Curriculum Visions

Body Teacher's Guide

More support material can be found
at the web site:

www.CurriculumVisions.com

At the web site most spreads in *The Body Book*
are matched by a *Body* web page.

You can also consult our web site:

www.AtlanticEurope.com

for material on a wide variety of topics
and our on-line catalogue.

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Feedback please!

We hope you are completely happy with our material, but if we have made any mistakes, please tell us!

Also, please write, fax or e-mail us with any suggestions as to how we can improve our material, such as suggestions for worksheets, additional examples that are required, new subject areas for worksheets and so on.

Your feedback is vital to making our product as useful to everyone as possible.

Contents

Section 1: Planning

Introducing the Students' Book

The Body Book is a full colour paperback book. It is arranged in double page spreads. The spreads are arranged in a sequence which can be used as a basis for teaching the topic, but each spread can also be taught on its own, so that it can be easily fitted into your existing scheme of work. This makes the material exceptionally flexible to your needs. For example, you may wish to dip into it in various years to study topics such as teeth or muscles and skeleton, or you may wish to make a term-long study of the body, ending with the concept of health, which brings all the topics together.

Each spread follows the same format, to help the pupils develop their reading and information finding skills. The reader-friendly text styles are supported by clear, colourful diagrams and photographs to promote interest and thorough understanding. Every spread begins with a short introductory paragraph in bold type. This paragraph describes the main content of the spread and helps the reader settle down to the page. The content is then developed in the main text. Each section also has clear headings for easy reference. The content of the main text is developed further in the extended captions. This allows the content of the spread to be read and understood by children with a wide range of abilities across **Key Stages 2 and 3**. Key or difficult words are featured in bold type to signify that they are explained in the glossary on pages 46 and 47.

The *Students' Book* is designed to be used primarily in class and to be bought as class sets. You will find that sets are priced accordingly. There is also a hardback edition for library use.

Introducing the Teacher's Guide

This guide has the following features:

- Information to help you match the *Curriculum Visions* materials with the curriculum.
- Photocopiable masters of worksheets which test comprehension of one of the diagrams and the text on each of the spreads. These worksheets can be used in a portfolio assessment scheme.
- Answers to the comprehension worksheets, suggestions for introducing the spread and background information. These are in the teacher's sheet on the back of each of the worksheets.
- Practical activities to support most of the spreads. These may provide opportunities to develop individual investigative skills, or allow the planning and carrying out of whole investigations.
- Extension materials, to provide an opportunity for building differentiation into your work. Some items may also be used for whole class revision, and all items can be used in a portfolio assessment scheme.

Planning to use the Students' Book and Teacher's Guide

Examine a spread in the *Students' Book* and look in the worksheet section of this guide to find the comprehension worksheet photocopiable master for the spread. Each comprehension worksheet has a page reference to the *Students' Book* top centre, a number top left and a pencil top right. Most comprehension worksheets are followed by one or more practical worksheets.

Look at the teacher's sheet on the back of the comprehension worksheet to read how the teaching of the spread may be introduced. If the spread is supported by practical work, the worksheets will be listed here. Advice is given on how to integrate practical work into reading and comprehension work. Page references for the extension worksheets are given and where appropriate there will be a small section suggesting how you could link the spread with other spreads in the *Students' Book*.

If the spread is supported by practical work, look at the practical worksheets.

They will have the same number as the comprehension worksheet top left and a letter top right where there is more than one practical. Look on the back of these for the teacher's sheet which lists the equipment and facilities you will need. These are also featured on pages 6 and 7 of this guide, together with the whole list of practicals. In this list, practicals which are suitable for whole investigations are marked with an *. There are also suggested outcomes to the practical work, which you may like to use, or change to suit your purposes.

There may also be background information on the backs of both comprehension worksheets and practical worksheets.

There are opportunities for extending the work on the teacher's sheets of many of the practicals. Where equipment is required for these, details are given on the sheet and are also shown by a '*' in the list on page 6.

Finally, look at the extension worksheets, Section 5 beginning on page 109, where details of any facilities or materials for the worksheets are stated. Each extension worksheet bears the same number as the comprehension worksheet, but in a square instead of a circle.

Each extension worksheet begins with an exercise, using the cloze technique, which may be used directly with the spread or as revision at the end of the work on the spread, perhaps to review practical work. The second question may involve further practical or survey work. Supporting material for this is in the teacher's sheet on the back of the corresponding comprehension worksheet. The answers for the cloze exercises are on pages 131 and 132. In the last ***Go further*** section of the extension work, there is an opportunity for the students to use a range of secondary sources to consolidate their work. The students are set one or more assignments for which they will need resources such as books, CD-ROMs and web sites, including:

www.CurriculumVisions.com/body

Web site support

If you have an Internet connection (or if some of your students have home connections), make sure that the students know that this is a web-linked book and that they can get additional material by visiting our web site at:

www.CurriculumVisions.com/body

The web site address is also in the *Students' Book*.

Each page in the book has an associated web page and there is also a site providing upgrades to this *Teacher's Guide*.

Don't worry if you don't have access to the web site at this time. As you become connected to the Internet, your students will find that this site is filled with information they can use for their lessons.

Support for the Science Co-ordinator

A major consideration in adopting a book for a course is the provision of materials and facilities for practical work. In the next section the requirements for core practicals (i.e. those that have a worksheet to themselves and follow the comprehension worksheets) are set out. This will help you take stock of your resources and help you plan your budget spending. The practicals have been designed to use the minimum of materials so that they can be made easily accessible to most children. The exception is the use of the microscope in the study of cells. This is a topic that you may chose not to use, but if you do have access to microscopes, instructions on set up and use are provided on the back of the appropriate sheet.

Also in the next section is a list of practicals that give the students an opportunity to plan and carry out whole investigations.

Section 2: Practical work

Safety first!

Before any kind of class or field work, please make sure you have thought through the appropriate safety precautions, especially safety with any sharp objects.

There are 24 practical activities. Most involve the minimum of specialist equipment, and all can be carried out in a classroom without the need for laboratory facilities. This makes the book a suitable course for both upper primary, and lower secondary schools where there is insufficient laboratory provision.

Before you begin, consult your school's policies on practical work with materials and the participation of children in experiments. Also consider the abilities and attitudes of the students in your class and select activities for which you are confident to take responsibility.

The following is a list of equipment needed for each of the practicals, set out by experiment. An asterisk indicates additional material required for the extended activity on the teacher's sheet.

1: Ink pads, sheets of white paper and magnifying glasses.

2A: Cardboard, scissors, sticky tape, long elastic bands.

2B: Long pole.

3A: Microscope, microscope slides, lamp, sand.

3B: Microscope, microscope slides, lamp, potato peeling.
*Prepared slides of human cells.

4: Small sheets of paper and a selection of foods.
*Cooking oil, spoon, tumbler of water.

5: Mirrors without sharp edges.

6: Beakers or jars, water, sugar lumps, granulated sugar, spoons, stop clock, measuring cylinder.

7: Stop clocks.

9A: –

9B: Stop clocks.

11A: A few paper straws, a means of supporting the straws (such as the edges of two tables or columns of wooden blocks), a scale pan and some weights (either scientific masses or small objects such as coins).

11B: Sheets of paper, a means of supporting the paper 'bones' (such as the edges of two tables or columns of wooden blocks), a scale pan and some weights (either scientific masses or small objects such as coins, kitchen weights may also be needed with the larger 'bones').

12A: –

12B: Scissors and glue.

13: –

14: –

15A: Toothpicks, glue and cards.

15B: Mirrors without sharp edges, pens and pen tops.

15C: Rulers.

15D: –

16A: Plasticine and graph paper.

16B: Large and small containers (made of the same material – preferably something that will lose heat quickly like plastic or metal), stop clock and spirit thermometers, graph paper.

19: –

Note: please read the introductions to the spreads and practicals as they may contain suggestions for using various additional pieces of equipment and materials to help set the scene for the work.

Developing investigative skills

Whilst all the practical activities provide opportunities for observations, some also provide opportunities for completing tables, drawing graphs and scientific modelling. Those practicals marked with an asterisk in the list below provide an opportunity for the students to demonstrate their full range of investigative skills.

1: Fingerprints

2A: A model arm

2B: Controlling the muscles

3A: Using a microscope

3B: Looking at cells
4: Testing food for fats
5: Making a tooth map
6: Investigating surface area*
7: How often do you breathe?*
9A: Find your pulse
9B: Investigating the pulse*
11A: Testing the length of 'bones'*
11B: Testing the thickness of 'bones'*
12A: Your skeleton
12B: Your skeleton (part 2)
13: Joints
14: Muscles
15A: Skin test
15B: Eye test
15C: Reaction timer*
15D: Memory test
16A: Growth of a fetus
16B: How bodies cool down*
19: A healthy diet

There are also two accounts of investigations which test comprehension and serve as examples of investigations from the past which have influenced the present:

18A: Edward Jenner's experiment
18B: Alexander Fleming's discovery

The Body Book web support material

The *Students' Book* and *Teacher's Guide* are rich in pictures and diagrams. They form the core around which you and your students can build. However, the information can be greatly extended by visiting our dedicated special support web site at:

www.CurriculumVisions.com/body

or our home page at:

www.AtlanticEurope.com

It is important to understand that the *Students' Book* is quite self-contained. Use of the Internet site is not required for using either the *Students' Book* or for comprehension of the material. However, if you want to find additional pictures and information, or if you want your students to get involved in using ICT, you will find our **Body** web pages have much to offer.

Our **Body** web pages are organised so that every main spread in the book is linked to a specific web page. So, students can be asked to refer to the web for each topic they study. Remember that the web is a more informal learning place than a book, and the material can be changed frequently. If you also have time to investigate the web site, you will find that there are many pictures and some case studies that can be downloaded for your teaching needs. And, if what you want is not there – you can always ask us, and we may well be able to provide it.

The web is simple. Here's how to make use of it:

In case you are not familiar with how easy this whole process can be, here are the simple steps you might like to follow (or use in conjunction with your IT colleague).

1) Start up the application program (which is called a web browser) that links you to the web. You will probably find this is called Netscape Navigator™ or Microsoft® Internet Explorer. Our web site is optimised for Netscape Navigator™ 4 and above.
2) Once the application is up and running, you will need to enter our electronic address:

   www.CurriculumVisions.com

   into the blank line near the top of the browser window.
   NOTE: Make sure to include the full stop after 'www', and after 'Visions', and don't put any spaces or dashes between the parts of our name.
   (You will notice that the www.CurriculumVisions.com/body web site address is also written in the *Students' Book*, so students can easily get to the site, too.)
3) Press enter and the browser will dial up the Internet and connect you to our site.
4) Please read the preferences section on the first (home) screen to make sure you set up the browser to make the most of the site.
5) Click on the button labelled '**Body**' to take you to the correct section. A navigation bar appears on the top left-hand side of the

window. Click once on 'Student Book' or on the main image of The Body Book.

Important: The web sites contain much valuable information, which you are free to download for non-commercial use in schools only. This material is covered by copyright protection in just the same way as the book.

6) You will now find a list of page numbers down the left-hand side, together with a button for the glossary and other materials. Choose any number and click once. You will find yourself at that page, with its pictures and more text.
7) Now you can browse through the page, using the scroll bar on the right of the window.
8) And that's all there is to it!

Getting pictures and text to use yourself

One of the great things about the information found on the web is that it is easy to copy. Many of our pages have been made up in a special format called 'PDF' (Portable Document Format). When you click on the label of a PDF file, the file will be downloaded to your computer so that you can browse it off-line. To read a PDF file you ideally need Acrobat, a free piece of software from Adobe. Acrobat is often already installed on your computer as PDF files are common on the web. However, if you need to download the software, it's free at the Adobe web site. You can build up a library of these PDF files and keep them on your own computer or on the school's network computer system. Students can then get access to them whenever they want to without having to go to the Internet.

The PDF file also contains all of the fonts and page layouts that we devised, so that you can print it and get results similar to those in a colour or black and white book.

Companion information

There are other useful books published by Atlantic Europe Publishing and available by direct order at substantial discounts.

Companion science titles include:

- The Plant Book
- The Electricity Book

Other titles in the Curriculum Visions series are:

- The Mountain Book
- The River Book
- The Weather Book
- The Places Book

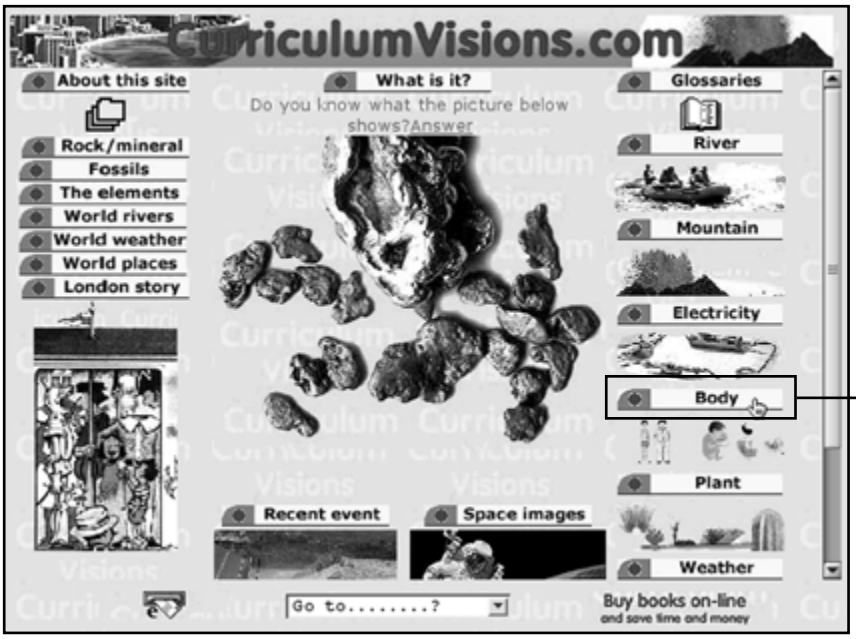
Each has a comprehensive *Teacher's Guide* and some are available with companion CDs, posters and readers. Together they provide a flexible, thorough coverage of your curriculum requirements.

For an up-to-date list of titles available see our web site at:

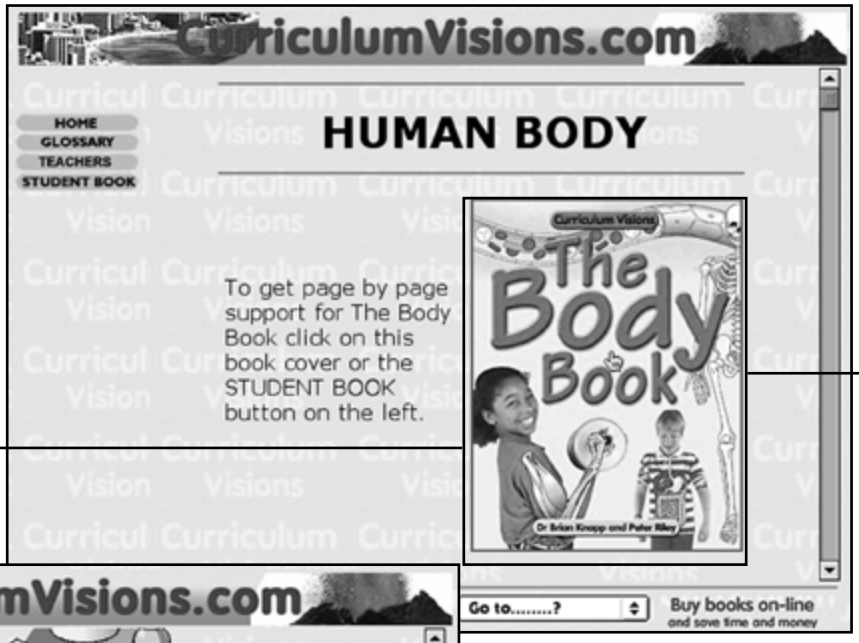
www.AtlanticEurope.com

The Curriculum Visions web site

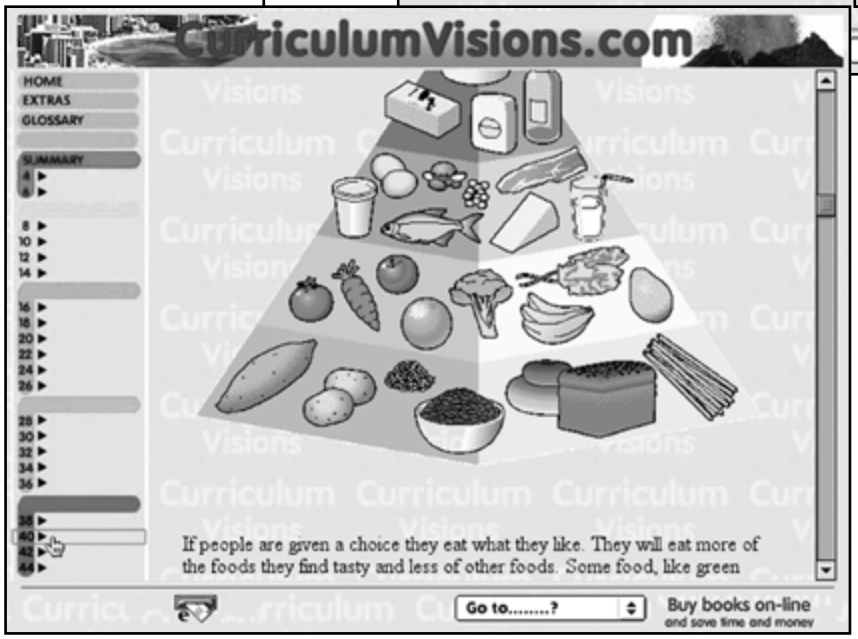
Please note that the detail shown on these screens may change as new materials are added regularly.



▶ **This is the home screen of the CurriculumVisions.com web site. It shows each of the books and the many kinds of information available. Click on the button labelled '*Body*' to go to the *Body* home screen.**



▶ **From the *Body* home screen, click on the left-hand button labelled 'Student Book', or the picture of *The Body Book*.**



◀ **You will now find page number buttons down the left-hand side. Click on any page number for more information and additional pictures covering each of the spreads in the *Students' Book*. Here you can see the *Body* web page covering healthy diets (pages 40 and 41 of the *Students' Book*).**

Section 3: Considering the Curriculum

The core parts of the two syllabuses this material is addressing are as follows, but the materials can be used for other syllabuses and for a broad range of abilities in many types of school.

National Curriculum Science Key Stage 2

Life processes and living things

1. Life processes

a. Life processes common to humans and other animals include nutrition, movement, growth and reproduction.

2. Humans and other animals

Nutrition

a. The functions and care of teeth.

b. The need for food, activity and growth, and the importance of an adequate and varied diet for health.

Circulation

c. The heart acts as a pump to circulate the blood through vessels around the body, including through the lungs.

d. The effect of exercise on pulse rate.

Movement

e. Humans have skeletons and muscles to support and protect their bodies and to help them move.

Growth and reproduction

f. The main stages of the human life cycle.

Health

g. The effects on the human body of tobacco, alcohol and other drugs and how these relate to personal health.

h. The importance of exercise for good health.

National Guidelines Environmental Studies 5-14: Science

Living things and the processes of life

The processes of life

- Name the life processes common to humans and other animals.
- Identify the main organs of the human body.
- Describe the broad functions of the organs of the human body.
- Describe the role of lungs in breathing.
- Outline the process of digestion.
- Describe the main stages in human reproduction.
- Identify and give the functions of the main structures found in animal cells.

Section 4: Photocopiable worksheets for *The Body Book*

Introduction

The photocopiable worksheets in this *Teacher's Guide* have been designed to be a fast and efficient way of working through the study of the body. They are divided up in the following way in this section:

From pages 13 to 108 are comprehension worksheets on the spreads, and worksheets on the supporting practical work. It is intended that you photocopy the front of each worksheet for students to complete. Students need to be instructed to write their name and form on the top of the worksheet and that the '✎' symbol indicates where they should write their answers. In some cases students will need to colour in the diagrams too.

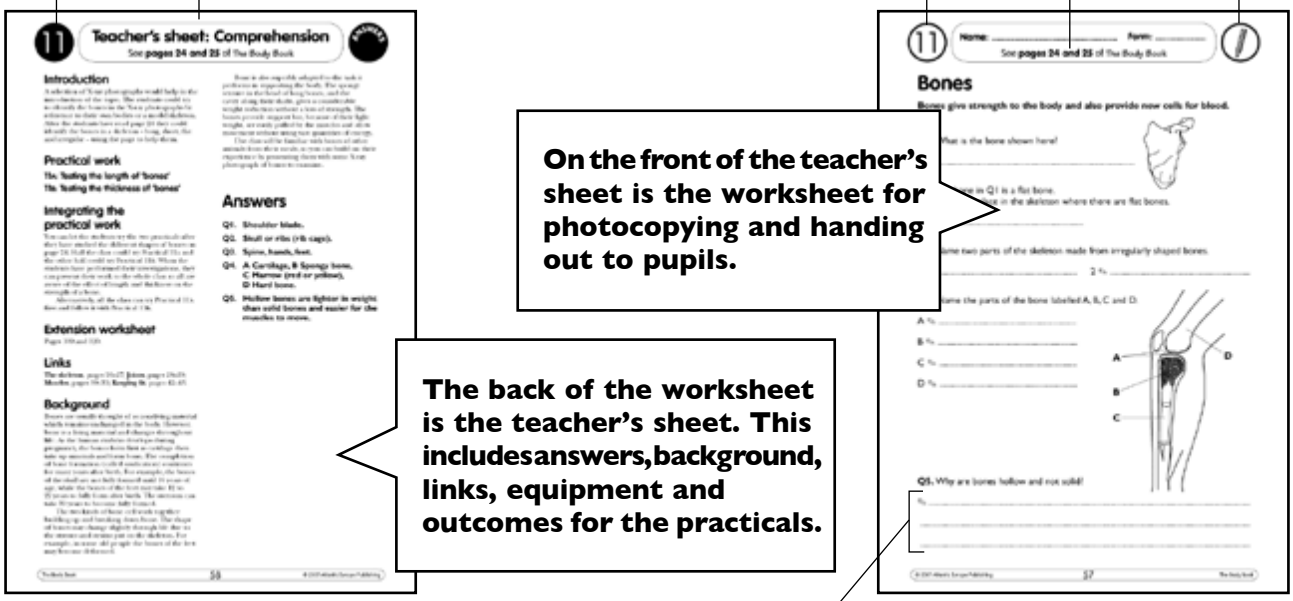
These worksheets are intended for use directly with the *Students' Book*. At the head of each sheet are the relevant pages of the *Students' Book* where the answers can be found. The worksheet number, top left, is common to all comprehension, practical and extension material connected to a particular topic. Top right of the page is a circle which contains either a pencil, for a comprehension worksheet, or the word practical, followed by a letter if there is more than one practical for that level.

On the back of each worksheet is the teacher's sheet with answers and background information. This additional information is intended to help you provide an overview to the relevant pages in the *Students' Book*, set the context to the questions, and present some additional important points.

The number is common to the comprehension worksheets, practicals and extension material covering a particular topic.

Refers to the page numbers in the *Students' Book* to which the worksheet relates.

A pencil in a circle shows that this is a comprehension worksheet.



On the front of the teacher's sheet is the worksheet for photocopying and handing out to pupils.

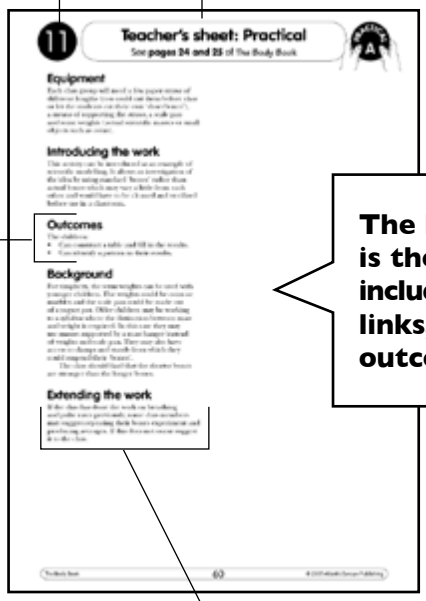
The back of the worksheet is the teacher's sheet. This includesanswers,background, links, equipment and outcomes for the practicals.

