ligaments do?

✎.....

✎.....

Q6. Why are broken bones put in casts?

✎.....

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 10 and 11** of *Moving and growing*

Answers

1. **A = spongy bone; B = marrow; C = hard bone.**
2. **So it will be as strong and as light as possible.**
3. **(i) Calcium; (ii) Milk, or many fruits.**
4. **Cartilage.**
5. **They join or 'lash' the bones and cartilages together.**
6. **While a broken bone is repairing itself, it is weak and can easily be broken again. The plaster supports the bone while it heals.**

Complementary work

About 15% of the body's weight is due to the weight of the skeleton. You may like the children to weigh themselves and calculate how much of their body is bone. Alternatively, you could say that a person who weighs 30kg (close to the children's own weight) has a skeleton which weighs about 4.5kg. You could use bags of flour or sugar to represent this weight. The children may be surprised at the low weight of their skeletons.

Teaching notes

The children may have already learned about the importance of calcium in the diet. They may know that milk, cheese, eggs, bread, orange and cauliflower are rich sources of calcium. If calcium is lacking from the diet, the bones become soft and brittle. Vitamin D is also needed to help the body take up calcium. If this is lacking in the diet of young children, the disease called rickets develops. This causes the bones to soften, and the leg bones bend under the weight of the body. Rickets can be cured by eating foods rich in vitamin D such as butter, milk and cheese.

The ends of the bones that move are protected by cartilage. This is a tough material with a slippery surface. It reduces the friction between the bones and allows them to move easily over each other. Cartilage also prevents the ends of the bones from rubbing on each other, wearing each other down and causing pain. Many joints also have a liquid in them which acts like an oil to lubricate the joint. This liquid is held in a sack called the bursa.

The bones are held together by ligaments. These are made of fibres which are not elastic. They hold the bones together firmly but can be damaged in a sports' injury.

Muscles are connected to bones by non-elastic fibres called tendons.

Name: ..... Form: .....

Based on **pages 10 and 11** of *Moving and growing*

Looking at bones

Try this...

1. Can you make an accurate drawing of a bone? Take a bone, look at it carefully and draw it in this space.

2. Write down where in the animal's body you think the bone came from.

✎.....

Give a reason for your answer.

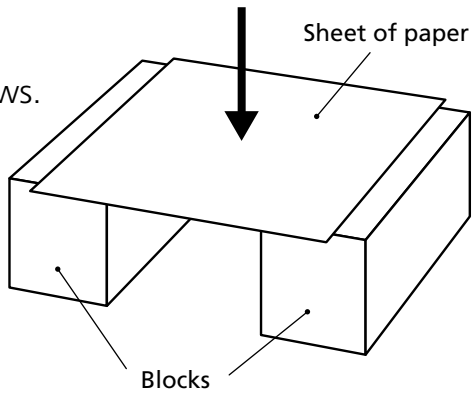
✎.....

✎.....

3. Some bones are flat while others are shaped like tubes.

Which kind of bone do you think is stronger? ✎.....

4. Set up a sheet of paper as the diagram shows.



5. Place coins or Plasticine weights where the arrow shows. How many can you add before the paper collapses?

✎.....

6. Roll up the paper to make a tube. Use sticky tape to hold the rolled up paper in place.

7. Set up the tube on the blocks.

8. Place coins or weights on the tube.
How many can you add before the tube collapses? ✎.....

Looking at the results.

9. What do the results show?

✎.....

Teacher's sheet: activity

Based on **pages 10 and 11** of *Moving and growing*

Introducing the activity

(a) Tell the children they are going to make some observations on a real bone, and also test an idea about bone strength using models.

Using the sheet

(b) Give out the sheet and let the children fill in their names and form. Go through task 1, then let the children try it (see note (i)).

(c) Go through task 2, then let the children try it (see note (ii)).

(d) Go through task 3, then let the children try it (see note (iii)).

(e) Go through tasks 4 and 5, then let the children try them (see note (iv)).

(f) Go through tasks 6 to 8, then let the children try them (see note (v)).

(g) Go through task 9, then let the children try it.

Completing the activity

(h) Let the children compare their results about the strength of model bones.

Conclusion

The features of a bone can be accurately shown in a drawing. The location of a bone in the body can be deduced from the bone's features.

A sheet of paper can support only a few coins or weights before it collapses. A tube of paper can support a greater number of coins or weights. This suggests that tubular bones are stronger than flat bones.

Teaching notes

(i) A chicken leg bone makes a simple, suitable bone to draw. After it has been cleaned it may show signs of its honeycomb structure on its surface. The children could label this. The parts of the bones which form joints could also be labelled. The children may like to use magnifying glasses to make their observations.

(ii) If a leg bone is used, the children may suggest it is a leg bone because it is thick and sturdy.

(iii) You may like to remind the children that bones in the skull are thin, while limb bones are tubular.

(iv) The weights should be set up as a pile on the spot indicated by the arrow.

(v) The tube should not have such a large diameter that the sides collapse like two sheets of paper. If the tube is rolled loosely, children can place the coins or weights on top of the tube. Alternatively, children could roll the tube tighter and use a piece of Plasticine, shaped like a saddle, to hold the coins or weights in place.

C

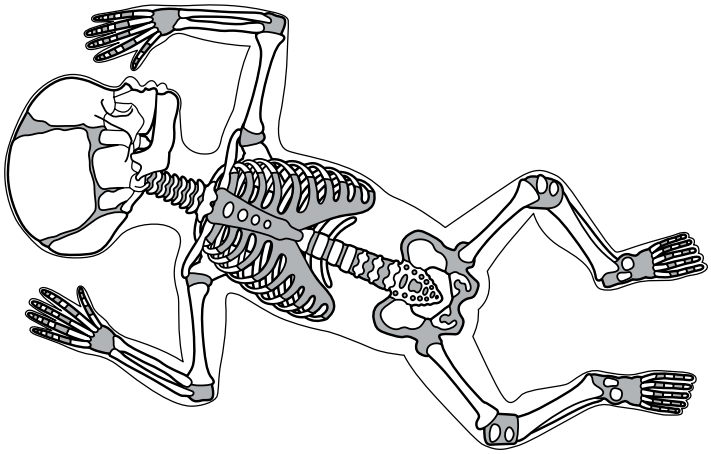
5

Name: ..... Form: .....

See **pages 12 and 13** of *Moving and growing*

Bones grow

Your bones are not made of unchanging material, but grow and change shape throughout your life.



Q1. (i) Is the baby in the diagram newly born or older? How can you tell?

✎.....

✎.....

(ii) What are the shaded parts of the skeleton made of?

✎.....

Q2. How does your face change as you grow?

✎.....

Q3. Which parts of a bone grow the most? ✎.....

Q4. What would happen if your bones did not grow thicker?

✎.....

Q5. What happens to your height as your bones grow?

✎.....

Q6. (i) When do people start to lose more bone than they grow?

✎.....

(ii) What happens to people when they lose more bone than they grow?

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 12 and 13** of *Moving and growing*

Answers

1. **(i) Newborn, because the bones are not all formed; (ii) Cartilage.**
2. **It gets taller faster than it gets wider.**
3. **The ends.**
4. **They would be too thin and liable to break.**
5. **It increases, you get taller.**
6. **(i) After the age of 35; (ii) They become smaller and their bones become thinner and more liable to break.**

Complementary work

The children can use secondary sources to find out about the importance of well-fitting shoes, and the damage that can be done to feet if ill-fitting shoes are worn for a long time.