The '✎' symbol shows the children where to write their answers.

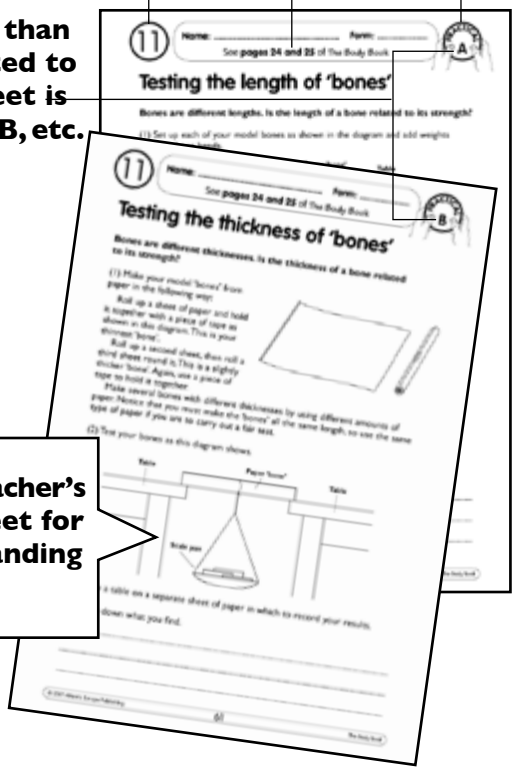
The number is common to the comprehension worksheets, practicals and extension material covering a particular topic.

Refers to the page numbers in the *Students' Book* to which the worksheet relates.

The word 'Practical' held by a pair of hands shows this is a practical worksheet.



Where there is more than one practical connected to a topic, each worksheet is distinguished by an A, B, etc.



The back of the worksheet is the teacher's sheet. This includes answers, background, links, equipment and outcomes for the practicals.

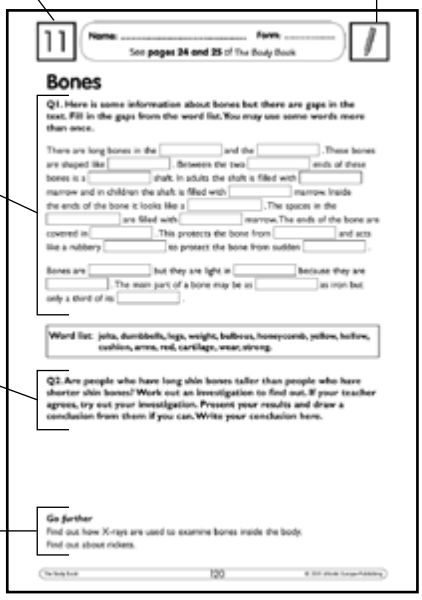
On the front of the teacher's sheet is the worksheet for photocopying and handing out to pupils.

Many practical teacher's sheets provide opportunities for extending the work. Resources for these are also on page 6 (marked with a '*').

On the practical teacher's sheet you will find suggested outcomes to help with the planning of your work. You may wish to use the outcomes as they are stated, or modify them to meet your needs.

The number is common to all material covering a particular topic.

A pencil in a square shows this is the corresponding extension worksheet.



Cloze exercise.

Exercise related to the spread.

***Go further* section to encourage research.**

From page 109 to 132 are extension materials. There is one page for each spread of the book. The page is divided up into a cloze exercise, an exercise related to the spread or to supplement the spread and a ***Go further*** section which encourages the students to research the topic using as wide a range of secondary sources as possible.

And don't forget…

Remember to use our web site information to provide you with the back-up resources and extra materials for your students.

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

See **pages 4 and 5** of *The Body Book*

Introduction (part 1)

The body has many tasks to perform. Different parts of the body perform different tasks.

Q1. What is the part of the body labelled A?

✎ .....

Q2. What does A do?

✎ .....

.....

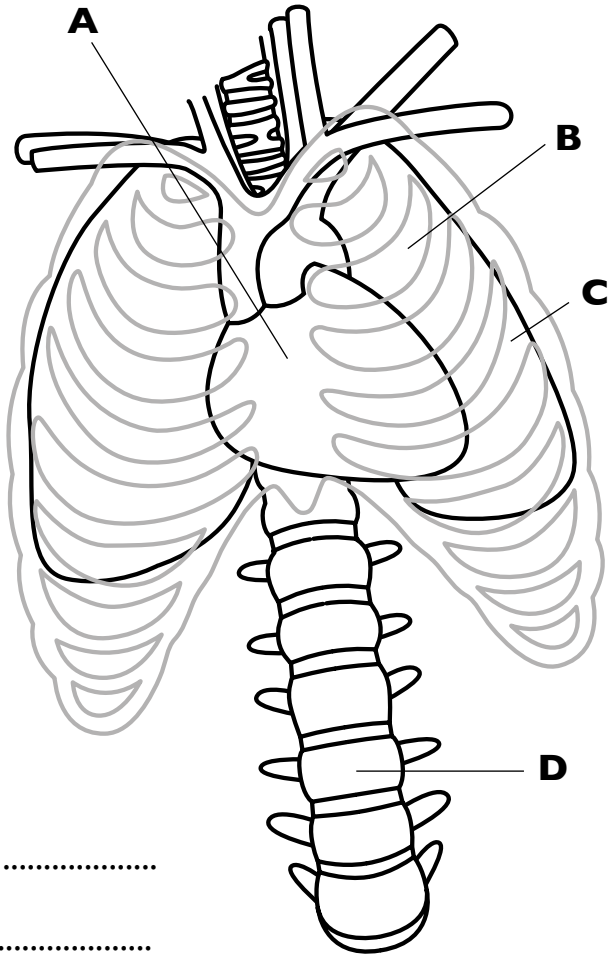
Q3. What is the part of the body labelled B?

✎ .....

Q4. What does B do?

✎ .....

.....



Q5. Name parts C and D and write what they are made from.

C ✎ .....

D ✎ .....

Q6. The body is made up from tiny building blocks. What are they called?

✎ .....

Q7. What do these building blocks need to stay alive?

✎ .....

1 Teacher's sheet: Comprehension

See **pages 4 and 5** of *The Body Book*

ANSWERS

Introduction

Ask the children what they know about chemistry sets. They may readily volunteer anecdotes. Then ask them what they know about chemicals and introduce the idea that we are made from chemicals and that we use chemicals to stay alive. Immediate evidence for this comes from the need for oxygen and the production of carbon dioxide. Less immediate but equally vital is the need for food and the expelling of solid and liquid wastes.

Ask the children what they know about cells. Some may know a little from background reading and some may confuse the term with that used for a battery. You need not develop the idea any more than it is on page 4, but depending on the interest and ability of the students, you may wish to develop the concept more, using pages 8 and 9 in the *Students' Book*.

You may wish to read through the spread aloud by way of introducing the body, and let the children follow up the page references and look briefly at the appropriate spreads. This will help the children realise the complexity of the human body.

At the end of your study of *The Body Book* you may like to use this spread for revision purposes.

Practical work

1: Fingerprints

Advance preparation: make a collection of ink pads like those used in offices.

Integrating the practical work

Ask the children what protects all the cells and organs that have been featured in the spread. When they reply it is the skin, tell them that in an adult the surface of the skin is about two square metres. You may like to show them a table cloth of about that size to emphasise the point. Ask the children what they know about fingerprints. Some may already know that each set is unique. Introduce the practical to investigate this idea.

Extension worksheet

Pages 109 and 110.

Links

Cells, **Food**, **Digestion**, **Breathing**, **The heart**, **How blood circulates** and **Muscles**, as the page references suggest. Before you move onto any of them you may prefer to finish off the introduction by turning to page 6.

Using the questions

The questions in this worksheet are aimed at finding out what children may already know from earlier work. They can be used for diagnostic purposes and may help you plan your course.

Answers

Q1. The heart.

Q2. It pumps blood around the body.

Q3. A lung.

Q4. It is used for breathing. It takes in oxygen from the air and gives out carbon dioxide from the body.

Q5. C Rib, D Backbone. They are both made from bone.

Q6. Cells.

Q7. Food and energy. Also oxygen to release energy from food.

1

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

See **pages 4 and 5** of *The Body Book*

Fingerprints

(1) Make sure that your fingers are clean.

(2) Roll each finger and thumb down to the first joint on an ink pad then roll it on the paper. Set out your finger and thumb prints in the order shown below.

LEFT HAND

Little finger	Ring finger	Middle finger	Index finger	Thumb
✎	✎	✎	✎	✎ .....

RIGHT HAND

Thumb	Index finger	Middle finger	Ring finger	Little finger
✎	✎	✎	✎	✎ .....

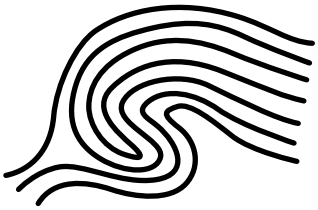
(3) Look at each print in turn with a magnifying glass and see if you can identify the pattern from the four shown below.

Arch

Loop

Whorl

Double whorl

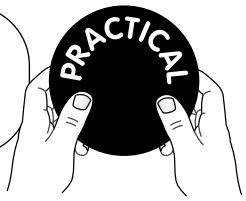


(4) In the space under your fingerprints, write down the pattern made by each print.

(5) Compare the number and kinds of patterns with others in your class.

1 Teacher's sheet: Practical

See **pages 4 and 5** of *The Body Book*



Equipment

You will need ink pads, sheets of white paper and magnifying glasses.

Outcomes

The children:

- Can follow instructions.
- Can use a magnifying glass.
- Can make comparisons.

Background

The skin is only about 3mm thick but can become much thicker (up to about 10mm) on the soles of the feet.

The functions of the skin include protection of the internal organs from injury, prevention of invasion by micro-organisms, and temperature regulation to keep the body temperature constant by either sweating to release excess heat or withdrawing blood from the surface and developing a pallor to retain heat in the body. The ends of the fingers and thumbs have ridges which help in gripping objects. The ridges form patterns which may be left behind in the oil on the objects that have been handled.

Everybody can be identified by the pattern of ridges on the ends of their fingers and thumbs. Even identical twins have different fingerprints. Identifying someone from their fingerprints requires expert observation of the prints, but the essential patterns can be seen by making inky fingerprints on paper. Members of the class may find that they have different numbers of the essential patterns on their hands.

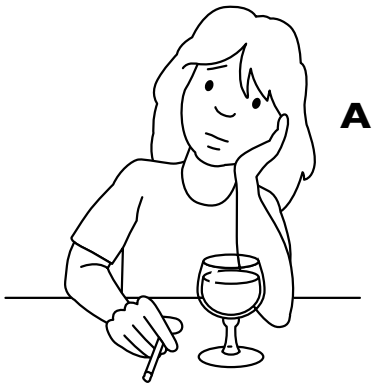
2

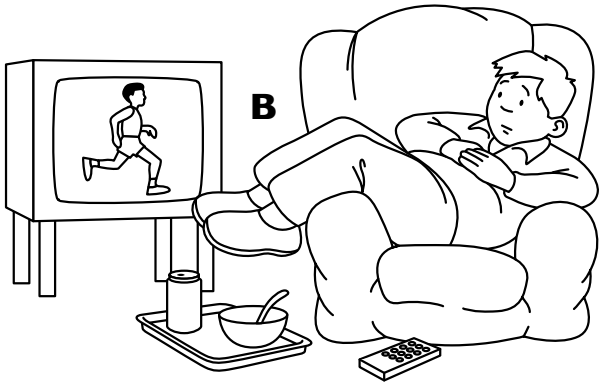
Name: ..... **Form:** .....

See **pages 6 and 7** of *The Body Book*

Introduction (part 2)

The health of the body is affected by the way we live and the diseases we catch.





Q1. How could these people be affecting their health?

Person A .....

.....

Person B .....

.....

Q2. How can sugary foods affect your health?

✎ .....

Q3. What kinds of foods should only be eaten in small amounts?

✎ .....

Q4. Why should you only eat small quantities of these foods?

✎ .....

.....

Q5. What causes disease? ✎ .....

Q6. Which part of the body fights disease? ✎ .....

2 Teacher's sheet: Comprehension

See **pages 6 and 7** of *The Body Book*

ANSWERS

Introduction

You may read this spread straight after the last one without breaking for the practical work. If this is the case, continue reading through this spread and let the children follow up the page references and look briefly at the appropriate spreads. This will further help the children realise the complexity of the human body.

If you have spent time on Practical 1 you may need to reintroduce the children to the wide range of topics relating to the human body. You may begin by reminding them about the contents of the previous spread, then go through this spread with them. As the body was previously introduced as a walking chemistry set, perhaps you may like to now introduce it as a machine. The opening paragraph on page 6 can help you. Read the background information on page 20 to help you set the scene for a discussion on the body as a machine. You may like to compare the body with a machine and say it uses fuel for energy the way we use food for energy; machines may need air to burn fuel, like a car engine; machines may move; they may excrete wastes, such as exhaust fumes; and they may be sensitive to environment through sensors and built-in computers. Where the analogy of the machine breaks down is when we consider growth and reproduction – a machine does neither of these – yet!

Practical work

2A: A model arm

2B: Controlling the muscles

Integrating the practical work

You may use these practicals even if you do not use the machine analogy. They can be used as extensions of the first and second paragraphs on page 6 respectively. Introduce Practical 2A by considering the relationship between muscles and bones. You may like the children to extend and flex their own arms, then say that in order to understand how something works scientists make models. This will lead you into Practical 2A. You can introduce Practical 2B by reference to the brain as a computer controlling the muscles automatically.

You may wish to leave these practicals until later, when studying muscles, but they are very useful here to provide a stimulating introduction and draw in the reluctant learners in the class at the beginning of the topic.

Extension worksheet

Pages 109 and 111.

Links

The skeleton, **Muscles**, **The brain**, **A new human life begins**, **Bacteria and viruses**, **Getting immunity**, **A healthy diet**, **Keeping fit** and **Taking risks**.

Using the questions

The questions aim to test the children's background knowledge of health issues. You may use the test for diagnostic purposes for planning your work or integrating the health content of this book into your PSHE scheme.

Answers

Q1. Person A is smoking and drinking alcohol. Smoking can cause bronchitis, cancer and heart disease. Drinking large amounts of alcohol can cause drunkenness when people may injure themselves. Drinking large amounts of alcohol over a long period of time can cause liver damage.

Person B is not taking exercise. This can lead to the body becoming overweight, muscles working poorly and heart disease.

Q2. Sugar may cause tooth decay. Eating too much sugar may make people overweight.

Q3. Fatty foods.

Q4. Eating too much fatty food makes people fat and can lead to heart disease.

Q5. Germs, bacteria, viruses.

Q6. The immune system.

2

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

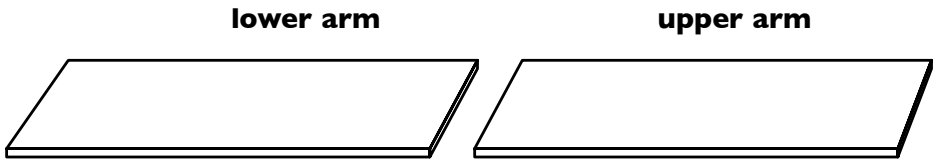
See **pages 6 and 7** of *The Body Book*

PRACTICAL A

A model arm

(1) Cut out two strips of thick card about 5cm long and 2cm wide to make the upper and lower arm.

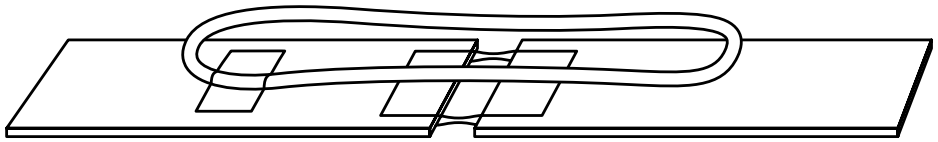
(2) Leave a gap of about half a centimetre between the ends.



(3) Join the cards with sticky tape on both sides.

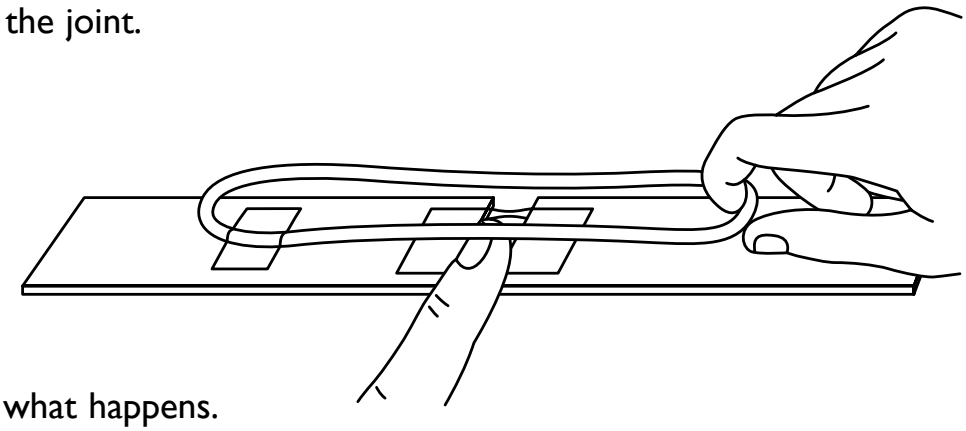
(4) Lay a long elastic band across the joint.

(5) Tape one end of the band to the middle of the lower arm.



(6) Put your finger on the centre of the joint, under the elastic band.

(7) Gently hold the end of the elastic band resting on the upper arm and gently pull it across the joint.



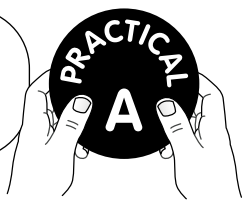
(8) Describe what happens.

✎ .....

.....

2 Teacher's sheet: Practical

See **pages 6 and 7** of *The Body Book*



Equipment

You will need cardboard, sticky tape and long elastic bands.

Introducing the work

If you have used the analogy of the machine to explain the body, as described in the background on page 18, you may like the children to try this practical work now. It could be integrated into their design and technology work.

If you have not used the machine analogy you may like to leave this practical work until you study pages 30 and 31 in the *Students' Book* and worksheet 14 on pages 75 to 76 in this book.

This simple activity enables you to introduce the idea of scientific modelling as a way of understanding processes and allows the class to see how an increase in tension in the 'muscle' brings about movement.

When scientists are studying how a process works they sometimes make a model of it to test their ideas.

You may begin by asking the members of the class to extend their right arm and feel the muscle in the front upper arm – the biceps. Let them flex their arm while feeling the muscle and they should feel it become harder and shorter. Let them also feel the tendons of the muscle as they cross the joint into the lower arm. Ask the class what happened to the lower and upper arm when the biceps muscle contracted. They should answer that the lower arm raised but the upper arm remained still.

At this point the class can then try the sheet. You may use this activity to assess how well the class can follow instructions and describe an observation. In the description, look for the tension in the band increasing at first, as it was pulled with the lower arm lying flat. Then, as the tension increases, the lower arm is raised.

Outcomes

The children:

- Can use simple equipment and materials.
- Can control risks in the performance of an activity.
- Can make an accurate description of an event from their observations.

Background

In the first part of the introduction, on pages 4 and 5, the body was considered in the context of a chemistry set. The body can also be thought of as a machine. In fact, an Italian doctor called Luigi Baglivi, who lived in the seventeenth century, believed that the body was a machine and likened the action of the jaw to scissors and the lungs to bellows. He also believed that the bones acted as levers, which indeed many do. For example, the long bones of the lower arm act as a lever pivoted on the elbow. Their movement allows the hand to be lowered or raised.

Although a bone is a rigid structure, it is connected to other bones through joints to allow flexibility. Skeletons do not have the power of movement (contrary to the impressions given in some horror stories or trips on the ghost train at a fun fair). The movement is produced by muscle action. Muscles are attached to bones on either side of a joint to bring about movement. A muscle can only bring about movement when it contracts (gets shorter). so there has to be a second muscle associated with it, which is arranged so that when it contracts it stretches the first muscle, and moves the bone back to its original position.

The action of the muscles is controlled by the nervous system. In addition to the receptor nerve cells in the eye, ear, tongue, nose and skin, there are also receptor cells in the muscles which provide the brain with information about how much each muscle is contracting. This allows us to know whether our arms and legs are extended or flexed, without looking at them.

When we are standing up many of our muscles are sending messages to the brain all the time, and the brain sends messages back to keep them pulling on the bones to keep us upright. The correcting movements made by the muscles can be seen in magnifying glasses. See Activity A of Practical 2B for more on this.

We also use our eyes to help us keep our balance. This can be demonstrated by Activity B on Practical 2B.

The analogy with the machine breaks down when reproduction and growth are considered, although machines capable of assembling themselves may be developed in nanotechnology.

Finally, as a machine can fail to function due to it wearing out, the same can be said of the body. In addition, the body is attacked by a range of micro-organisms which can affect health. These are attacked by the immune system, and the immune system can be helped to fight some micro-organisms that cause dangerous diseases such as tuberculosis, tetanus and polio by a system of vaccination.

2

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

See **pages 6 and 7** of *The Body Book*

PRACTICAL B

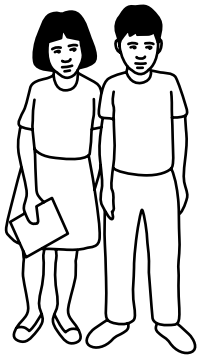
Controlling the muscles

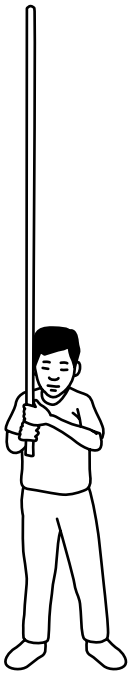
Activity A

Take turns at this activity with other members of your group.

(1) Hold up a long pole and stand as still as possible for one minute. Keep your eyes open.

(2) Ask other members of the group to watch the top of the pole and to note how often the pole moves.





(3) Repeat (1) and (2) but this time close your eyes.

(4) Describe what happened when the pole was held with (a) the eyes open.

✎ .....

.....

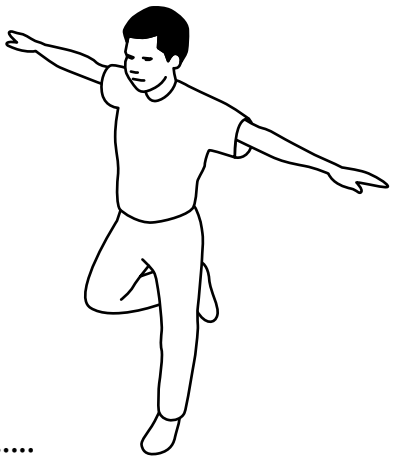
(b) the eyes closed.

✎ .....

.....

Activity B

Try this activity on your own.



(1) Hold out your arms from your sides and stand on one leg. Keep your eyes open. Try to balance for a minute. Put your foot down if you begin to fall.

(2) Repeat (1) with your eyes shut.

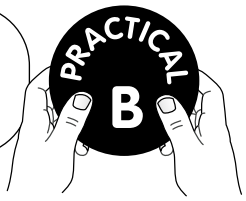
(3) Describe what happened.

✎ .....

.....

2 Teacher's sheet: Practical

See **pages 6 and 7** of *The Body Book*



Equipment

You will need a long pole like a broom handle or a metre stick.

Introducing the work

If you have introduced the machine analogy when introducing the body, and have done Practical 2A, you may like to follow it with this activity.

If you have not used the machine analogy or Practical 2A you may wish to leave this work until the children study pages 30 and 31, or 32 and 33, in the *Students' Book*, or have studied Practical 15C on page 83. This is also a fun practical, like fingerprints, and may be useful in drawing in reluctant learners early in the topic.

Outcomes

The children:

- Can co-operate with each other in carrying out an investigation.
- Can make an accurate description of an event from their observations.
- Can control risks in the performance of an activity.

Background

Muscles are usually in a slight state of tension. When one muscle pulls on a bone the muscle that opposes its motion may relax a little, letting the muscle bring about some slight movement. Or, the muscle may contract and prevent movement or produce movement in the opposite direction.

When we are standing or sitting, the receptors in the body's muscles are sending messages to the brain and spinal cord, and the muscles are receiving messages back which control their contractions and keep the body steady. This control is done automatically by reflex actions which we do not have to think about. Consciously, if we had to think about these actions, we would not have time to think of other things, such as searching for something to eat or avoiding danger.

The movements made by the muscles in Activity A are small, but the use of the long pole helps to magnify them so the movement can be seen. The eyes also help us to maintain our position and balance. The pole will move less with the eyes open than when the eyes are closed. A person will balance comfortably on one leg for a minute with the eyes open but may soon lose their balance when the eyes are closed.

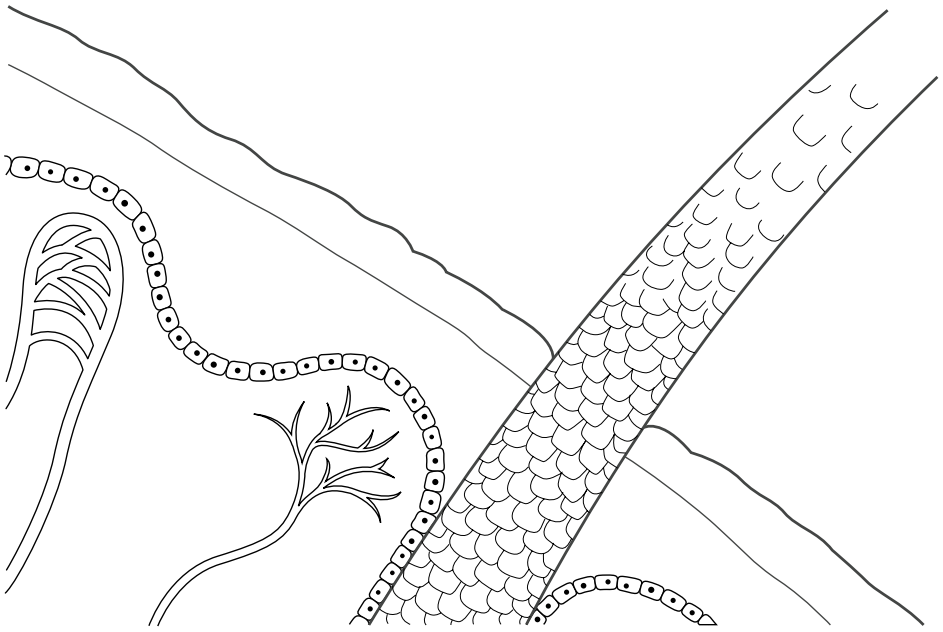
We also use receptors in our ears to help us keep our balance. The receptors work with tiny hairs inside part of the ear. If a person spins round and round then stops, the hairs keep moving for some time afterwards, responding to changes in air pressure. The receptors detect these movements and send messages to the brain which interprets them as though the body is still moving. Messages from other parts of the body inform the brain that this is not the case, and the conflicting messages give rise to the sensation of dizziness. A ballet dancer avoids this problem by looking at a single point on a wall, turning the body as far as it can go, then swing the head round quickly to look at the point on the wall again as the rest of the body continues to turn.

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

See **pages 8 and 9** of *The Body Book*

Cells

Cells are the tiny building blocks of each body. They can form in many different shapes and sizes. The body is made from billions of them.



Q1. Which parts of this diagram are made from dead cells. Colour the parts in blue.

Q2. What is the control centre of a cell called? ✎ .....

Q3. Describe the appearance of the control centre.

✎ .....

Q4. How is a red blood cell different from other cells?

✎ .....

Q5. What instrument do you need so that you can see cells?

✎ .....

Q6. Cells may be flat, like cubes or like discs.

Which shape are (a) skin cells? ✎ .....

(b) red blood cells? ✎ .....

3 Teacher's sheet: Comprehension

See **pages 8 and 9** of *The Body Book*

ANSWERS

Introduction

You may begin by showing the students an onion. Cut it in half, pull the segments apart and pull away a piece of thin skin from the inner side of a segment. This is a tissue. Say that people once thought that all living things, including us, were made from tissues. Then someone invented the microscope and showed that the tissue was made of even smaller objects which looked like bricks in a wall. These objects are called cells. If you are planning to let the children use a microscope and feel competent in its use (see Practical 3A on page 26 to help you), you could demonstrate that the onion skin is made of cells by spreading a piece on a microscope slide and putting it in the microscope for the children to observe.

Practical work

3A: Using a microscope

3B: Looking at cells

Integrating the practical work

You may wish to introduce the microscope early on in the use of this spread so that the students can appreciate the small sizes of objects, and the microscope's strong magnifying power compared to a magnifying glass. When the students have mastered the use of the microscope to draw sand grains, let them try Practical 3B.

Extension worksheet

Pages 109 and 112.

Links

This spread can be linked to all other spreads, but the most relevant links at this level are to **Blood**, pages 18–19 and **Bacteria and viruses**, pages 36–37.

Answers

Q1. The top layer of the skin and the hair.

Q2. The nucleus.

Q3. Oval, dark, in centre of cell.

Q4. No nucleus.

Q5. A microscope.

Q6. (a) Flat; (b) Disc-shaped.

3

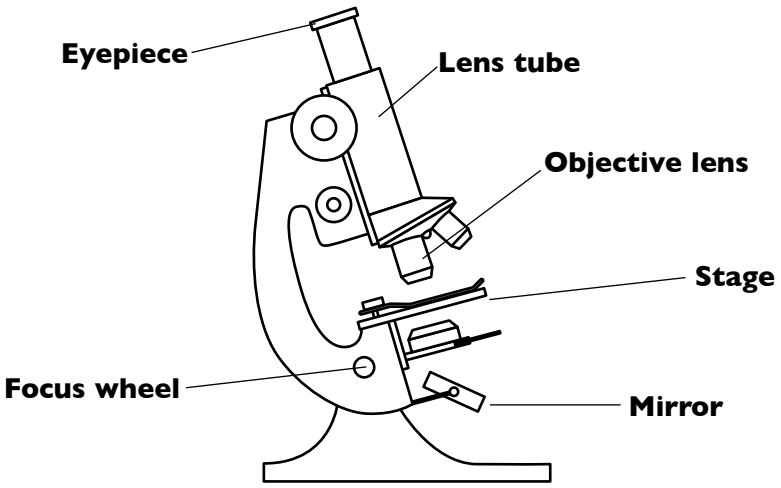
Name: ..... **Form:** .....

See **pages 8 and 9** of *The Body Book*

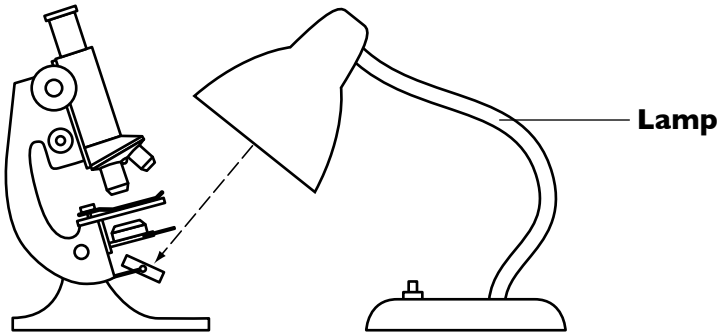
PRACTICAL A

Using a microscope

(1) Look at your microscope and identify its parts. Use this diagram to help you.



(2) Set up the microscope so that light shines from a lamp onto the mirror and up the lens tube. Check this by looking down the microscope and moving the mirror. When you have got a full circle of light in the lens move on to (3).



(3) Put a pinch of dry sand on a microscope slide.

(4) Put the slide on the microscope stage.

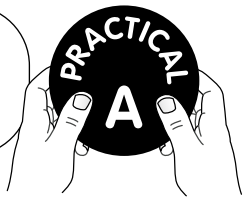
(5) Turn the focus wheel so the objective lens moves close to the slide.

(6) Look through the eyepiece and turn the focus wheel slowly, so the objective lens moves away from the slide, until you see the sand grains come into view.

(7) Draw some of the sand grains in the circle.

3 Teacher's sheet: Practical

See **pages 8 and 9** of *The Body Book*



Equipment

You will need a microscope, a slide, sand, a desk lamp.

Introducing the work

Let the children look at sand and describe what they see. Give the children a magnifying glass and let them look at the sand again and describe what they see. Tell the children that when two small lenses are put at a certain distance apart they each act as magnifying glasses and make things look even larger.

Show the children a microscope and demonstrate its use.

Outcomes

The children:

- Can follow instructions.
- Can control risks in the performance of an activity.
- Can record findings using a diagram.

Background

The children should be familiar with using a magnifying glass. You may introduce the microscope as an instrument which has two magnifying glasses, or lenses. One lens is in the eyepiece and one is in the lens mounting near the object to be viewed. The lens near the object to be viewed is called the objective lens, or simply the objective.

If the microscope has more than one objective lens make sure the lowest power lens is in position under the lens tube. This will give the widest field of view so you can observe more of the object. Select regions to look at more closely with the higher powered lenses.

Check to see if your microscope is brought into focus by moving the stage up and down, or by moving the mounting which carries the lenses. Some microscopes can be tilted, and children like to do this, but it is not useful for examining loose objects on slides, such as sand grains, as the objects simply fall off. Keep the stage flat.

By moving the mirror while they look down the microscope, they will see how the light from the lamp changes and will learn how to brighten a dim field of view. NEVER USE THE SUN AS A SOURCE OF LIGHT AND KEEP ALL MICROSCOPES AWAY FROM SUNNY WINDOWS. The bright light from the Sun shining on a mirror can seriously damage the eyes.

Let the children put their own sand on the slide and place it on the stage. They will see that the sand grains have to be over the hole in the stage if they are to be seen in the microscope.

The children should be impressed by the range of colours and shapes of the sand grains. You may like them to look at salt and sugar crystals, too.

The children may find that when they push the slide to the left, it appears to move to the right when viewed down the microscope. All movements will appear to take place in the opposite direction due to the arrangement of the lenses in the microscope.

Although slide covers are normally used with microscope slides, they can give air bubbles, which are easy to confuse with cells, so we will not be using slide covers in these activities.

You may like to extend the activity by allowing them to view professionally prepared slides obtainable from secondary school science suppliers.

Further details on the use of the microscope are given in *The Plant Book*.

3

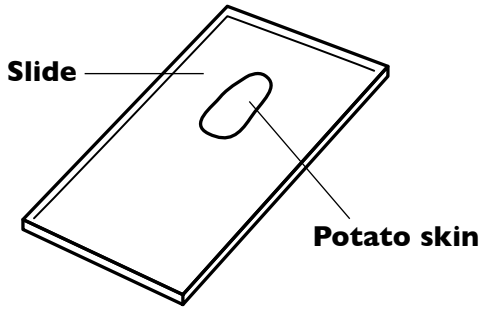
Name: ..... **Form:** .....

See **pages 8 and 9** of *The Body Book*

PRACTICAL B

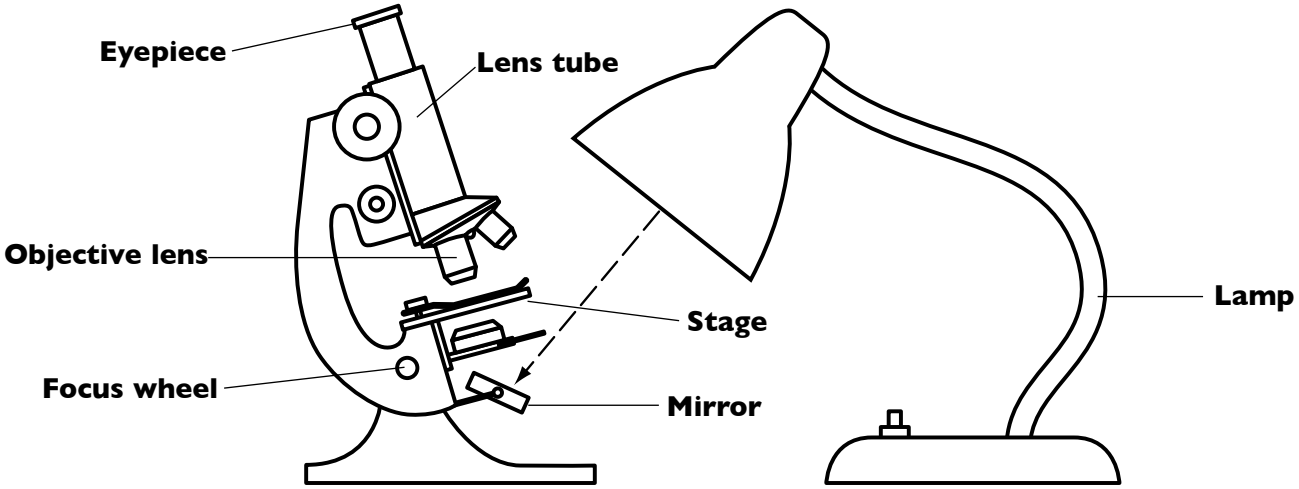
Looking at cells

(1) Cut a piece of skin off a potato.

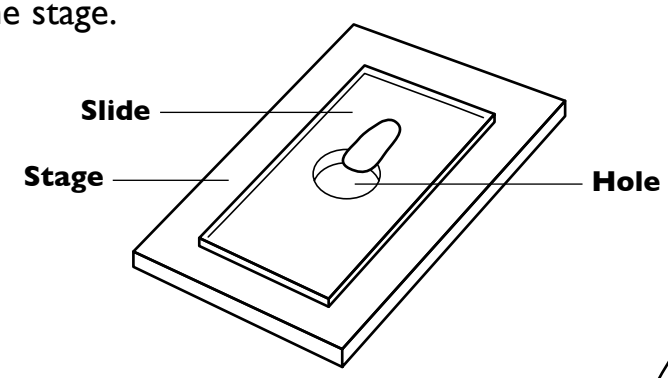


(2) Put it in the centre of a microscope slide.

(3) Set up the microscope so that light shines from a lamp onto the mirror and up the lens tube.



(4) Put the slide on the stage with the edge of the potato skin over the hole in the stage.



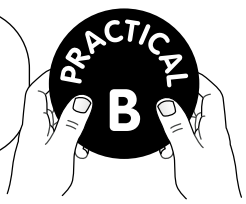
(5) Turn the focus wheel so the objective lens moves close to the potato skin.

(6) Look down the microscope and turn the focus wheel slowly, so the objective lens moves away from the potato skin, until you can see the corky cells at the edge of the skin come into view.

(7) Draw some of the cells in the circle.

3 Teacher's sheet: Practical

See **pages 8 and 9** of *The Body Book*



Equipment

You will need a microscope, a slide, a piece of potato skin, a desk lamp.

Introducing the work

You could introduce the work by saying that the idea that living things were made from cells was first proposed by a scientist called Robert Hooke, who looked at cork under the microscope in 1665. Cork is also found in small amounts in the skin of potatoes, so invite the children to look at cells in a potato peeling.

You may have to demonstrate the procedure on the sheet before the students are confident enough to try it for themselves.

Outcomes

The children:

- Can follow instructions.
- Can control risks in the performance of an activity.
- Can record findings using a diagram.

Background

When scientists first investigated the structure of the body they found that it was made from different kinds of materials which they called tissues. When the tissues were examined with a microscope they were found to be composed of cells.

Cells of all animals, including humans, have three basic parts: the cell membrane, which allows many substances to pass through it; the cytoplasm, in which chemical reactions take place which keep the cell alive; and the nucleus, which contains the instructions, in the form of DNA, which tell the cell what to do and how to develop. In plant cells there are two more features: the cell wall, which supports the cell; and a cavity in the cytoplasm called the vacuole which contains liquid made from water and dissolved substances (see **The Plant Book**).

The shape of each cell makes it suitable for the task it performs in the body. For example, the flat skin cells act like tiles on a roof, or flagstones on a pavement, to protect the more delicate tissues underneath. When the skin cells are first produced they are more box-shaped but they become flatter as they rise to the skin surface. They break off in groups and form flakes. The larger flakes of skin on the head form dandruff. Much of the dust in the home and school is really flakes of skin cells from the people who live and work there.

Most nerve cells found throughout the body have a long, branch-like structure which carries electrical messages. The longest nerve cell branch has its body in the base of the spine and is connected to a receptor in the skin of the big toe. In the brain, the cells do not have one long branch, but have many projections which connect with the many projections of other brain cells.

The red blood cell is unusual in that it loses its nucleus when it is fully formed. This allows the cell to become packed with the red pigment haemoglobin which carries oxygen.

Some cells have tiny hairs on one of their surfaces. These hairs are called cilia. Ciliated cells provide movement. In the windpipe, they remove dirt which could damage the lungs. In the female reproductive system they line a tube called the oviduct and generate a current in the liquid there which moves the egg from the place of its formation (the ovary) to a place where fertilisation can take place (the oviduct itself). Unlike the sperm, which has a tail that provides movement, the egg has no means of moving on its own.

Extending the work

The concept of the cell was developed from looking at tiny spaces in a piece of cork under the microscope. Cork is formed from the bark of the cork oak tree, and some corky cells are found in the bark of other trees. The potato is a swollen part of an underground stem and its skin also contains cork cells, which can be seen at the very thin edge of a piece of potato peeling. By following the instructions on the sheet the class will come to appreciate how a piece of material from a living thing can be processed to show that it is made from cells. They should also come to appreciate the size of cells and see how they join together.

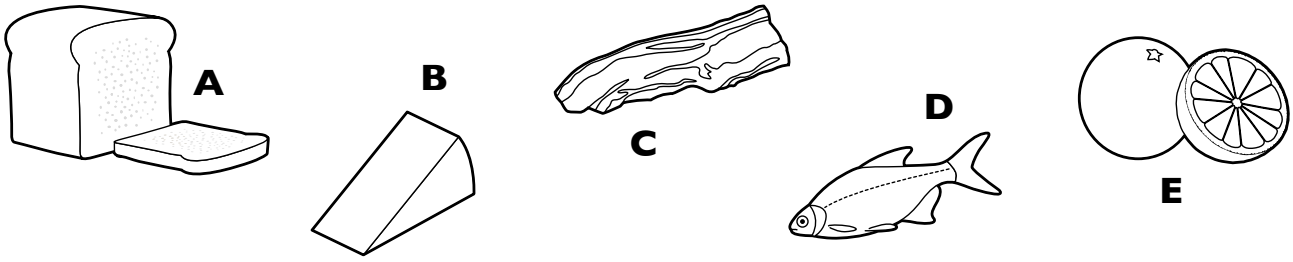
You may like to extend the activity by allowing them to view professionally prepared slides obtainable from secondary school science suppliers. Slides of blood, skin, nerves, lungs, bones, muscles and parts of the digestive system may be obtained.

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

See **pages 10 and 11** of *The Body Book*

Food

Food provides the energy and nourishment for living. Each food contains its own unique combination of nourishment and energy.



Q1. The five food groups are carbohydrates, fats, proteins, vitamins and minerals. Which food groups are found in the foods in the diagram? (Hint: some foods contain more than one food group.)

A .....

B .....

C .....

D .....

E .....

Q2. Which food groups only provide you with energy?

✎ .....

Q3. To which food group do sugar and starch belong?

✎ .....

Q4. Which of these food groups provides you with materials for building new cells?

Protein **Fat** **Carbohydrate** (Circle your answer)

Q5. Ben is a vegetarian. He does not eat meat but still needs protein. What foods can Ben eat to get the protein he needs?

✎ .....

4 Teacher's sheet: Comprehension

See **pages 10 and 11** of *The Body Book*

ANSWERS

Introduction

Before you introduce this spread to the class you may like to ask them to write down the foods they eat in a typical day. This should include all drinks and snacks. When you have discussed the spread with the class ask them to identify, as far as possible, which food groups each of their foods contains. They can then group their foods under the following headings: 'Energy foods', 'Foods for growth and repair', 'Foods rich in vitamins', 'Foods rich in minerals'. The class members should then describe their diet as being low or high in each of the groups. The information can then be kept for use with **A healthy diet**, pages 40 and 41 of the *Students' Book*.

After studying the spread and completing the questions on the practical worksheet you may like to extend the work by asking the class to study the contents list on the side of cereal packets and other packaged foods and look for mention of the various food groups. The contents list on a tin of milk powder for infants reveals a long list of nutrients which makes the reader aware of the nutrient demands of a growing infant and reinforces the idea of the body as a chemistry set.

Practical work

4: Testing food for fats

Integrating the practical work

You may like to introduce the test for fats after the students have read the appropriate section on the spread.

Extension worksheet

Pages 109 and 113.

Links

A healthy diet, pages 40–41.

Answers

Q1. A Carbohydrate and minerals;
B Fat and minerals;
C Fat, protein and minerals;
D Protein;
E Vitamins.

Q2. Carbohydrate and fat.

Q3. Carbohydrate.

Q4. Protein.

Q5. Peas, beans, eggs and cereals.

4

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

See **pages 10 and 11** of *The Body Book*

Testing food for fats

(1) Make a collection of different foods.

(2) List them in the first column of the table.

(3) Rub each food on a clean piece of paper and hold the paper up to a light.

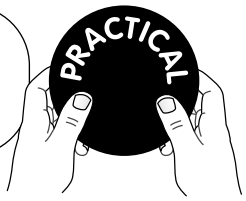
If the food contains fat it will have made a greasy mark that lets some of the light pass through. If the food does not contain fat it will not leave a greasy mark.

(4) If the food makes a greasy mark put a tick in the second column next to the food's name. If the food does not leave a mark put a cross.

	Food	**Fat present**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

4 Teacher's sheet: Practical

See **pages 10 and 11** of *The Body Book*



Equipment

For the main activity you will need some small sheets of paper and a selection of foods.

For the extension activity you will need small test tubes or transparent screw top jars, water, olive oil, milk (you may wish to dilute this a little before the lesson to make the fat globules easier for some pupils to see), a microscope, a slide.

Introducing the work

If you remind the class about the body being a chemistry set, you can tell them that chemicals give food their useful properties, and also give foods certain properties which can be used to reveal the presence of the food groups. Most of the tests for food require the use of other chemicals, but a simple test for fat needs only for the food to be rubbed on a clean piece of paper. If fat is present it makes a translucent mark on the paper.

Fats form part of a larger food group called lipids, which includes edible oils. These also make a translucent mark on paper.

Outcomes

The children:

- Can follow instructions.
- Can make observations.
- Can fill in a table correctly.

Background

You may wish the class to know more about some vitamins and minerals they have discovered in the packaged food. The following may be helpful.

Vitamin A keeps the skin healthy and moist, helps to increase resistance to disease, allows night vision (vision in dim light). Without vitamin A only lights can be seen, not outlines of non-luminous objects.

Vitamin B There are a number of different B vitamins. Generally they help in the release of energy from food, keep the nerves, digestive system and skin healthy.

Vitamin C helps to hold the cells together in tissues. A lack of vitamin C leads to a disease called scurvy in which the blood vessels leak blood under the skin and into joints and causes bleeding gums, loss of teeth and eventually death.

Vitamin D helps in the formation of bones and teeth. A lack of vitamin D leads to a disease called rickets in which the bones become soft and deformed. This vitamin is also made by the skin when it is exposed to sunlight.

Iron makes part of the red blood pigment called haemoglobin which transports oxygen round the body.

Phosphorus is needed for the formation of bones and teeth and to help the muscles contract.

Potassium is used in chemical reactions taking place in the cytoplasm of cells and for the production of electrical signals which travel along nerve cells.

Sodium is used for the production of electrical signals which travel along nerve cells and for the healthy working of the kidneys.

Before leaving the topic you should make the class aware that the body needs water. Some water is taken in from the food that is eaten. Fruits, for example, contain large amounts of water. Water is also produced in the process of respiration (see page 16 of the *Students' Book*). Water is needed for all the cells because the chemical reactions which keep them alive must take place in water.

Extending the work

You could ask the class if they can make oil and water mix by shaking them together. Ask the class what they see happening. They should see that the oil breaks up into tiny globules and that the mixture becomes pale as the globules scatter light in all directions. After a few minutes the class should see that the oil and water separate.