Teaching notes

When the skeleton first forms it is made of cartilage. As the baby develops in the mother's womb some of the cartilage turns to bone. At birth many parts of the skeleton are still made from cartilage but over the years they turn to bone. Not all bones ossify, or turn to bone, at the same time. Here are some examples: bones of foot, 12 to 22 years; large leg bones and humerus in arm, 15 to 25 years; skull, 16 years; humerus, vertebrae 20 to 25 years; breast bone or sternum, 25 to 30 years.

When a group of people is being measured for height or weight, the results can be divided into size groups. When these are shown on a bar chart, the tallest bars are in the centre of the chart and the smallest bars are at the lower and higher ends of the chart. This pattern is called a normal distribution. In work on measuring groups of people, you may produce normal distribution charts. You may point out that differences in height are normal in order to reassure children who are sensitive about being 'abnormal'. You may also point out that people grow at different rates and at different times. The six year old children on page 12 support this by showing different heights for the same age.

5

Name: ..... **Form:** .....

Based on **pages 12 and 13** of *Moving and growing*

Investigating arm bones

Try this...

1. Measure the length of your forearm.
Record the length of your forearm here. ✎.....

2. Do you think that everyone in your class has the same length of forearm? ✎.....

3. Give a reason for your answer.

✎.....

4. How can you test your idea?

✎.....

✎.....

5. Show the teacher your idea and if your teacher approves, try it.

Use a separate sheet to record your results.

6. What do your results show?

✎.....

7. How do you think the lengths of people's forearms in the following classes compare with yours?

(i) One class below you. ✎.....

(ii) Two classes below you. ✎.....

(iii) One class above you. ✎.....

(iv) Two classes above you. ✎.....

8. Plan an investigation to test your idea. Write your plan on a separate sheet.

9. Show the teacher your idea and if your teacher approves, try it.

10. Record your results on a separate sheet and write what they show.

Teacher's sheet: activity

Based on **pages 12 and 13** of *Moving and growing*

Introducing the activity

(a) Use this activity after the children have studied the unit in the pupil book. Tell them that growth is usually measured by measuring height, which is due to the growth of the leg bones, backbone and skull. Ask the children if they think it is possible to measure growth by measuring just the forearm, then tell them they can perform some investigations to find out.

Using the sheet

(b) Give out the sheet, let the children fill in their names and form. Go through task 1, then let the children try it (see note (i)).

(c) Go through tasks 2 and 3, then let the children try them (see note (ii)).

(d) Go through tasks 4 and 5, then let the children try them (see note (iii).

(e) Let the children perform task 6.

(f) Go through task 7, then let the children try it.

(g) Go through tasks 8 to 10, then let the children try them (see note (iv).

Completing the activity

(h) This will depend on the approach taken, but at some stage the children should have an opportunity to compare their results and the techniques they used.

(i) You may like to divide up the data into age groups to produce bar charts. They should show a normal distribution of forearm lengths (see note (v)).

Conclusion

The lengths of forearms vary in every class. The forearms of people in younger classes are shorter than the forearms of people in older classes.

Teaching notes

(i) The purpose of this exercise is to help the children recognise the forearm and find a way of reliably measuring its length. This technique can then be applied to the forearms of other children in the following investigations.

(ii) As with all investigations which involve the children measuring themselves, some care and sensitivity may be needed.

(iii) You may tackle this in a variety of ways, depending on the ability and aptitude of the children. You could do this as a whole class activity, or each group in the class could contribute to the results of the whole class.

(iv) This will depend on the co-operation of the teachers in the other classes. They may be able to use the data your class collects in some of their own work. The children may choose to investigate the forearms in just one class, or they may choose to investigate the forearms of five people in several classes.

(v) In a normal distribution, the bars at the centre of the chart are the tallest. You may need to reassure some children that variation is natural and normal.

C

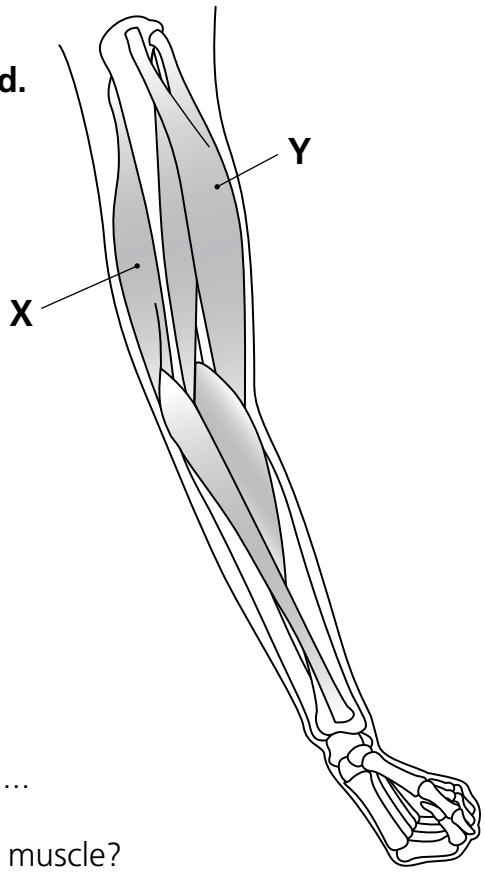
6

Name: ..... Form: .....

See **pages 14 and 15** of *Moving and growing*

Muscles move bones

Bones have rounded ends so they can be moved. But to move them requires muscles.



Q1. (i) Name muscles X and Y.

X ✎.....

Y ✎.....

(ii). When X is relaxed, and Y tightens, which way does the lower arm move? Draw an arrow on the diagram.

Q2. How many muscles are there in the body?

(a) Over 400; (b) Over 500; (c) Over 600 ✎.....

Q3. How can you tell a strong muscle from a weak muscle?

✎.....

Q4. (i) What happens to a muscle when it tightens?

✎.....

(ii) What happens to a muscle when it relaxes?

✎.....

Q5. How many muscles are around each joint in the skeleton?

✎.....

Q6. (i) What will happen to muscle X when muscle Y tightens?

✎.....

(ii) What will happen to muscle Y when muscle X tightens?

✎.....

Teacher's sheet: comprehension

See **pages 14 and 15** of *Moving and growing*

Answers

1. **(i) X = triceps, Y = biceps;**
   (ii) The arrow should show the arm moving upwards.
2. **(c) Over 600.**
3. **A stronger muscle is larger.**
4. **(i) It becomes shorter;**
   (ii) It becomes longer.
5. **At least two.**
6. **(i) It relaxes and lengthens;**
   (ii) It relaxes and lengthens.

Complementary work

(a) The pushing force of the leg muscles can be measured in the following way. One child lies on the floor close to the wall. A second child holds a bathroom scale against the wall and the first child puts his or her right foot on the scale and pushes while still lying on the ground. The pushing force of the left leg can then be measured and compared with the pushing force of the right leg. The children could find out how many people in the class have right legs which are stronger than left legs.

(b) About 45% of the body's weight is due to the weight of the muscles. You may like the children to weigh themselves and calculate how much of their body is muscle.

Alternatively, you could say that a person who weighs 30kg (a weight close to the children's own weight) has a skeleton which weighs about 13.5kg. You could use bags of flour or sugar to represent this.

Teaching notes

There are three kinds of muscle in the body. They are skeletal muscle, smooth muscle and heart muscle.

Skeletal muscle, which makes up 45% of the body's weight, is attached to the bones and provides the power to move them. Smooth muscle is found in the digestive system. It pushes the food down the throat and intestine and allows the stomach to churn up a meal.

Heart, or cardiac, muscle is different from other muscle in that it is constantly active in pumping the blood round the body.

Children sometimes think that skeletons can move on their own, due to a ride on a ghost train or watching films and cartoons. You may need to make sure they realise it is the muscles that allow the body to move.