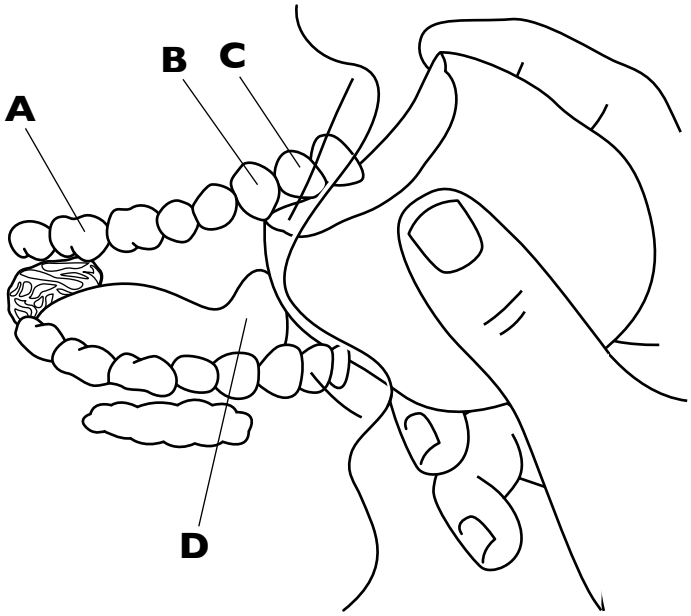
Ask the class what drink the pale mixture of oil and water reminds them of and look for the answer – milk. Ask them how they could test the idea and if necessary help them come to the idea of using the microscope. Set up a microscope as shown in Practical 3A and let the class put a drop of milk on a slide and examine it to find globules of fat. Ask the class why milk appears white (it contains globules which scatter light) and that cream appears at the top of the milk (it contains a large amount of fat which separates from the more watery milk by floating on it like the olive oil on the water).

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

See **pages 12 and 13** of *The Body Book*

The Mouth (part 1)

Mouths are designed to do many jobs. Among the most important are breaking down food and tasting that it is fit to eat.



Q1. Write down the names of the teeth labelled A, B and C.

A ✎ .....

B ✎ .....

C ✎ .....

Q2. What does tooth A do to food?

✎ .....

Q3. What does tooth C do to food?

✎ .....

Q4. How are teeth held in the mouth?

✎ .....

Q5. What is D and what does it do?

✎ .....

.....

Q6. Why is saliva useful?

✎ .....

.....

5 Teacher's sheet: Comprehension

See **pages 12 and 13** of *The Body Book*

ANSWERS

Introduction

You may wish to precede the study of this spread by considering the reasons why food has to be broken down. At its most simplest, food is broken down to fit in the mouth using a knife and fork, then broken down by the teeth into smaller pieces so that it can be swallowed. A less obvious yet equally important reason is that breaking food down into smaller pieces increases the surface area on which digestive processes can work.

The pupils could be given a 2cm wood block and asked to find its surface area by measuring the length of a side, calculating the area of a side, and multiplying it by six. They could then be given eight 1cm cubes which they put together to make the same volume as a larger cube. The pupils could then disperse the blocks again and find their total surface area and compare it with that of the larger cube. The importance of surface area can be investigated in Practical 6 on page 41.

Practical work

5: Making a tooth map

Integrating the practical work

You may wish to try the practical work after the students have studied Diagram 1 on page 12 of the *Students' Book*.

Extension worksheet

Pages 109 and 114.

Links

Digestion, pages 14–15; **Bacteria and viruses**, pages 36–37; the section on **Health and fitness**, pages 40–45.

Answers

Q1. A Molar, B Canine, C Incisor.

Q2. It crushes the food.

Q3. It cuts up the food.

Q4. They have roots which are covered by the gums.

Q5. The tongue. It moves food around the mouth, shapes the food for easy swallowing and tastes the food to check it is safe to eat.

Q6. It breaks down some materials in food and protects the mouth from infection. It also makes food easier to swallow.

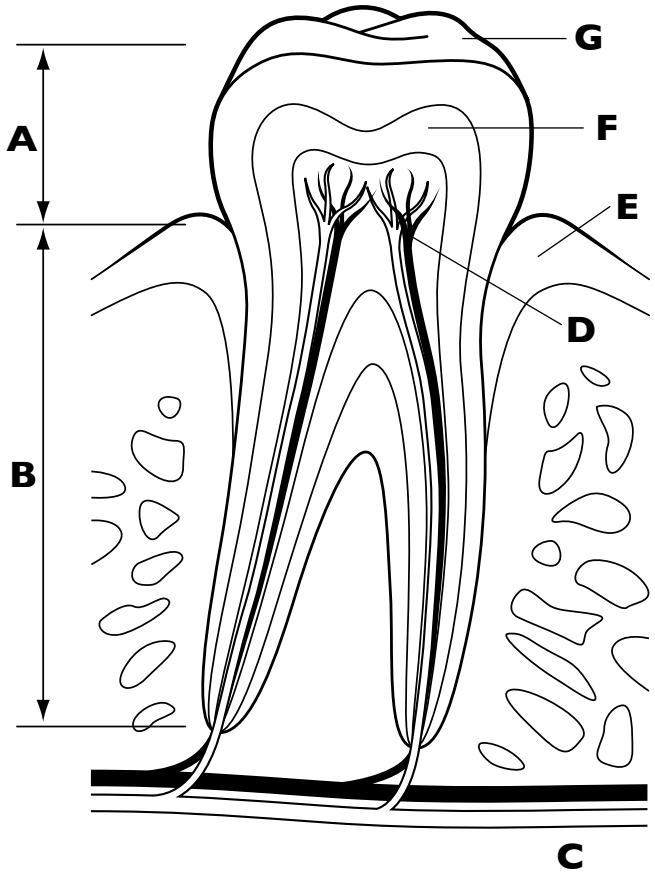
Name: ..... Form: .....

See **pages 12 and 13** of *The Body Book*

The Mouth (part 2)

Teeth play a vital role in the digestion of food and they must be kept healthy.

Q1. Name the parts of the tooth labelled A to G.



A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

.....

E ✎ .....

F ✎ .....

G ✎ .....

Q2. What is plaque?

✎ .....

.....

Q3. Why do teeth decay?

✎ .....

.....

Q4. How can tooth decay be prevented?

✎ .....

.....

.....

5 Teacher's sheet: Comprehension

See **pages 12 and 13** of *The Body Book*

ANSWERS

Introduction

You may wish to use this test after the students have studied Diagram 2 on page 13 of the *Students' Book* and read about mouth care.

Extension worksheet

Pages 109 and 114. The same as the previous sheet.

Links

Digestion, pages 14–15; **Bacteria and viruses**, pages 36–37; the section on **Health and fitness**, pages 40–45.

Background

The class may be under the impression that teeth and bones are not living structures. The non-living enamel coating on the crown is the hardest material that the body makes. Underneath it is softer dentine. This has tiny channels in it through which substances from digested food pass from the pulp cavity to form the dentine material. The pulp cavity contains receptors which are sensitive to heat, cold and pain. They are connected to nerves which take the messages from them to the brain. The pulp cavity contains blood vessels which provides food and oxygen for the cells and take away wastes. The root is held in the jaw by fibres and natural cement.

The tongue has taste buds which are sensitive to four tastes: sweetness at the tip; saltiness on either side of the tip on the sides; sourness on the sides further back; and bitterness at the back. Being able to sense these four tastes provides important information to the body. Sweetness suggests that the food is high in energy. Too much salt in the body is dangerous, so the salt receptors detect salty foods which can be rejected. The detection of sourness and bitterness in a food can be due to poisons or to the food having decayed, which can lead to these harmful foods being rejected.

Saliva is a watery substance that contains the protein mucin, which makes it slippy. Saliva lubricates the food and makes it easier to swallow and pass along the gut. It also contains an enzyme which breaks down starch into sugar.

Answers

Q1. A Crown, B Root, C Jaw, D Nerves and blood vessels, E Gum, F Dentine, G Enamel.

Q2. It is a mixture of saliva, food and bacteria which forms on the crowns of teeth.

Q3. Bacteria feed on the sugar in food and produce acids. The acids dissolve away the enamel and dentine.

Q4. Regular brushing removes plaque and toothpaste contains chemicals which neutralise or counteract the acid and make it harmless to teeth. Foods with a high sugar content such as biscuits, sweets and soft drinks should be avoided.

5

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

See **pages 12 and 13** of *The Body Book*

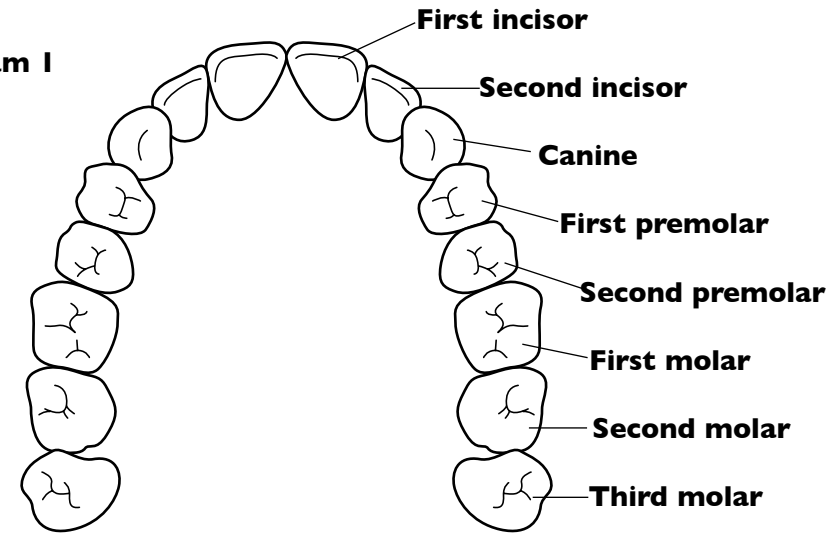
PRACTICAL

Making a tooth map

Diagram 1 shows the adult set of teeth present in the upper jaw. The lower jaw has the same arrangement of teeth.

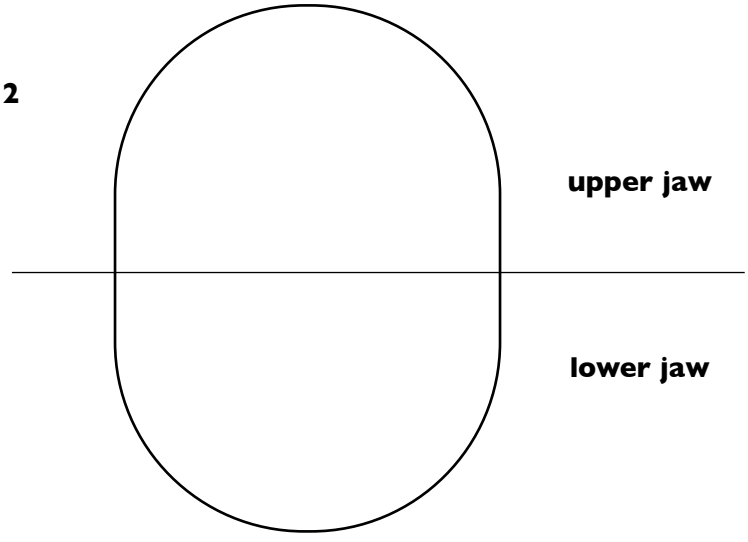
(1) Look in a mirror at the teeth in your upper jaw and compare them with the teeth in Diagram 1.

Diagram 1



(2) Draw the arrangement of the teeth in your upper jaw in the top half of Diagram 2 and label them.

Diagram 2



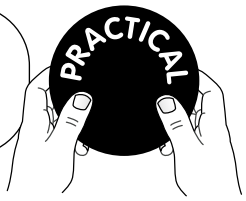
(3) Draw the arrangement of the teeth in your lower jaw in the lower half of Diagram 2 and label them.

(4) How many teeth do you have in your upper and lower jaw?

✎ .....

5 Teacher's sheet: Practical

See **pages 12 and 13** of *The Body Book*



Equipment

You will need mirrors. If they are hand held mirrors make sure that they do not have sharp edges. Make sure the pupils do not put the mirrors in their mouths.

Look for the pupils' ability to transpose the information in Diagram 1 when they are making a tooth map of the lower jaw.

The number of teeth each student has will depend on how many baby teeth they have lost so far.

Introducing the work

Depending on the age of the pupils you may find that they have recent experience of getting new teeth. You may like to build on this experience and talk about the two sets of teeth.

Outcomes

The children:

- Can make observations.
- Can record findings using a diagram.

Background

Teeth form in the gums of the foetus but do not start to emerge through the gums until the baby is about six months old. There are twenty teeth in the first set of teeth, sometimes called the milk teeth. In each jaw there are four incisors, two canines and four molars. The teeth emerge in the following sequence: 6 months – two front central incisors called first incisors; 7 months – the second incisors; 12 months – the first molars nearest the front of the jaw; 18 months – the canines; two to three years – the back molars. When the milk teeth are replaced by the adult teeth their roots are absorbed back into the body and this makes the teeth wobbly. The teeth in the adult set emerge in the following sequence: about 6 years – first incisors and first molars; about 7 years – second incisors; about 9 years – canines; about 10 years – first and second premolars; about 11 years – second molars; at 17 years or later – the third molars or wisdom teeth.

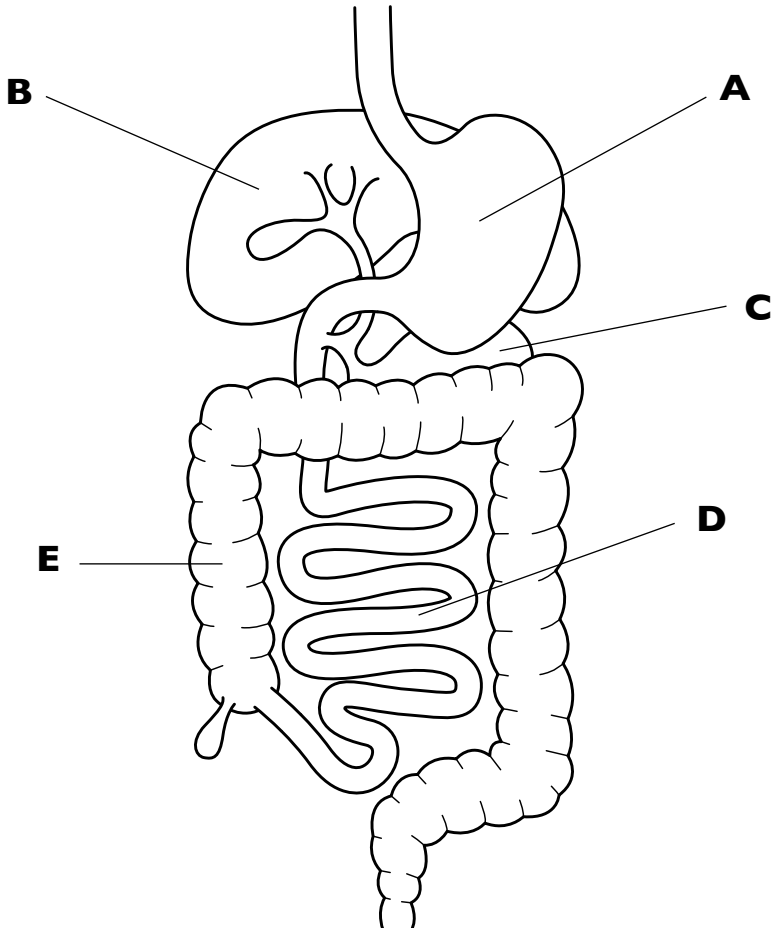
The premolars are distinguished from the molars by their smaller crowns and position behind the canines, but they have the same function as molars which is to grind or mash up the food.

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

See **pages 14 and 15** of *The Body Book*

Digestion

Digestion is the way food gets changed into substances the body can use. There are two stages of digestion: first the food is broken down and dissolved in liquids; then it is taken into the body.



Q1. Where does digestion begin in the body?

✎ .....

Q2. Name the parts labelled A to E in the diagram.

A ✎ ..... B ✎ ..... C ✎ .....

D ✎ ..... E ✎ .....

Q3. Colour in red the place where acid is present.

Q4. Colour in blue the place where food passes into the blood.

Q5. Colour in green the place where water is removed from undigested food.

6 Teacher's sheet: Comprehension

See **pages 14 and 15** of *The Body Book*

ANSWERS

Introduction

You may like to begin this topic by asking the class to clear their mouths by swallowing, then think about where the saliva comes from as it begins to seep into their mouths. While they are doing this you may like to pour out two litres of water into beakers and say that this is about the maximum amount of saliva a mouth produces a day. (Saliva production is between 1 and 2 litres.) Ask the class to swallow, then show them a volume of water about 1.7 litres. This is about the maximum volume of the stomach. You may like to add that different kinds of food stay in the stomach for different lengths of time. For example, rice and soft boiled eggs only stay up to two hours in the stomach, while bread and creamed potatoes stay up to an hour longer. Most meat and vegetables like peas and lentils stay between three and five hours while sardines in oil may stay there as long as nine hours.

You can build on the idea of oily food by saying that the digestive system produces chemicals to break down foods. One chemical is called bile. It is produced by the liver and is made from the haemoglobin of worn out blood cells that have been destroyed in the spleen. Bile is not an enzyme and only breaks down the food into simple chemicals. It breaks down fats into small droplets so that fat digesting enzymes can work on them.

You can demonstrate the action of bile by filling a tall straight sided glass with water, pouring one centimetre depth of cold cooking oil on the top and stirring for about half a minute. The class will enjoy the tornado like effect as the oil swirls together in the middle of the glass and settles at the top again. Repeat with another glass of water and oil to which a few drops of washing up liquid has been added. The tornado will be more difficult to see because of the small droplets of oil that have been created which make the water grey-white.

Young people are fascinated by the idea of the length of the small intestine and you may like to build on this by unwinding a tape measure, or having the class make a strip of paper seven metres long by three centimetres wide. This can then be folded up to show how such a long length can fit into a small space.

Practical work

6: Investigating surface area

Integrating the practical work

You may wish the students to try the practical work after they have read the section about breaking food down on page 15 of the *Students' Book*.

Extension worksheet

Pages 109 and 115.

Links

Food, pages 10–11; **The mouth**, pages 12–13; **A healthy diet**, pages 40–41. You may also like to link this work with **Breathing**, pages 16–17 to study how the body takes in two vital commodities – food and oxygen – for the release of energy.

Background

The unfamiliar word egestion is the correct term for eliminating solid wastes from the body. It is often confused with excretion, which is the removal of chemicals produced by the reactions taking part in the cells. For example, carbon dioxide is excreted through the lungs; urea which is produced in the liver from excess protein, is excreted by filtration from the blood in the kidneys and discharged in urine, which is stored in the bladder.

Answers

Q1. In the mouth (with the action of the teeth and saliva).

Q2. A Stomach, B Liver, C Pancreas, D Small intestine, E Large intestine.

Q3. The stomach should be coloured red.

Q4. The small intestine should be coloured blue.

Q5. The large intestine should be coloured green.

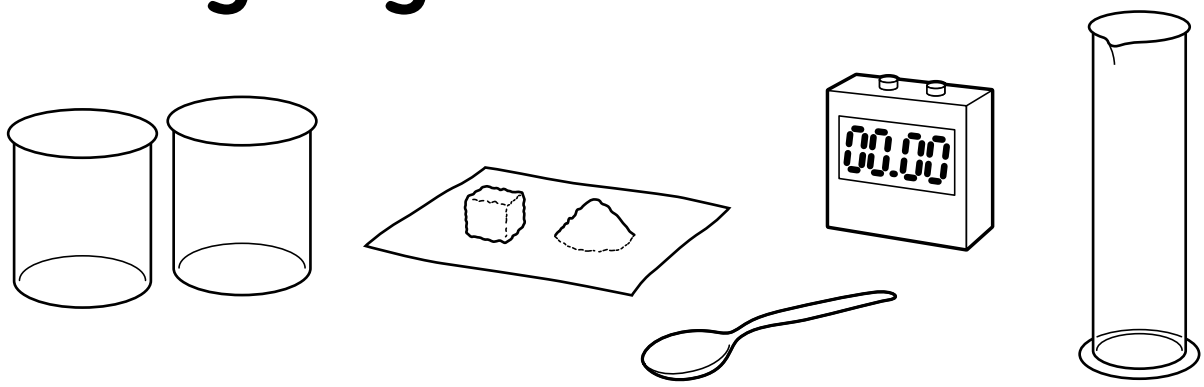
6

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

See **pages 14 and 15** of *The Body Book*

PRACTICAL

Investigating surface area



(1) Take a sugar lump and use the spoon to make a pile of sugar crystals next to it which contains about the same amount of sugar.

(2) Measure the same amount of water into two jars.

(3) Put the sugar lump in the water of one jar, start the stop clock and stir the water steadily.

(4) When all the sugar has dissolved stop the clock and write down how long it took for the sugar to dissolve.

(5) Repeat steps (3) and (4) with the pile of sugar crystals.

(6) Record your results here.

How could the investigation be made better?

✎ .....

.....

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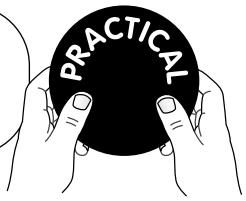
6 Teacher's sheet: Practical

See **pages 14 and 15** of *The Body Book*



Equipment

You will need beakers or jars, water, sugar lumps, granulated sugar, spoons, stop clock, measuring cylinder.

Introducing the work

You may introduce the work after the students have read about breaking down food on page 15.

Food is broken down into small pieces in the mouth and as the pieces get smaller the surface area of the material gets bigger. To emphasise this point you may describe (or demonstrate with Plasticine) how a 2cm cube has a surface area of 24 square centimetres but if it is cut up into eight, 1cm cubes, the surface area of the material is increased to 48 square centimetres. This large surface area increases the area of the material in contact with the liquids in the digestive system and gives the liquids a larger surface to work on in the digestive process. In this activity the water acts on the surface of the sugar to dissolve it.

When the students read through the sheet they may notice they have not been told how much water to use or how much sugar. Tell them that they must decide suitable amounts. Some students may use the sheet for the basis of a plan for an investigation and organise their work thoroughly.

In the students' ideas for improving the experiment look for stirring each sugar sample the same number of times, letting the same person do the stirring, and checking that the temperature of the water is the same in all jars.

Outcomes

The children:

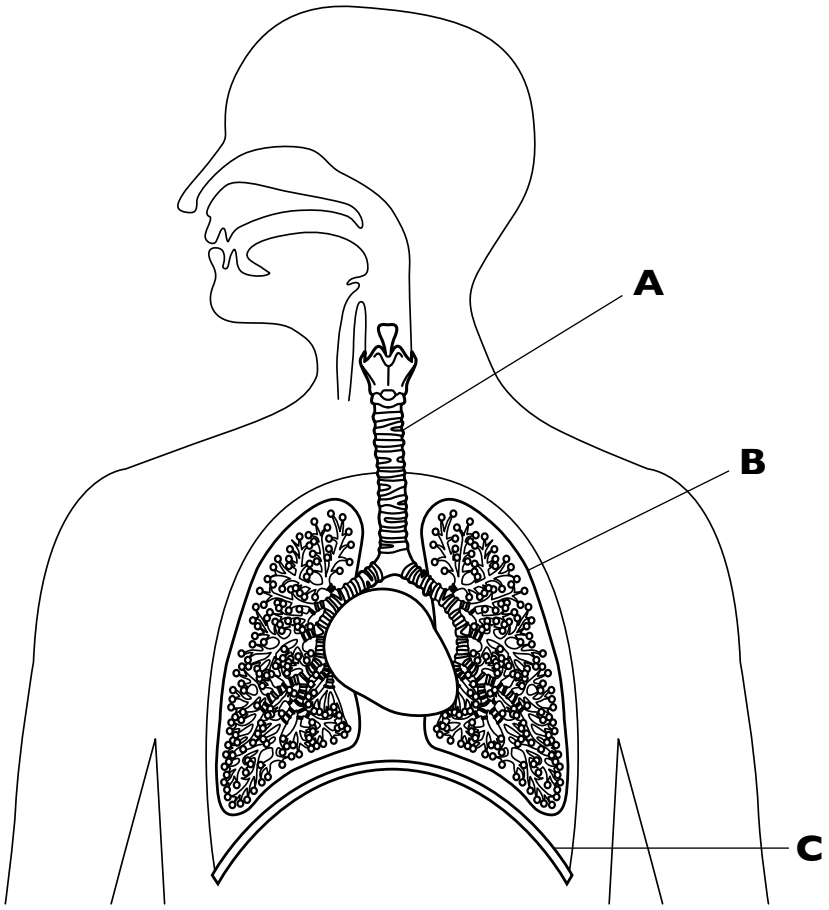
- Can use simple equipment.
- Can make accurate measurements.
- Can make a fair test.
- Can suggest improvements to an investigation.