Each muscle is attached to two bones. One bone does not move when the muscle contracts. The place where the muscle is attached to the immovable bone is called the point of origin. Muscles are also attached to bone which moves when the muscle contracts. The muscle is attached to this bone by a tendon which crosses the joint between the two bones. The place where the muscle is attached to the movable bone is called the point of insertion.

When a person is asleep the skeletal muscles relax. When a person is awake the muscles are slightly contracted. This is called muscle tone. The slight changes in the movement of the pole in the introduction to this unit is due to changes in muscle tone as the muscles try to keep the body upright and still.

C

6

Name: ..... Form: .....

Based on **pages 14 and 15** of *Moving and growing*

Looking at arm muscles

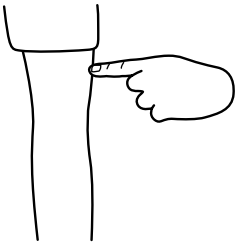
Try this...

1. Hold your right arm by your side.

2. Push the index finger of your left hand into the muscle on the front of your upper arm as Diagram 1 shows.

3. Raise your right forearm until your right thumb touches your shoulder.

Diagram 1



4. Write down how the muscle in your upper arm changed as the forearm was raised.

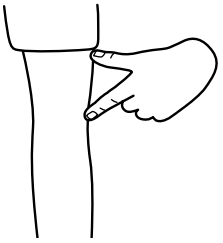
✎.....

5. Hold your right arm by your side again.

6. Stick out your thumb and index finger of your left hand so they are about three centimetres apart.

7. Press the thumb and index finger into the muscle on the front of your upper arm as Diagram 2 shows.

Diagram 2



8. Raise your right forearm until your right thumb touches your shoulder.

9. Did the thumb and index finger:
(a) come closer together; (b) stay the same; (c) move further apart? ✎.....

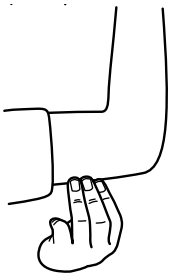
10. Explain your answer to question 9.

✎.....

11. Hold up your right arm and feel the muscle as Diagram 3 shows.

12. Straighten your right arm, then bend it again. How does the muscle change?

Diagram 3



✎.....

✎.....

Teacher's sheet: activity

Based on **pages 14 and 15** of *Moving and growing*

Introducing the activity

(a) Ask the children to stretch out the fingers of one hand and wiggle them. Ask the children to look at the skin on the back of the hand and tell you what they see. From class discussions, the children should learn that there are tendons connecting the bones of the fingers to muscles in the forearm, and the action of these muscles makes the finger bones move. Let the children feel the flesh in the lower arm and feel the muscles moving. Tell the children that in the upper arm there are fewer but larger muscles to move the forearm and these can be studied a little easier.

Using the sheet

(b) Give the children the sheet, let them write their names and form on it, then go through tasks 1 to 4 (see note (i)).

(c) Let the children try tasks 1 to 4.

(d) Go through tasks 5 to 8 with the children.

(e) Let the children try tasks 5 to 8.

(f) Go through tasks 9 and 10, then let the children try them (see note (ii)).

(g) Go through tasks 11 and 12 with the children (see note (iii)).

(h) Let the children try tasks 11 and 12.

Completing the activity

(i) Let the children compare their results.

Conclusion

When the arm is held straight, the biceps muscle is soft. When the forearm is raised, the biceps muscle becomes tighter and shorter. When the arm is bent, the triceps muscle is soft. When the arm is straightened, the triceps muscle becomes tighter and shorter.

Teaching notes

(i) The children need to be wearing a short-sleeved shirt or blouse, or be able to roll up their sleeve. You may like to remind the children that this muscle is called the biceps.

(ii) The thumb and index finger should come closer together. The children should be able to feel the finger bending towards the thumb. They may need some help to explain that this is due to the shortening of the muscle.

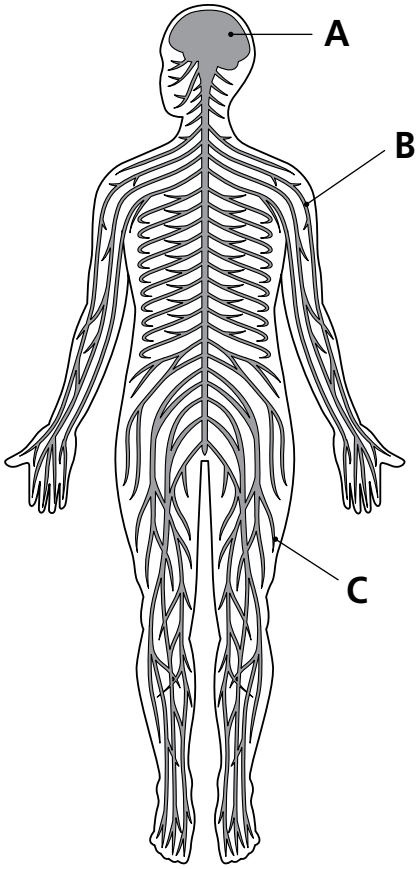
(iii) You may like to remind the children that this muscle is called the triceps muscle.

Name: ..... Form: .....

See **pages 16 and 17** of *Moving and growing*

Muscles use electricity and energy

Muscles can only move because they get electrical instructions and a continuous supply of energy.



Q1. (i) What is A in the diagram?

✎.....

(ii) What are B and C in the diagram?

✎.....

Q2. What part of the body tells the muscles to move?

✎.....

Q3. (i) In which country was Luigi Galvani born?

✎.....

(ii) What did Galvani use in his experiment?

✎.....

(iii) What did Galvani make by accident?

✎.....

(iv) What did the electricity do in Galvani's experiment?

✎.....

Q4. What carries electrical signals in the body? ✎.....

Q5. Where does a muscle get its stored energy from? ✎.....

Q6. (i) What is needed to change stored energy into movement energy?

✎.....

(ii) What carries stored energy to the muscle? ✎.....

Teacher's sheet: comprehension

See **pages 16 and 17** of *Moving and growing*

Answers

1. **(i) The brain; (ii) Nerves.**
2. **The brain.**
3. **(i) Italy; (ii) The leg of a dead frog and two pieces of metal; (iii) A battery; (iv) It made the leg twitch.**
4. **Nerves.**
5. **Sugar.**
6. **(i) Oxygen; (ii) The blood.**

Complementary work

Ask the children to stand on one leg and keep their eyes open. As they wobble about tell them that their brain is sending messages to different muscles to help them keep their balance. The brain takes messages from the eyes and a special part of the ear concerned with balance.

Now tell the children to close their eyes and try to keep balancing. They should find this more difficult and they soon have to put down their raised leg to stop themselves falling over. This demonstrates the importance of the eyes in maintaining balance.

Teaching notes

The body is made from billions of cells. Cells that perform different functions have different shapes. The nerve cells are very long and thin, like microscopic threads. The longest nerve cells run from the base of the spine to the end of the big toe. Nerve cells going to the same area of the body are joined together into larger structures called nerves, which can be seen without the aid of a microscope.

There are two kinds of nerve cells found in nerves. One kind carry messages from the sense organs, such as the eye and the ear, to the brain. The other kind carry messages from the brain to the muscles. Nerves which carry messages from sense organs are called sensory nerves. The optic nerve from the eye and the auditory nerve from the ear are examples of sensory nerves. Nerves which carry messages to the muscles are called motor nerves. The messages are very weak electric currents.

Inside the brain are nerve cells which are shaped differently. Each one is flat and round and has lots of arms which are connected to the arms of other brain cells.

When you look at something, the light-sensitive cells in the back of the eye send messages along the optic nerve to the brain. The messages pass through some of the brain cells and the brain decides how to use the message. If movement is needed, the brain sends messages to the muscles along a motor nerve. When the messages reach the muscle, it uses sugar and oxygen from the blood to release energy so it can tighten and pull on a bone. Energy is released from food in a process called respiration.