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

See **pages 16 and 17** of *The Body Book*

Breathing

A large part of the body is used for taking in oxygen and expelling waste gas. This process is called respiration.



Q1. Name the parts of the body labelled A to C.

A ✎ .....

B ✎ .....

C ✎ .....

Q2. Shade in where oxygen passes into the blood.

Q3. Draw an arrow to show the direction that the air moves in the throat when C goes down.

Q4. What pulls on the ribs to move them up ?

✎ .....

Q5. When the ribs move up do you breathe in or out?

✎ .....

Q6. What is the waste gas the body expels?

✎ .....

7 Teacher's sheet: Comprehension

See **pages 16 and 17** of *The Body Book*

ANSWERS

Introduction

Ask the students to press their fingers onto the rib cage and breathe in deeply then breathe out. Ask them for their observations, which should be that the ribs move up and out when they breathe in and down and in when they breathe out. Now ask the students to put their hand on their 'stomach' – really their upper abdomen or intestines – and breathe in and out again. They should notice that the flesh moves out when they breathe in, and moves in when they breathe out. Now move onto the study of the spread.

Practical work

7: How often do you breathe?

Integrating the practical work

When the students have finished the spread ask them to describe in more detail the changes that take place as they breathe in and out. This should include the work they have learnt from the spread. Follow this by asking the students how often they think they breathe. Record their ideas on the board and then introduce the practical work.

Extension worksheet

Pages 109 and 116.

Links

How blood circulates, pages 22–23.

Background

There is sometimes some confusion about breathing and respiration, due in part to the naming of the respiratory system, which suggests that this is the only place that respiration takes place. Respiration can be divided into three parts: internal respiration, external respiration and cellular respiration.

External respiration is the exchange of oxygen and carbon dioxide that takes place between the blood and the air at the respiratory surface in the lungs.

Internal respiration takes place when the respiratory gases are exchanged between the blood and the cells.

Cellular respiration takes place inside cells. In this process glucose reacts with oxygen to produce water and carbon dioxide and to release energy. The cell uses this energy for all life processes which keep the body alive. This is the type of respiration which may be featured in exam questions.

Breathing is the process of moving air in and out of the lungs and is also called ventilation.

You should think of breathing as moving the respiratory gases, and respiration as a process which occurs in all cells to keep them alive.

The class may think that only oxygen and carbon dioxide gases move in and out of the lungs so you should tell them that air is actually one-fifth oxygen and four-fifths nitrogen. The amount of carbon dioxide in expired breath is 4%, while the amount of oxygen is 16%.

The class can discover the movements of the ribs and diaphragm for themselves. Ask them to spread their fingertips along the lower edge of the rib cage and breathe in and out deeply. Ask the class to press a hand gently on the body just below the rib cage and breathe in and out deeply. When the diaphragm moves down it pushes on the intestines and makes the body push outwards at the front.

The diaphragm is a sheet of strong tissue with muscles around its edge.

Answers

Q1. A Windpipe, B Lung, C Diaphragm.

Q2. The lungs should be shaded.

Q3. The arrow should point down.

Q4. Muscles.

Q5. In.

Q6. Carbon dioxide.

7

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

See **pages 16 and 17** of *The Body Book*

How often do you breathe?

(1) Lie down and relax for two minutes, then count how many times you breathe in a minute. Repeat twice more.

(2) Walk for two minutes, then stop for one minute and count how many times you breathe in that minute. Repeat twice more.

(3) Run for two minutes then stop for a minute and count how many times you breathe in that minute. Repeat twice more.

(4) Set out your results in the table here.

Count	No. of breaths after lying down	No. of breaths after walking	No. of breaths after running
1			
2			
3			

(5) Describe any pattern you see in your results.

✎ .....

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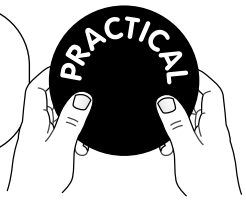
7 Teacher's sheet: Practical

See **pages 16 and 17** of *The Body Book*



Equipment

The class groups will need stop clocks.

Special note

Make sure that all members of the class taking part in the exercise are fit to do so and do not have a condition which may affect their health during or after exercise.

Introducing the work

You may like to introduce the activity by asking the class how often they think they breathe in a minute. The estimates may vary widely, and you may add that this is an automatic response of the body, so we do not have to think about it. Introduce the sheet and go through it with the class. You may ask them to predict a result, although some members of the class may try to match their predictions. It must be stressed to the class that they should breathe normally. In this activity they must view their body objectively as they do other objects and phenomena in science investigations. When the class are evaluating the activity, they may mention the difficulty with counting breaths and not controlling them. They may suggest that they should count each others breaths to make the activity more objective.

Outcomes

The children:

- Can follow instructions.
- Can fill in a table.
- Can identify a pattern in the results.

Background

The amount of oxygen used and carbon dioxide produced depends upon the activity of the cells. When the muscles are at rest, the demand for an exchange of gases will be low and fewer breaths will be taken in a minute. As the activity of the muscles increases, the breathing rate also increases to meet the cells' demands.

The class should see the pattern that, as activity increases, the rate of breathing increases. Some class members may say that the depth of each breath also increases although this has not been measured.

Extending the work

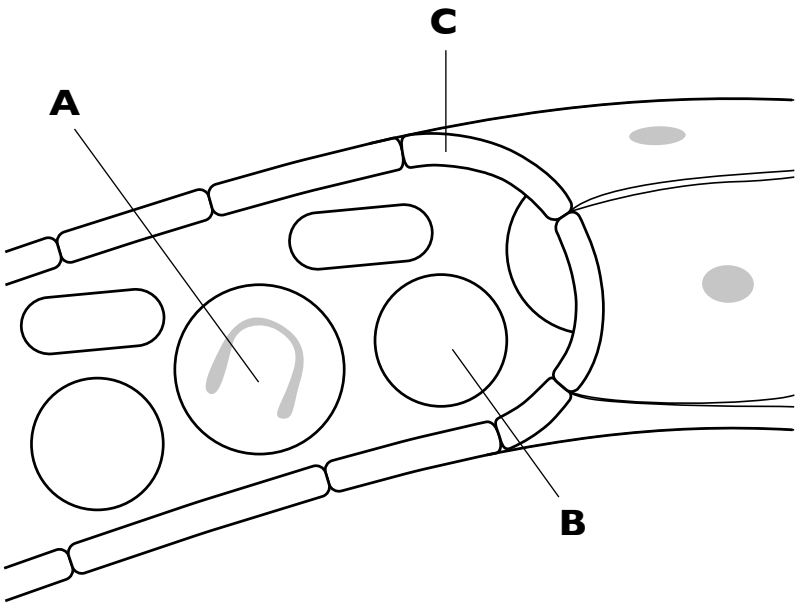
A table is provided on the sheet but you may blank it out and let the class construct their own tables so you can assess this skill. Some class members may wish to calculate and display averages.

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

See **pages 18 and 19** of *The Body Book*

Blood

There are up to six litres of blood circulating round the body and providing the cells with their needs. Blood looks like a red liquid, but it is really a mixture of solids and a liquid. It delivers nourishment, heat and oxygen to cells, and collects and removes waste.



Q1. Name the parts in the diagram labelled A, B and C.

A ✎ .....

B ✎ .....

C ✎ .....

Q2. What is the purpose of A?

✎ .....

Q3. What is the purpose of B?

✎ .....

Q4. On the diagram, shade in where plasma is found.

Q5. What is the colour of plasma?

✎ .....

Q6. Where are blood cells made?

✎ .....

8 Teacher's sheet: Comprehension

See **pages 18 and 19** of *The Body Book*

ANSWERS

Introduction

To introduce this topic you could put some red food colouring in water and ask for some members of the class to help you measure out five or six litres. As the volume of red water builds up on the demonstration table members of the class may be surprised at how much, or perhaps how little, there is.

Supplementary practical work

If a slide of a prepared specimen of blood can be borrowed from a secondary school, or purchased from the slide selection of a primary school supplier, you may let the class look at it to appreciate the size of the cells. The specimen will have been stained, and the white blood cells will have taken up a colour such as blue.

Extension worksheet

Pages 109 and 117.

Links

Cells, pages 8–9; **The heart**, pages 20–21; **How blood circulates**, pages 22–23; **Bones**, pages 24–25.

Background

The red blood cells are the only cells in the body which do not have a nucleus when they are fully formed. They have a nucleus when they are first formed in the bone marrow, but they lose it as they become packed with the respiratory pigment haemoglobin. This pigment contains iron. People who have a diet which lacks iron can develop anaemia, in which they become tired and listless due to the blood being unable to take up the amount of oxygen required for full health.

When the blood takes up oxygen it changes from purple to bright pink in colour as the haemoglobin is converted to oxyhaemoglobin. This chemical compound breaks down in regions of the body where there is a lack of oxygen and the oxygen is released for cell respiration. Back in the lungs, where there is a high concentration of oxygen, the haemoglobin is converted to oxyhaemoglobin again.

The blood's ability to cease flowing after a cut or injury is due to its ability to clot. During clotting chemical reactions take place in the plasma. These reactions produce microscopic fibres which form a 'wire netting' effect across the wound. This traps blood cells, which eventually stop the flow of plasma as their numbers build up.

White blood cells attack invading bacteria and die as they do so. The white pus that forms as the cut heals is due to the build up of white blood cells. New skin forms beneath this protective coat.

Answers

Q1. A White cell, B Red cell, C Capillary wall (cell).

Q2. Fight disease.

Q3. Carry oxygen.

Q4. Shade in between cells inside capillary.

Q5. Pale yellow.

Q6. In bone marrow.

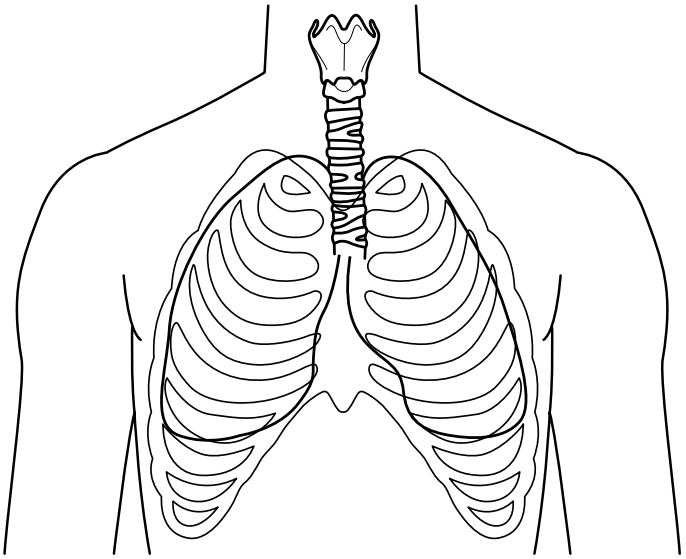
Name: ..... Form: .....

See **pages 20 and 21** of *The Body Book*

The Heart

The heart is a pump made of muscle. Its job is to pump blood around the body.

Q1. Draw in the position of the heart in this body.



Q2. Where is the blood going that follows arrow A? Is this blood rich or poor in oxygen?

✎ .....

.....

Q3. Where is the blood going that follows arrow B? Is this blood rich or poor in oxygen?

✎ .....

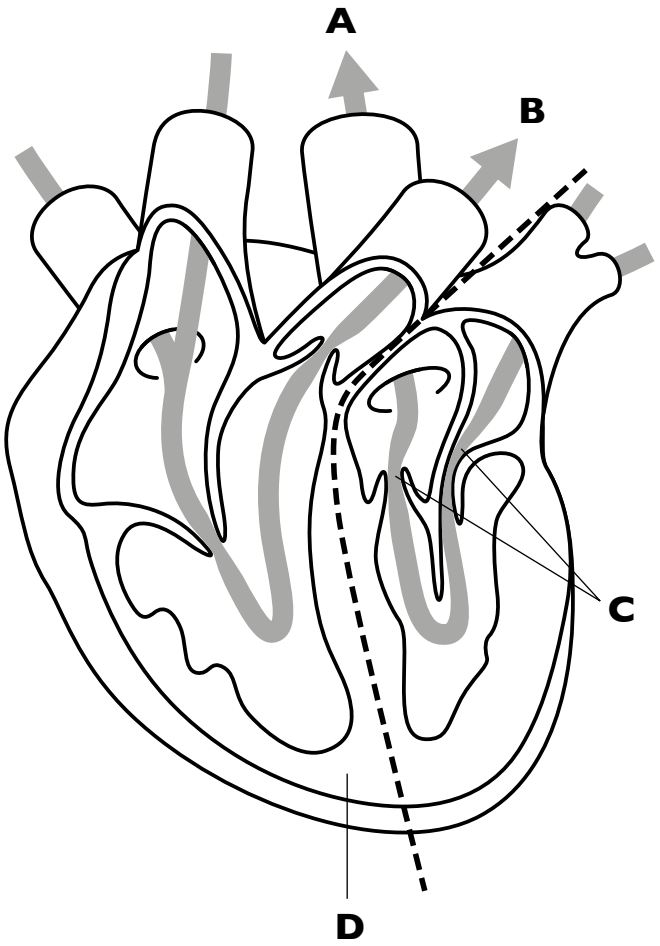
.....

Q4. What are the parts labelled C?

✎ .....

Q5. What is D made of?

✎ .....



9 Teacher's sheet: Comprehension

See **pages 20 and 21** of *The Body Book*

ANSWERS

Introduction

At the outset you should make sure the class knows how the heart is represented in the book. In Diagram 1 the heart is in the chest of a person facing the reader. It can be clearly seen that the left side of the person's heart is on the reader's right. This convention is commonly used in diagrams of the heart. They are nearly always presented as being viewed from the front of a person's chest, so the left side of the heart is on the reader's right and the right side of the heart is on the reader's left. It is important for the class to secure this knowledge as it will help them in their descriptions of how the blood passes through the circulatory system later. When the children are sure about the anatomy of the heart move onto the heart cycle on page 21.

Practical work

9A: Find the pulse

9B: Investigating the pulse

Integrating the practical work

When the students have read about the heartbeat on page 21 of the *Students' Book*, try Practical 9A with them. When they are all sure how to take a pulse, move on to Practical 9B.

Extension worksheet

Pages 109 and 118.

Links

How blood circulates, pages 22–23; **Keeping fit**, pages 42–43.

Background

Although for simplicity we speak of the heart as a pump, it is in fact a double pump. The pump (ventricle) on the right side pumps blood to the lungs and the pump on the left pumps blood around the body. As the pump on the left has more work to do than the pump on the right, the wall of the left ventricle is thicker than the wall of the right ventricle. Heart muscle, called cardiac muscle, is different from the muscles which move the bones. Cardiac muscle contracts 100,000 times a day. The heart contains a structure made of nerves, called the pace maker, which synchronises the action of the muscles and keeps the heart beat regular. The brain receives messages from sensors in the circulatory system which monitor the condition of the blood. For example, if the carbon dioxide content is too high the brain sends messages to the heart to speed up its beat so more blood can pass through the lungs and more carbon dioxide can be removed. If the concentration of carbon dioxide is low the brain tells the heart to slow down.

The heart is supplied with its own blood vessels, coronary artery and veins. If there are too many fatty substances, such as cholesterol, in the blood the coronary artery may become blocked by the deposits. When this happens, part of the heart muscle does not receive the oxygen it needs and dies, causing a heart attack. If the topic of heart attacks arises it should be dealt with sensitively as members of the class may have relatives who have had one.

Answers

Q1. The heart should occupy an area about the size of the clenched fist and be a little left of centre in the chest. (Or see *Students' Book* page 20.)

Q2. The body. It is rich in oxygen.

Q3. The lungs. It is poor in oxygen.

Q4. Valves.

Q5. Muscle.

9

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

See **pages 20 and 21** of *The Body Book*

PRACTICAL A

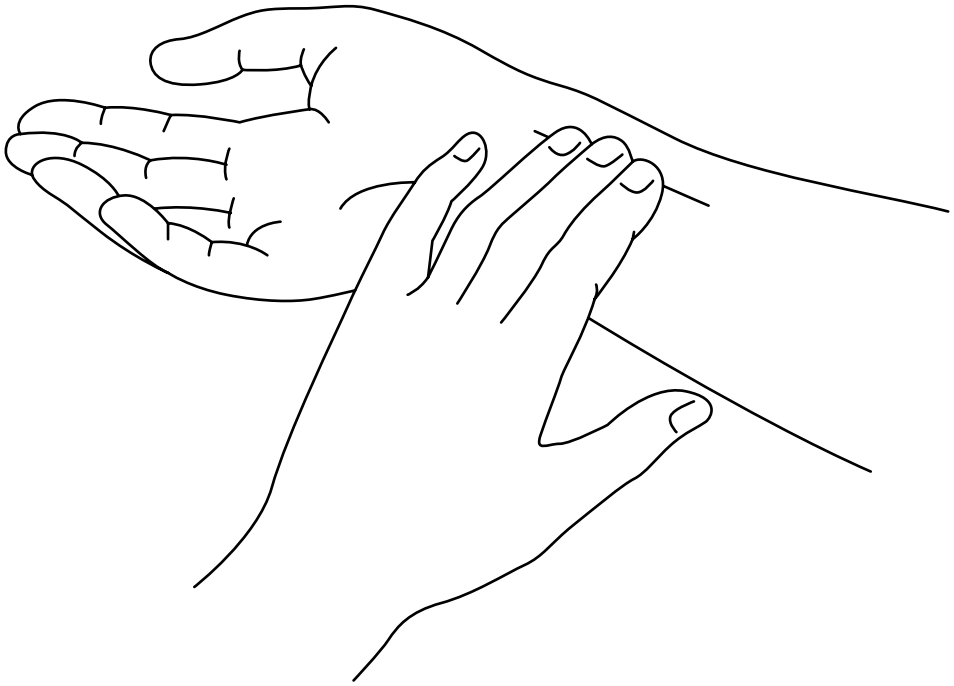
Find your pulse

Your pulse is a measure of your heart beat.

(1) Turn your right hand over so that your palm is facing up.

(2) Turn your left hand so that the palm faces downwards, lower your thumb and bring your left hand towards your right hand.

(3) Put your left thumb below the right wrist and bring down two or three fingers of your left hand on your right wrist.



(4) Bring the fingers to the right of centre of the wrist and push the tips gently into your skin.

(5) Feel around the skin for the pulse.

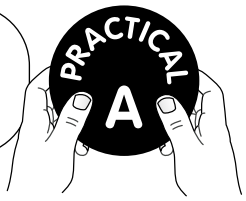
(6) Describe your pulse.

✎ .....

.....

9 Teacher's sheet: Practical

See **pages 20 and 21** of *The Body Book*



Equipment

None is needed for the activity on the sheet but you may like to extend the work and let the students try timing their pulse once they have found it. Stop clocks will be needed for this.

Introducing the work

After the students have studied the heart cycle on page 21 and read about the heart beat, ask how many of them can take their pulse. You may find that even those who think they can take their pulse may use their thumb instead of their fingers. This gives you an opportunity to hand out the sheet. Members of the class will vary widely in their ability to find their pulse. This sheet allows the class to show how they can follow instructions and also helps you by providing instructions while you work with those class members who are having difficulty finding their pulse.

Outcomes

The children:

- Can follow instructions.
- Can make an accurate description from their observations.

Background

The thumb should not be used for finding a pulse as it has a pulse itself.

Extending the work

Those class members who have been successful at finding the pulse in their right wrist should be asked to find it in their left wrist. A pulse can be found under the lower jaw by pushing two fingers of the right hand into the flesh under the right-side of the jaw, next to your throat.

You may also let those who have successfully found their pulse practice timing their pulse.

9

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

See **pages 20 and 21** of *The Body Book*

Investigating the pulse

(1) Lie down for two minutes, then count your pulse for 30 seconds. Multiply the beats you have counted by two to find the beats per minute. Repeat twice more.

(2) Walk for two minutes, then stop and count your pulse for 30 seconds. Multiply the beat you have counted by two to find the beats per minute. Repeat twice more.

(3) Run for two minutes, then stop and count your pulse for 30 seconds. Multiply the beats you have counted by two to find the beats per minute. Repeat twice more.

(4) Set out your results in the table here.

Count	No. of beats after lying down	No. of beats after walking	No. of beats after running
1			
2			
3			

(5) Describe any pattern you see in your results.

✎ .....

.....

.....

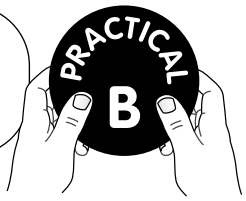
.....

.....

.....

9 Teacher's sheet: Practical

See **pages 20 and 21** of *The Body Book*



Equipment

The class groups will need stop clocks.

Special note

Make sure that all the members of the class taking part in the exercise are fit to do so and do not have a condition which may affect their health during or after exercise.

Introducing the work

This activity can be related to Practical 7: How often do you breathe. You may wish to refer to Practical 7 before you begin this one, and let the class use the information they discovered there to help them predict the outcome of this activity. Alternatively, you may like to do this activity first and ask the class about other work on the body which supports these results. In both strategies, look for explanations relating to supplying oxygen to the muscles in time to meet their needs (and to remove carbon dioxide).

Outcomes

The children:

- Can follow instructions.
- Can fill in a table.
- Can identify a pattern in the results.

Background

The class should see the pattern that, as activity increases, the pulse rate increases. Some class members may also say that the heart beats more strongly, although this has not been measured.

Extending the work

You may let the class use the table on the sheet or blank it out and let the class construct their own tables so you can assess this skill. Some class members may wish to calculate and display averages.

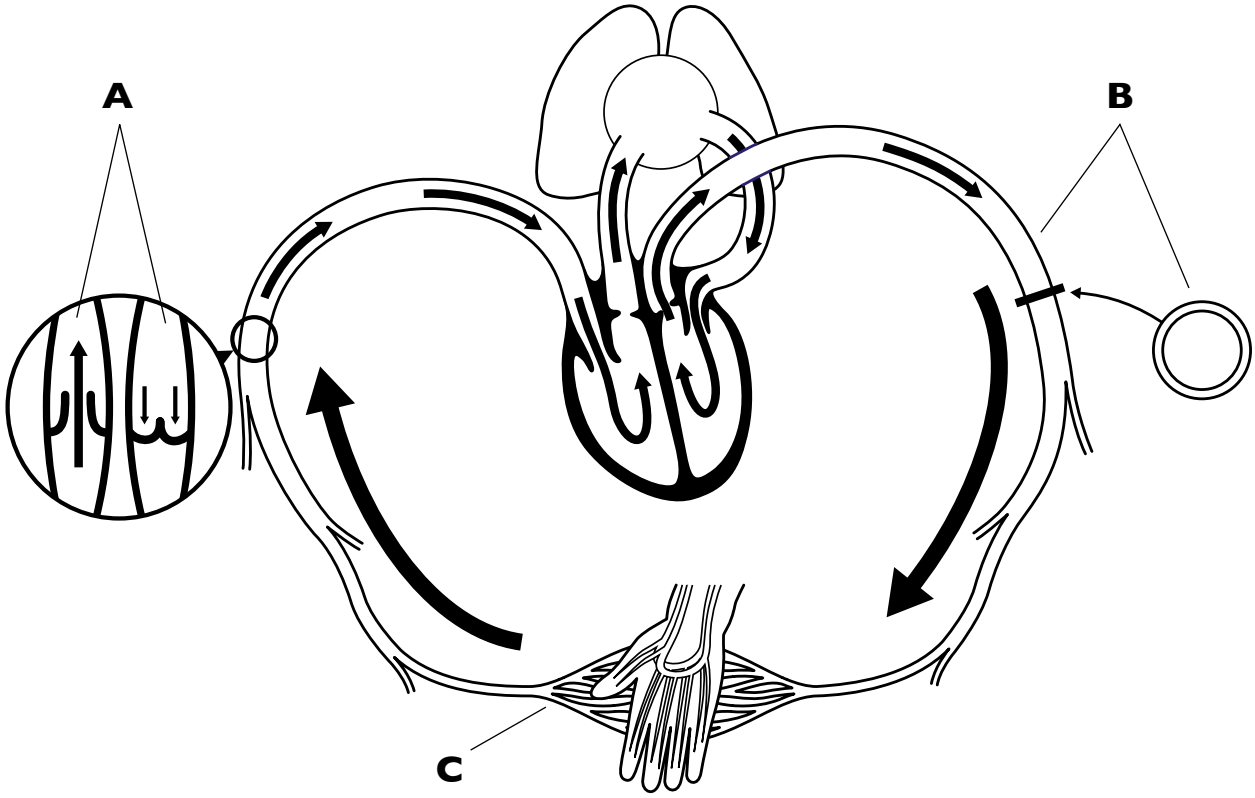
When evaluating the activity the class may mention that here their personal results are more objective than in the breathing activity because they cannot control their pulse rate in the same way that they could exert some control over the frequency of their breathing.