Some quick actions are so fast that the brain is not involved. A sensory nerve sends its message directly to a motor nerve. These actions are called reflex actions. They are used to test the health of the nervous system. For example, tapping below the knee cap produces a reflex action which shows there is no damage to the lower spinal cord.

The activity in the introduction works because the heart has to pump blood, containing sugar and oxygen, up the arm against the force of gravity, and the quick action of the muscles uses up the sugar and oxygen faster than it can be supplied. Lowering the arm increases the blood supply to match the muscles' needs.

C

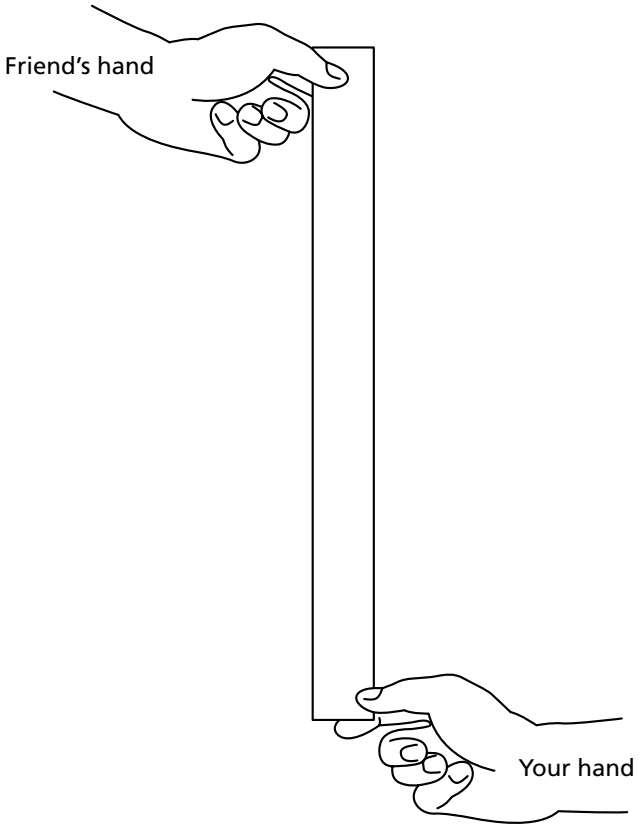
7

Name: ..... Form: .....

Based on **pages 16 and 17** of *Moving and growing*

How fast can you catch?

Try this…



1. Ask a friend to hold up a ruler as the diagram shows.

2. Place your right hand at the bottom of the ruler as the diagram shows, and leave a gap about two centimetres wide between your finger and thumb.

3. Ask your friend to let the ruler fall without warning you.

4. Try to catch the ruler between your finger and thumb.

5. Find the distance dropped by the ruler before you caught it. If you are fast, the ruler may have dropped only a few centimetres. If you are slow, it may have dropped many centimetres.

6. Record the distance dropped in the table on the right. If you failed to catch the ruler at all, write 30cm+ in the table.

7. Repeat steps 1 to 6 nine more times with your right hand.

8. Repeat steps 1 to 6 ten times with your left hand.

Trial	Left hand	Right hand
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Looking at the results.

9. What do the results show?

✎.....

Teacher's sheet: activity

Based on **pages 16 and 17** of *Moving and growing*

Introducing the activity

(a) You could begin the activity by making a loud noise when the children are not expecting it (see note (i)). As the children look round, tell them that they have moved their heads because their brain told their neck muscles to work. Ask the children about electronic games and tell them that they can move their fingers quickly enough to play the games because of the speed with which the brain sends signals to their muscles to make them work.

Tell the children the speed at which signals travel in the body can be measured very simply by using a ruler.

Using the sheet

(b) Give out the sheet and let the children fill in their names and form, then go through tasks 1 to 4 (see note (ii)).

(c) Go through tasks 5 and 6 with the children (see note (iii)).

(d) Make sure that the children know how to carry out all parts of the activity, then let them try tasks 1 to 6 (see note (iv)).

(e) Go through task 7, then let the children try it.

(f) Go through task 8, then let the children try it.

(g) Go through task 9, then let the children try it (see note (v)).

Completing the activity

(h) Let the children compare their results.

Conclusion

The speed with which the brain can send messages to the muscles can be investigated by measuring how far a ruler falls before it is caught.

There may be a difference in the speed with which a hand can catch a falling ruler.

Teaching notes

(i) You could drop a large book or a metal tray.

(ii) You may like to demonstrate this activity with a volunteer from the class.

(iii) Hold the ruler so that the 1 on the centimetre scale is at the bottom. This makes it easier to measure the distance dropped.

(iv) Make sure that the children do not think they have to throw the ruler down. You may like to arrange the children in threes so that one can make sure that the fingers and thumb are kept at the correct distance and that the 'dropper' does not try to beat the 'catcher'.

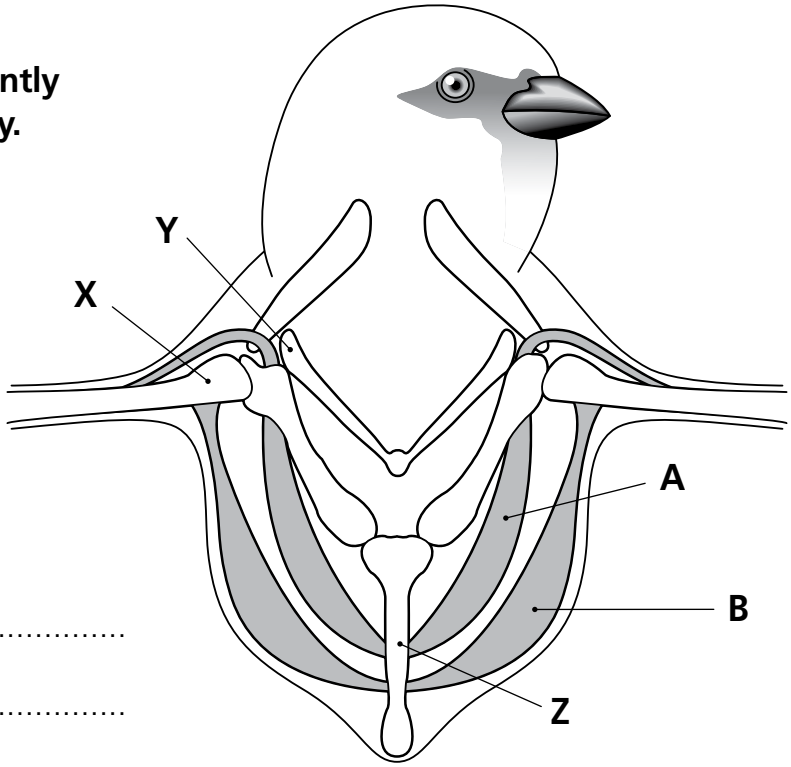
(v) The children may simply describe how the measurements vary between the two columns or they can add up the total distance dropped through each hand to make a comparison.

Name: ..... Form: .....

See **pages 18 and 19** of *Moving and growing*

Animal bones

Animal bones are shaped differently because animals move differently.



Q1. The diagram shows some muscles and bones in a bird.

(i) Name the bones X, Y and Z.

X ✎.....

Y ✎.....

Z ✎.....

(ii) Which muscle pulls the wing down, A or B?

Q2. What are two ways in which bird bones are different from our bones?

✎.....

✎.....

Q3. How are the arms of birds different from our arms?

✎.....

Q4. How does a frog normally hold its back legs?

✎.....

Q5. How do its legs help a frog spring away from danger?

✎.....

Q6. How does the shape of the leg bones affect the way the frog moves?

✎.....

Teacher's sheet: comprehension

See **pages 18 and 19** of *Moving and growing*

Answers

1. **(i) X = upper wing bone, Y = wish bone, Z = breast bone; (ii) B.**
2. **More lightweight, thinner, more hollow, they have struts inside.**
3. **Enormously long, connected to each other inside the body.**
4. **Folded up.**
5. **They straighten immediately.**
6. **The frog cannot walk, it can only hop.**

Complementary work

(a) You could tell the children that a pet frog called Davy Croakett once leapt 6.17 metres. Mark out this distance so the children can see how far the frog leapt. Ask the children to see how far they can leap from a standing jump. They should find they cannot leap very far. Point out that the frog could leap so far because its bones and muscles were arranged in a special way.

(b) Prepare some owl pellets in accordance with your school policies. You can dissect them and show the children the animal bones they contain.

Teaching notes

The group of animals which have an internal skeleton with a backbone are called vertebrates. This group also contains sharks, which have a skeleton of cartilage. The skeletons of all vertebrates have the same basic plan. There is a skull and spine (also called the vertebral column), to which are attached bone girdles that connect the limbs to the spine. The girdle nearest the head is called the pectoral girdle. In humans, we normally call this the shoulders. The girdle furthest from the skull is called the pelvic girdle.

In fish, the girdles and limb bones are small. The main part of the limbs are the fin rays and the membranes between them. The spine is made up of many small back bones, or vertebrae, which have surfaces that allow the bones to move so the backbone can bend quickly from side to side. The muscles are arranged in W shapes along the backbone and contract in sequence to send a ripple of movement down the sides of the fish. The arrangement of the muscles allows smooth movement. The muscles push on the water and make the fish swim forwards.

In frogs, the backbone is short and the pelvic girdle makes up a large part of the back. This is so the bones in the pelvis can provide a large area of attachment for the leg muscles and so the pelvis can provide a strong frame to stand up to the fast, large contraction of these muscles. The bones in the front limbs are very small by comparison because the front limbs do not provide a propulsive force, but act as shock absorbers when the frog lands.

In birds, the pelvis is also very large, to support the leg muscles, and the backbone is rigid. If the pelvis was flexible, as in fish, a bird's body would bend about when it flapped its wings and it would not be able to fly in a straight line, or even get into the air.

Name: ..... Form: .....

Based on **pages 18 and 19** of *Moving and growing*

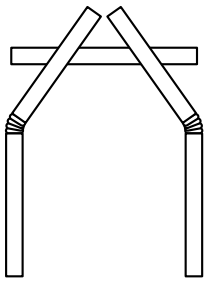
Make an animal skeleton

Try this…

1. Take two bendy straws. Measure 5cm below the bend of each straw and cut off the rest of the straw.

2. Tape the two bendy straws together using one of the pieces of straw that you had cut away, as Diagram 1 shows.

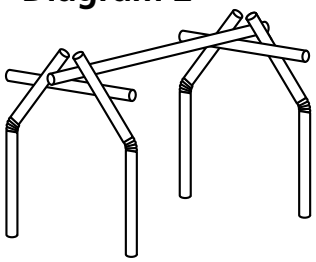
Diagram 1



3. Repeat steps 1 to 2 with another two straws.

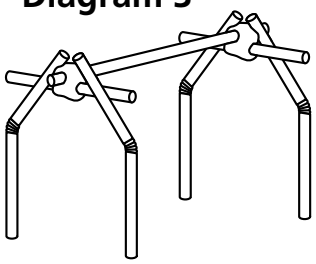
4. Use a piece of non-bendy straw to join the two pairs of straws together as Diagram 2 shows.

Diagram 2



5. Use Plasticine to hold the 'backbone' straw in place, as Diagram 3 shows.

Diagram 3

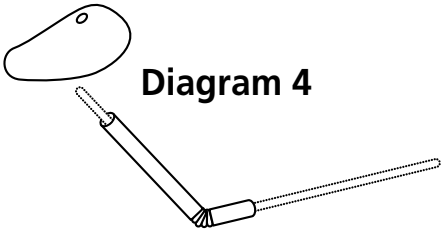


6. Take a piece of bendy straw, measure 1 centimetre below the bend, and cut off the rest of the straw.

7. Take a piece of Plasticine and make a skull.

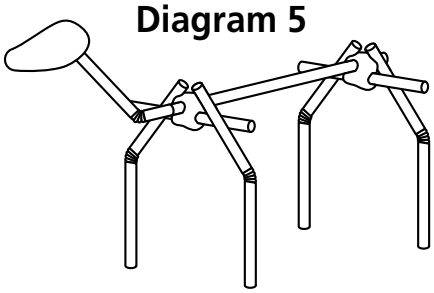
8. Assemble the skull, the straw from step 6 and a pipe cleaner, as Diagram 4 shows.

Diagram 4



9. Join the neck to the body to make a simple animal skeleton, as Diagram 5 shows.

Diagram 5



Teacher's sheet: activity

Based on **pages 18 and 19** of *Moving and growing*

Introducing the activity

(a) Use this activity after the children have read pages 18 and 19 in the pupil book. Remind them of how the bones are joined together for a particular purpose so the animal can live in a certain way. Tell the children that they are going to make a skeleton of an imaginary animal (see note (i)).

Using the sheet

(b) Give out the sheet and let the children fill in their names and form, then go through task 1.

(c) Let the children try task 1.

(d) Go through task 2, then let the children try it.

(e) Go through task 3, then let the children try it (see note (ii)).

(f) Let the children try task 4 (see note (iii)).

(g) Go through task 5, then let the children try it (see note (iv)).

(h) Go through task 6, then let the children try it.

(i) Go through task 7, then let the children try it (see note (v)).

(j) Go through tasks 8 and 9, then let the children try them (see note (vi)).

Completing the activity

(k) Let the children compare their animal skeletons and talk about the problems they had in making the bones support the animal.

(l) You could extend the activity by using neck bones from the activity in Unit 2 (see note (vii)).

Conclusion

The skeleton has special features to help it support the animal.

Teaching notes

(i) The purpose of this activity is to help the children realise some of the problems that the arrangement of the bones has to overcome if the skeleton is to work successfully.

(ii) When this is complete, the children have made two pairs of limbs, each connected to a supporting structure (like the shoulder girdle and pelvic girdle) that will help connect the limbs to the backbone.

(iii) The children should try and balance the straws in this position. They could also use small pieces of sticky tape to join the backbone to the girdles and see how flimsy the connection is.

(iv) The Plasticine is added to give the girdles extra strength, just like the bones in the pelvis are fused in the human skeleton to make a strong supporting structure. Here, as the animal has four legs, it needs two strong girdles.

(v) The skull should be made from a block of Plasticine 2cm long, 1cm wide and 1cm high.

(vi) The shoulder girdle may need some more Plasticine to hold both the backbone and the end of the neck, and to stop the neck from swinging down.

(vii) The bones will swivel round. You can show the children some real bones to show how they have projections to hold them in place.

The children may also like to add other features to the skeleton, such as a rib cage.