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

See **pages 22 and 23** of *The Body Book*

How blood circulates

Blood circulates around the body through arteries and veins.



Q1. Name the parts labelled A, B and C on the diagram.

A ✎ ..... B ✎ ..... C ✎ .....

Q2. On the diagram, put an X where the blood picks up oxygen and put a Y where the blood loses oxygen.

Q3. On the diagram, colour in red the part of the circulation system which carries blood rich in oxygen.

Q4. The heart has valves, but some tubes that carry blood have valves, too. What are these tubes called?

✎ .....

Q5. What do the valves do?

✎ .....

10 Teacher's sheet: Comprehension

See **pages 22 and 23** of *The Body Book*

ANSWERS

Introduction

Remind the students of their work on the pulse. Let them look at their wrists and find blood vessels near the skin that they did not use when taking the pulse. Tell the students that these are veins, and the pulse can only be felt in blood vessels called arteries that are deeper in the flesh. The pulse can be felt in arteries because they carry blood that has just left the heart. The veins take the blood towards the heart after it has flowed though tiny blood vessels in the flesh called capillaries. The force of the blood is weakened as it passes through the capillaries so it is not strong enough to create a pulse when it reaches the veins.

Supplementary practical work

If the thumb is pressed across the veins in the wrist for a few moments they will be seen to swell up a little, thus showing that blood only flows one way through them. If it flowed both ways the veins would not swell up

Extension worksheet

Pages 109 and 119.

Links

The heart, pages 20–21; **Keeping fit**, pages 42–43.

Background

It has been estimated that there are 100,000 kilometres of blood vessels in the body. Most are so tiny they are microscopic. They branch out and connect up again as they go between the cells. There are so many because all the cells have to be close to them so that substances can diffuse between the cells and the blood quickly enough to keep the cells alive.

The class needs to have secure knowledge of how the left and right sides of the heart are represented in books – ie the left side of the heart is on the reader's right. They also need to be sure that arteries always take blood away from the heart and veins always take blood towards it. They need to be aware that all arteries except the pulmonary artery (the one taking the blood from the heart to the lungs) carry blood rich in oxygen (oxygenated blood) and all veins except the pulmonary vein (the vein bringing blood from the lungs to the heart) carry blood low in oxygen (deoxygenated blood).

The heart is a double pump and the circulation is a double circulation. One circuit takes the blood from the heart to the lungs and back again. The other takes the blood from the heart to the body and back again. The main artery taking blood from the heart to the body is called the aorta. It splits up into other arteries such as the carotid arteries which take blood to the brain, the hepatic artery which takes blood to the liver and the renal artery which takes blood to the kidneys.

The vena cava is the vein which channels the blood from the body back into the heart. Other veins, such as the jugular veins in the neck, are connected to it. There is one vein which is not connected to the heart. It is called the hepatic portal vein and takes digested food from the small intestine directly to the liver. The liver performs many tasks in keeping the body alive, up to 500 chemical reactions take place there, so early deliveries of food from the small intestine are vital.

The arteries are buried deep in the flesh but the veins are nearer the skin surface. Small veins can be seen near the wrist. If the underside of the lower right arm is squeezed, about 6cm below the right wrist with the left hand, for a few moments, the veins can be seen to swell up a little as the one way flow of blood is halted. The grip must be released after a few seconds.

Answers

Q1. A Vein, B Artery, C Capillary.

Q2. X goes on lungs, Y goes on hand.

Q3. The right hand side is coloured red (the vein from the lung to the heart and the artery from the heart to the hand).

Q4. Veins.

Q5. Stop used blood returning to the capillaries.

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

See **pages 24 and 25** of *The Body Book*

Bones

Bones give strength to the body and also provide new cells for blood.

Q1. What is the bone shown here?

✎ .....

Q2. The bone in Q1 is a flat bone.
Name another place in the skeleton where there are flat bones.

✎ .....

Q3. Name two parts of the skeleton made from irregularly shaped bones.

1 ✎ ..... 2 ✎ .....

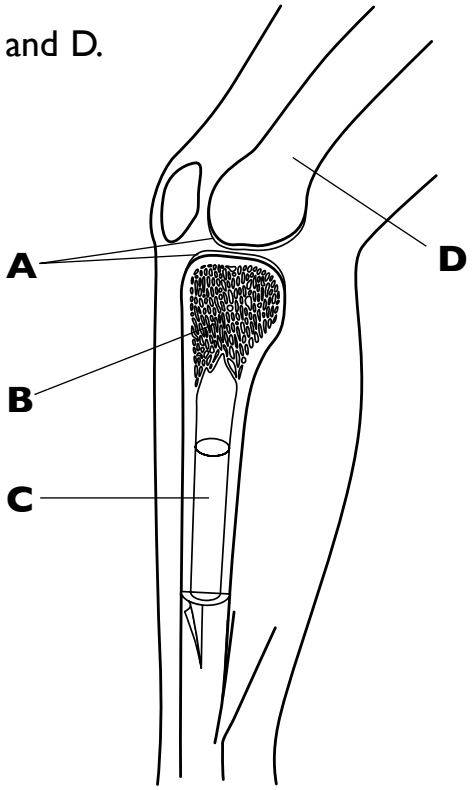
Q4. Name the parts of the bone labelled A, B, C and D.

A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....



Q5. Why are bones hollow and not solid?

✎ .....

.....

.....

11 Teacher's sheet: Comprehension

See **pages 24 and 25** of *The Body Book*

ANSWERS

Introduction

A selection of X-ray photographs would help in the introduction of the topic. The students could try to identify the bones in the X-ray photographs by reference to their own bodies or a model skeleton. After the students have read page 24 they could identify the bones in a skeleton – long, short, flat and irregular – using the page to help them.

Practical work

11A: Testing the length of 'bones'

11B: Testing the thickness of 'bones'

Integrating the practical work

You can let the students try the two practicals after they have studied the different shapes of bones on page 24. Half the class could try Practical 11A and the other half could try Practical 11B. When the students have performed their investigations, they can present their work to the whole class so all are aware of the effect of length and thickness on the strength of a bone.

Alternatively, all the class can try Practical 11A first and follow it with Practical 11B.

Extension worksheet

Pages 109 and 120.

Links

The skeleton, pages 26–27; **Joints**, pages 28–29; **Muscles**, pages 30–31; **Keeping fit**, pages 42–43.

Background

Bones are usually thought of as non-living material which remains unchanged in the body. However, bone is a living material and changes throughout life. As the human embryo develops during pregnancy, the bones form first as cartilage then take up minerals and form bone. The completion of bone formation (called ossification) continues for many years after birth. For example, the bones of the skull are not fully formed until 16 years of age, while the bones of the feet may take 12 to 22 years to fully form after birth. The sternum can take 30 years to become fully formed.

The two kinds of bone cell work together building up and breaking down bone. The shape of bones may change slightly through life due to the stresses and strains put on the skeleton. For example, in some old people the bones of the feet may become deformed.

Bone is also superbly adapted to the task it performs in supporting the body. The spongy texture in the head of long bones, and the cavity along their shafts, gives a considerable weight reduction without a loss of strength. The bones provide support but, because of their light weight, are easily pulled by the muscles and allow movement without using vast quantities of energy.

The class will be familiar with bones of other animals from their meals, so you can build on their experience by presenting them with some X-ray photograph of bones to examine.

Answers

Q1. Shoulder blade.

Q2. Skull or ribs (rib cage).

Q3. Spine, hands, feet.

Q4. A Cartilage, B Spongy bone, C Marrow (red or yellow), D Hard bone.

Q5. Hollow bones are lighter in weight than solid bones and easier for the muscles to move.

11

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

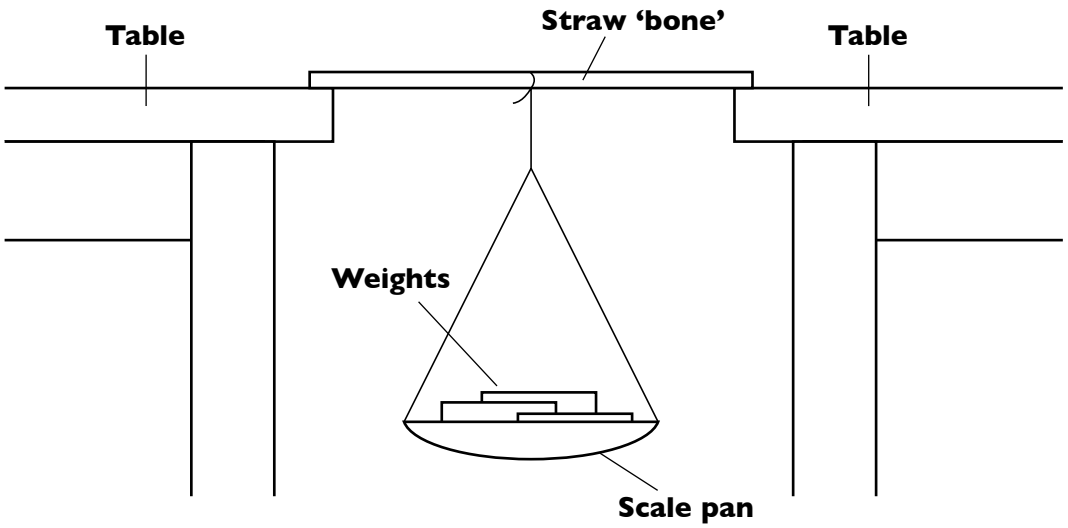
See **pages 24 and 25** of *The Body Book*

PRACTICAL A

Testing the length of 'bones'

Bones are different lengths. Is the length of a bone related to its strength?

(1) Set up each of your model bones as shown in the diagram and add weights until the bone bends.



(2) Construct a table in this space with your results.

(3) Write down what you find.

✎ .....

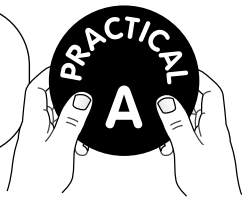
.....

.....

11

Teacher's sheet: Practical

See **pages 24 and 25** of *The Body Book*



Equipment

Each class group will need a few paper straws of different lengths (you could cut them before class or let the students cut their own 'short bones'), a means of supporting the straws, a scale pan and some weights (actual scientific masses or small objects such as coins).

Introducing the work

This activity can be introduced as an example of scientific modelling. It allows an investigation of the idea by using standard 'bones' rather than actual bones which may vary a little from each other and would have to be cleaned and sterilised before use in a classroom.

Outcomes

The children:

- Can construct a table and fill in the results.
- Can identify a pattern in their results.

Background

For simplicity, the term weights can be used with younger children. The weights could be coins or marbles and the scale pan could be made out of a yogurt pot. Older children may be working to a syllabus where the distinction between mass and weight is required. In this case they may use masses supported by a mass hanger instead of weights and scale pan. They may also have access to clamps and stands from which they could suspend their 'bones'.

The class should find that the shorter bones are stronger than the longer bones.

Extending the work

If the class has done the work on breathing and pulse rates previously, some class members may suggest repeating their bones experiment and producing averages. If this does not occur suggest it to the class.

11

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

See **pages 24 and 25** of *The Body Book*

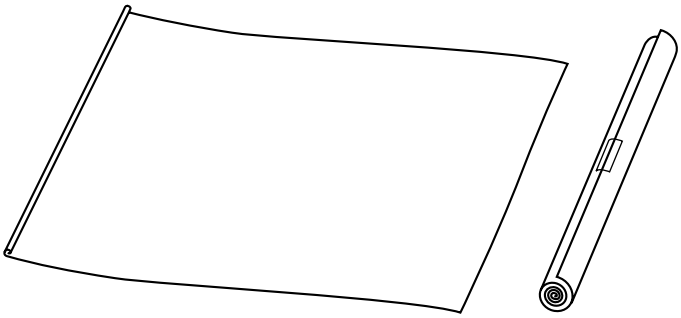
PRACTICAL B

Testing the thickness of 'bones'

Bones are different thicknesses. Is the thickness of a bone related to its strength?

(1) Make your model 'bones' from paper in the following way:

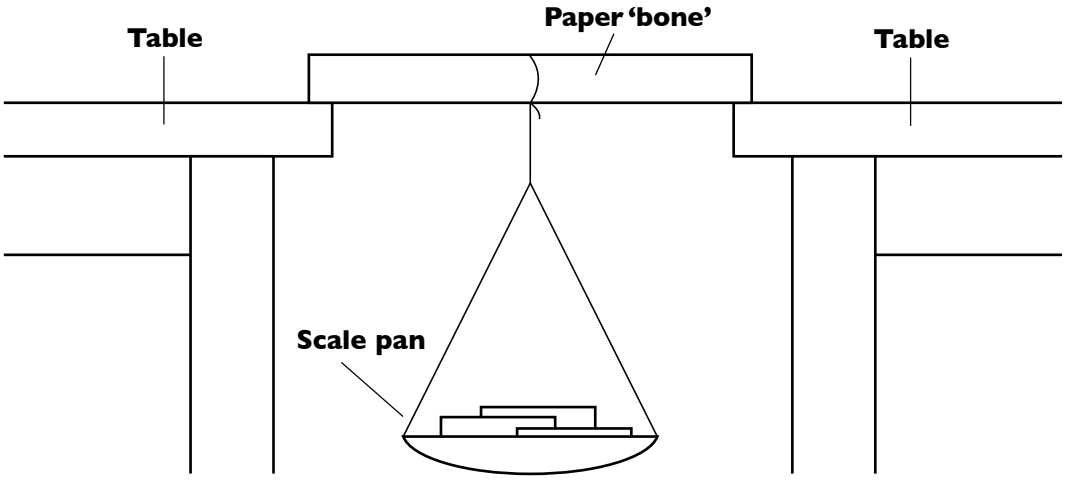
Roll up a sheet of paper and hold it together with a piece of tape as shown in this diagram. This is your thinnest 'bone'.



Roll up a second sheet, then roll a third sheet round it. This is a slightly thicker 'bone'. Again, use a piece of tape to hold it together.

Make several bones with different thicknesses by using different amounts of paper. Notice that you must make the 'bones' all the same length, so use the same type of paper if you are to carry out a fair test.

(2) Test your bones as this diagram shows.



(3) Draw a table on a separate sheet of paper in which to record your results.

(4) Write down what you find.

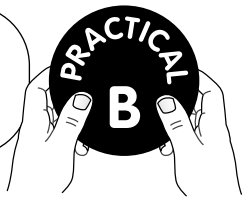
✎ .....

.....

.....

11 Teacher's sheet: Practical

See **pages 24 and 25** of *The Body Book*



Equipment

Each class group will need sheets of paper, a means of supporting the paper 'bones', a scale pan and some weights (actual scientific masses or small objects such as coins) and perhaps kitchen weights to use with the larger 'bones'.

Introducing the work

This activity can be introduced as an example of scientific modelling. It allows an investigation of the idea by using standard 'bones' rather than actual bones which may vary a little from each other and would have to be cleaned and sterilised before use in a classroom.

The practical may be done by half the class while others do Practical 11A, and the results of both groups pooled to find out how length and thickness affect bone strength. Alternatively, this practical could be done by students who have done Practical 11A previously. In this case the practical gives the class an opportunity to build on a technique they have learnt before. The students will probably make quite thick 'bones' and will need to adapt their weights to generate stronger forces. If all the bones are thick enough they may like to use a force meter instead of a scale pan and weights. This is attached in the same way as the scale pan but a member of the group slowly pulls down until the 'bone' bends. At this time a second member of the group records the distance travelled by the pointer on the spring of the meter.

Outcomes

The children:

- Can construct a table and fill in the results.
- Can identify a pattern in their results.
- Can control risks in the performance of an activity.

Background

The need for repeating the experiment may be more readily grasped, as the quality of the 'bones' also depends on the ability of the members of the group making them.

The class should find that the thicker bones are stronger than the thinner bones.

Extending the work

If the class have done the work on breathing and pulse rates previously, some class members may suggest repeating their bones experiment and producing averages. If this does not occur suggest it to the class.

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

See **pages 26 and 27** of *The Body Book*

Your skeleton

The skeleton is made of 206 bones held together by muscles.

Q1. On the diagram of the skeleton name the parts labelled A to E.

A ✎ .....

B ✎ .....

C ✎ .....

D ✎ .....

E ✎ .....

Q2. Which part of the body does A protect?

✎ .....

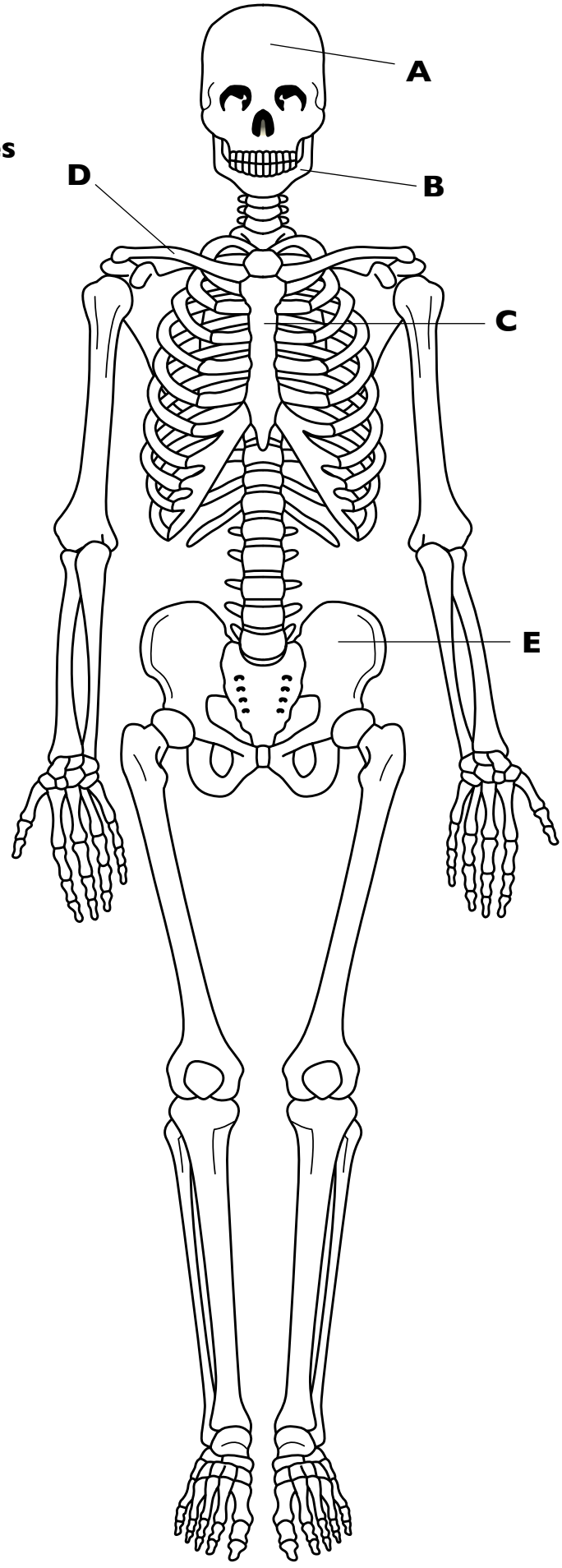
Q3. Shade in the part of the skeleton which protects the lungs and heart.

Q4. What do bones store?

✎ .....

Q5. How old will you be when your bones stop growing?

✎ .....



12 Teacher's sheet: Comprehension

See **pages 26 and 27** of *The Body Book*

ANSWERS

Introduction

If you did not use X-ray photographs of bones in the introduction to the spread on bones you could use them now. If you did use X-ray photographs of whole bones in that introduction try to show some X-ray photographs of broken bones later in the work on this spread, before studying Diagram 2 on page 27 of the *Students' Book*.

Diagram 2 can be used to initiate a discussion on broken bones and allow members of the class to describe any relevant experiences, such as time for healing, treatment received and care after the bone has healed.

Practical work

12A: Your skeleton (part 1)

12B: Your skeleton (part 2)

Integrating the practical work

The practicals may be used in several ways as described on the back of the sheets.

Extension worksheet

Pages 109 and 121.

Links

Bones, pages 24–25; **Joints**, pages 28–29; **Muscles**, pages 30–31; **Keeping fit**, pages 42–43.

Background

In reviewing your work on the skeleton, the class should be secure in knowing that the three main functions of the skeleton are support, protection and movement, as these may be asked for in examinations. (Note: It is the adult skeleton that contains 206 bones.)

Answers

Q1. A Skull, B Jaw bone, C Breast bone, D Collar bone, E Hip bone.

Q2. The brain.

Q3. The rib cage should be shaded in.

Q4. Minerals (calcium).

Q5. About 18.

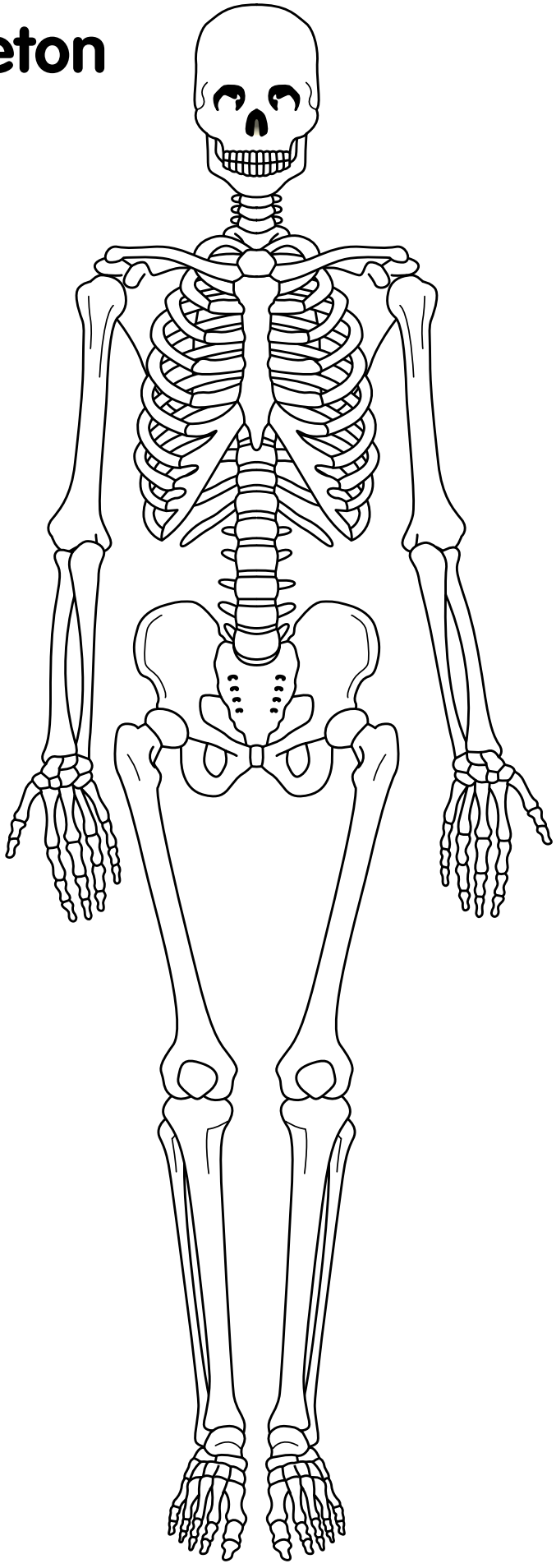
12

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

See **pages 26 and 27** of *The Body Book*

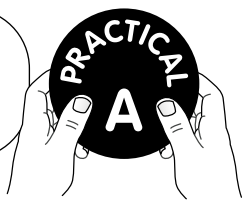
PRACTICAL A

Your skeleton



Teacher's sheet: Practical

See **pages 26 and 27** of *The Body Book*



Introducing the work

You may like to use this sheet in one of several ways. It could be used at the beginning of the topic, when one sheet is given to each group and the members pool their knowledge and work together to supply as many labels as possible. It may be used in a homework activity, it may be used as a supplement to the comprehension worksheet or set as a separate test.