C

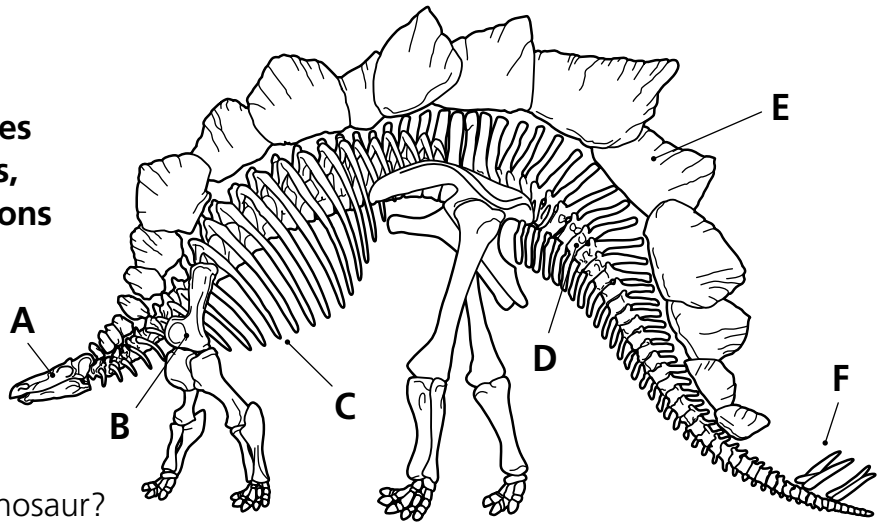
9

Name: ..... Form: .....

See **pages 20 and 21** of *Moving and growing*

Dinosaurs

The world's biggest creatures came in all shapes and sizes, but we can use their skeletons to suggest how they lived.



Q1. The diagram shows the skeleton of a dinosaur.

(i) What is the name of the dinosaur?

✎.....

(ii) Name the parts of the skeleton labelled A to F.

A ✎..... B ✎.....

C ✎..... D ✎.....

E ✎..... F ✎.....

Q2. To which animal group did dinosaurs belong? ✎.....

Q3. When did dinosaurs die out?

✎.....

Q4. What did plant-eating dinosaurs have to help them feed?

✎.....

Q5. Which were the largest dinosaurs: (a) Plant eaters, or (b) Meat eaters? ✎.....

Q6. (i) How did the arms of *Tyrannosaurus* differ from its legs?

✎.....

(ii) Why were the arms and legs of *Tyrannosaurus* different?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 20 and 21** of *Moving and growing*

Answers

1. **(i) Stegosaurus; (ii) A = skull, B = shoulder blade, C = rib, D = spine, E = plate, F = spike.**
2. **Reptiles.**
3. **65 million years ago.**
4. **Teeth suited to tearing leaves, a huge stomach to digest tonnes of food.**
5. **(a) Plant eaters.**
6. **(i) They were smaller and thinner; (ii) Because it walked on its legs and did not use its arms for walking.**

Complementary work

(a) The children can use secondary sources to find out that the Age of Dinosaurs was so long it was divided into three periods. Let the children find out about two dinosaurs from each period.

(b) The children can use secondary sources to find out about dinosaur tracks. They could find out how the dinosaur experts match fossilised prints to dinosaur bones. If they have done the activity in Unit 3 about the length of the stride, they could find out about the lengths of stride of dinosaurs.

Teaching notes

It is extremely likely that the children will be keen to volunteer their knowledge about dinosaurs and that some children will have quite a large amount of knowledge on the subject. However, some children may think that humans were present at the time of the dinosaurs, so it may be useful to give a simple account of fossils and their ages. You could say that throughout the history of the Earth, layers of rock have formed, and those rocks contain the remains of animals that were living when the rock was forming. From looking at the layers of rock in which dinosaur fossils are found, we can see that they lived from between 240 million and 65 million years ago.

The Age of Dinosaurs is divided into three time periods – the Triassic, Jurassic and Cretaceous. Different dinosaurs lived in different time periods. For example, the children may be surprised to find that *Tyrannosaurus* lived in the Cretaceous period and was not present when many of the very large *Brontosaurus*-type dinosaurs were alive.

It is important to emphasise that in the Age of Dinosaurs many other animal groups were also present. At the time, mammals were small lemur-like creatures. Birds also developed in the time of the dinosaurs and some scientists think that birds evolved from small dinosaurs. You could examine this idea further by comparing the bird skeleton on page 18 of the pupil book with the diagram of the skeleton of *Tyrannosaurus* on page 21.

C

9

Name: ..... Form: .....

Based on **pages 20 and 21** of *Moving and growing*

Dinosaur bones

Try this…

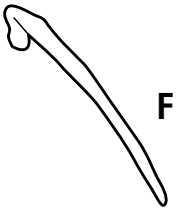
1. Use the diagrams on pages 20 and 21 of your book to identify the bones shown in Diagram 1, then fill out the table below.

Diagram 1

A

B

C



F

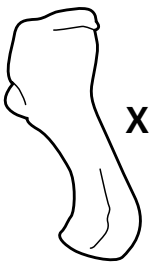
D

E

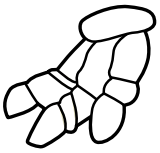
Bone	Dinosaur	Part of skeleton
A		
B		
C		
D		
E		
F		

2. Diagram 2 below shows some more dinosaur bones. They are shown to the same scale as the bones in Diagram 1. Compare the bones with those in Diagram 1 then suggest what kind of dinosaur the bones may have come from.

Diagram 2



X



Y

Z

X ✎.....

Y ✎.....

Z ✎.....

Teacher's sheet: activity

Based on **pages 20 and 21** of *Moving and growing*

Introducing the activity

(a) You may like to introduce this activity by reminding the children that no one has ever seen a living dinosaur. They died out long before humans evolved (see note (i)). All our knowledge of dinosaurs comes from the fossils that they left behind. When a new dinosaur bone is discovered it is compared with the bones in dinosaur skeletons in museums. If it cannot be identified, its size is compared to similar bones to see if the new dinosaur is larger or smaller than the dinosaurs we know. Tell the children they are going to try an activity which is also done by dinosaur hunters.

Using the sheet

(b) Give out the sheet and let the children fill in their names and form. Go through task 1 and let the children try it.

(c) Go through task 3, then let the children try it (see note (ii)).

(d) Go through task 3 (see note (iii)).

(e) Let the children try task 3.

Completing the activity

(f) Let the children compare their observations.

(g) Help the children appreciate the size of some of the dinosaur bones by showing them a picture of *Apatosaurus*. Tell them that a leg bone from this dinosaur is two metres high. Measure this height on a wall and let the children measure their heights against it.

Conclusion

A = *Stegosaurus* skull; B = *Tyrannosaurus* pelvis; C = *Tyrannosaurus* toe; D = *Stegosaurus* pillar like bone from lower front leg; E = *Tyrannosaurus* tail vertebra; F = *Stegosaurus* rib. X = A dinosaur which walks on four legs but is larger than *Stegosaurus*; Y = A dinosaur which has a hind leg like *Stegosaurus* but is larger; Z = A dinosaur which may walk on two legs but is smaller than *Tyrannosaurus*. It could be a young *Tyrannosaurus*.

Teaching notes

(i) Dinosaurs died out 65 million years ago, while humans first evolved about four million years ago.

(ii) You may like to go through the answers to task 2 before letting the children do task 3.

(iii) Make sure the children understand the phrase 'to the same scale'. This gives them a clue to the size of the unknown dinosaurs. If the bones appear larger than those in Diagram 1 they come from larger dinosaurs. If the bones appear smaller than the bones in Diagram 1 they come from smaller dinosaurs.

C

10

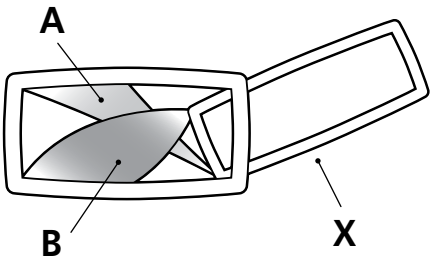
Name: ..... Form: .....

See **pages 22 and 23** of *Moving and growing*

Animals without bones

Most of the world's animals do not have bones, but instead have either skeletons on the outside (such as insects) or skeletons made of liquid (such as worms).

Q1. The diagram shows part of a leg of an animal.