You can use the information in the background notes here to show the students how to divide up the skeleton for easier study. If this information is used in describing the skeleton, the axial (skull to pelvis) part of the skeleton may be coloured in blue and the appendicular (arms and legs) part may be coloured in green before labelling. If the activity in Practical 12B is used, it may help the class assemble their skeletons.

Outcomes

The children:

- Can use scientific knowledge in making observations.

Background

The skeleton may just look like a confusion of bones, but it can be divided up into regions to help further study. The two main regions are the axial and the appendicular.

The axial skeleton

This is composed of the skull, the vertebral column and the rib cage.

The skull is made from the brain case or cranium, the upper jaw, called the maxilla, which is attached to the cranium, and the lower jaw, called the mandible, which can be lowered and raised.

The vertebral column (sometimes called the spinal column or backbone) is divided into the following regions – neck or cervical region (seven vertebrae); the chest or thoracic region (12 vertebrae); the waist or lower back, called the lumbar region (five vertebrae); the hip or sacral vertebrae which are fused together and to the pelvis to provide extra strength in the lower part of the torso; the tail vertebrae or coccyx, which is made from three to five bones fused together.

Each bone in the column is called a vertebra. Most vertebrae are separated from each other by a disc of cartilage. During sleep, water from the blood seeps into the disc and makes it thicker, so that in the morning a person is slightly taller than the night before. During the course of the day, as the discs are squeezed by the weight of the body, the water is lost to the blood, making the discs thinner and the person slightly shorter.

The rib cage is composed of seven pairs of 'true ribs', which are attached directly to the sternum or breast bone, and five pairs of 'false' ribs. Three pairs of 'false' ribs are fused together and attached to the lower end of the sternum and two pairs of 'false' ribs, called floating ribs, are not attached to the sternum.

The appendicular skeleton

This is divided into the girdles (bones which attach the limbs to the vertebral column) and the limbs. There are two girdles – the pectoral girdle made from the shoulder blade and collar bone, and the pelvic girdle, or pelvis, made from the pair of hip bones. Each hip bone is made from the fusion of three bones called the ilium, ischium and pubis. Human arms and legs are called five fingered, or pentadactyl, limbs. There are more details about them on page 68.

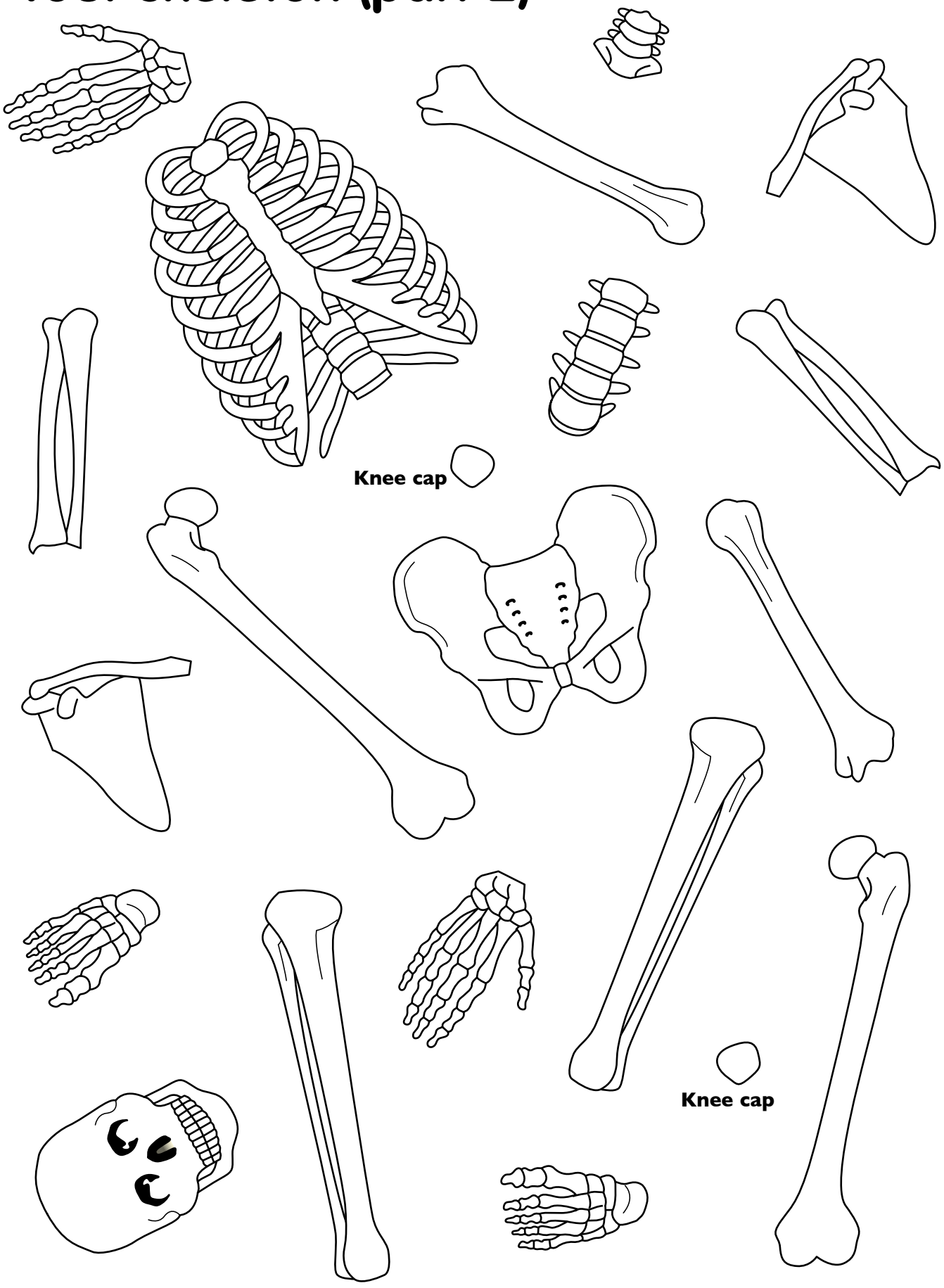
12

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

See **pages 26 and 27** of *The Body Book*

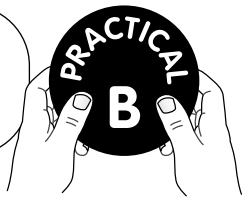
PRACTICAL B

Your skeleton (part 2)



12 Teacher's sheet: Practical

See **pages 26 and 27** of *The Body Book*



Equipment

You will need scissors, spare sheets on which to assemble the skeletons, paste. You may wish to enlarge the sheet when you copy it.

Introducing the work

You may wish to use this sheet in several ways. After the class have constructed a labelled skeleton in 12A, they can then use their sheet to help them assemble the skeleton on this sheet. You may issue each member of the class with a sheet and let them use the diagram in the *Students' Book* as a guide. If you have chosen to introduce the skeleton by considering the axial and appendicular components, you may work with the class so that they assemble the axial components first and colour them in, then assemble the girdles and finally the limb bones.

Outcomes

The children:

- Can use scientific knowledge in making observations.

Background

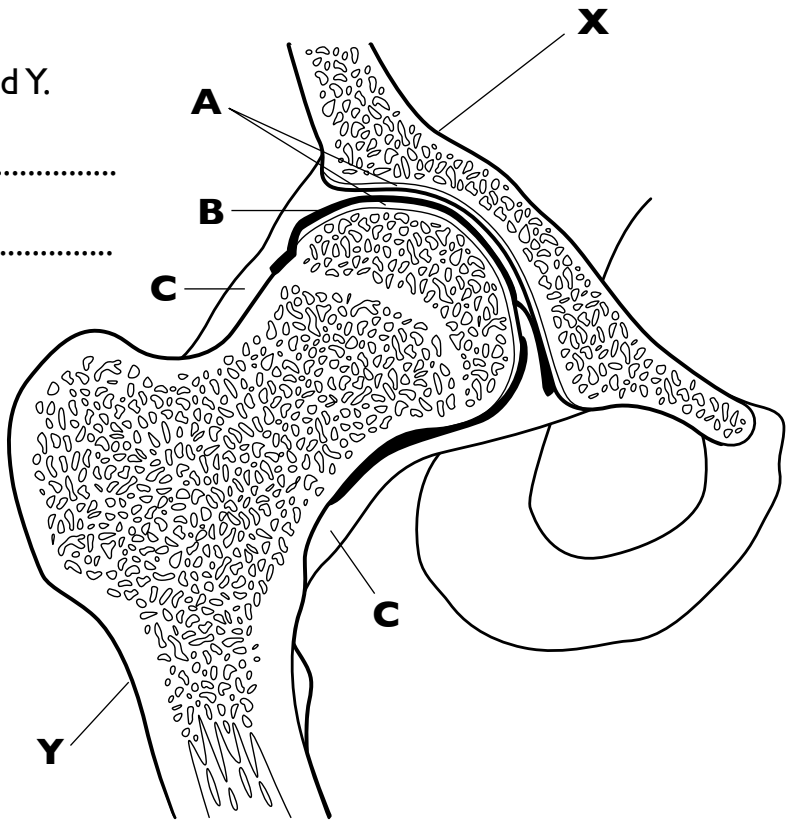
The long bones of the limbs may cause some confusion because they appear to be similar. In fact, the arm and leg are built on the same plan. They each end in five digits and because of this are known as pentadactyl limbs. Starting from the limb socket, both limbs have one long bone (the humerus in the arm and the femur in the leg), then a joint which, in the leg, includes the patella, or knee cap (there is no equivalent in the arm), then two more long bones. The thicker long bone is the radius in the arm and the tibia in the leg, and the thinner bone is the ulna in the arm and the fibula in the leg. These two bones are connected to a group of smaller bones. In the hand these bones are called carpals (eight bones) and in the foot they are called tarsals (seven bones). These are connected to a second group of five bones – the metacarpals in the hand and the metatarsals in the foot. The limbs end in five digits. Each digit has five bones.

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

See **pages 28 and 29** of *The Body Book*

Joints

There are joints between nearly all bones. They allow the bones to move in a variety of ways.



Q1. Name the bones labelled X and Y.

X ✎ .....

Y ✎ .....

Q2. What kind of joint do the two bones make?

✎ .....

.....

Q3. Name the parts of the joint labelled A, B and C.

Q4. What is the purpose of A?

✎ .....

.....

Q5. What is the purpose of B?

✎ .....

.....

Q6. What is the purpose of C?

✎ .....

.....

13 Teacher's sheet: Comprehension

See **pages 28 and 29** of *The Body Book*

ANSWERS

Introduction

You may begin by saying that we take the joints between our bones for granted so we need to spend some time looking at what they allow us to do. Ask members of the class to flex their arm then, by using the shoulder joint only, raise and lower it, move it backwards and forwards and in a circular motion.

Follow this by asking the members of the class to flex their arm again and raise and lower the hand using only the hinge joint at the elbow. Ask them now to reach forwards and to describe the actions at the shoulder and elbow joint. Ask them to reach forwards and pick something up and then describe the movements made by the gliding joints in the hand. Finally, ask them to hold out a hand, palm uppermost, and grip the ulna and radius near the wrist with the other hand. They should then turn their hand palm down. They should be surprised to feel their bones swivel over one another as the bones move in their pivot joint.

Practical work

13: Joints

Integrating the practical work

You may use the practical as an extension of your introduction or you may use it at the end of the spread to help summarise ideas about joints.

Extension worksheet

Pages 109 and 122.

Links

Bones, pages 24–25; **The skeleton**, pages 26–27; **Muscles**, pages 30–31; **Keeping fit**, pages 42–43.

Background

The pivot joint in the neck which allows the head to turn is of a different construction to that in the arm. The top vertebra, called the atlas, has a hole in it which contains a peg of bone from the vertebra beneath it called the axis. Muscles move the atlas so that it pivots round the peg to turn the head from side to side.

Incidentally, the nodding of the head is possible due to the way the skull is connected to the top surface of the atlas. There are two lumps of bone at the base of the skull on either side of the hole though which the spinal cord passes. These lumps rest on two flat surfaces on the upper side of the atlas and allow the skull to rock forwards or backwards when neck muscles pull on it.

The action of the joints in the arm may be studied further with the practical.

Answers

Q1. X Hip bone, Y Thigh bone.

Q2. Ball and socket joint.

Q3. A Cartilage, B Liquid, C Ligament.

Q4. Protects the ends of the bone from wear.

Q5. Reduces wear.

Q6. Holds bones together.

13

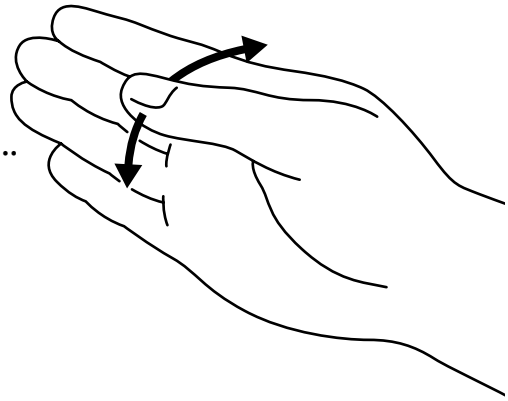
Name: ..... **Form:** .....

See **pages 28 and 29** of *The Body Book*

PRACTICAL

Joints

The way joints help us can be found by careful observation of simple actions.



(1) Write your full name here.

✎ .....

(2) Now try again but this time keep your fingers and palm straight so their joints are not used. You can move your thumb as the diagram shows.

✎ .....

(3) Repeat step (2) but this time do not allow your wrist to turn.

✎ .....

(4) Repeat step (3) but do not allow your elbow joint to move.

✎ .....

(5) Repeat step (4) but do not allow your shoulder joint to move. (You will have to rock your body to move your pen.)

✎ .....

(6) Think about other ways in which the joints help you in your daily life. Try some investigations of your own, then explain below why hand and arm joints are important.

✎ .....

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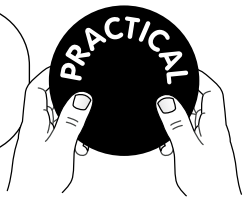
.....

13

Teacher's sheet: Practical

See **pages 28 and 29** of *The Body Book*



Introducing the work

This activity follows on from the introduction. It aims to make the class observe everyday actions more closely. The members of the class should find it increasingly difficult to write their names as they move through the steps.

In step 6 they should investigate how they could read a book, carry something or eat with the various limitations described in steps 1 to 5.

Outcomes

The children:

- Can follow instructions.
- Can plan an investigation.
- Can carry out an investigation they have planned.

Background

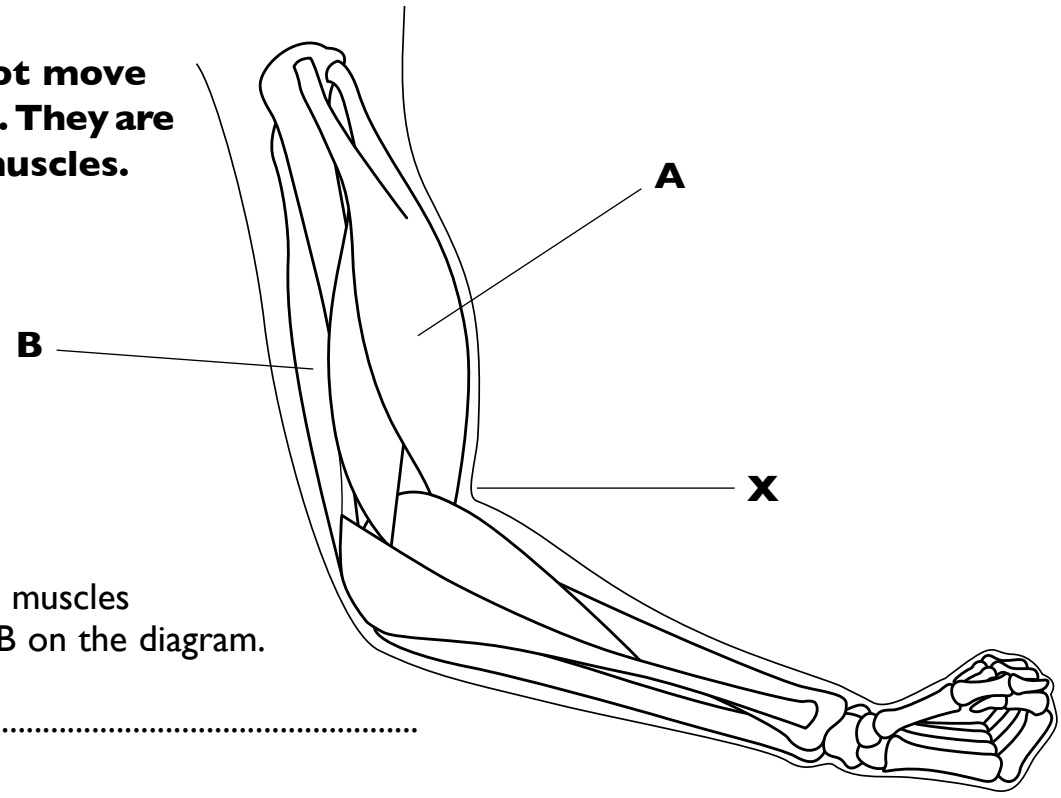
The students' account should include a mention of the way the gliding joints in the hand allow things to be securely gripped and to manipulate things (e.g. keyboard skills, turning an apple round as you eat it, tying a shoe lace) and the way the pivot joint in the wrist allows further manipulation such as reading a book, preparing a meal. The hinge joint allows things to be lifted, such as food to the mouth, and manipulation like the combing of hair. The shoulder joint allows the arm to push and pull things and also to lift things. The elbow joint also allows the arm to lift things. The shoulder joint also allows the arm to be stretched to reach things.

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

See **pages 30 and 31** of *The Body Book*

Muscles

Bones cannot move on their own. They are moved by muscles.



Q1. Name the muscles labelled A and B on the diagram.

A ✎ .....

B ✎ .....

Q2. What kind of joint is joint X?

✎ .....

Q3. Which way does the forearm move when muscle A contracts?

✎ .....

Q4. Which way does the arm move when muscle B contracts?

✎ .....

Q5. What happens to muscle A when muscle B contracts?

✎ .....

Q6. What links the brain to the muscles?

✎ .....

14 Teacher's sheet: Comprehension

See **pages 30 and 31** of *The Body Book*

ANSWERS

Introduction

Ask the students to touch their cheeks with their fingers and smile and then frown. Ask them what their fingers feel. They should feel the movement of muscles in the face. Tell the students that when they smile they use 17 muscles, and when they frown they use 40, so frowning takes much more energy than smiling.

Ask for a volunteer to be weighed and say that 45% of their weight is due to their muscles. Ask another student to calculate 45% of the volunteer's weight, and ask a third student to pile objects, such as books, onto a bathroom scale until the weight of the volunteers muscles is reached. This allows the students to visualise how much of their body is muscle.

Practical work

14: Muscles

2A: The model arm*

2B: Controlling the muscles*

*If they were not done while studying the introduction.

Integrating the practical work

You may use the introduction to the practical work on page 76 of this *Teacher's Guide* to introduce Diagram 2 on page 31 of the *Students' Book*. When you have studied Diagram 2 move on the practical work.

Extension worksheet

Pages 109 and 123.

Links

The skeleton, pages 26–27; **Joints**, pages 28–29; **Keeping fit**, pages 42–43.

Background

While skeletal muscle is made from fibres with microscopic stripes across them, smooth muscle is made from long, spindle-shaped cells. The smooth muscles in the intestine, for example, are arranged in two layers in the intestine wall. The outer layer has cells arranged along the length of the intestine and is called longitudinal muscle. When it contracts, the intestine becomes shorter. Inside this is a layer of cells arranged around the sides of the intestine and is called circular muscle. When it contracts, the width of the intestine becomes shorter. By alternately contracting the two layers of muscles, a wave of movement called peristalsis passes along the intestine which pushes the food along. This also occurs in the oesophagus (the tube that carries food from the mouth to the stomach) and can sometimes be felt when something is difficult to swallow. (See also page 82 of this *Teacher's Guide* for how muscles control the iris.)

Answers

Q1. A Biceps, B Triceps.

Q2. Hinge joint.

Q3. Upward.

Q4. Downward.

Q5. It relaxes.

Q6. Nerves.

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

See **pages 30 and 31** of *The Body Book*

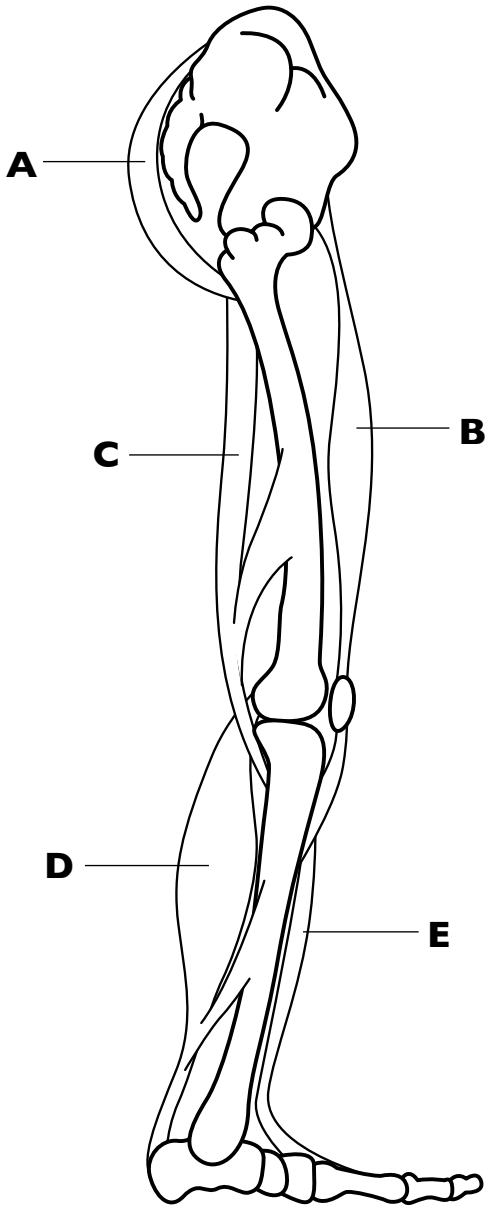
PRACTICAL

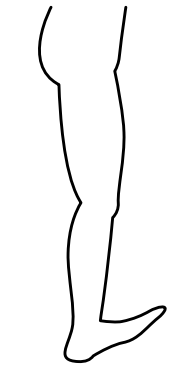
Muscles

The large diagram shows five muscles which move the bones in the leg when they contract.

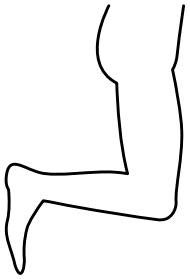
(1) Try and work out which muscles are contracting to produce the five movements shown in the smaller pictures.

You may feel the muscles in your own legs as you try the actions to help you answer.

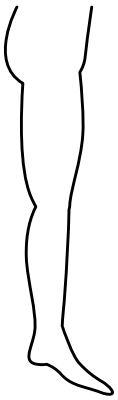




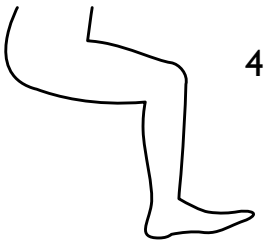
1 ✎ .....



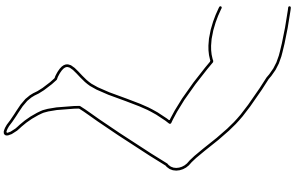
2 ✎ .....



3 ✎ .....