(i) Is the skeleton on the inside or the outside of the body?

✎.....

(ii) Name an animal that has this kind of skeleton. ✎.....

(iii) A and B are muscles. Which muscle is tightening and which one is relaxing?

Muscle tightening ✎..... Muscle relaxing ✎.....

(iv) Draw an arrow to show which way the part labelled X moves.

Q2. What kind of skeleton does a leach have?

✎.....

Q3. Why do animals with watery skeletons live in moist conditions?

✎.....

Q4. Name one kind of mollusc. ✎.....

Q5. (i) Why does a crab have to moult?

✎.....

✎.....

(ii) What happens when a crab moults?

✎.....

✎.....

(iii) Why doesn't a clam moult?

✎.....

Teacher's sheet: comprehension

See **pages 22 and 23** of *Moving and growing*

Answers

1. **(i) The outside of the body;**
   (ii) Insect, crab, prawn, lobster;
   (iii) B is tightening, A is relaxing;
   (iv) The arrow points anticlockwise.

2. **A watery skeleton.**

3. **To keep them from drying out.**

4. **Mussel, cockle, clam.**

5. **(i) Because its skeleton does not grow with the rest of its body;**
   (ii) It squeezes out of its old skeleton and quickly grows a bigger one;
   (iii) Its shell grows with the rest of its body.

Complementary work

The children can examine a collection of shells and identify them from secondary sources. They can then find out about the lives of the animals that had the shells.

Teaching notes

The animals featured in this group are sometimes called animals without backbones, or invertebrates.

If you have studied solids and liquids, you may have shown the children that solids and liquids cannot be squashed. This property of water allows it to be used as a supporting material. Water is used to make a watery, or hydrostatic, skeleton in worms and molluscs (slugs, snails, clams, squids). It is also used in the tube-shaped feet of starfish which are arranged in lines on the underside of the starfish arms.

In each earthworm segment there are muscles which make the segment long and thin and muscles which make it short and fat. The muscles work together, like the biceps and triceps in the human arm. The earthworm has a spinal nerve on its underside which coordinates the activities of the muscles so the segments can change shape to push the earthworm forwards.

In molluscs, snails and clams use their shells for protection and support and also have watery skeletons.

Crabs, prawns and lobsters belong to a group of invertebrates called the crustaceans. They are mainly found in water.

The woodlouse is an exception, being found in moist places on land.

The crustaceans, insects, spiders, centipedes and millipedes all have a hard, external skeleton, sometimes called an exoskeleton. They form a large group of invertebrates called the arthropods. This word means 'jointed leg' and refers to the way the segments in their legs are connected together.

Name: ..... Form: .....

Based on **pages 22 and 23** of *Moving and growing*

How do earthworms move?

Try this…

1. Put an earthworm on a paper towel and watch it move.

2. Does the earthworm have a head end? ✎.....

3. How can you tell?

✎.....

4. The body of the worm is divided into rings called segments. How do the segments change as the earthworm moves?

✎.....

✎.....

5. Look at the top of the worm with a magnifying glass. Carefully turn the worm over, then look underneath. What differences can you see?

✎.....

✎.....

6. Put your ear close to the paper towel when the worm is moving. What can you hear?

✎.....

7. Suggest a reason for the sound.

✎.....

8. Make a drawing of your earthworm and add some labels.

9. Carefully return the earthworm to the soil.

Teacher's sheet: activity

Based on **pages 22 and 23** of *Moving and growing*

Introducing the activity

(a) Tell the children that they are going to make some observations on a living animal and must treat it with great care (see note (i)).

Using the sheet

(b) Give out the sheet and let the children fill in their names and form, then go through tasks 1 to 3 (see note (ii)).

(c) Let the children try tasks 1 to 3.

(d) Go through task 4, then let the children try it.

(e) Go through task 5, then let the children try it (see note (iii)).

(f) Go through tasks 6 and 7, then let the children try them (see note (iv)).

(g) Go through task 8, then let the children try it (see note (v)).

(h) Let the children try task 9 (see note (vi).

Completing the activity

(i) Let the children compare their observations.

Conclusion

The earthworm has a head. It is at the pointed end of the worm. The earthworm often moves head first but it may sometimes coil and wriggle on the paper.

The segments become short and fat then long and thin. Waves of long and thin segments may be seen passing along the length of the body. The top is darker than the underside. On the underside of each segment (apart from the first and last) are four pairs of bristles. They make a scratching noise on paper when the earthworm moves (see note (vii)).

Teaching notes

(i) Some children find earthworms repulsive. They can be allowed to work with others who are happy to try the activity.

(ii) Make sure the children handle the earthworms in accordance with your school policies (use of gloves, for example). Earthworms are sensitive to light and the investigation must not be lengthy so they can soon be returned to the darkness of the soil.

(iii) The children may be reminded to treat the earthworm carefully.

(iv) The room will have to be very quiet. Perhaps all children could do this task at the same time. Alternatively, they could take the earthworm to a quiet place. The children could cup their ear or try a hearing cone (small ear trumpet) made from card to see if they can hear more clearly.

(v) The diagram could have the following labels: head, back or upperside, underside segment, a magnified part may be drawn to show a bristle. The blood vessel on the back may be labelled.

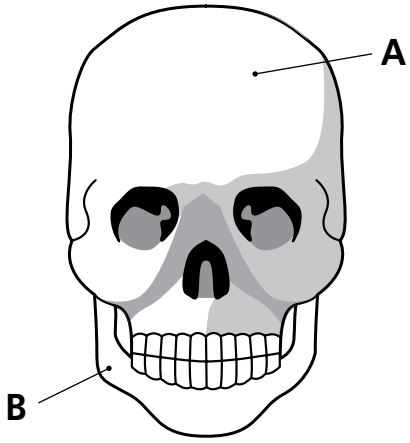
(vi) If the earthworms are in a large plant pot of soil, they may be put on the top to see how they burrow in. If the earthworms have been in the light for some time they should be buried back in the soil.

(vii) The bristles are stuck out when the segments are short and fat to help the earthworm grip its burrow as the long thin segments move the body forward.

SAT STYLE QUESTIONS

Name: ..... **Form:** .....

Q1. (i) Name parts A and B in the diagram.



A ✎.....

B ✎.....

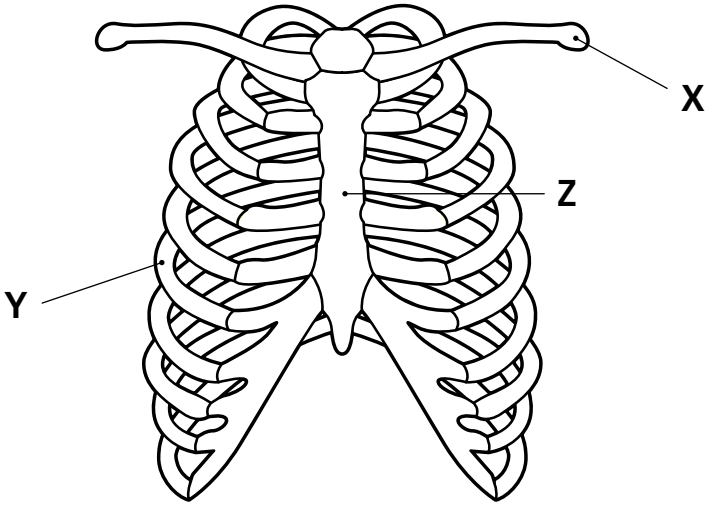
(ii) What part of the body does A protect?

✎.....

Q2. How many bones are there in the skeleton of a grown up?

Tick one box: 275 ☐ 252 ☐ 206 ☐ 164 ☐

Q3.



(i) Name bones X, Y and Z.

X ✎..... Y ✎.....

Z ✎.....

(ii) Which part of the body is protected by Y and Z?

✎.....

SAT STYLE QUESTIONS

Name: ..... **Form:** .....

Q4. (i) There are 33 bones in your spine. Where are the largest bones found?

Tick one box: Near the top ☐ In the middle ☐ Near the bottom ☐

(ii) Explain your answer to (i).

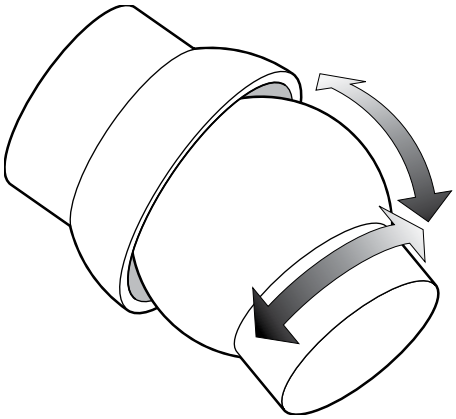
✎.....

Q5. Why is the spine curved?

Tick one box: To make it stronger ☐ To make it more flexible ☐

To make it rigid ☐ To help you twist ☐

Q6.



(i) What kind of joint is this?

✎.....

(ii) What do the arrows show?

✎.....

(iii) Name a place in the body where you may find this kind of joint.

✎.....

Q7. (i) How many long bones are there in the arm? ✎.....

(ii) How many long bones are there in the leg? ✎.....

SAT STYLE QUESTIONS

Name: ..... **Form:** .....

Q8. Mina has a record of her height for three years.

Age (years)	Height (cm)
4	102
5	107
6	113
7	121

(i) How much did she grow between the age of 4 and 5? ✎.....

(ii) How much did she grow between the age of 5 and 6? ✎.....

(iii) How much did she grow between the age of 6 and 7? ✎.....

(iv) At which time did she grow the most? ✎.....

(v) Mina is now nine years old and has a height of 132cm.
How much has she grown since she was four years old? ✎.....

Q9. Paul did a survey of the heights of all the children in his class. He divided up the results into four groups, as the table shows.

Group	Height range (cm)	Number of children
1	125-129	4
2	130-134	10
3	135-139	9
4	140-144	2

(i) Paul has a height of 137cm. To which group does he belong? ✎.....

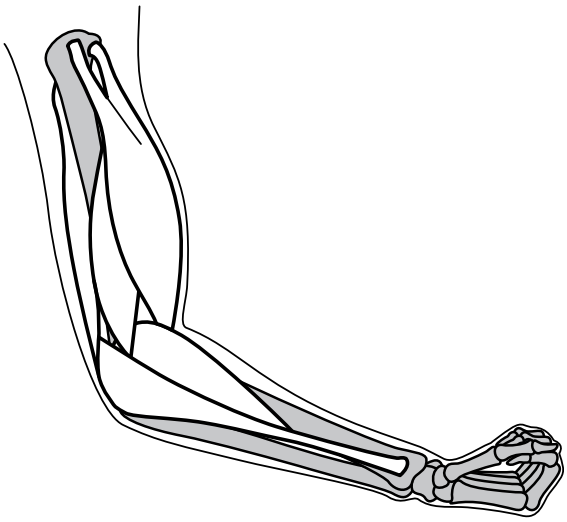
(ii) Arif is in group 4. What could his height be?

✎.....

(iii) Which group is the smallest? ✎.....

Name: ..... **Form:** .....

Q10. The diagram shows the muscles in Jane's arm.



(i) Shade in the muscle Jane uses to raise her forearm.

(ii) What is the name of the muscle?

✎.....

(iii) When this muscle raises the forearm does it tighten or relax?

✎.....

(iv) What is the name of the muscle Jane uses to lower her forearm?

✎.....

(v) Label the muscle with the letter X.

Q11. What do nerves carry in the body?

Tick one box: Food ☐ Blood ☐ Air ☐ Electrical messages ☐

Q12. (i) What food contains energy that the muscles can use?

✎.....

(ii) What else does the body need to release the energy?

✎.....

(iii) What happens to a muscle when it uses energy?

✎.....

SAT STYLE QUESTIONS

Name: ..... **Form:** .....

Q13. What holds the bones together in the skeleton?

Tick one box: Ligaments ☐ Cartilage ☐ Muscles ☐ Nerves ☐

Q14. The length of the legs of three animals was measured. The length of the animals' strides were then measured. The table shows the results.

Animal	Leg length (cm)	Stride (cm)
A	60	25
B	100	60
C	120	90

(i) Which animal had the smallest stride? ✎.....

(ii) Which animal had the longest leg? ✎.....

(iii) How does the length of the leg seem to affect the length of the stride?

✎.....

Q15. Draw lines between the boxes to match each dinosaur with the way it feeds.

Stegosaurus	**Hunter and scavenger**
Tyrannosaurus	**Hunted in packs**
Deinonychus	**Plant eater**

Name: ..... **Form:** .....

Q16. How did dinosaurs differ from reptiles living today?

Tick three boxes:

Were cold-blooded ☐ Had legs sticking out at the sides ☐

Many were very large ☐ Had scales ☐

Had legs tucked under body ☐ Were warm-blooded ☐

Q17. What material is used to make the skeleton of a worm?

✎.....

Q18. What is the substance we get from foods like milk that helps to make our bones?

✎.....

Q19. Arif is looking at a crab leg.

(i) When he looks inside the leg, what would you expect him to see?

✎.....

(ii) Where on its body is the skeleton of a crab?

✎.....

(iii) Name another kind of animal with a similar skeleton.

✎.....

ANSWERS
SAT STYLE QUESTIONS

1. (i) A = skull, B = jaw bone. *2 marks*
(ii) Brain. *1 mark*

2. 206. 1 mark

3. (i) A = collar bone, B = rib, C = breast bone. *3 marks*
(ii) Lungs. *1 mark*

4. (i) Near the bottom. *1 mark*
(ii) They have to support the largest weight. *1 mark*

5. To make it stronger. *1 mark*

6. (i) Ball-and-socket joint. *1 mark*
(ii) Movement of the ball. *1 mark*
(iii) Shoulder, hip. *1 mark*

7. (i) 3. *1 mark*
(ii) 3. *1 mark*

8. (i) 5cm. *1 mark*
(ii) 6cm. *1 mark*
(iii) 8cm. *1 mark*
(iv) Between 6 and 7 years of age. *1 mark*
(v) 30cm. *1 mark*

9. (i) Group 3. *1 mark*
(ii) 140, 141, 142, 143 or 144cm. *1 mark*
(iii) Group 4. *1 mark*

10. (i) Biceps shaded in. *1 mark*
(ii) Bicep. *1 marks*
(iii) Tighten. *1 mark*
(iv) Triceps. *1 mark*
(v) Triceps labelled with X and line from the X to the muscle. *1 mark*

11. Electrical messages. *1 mark*

12. (i) Sugar. *1 mark*
(ii) Oxygen. *1 mark*
(iii) It tightens and pulls on a bone. *1 mark*

13. Ligaments. *1 mark*

14. (i) A. *1 mark*
(ii) C. *1 mark*
(iii) The longer the leg, the longer the stride. *1 mark*

15. *Stegosaurus* ➔ plant eater; *Tyrannosaurus* ➔ hunter and scavenger; *Deinonychus* ➔ hunted in packs. *3 marks*

16. Were warm-blooded, many were very large, had legs tucked under the body. *3 marks*

17. Water. *1 mark*

18. Calcium. *1 mark*

19. (i) Muscles. *1 mark*
(ii) On the outside of its body. *1 mark*
(iii) Lobster, prawn, insect. *2 marks*

Total marks: 49