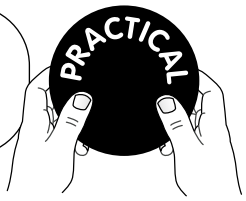
4 ✎ .....



5 ✎ .....

14 Teacher's sheet: Practical

See **pages 30 and 31** of *The Body Book*



Introducing the work

Use the following to integrate with Diagram 2 on page 31 of the *Students' Book*.

If someone is asked about the strength of their muscles, they may raise their arms and flex them to display biceps. This type of incident can be used to introduce this practical work. When someone is challenged to feel the bicep muscles, they are supposed to be impressed at how hard the muscle is. This can be built on by asking the class members to put their thumb and first finger three centimetres apart then stick the tips into the contracted biceps muscles and push in to feel how hard it is. Then with the finger and thumb tips still in place, the arm should be straightened. The muscle will feel softer and also longer. You may say that the bicep muscle has been lengthened by the action of the tricep muscle on the back of the upper arm, and ask the class to investigate this muscle with their finger and thumb. They should find the triceps becomes harder and shorter when the arm is outstretched, and longer and softer when the arm is flexed.

Pairs of muscles which produce opposite effects are called antagonistic muscles. The biceps and triceps are easy to see. Other skeletal muscles are arranged in similar pairs but cannot be investigated easily. To emphasise this point you could ask the class to feel the tendon of the biceps in the elbow joint as they flex and extend their arm. Then they should stretch out a hand and wiggle their fingers to see the tendons connected to the fingers moving under their skin. The class may be surprised to find that the muscles which operate their fingers are actually located in the lower arm and not between the fingers themselves. They may like to speculate on how their fingers would look if the muscles were attached between each finger bone. This one example shows how the arrangements of muscles on the skeleton can be complex.

Use the following to introduce this practical work.

The muscle diagram shown here is greatly simplified, to show the consequences of the action of five muscles in the leg. There are many more muscles in the leg, which the class will appreciate as they try to confirm their ideas by examining their own legs.

Before the class tries this activity you may also like to make sure that they are aware of the importance of tendons. These are tough, non-elastic cords which connect the muscle to the bone. The class may like to speculate on what would happen if the tendons were elastic (the muscles would pull on them instead of the bones and movement would be reduced).

They could also feel the hamstring tendons at the back of the leg.

Outcomes

The children:

- Can interpret diagrams.
- Can make observations and use them to answer questions.

Answers

(1) E.

(2) C.

(3) D.

(4) B.

(5) A, C and D.

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

See **pages 32 and 33** of *The Body Book*

The brain

The nervous system, including the brain, controls how the body works.

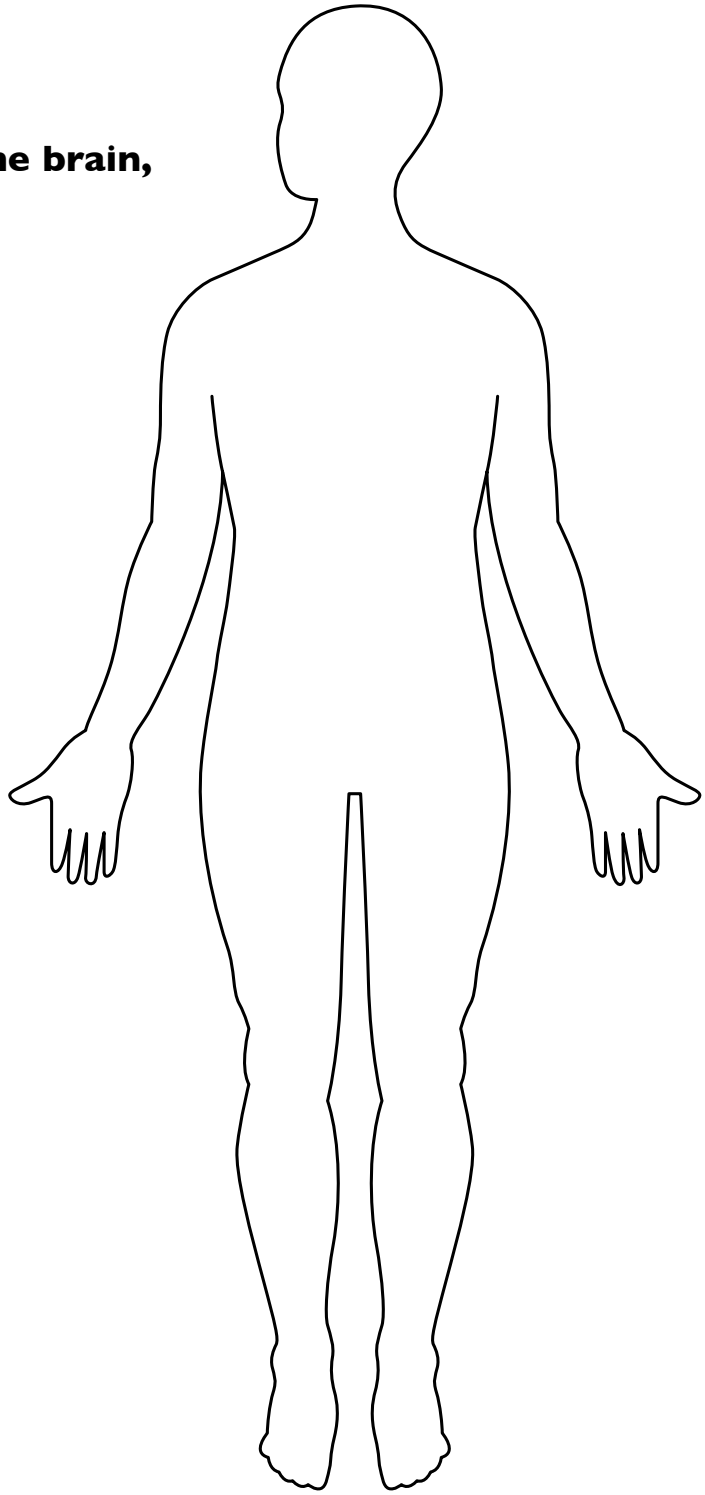
Q1. In the outline of the body draw the following:

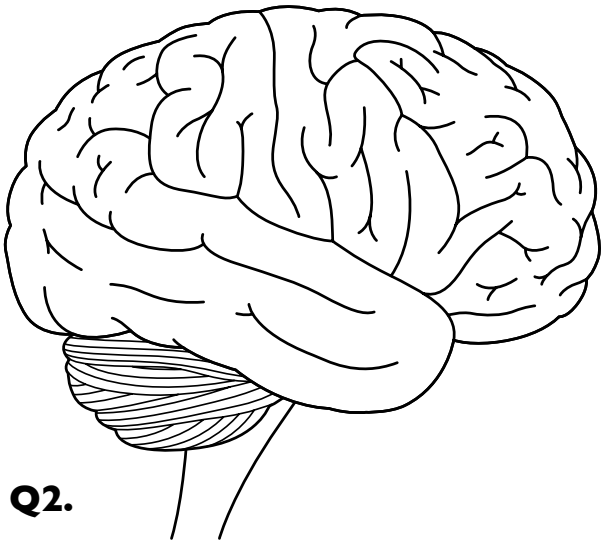
(a) The brain.

(b) The spinal cord.

(c) A nerve to the hand.

(d) A nerve to the foot.





Q2.

(a) Colour in red the area of the brain concerned with thinking.

(b) Colour in blue the area concerned with movement.

(c) Colour in green the area concerned with memory.

(d) Shade in grey the area concerned with balance.

Q3. What kinds of signals travel along nerves to the brain?

✎ .....

Q4. The brain receives messages from the sense organs. What are they?

✎ .....

.....

.....

15 Teacher's sheet: Comprehension

See **pages 32 and 33** of *The Body Book*

ANSWERS

Introduction

You may like to begin with a question and answer session about the brain to see what the students know. The main point to draw from this is that the brain communicates with the body through nerves. Some nerves take information from the sense organs to the brain and other nerves take information from the nerves to the muscles.

Practical work

15A: Skin test

15B: Eye test

15C: Reaction timer

15D: Memory test

2B: Controlling the muscles*

*If not done with the introductory work.

Integrating the practical work

Let the students read the paragraphs on page 32 of the *Students' Book* and look at the two diagrams, then introduce Practical 15A followed by Practical 15B as examples of studying sense organs which provide information for the brain.

Read through page 33 and let the students study Diagram 3 on that page, then introduce Practical 2B, if it has not been done in the introduction, followed by Practical 15C. If Practical 2B has been done, introduce Practical 15C as an example of how the brain sends information to control the muscles. Memory plays a part in conscious actions and the action of the memory can be demonstrated by trying Practical 15D.

Extension worksheet

Pages 109 and 124.

Links

Muscles, pages 30–31; **Taking risks**, pages 44–45.

Background

The brain co-ordinates many actions necessary for life, without our being aware of it. These are called the brain's automatic functions. In addition to co-ordinating the activities of the skeletal muscles so that we do not have to think about posture, the brain co-ordinates the activities of the rib and diaphragm muscles, the heart muscle and the muscles in the digestive system.

The nervous system is one of two systems which control and co-ordinate the body. The other system is the endocrine system. Where the nervous system produces quick responses by sending electrical signals, the endocrine system generally makes slower responses, which last a longer time, by sending chemical messages through the blood in the form of hormones. The hormone secreting organs are the endocrine glands. The most well known are the adrenal glands, which produce adrenaline that prepares us for fight or flight. It is produced in stressful situations, e.g. stage fright.

Answers

Q1. (a) The brain should fill the upper half of the head.

(b) The spinal cord should go from the base of the brain, through the centre of the body, to near the base of the torso.

(c) The nerve should come out of the spinal cord near the shoulder and go down the arm.

(d) The nerve should come out of the spinal cord near its base and go down the leg.

Q2. Check with the diagram on page 32 of the *Students' Book*, but for rough guidance:

(a) This is at the front.

(b) This is a line down the upper part of the brain in the centre of the diagram.

(c) This is at the front, just behind the part that controls thinking.

(d) This is the lump at the top of the spinal cord.

Q3. Electrical.

Q4. The eye, ear, nose, tongue and skin.

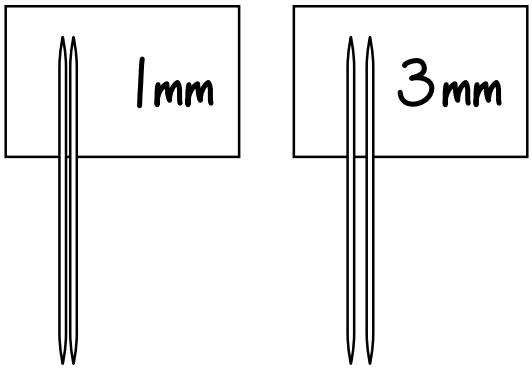
15

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

See **pages 32 and 33** of *The Body Book*

PRACTICAL A

Skin test



(1) Glue two tooth picks to a card. Make the tips 1mm apart.

(2) Make cards with tooth picks 3, 5 and 10mm apart. Let the glue dry and write the distance between the tooth pick tips on the card.

(3) The person to be tested should close their eyes. The person testing should select one card and also a single tooth pick and test the five areas in the chart below. The card with two toothpicks, and the single tooth pick, should be presented alternately at each area of skin. Only lightly touch the skin with the toothpicks, do not push them into the skin.

(4) The person should be asked if they feel one or two points. Put a tick in the table if two points are detected and a cross if only one point is detected.

(5) Fill the answers in the table as you go along, then repeat the test with the other cards and the single tooth pick until the table is full.

	Distance (mm)			
Skin region	**1**	**3**	**5**	**10**
Fingertip				
Palm				
Back of hand				
Forearm				
Back of neck				

(6) Describe your results.

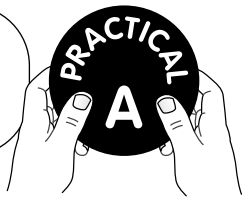
✎ .....

.....

.....

15 Teacher's sheet: Practical

See **pages 32 and 33** of *The Body Book*



Equipment

Each class group will need toothpicks, glue and card.

Introducing the work

The members of the class may think that all areas of the skin are equally sensitive. Five areas of skin which are normally exposed are the fingertip, palm, back of hand, forearm and neck. The class may be invited to touch or gently scratch each in turn as a preliminary test on the sensitivity of the skin. This may not yield conclusive results, due to the difference in degree and strength of scratching, and can lead to a discussion of the need for a standardised test.

Suggest, or draw from the class, the idea that the skin could be tested with two pointed instruments which are not too sharp, such as tooth picks. Suggest that pairs of tooth picks may be set at different distances apart for the test and that the most sensitive skin will detect the tooth picks that are closest as two points, while the least sensitive skin will detect them as one point.

Some class members may suggest that the experiment will not work because the person being tested could say "two" all the time. To avoid this temptation a single tooth pick can be presented, either before or after the toothpicks on the card, but only the result of the two toothpicks is recorded in the table.

Outcomes

The children:

- Can fill in a table.
- Can control risks in the performance of an activity.
- Can provide a written account of the results of an investigation.

Background

It should be found that the fingertip is the most sensitive and the neck is the least sensitive.

The outer layer of the skin is composed of dead cells which are continually being lost. Beneath this is a layer of cells which produce new outer skin cells. These two layers form the epidermis layer of the skin. Beneath the epidermis is the dermis layer which contains hair follicles, sweat glands and receptors which are sensitive to touch, pressure, heat and cold. The receptors are not evenly distributed over the skin but are concentrated in the regions which come into most contact with a wide variety of objects – the hands.

Extending the work

You could ask the class why there is a difference and look for the answer suggesting that the most sensitive area of skin comes in to contact with all kinds of objects we use in our daily lives, and information about textures (and temperatures) is useful.

15

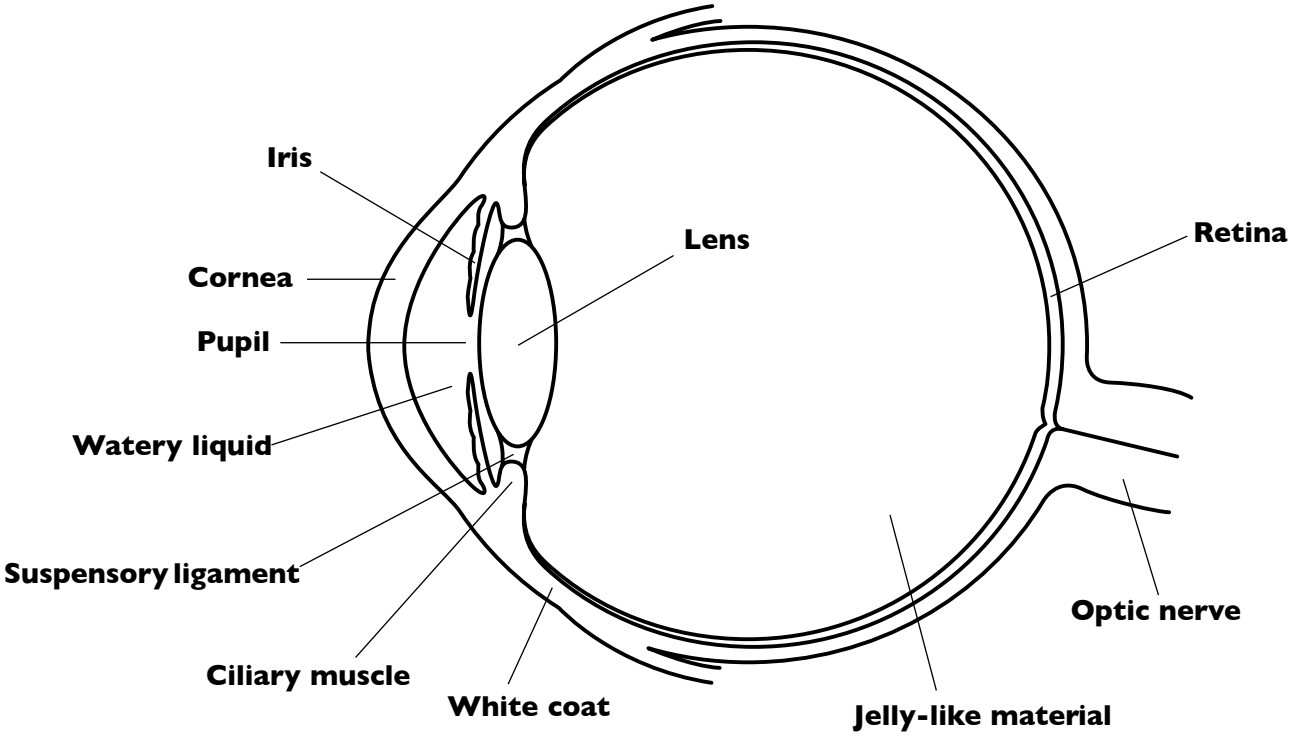
Name: ..... **Form:** .....

See **pages 32 and 33** of *The Body Book*

PRACTICAL B

Eye test

This diagram shows the inside of the eye as seen from above. The parts you can see from the front are the cornea, white coat, iris and pupil.



(1) Look in a mirror at your eyes. Draw one eye on a separate sheet of paper. Label the iris and pupil. You may use the diagram above to help you.

(2) Make sure that the room is brightly lit, close and cover your eyes with your hands and slowly count to 60. Quickly remove your hands, open your eyes and look at your pupils. Describe how they changed.

✎ .....

.....

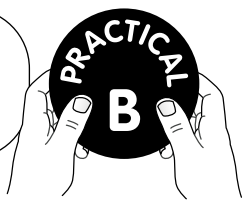
(3) Put a pen and its top separately on a table. Look away. Close one eye then, keeping that eye closed, turn and quickly pick up the pen and top. Holding them at almost arm's length, try to put the top on the pen.

(4) Close your left eye, hold this sheet about thirty centimetres away from your face. Look at the cross and move the sheet towards you. What happens to the spot?

+ ●

15 Teacher's sheet: Practical

See **pages 32 and 33** of *The Body Book*



Equipment

You will need a magnifying glass, mirrors without sharp edges, pens and pen tops.

Introducing the work

This work can be introduced straight after the work on the skin. The eye can be introduced as a sense organ specialised for detecting light. You may wish to discuss the diagram of the eye with the students, using the background information on this page. You may illustrate your talk by showing how a magnifying glass can reverse an image from a window, just as the lens in the eye does.

As the students work through the sheet they should find that:

In (1) the iris should get smaller as the eyes are exposed to bright light.

In (2) the first attempt to put the top on the pen should fail, as the perception of depth has been lost by using only one eye. The use of memory and information from the positions of the muscles in the arms and fingers also help in this exercise and may make it possible to put the top on straight away.

In (3) the spot disappears at a certain distance from the face, depending on the individual. It is essential that the right eye looks at the cross all the time. The spot disappears because the image of it falls in the blind spot, which is the place where the optic nerve carrying all the nerve fibres leaves the eye for the brain. There is no space for light receptors at this spot.

Outcomes

The children:

- Can make observations.
- Can make a report of their observations.

Background

We rely mostly on our sense of sight to provide us with information. The eye is both a light gathering organ and an organ for sending information to the brain. You may wish to talk about this with the class by referring to the diagram on the sheet. When a light ray passes from the air to another transparent material it is bent or refracted. Light rays striking the transparent front of the eye, called the cornea, are bent so that they pass through the pupil.

Behind the pupil is the lens, which further bends the rays of light so that they come to a point of focus on the back wall of the eye ball. A picture of the eye's view, called the image, forms on a tissue called the retina which is made from light-receptor cells. They send messages to the brain where the images from the two eyes are put together and turned the right way up to give us our vision and sense of three dimensions. There are 10 million cone-shaped receptors which are sensitive to colour and 130 million rod-shaped receptors which are sensitive to low levels of illumination. When the light is too dim, the cones do not work and we see only black and white, provided by information from the rod cells.

The coloured ring around the pupil is called the iris and contains two sets of smooth muscle which alter the shape of the iris and the size of the pupil. One set of muscles are arranged like spokes in a bicycle wheel. When they contract they make the iris narrower and the pupils larger. The second set are arranged in circles around the pupil. When they contract they make the iris wider and the pupil smaller. The muscles control the size of the pupil and prevent too much light entering the eye.

Most of the surface of the eye is covered by a tough, white coating known as the sclera.

The watery liquid (called the aqueous humor) and the jelly-like material (called the vitreous humor) provide internal support to the eyeball and, being transparent, let the light rays pass through them.

The action of the ciliary muscle alters the shape of the lens and changes its focusing power. The suspensory ligament is the means by which the muscle is attached to the lens. When the muscle contracts, it squeezes on the eye ball and makes the lens thicker so that light from close up can be focused. When the muscle relaxes it is stretched by the tension in the eyeball and the lens becomes thinner and can focus light from more distant objects.

The middle layer of the eye is unlabelled, but is called the choroid, and contains blood vessels which service the various parts of the eye.

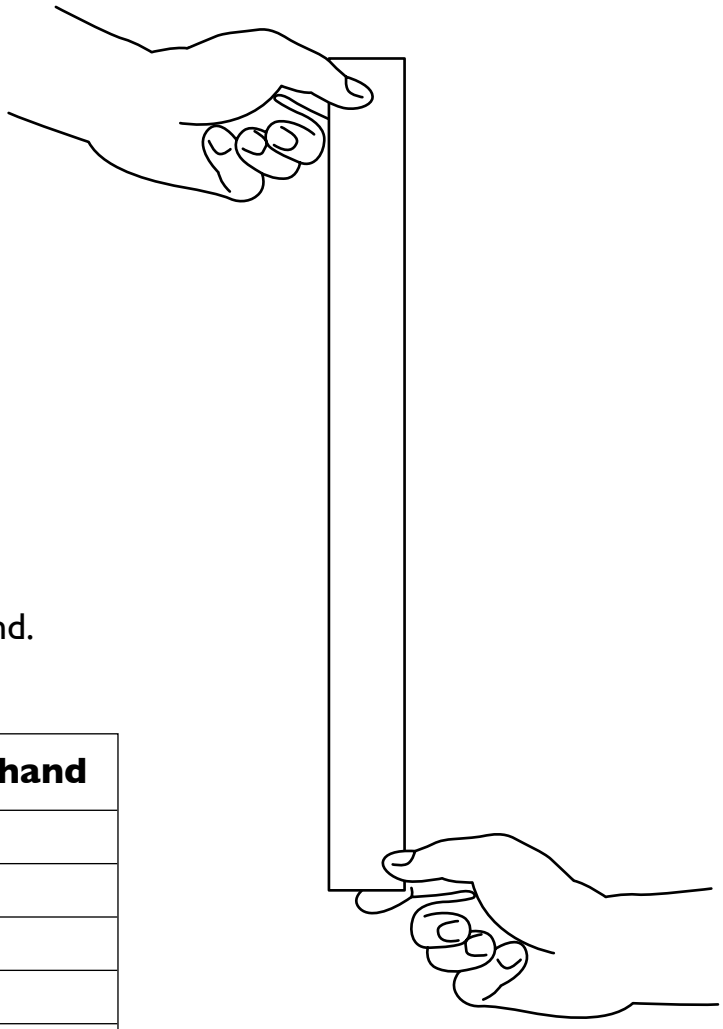
Name: ..... Form: .....

See **pages 32 and 33** of *The Body Book*

PRACTICAL C

Reaction timer

(1) Ask your partner to hold up a ruler, then open your hand and put it at the bottom of the ruler as shown in the diagram. There should be about 2cm of space between the ruler and your finger and thumb.



(2) Ask your partner to let the ruler drop without warning you and try to catch the ruler as quickly as possible. Record the distance dropped by the ruler in the table and repeat nine more times.

(3) Repeat step (2) with your other hand.

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

(4) What do your results show?

✎ .....

.....

.....

15

Teacher's sheet: Practical

See **pages 32 and 33** of *The Body Book*

Equipment

A ruler for each pair of students.

Introducing the work

You may wish to begin by making a loud noise such as dropping a heavy book or a sheet of metal when the students are not looking. Their action on hearing the noise is their reaction to it. Some students may pride themselves on their reactions in using an electronic game. Introduce this activity as a way to measure the reaction to a falling object. It is a measure of how fast signals pass from the eye along nerves to the brain and then along nerves to the muscles.

Outcomes

The children:

- Can carry out a fair test.
- Can fill in a table correctly.
- Can draw conclusions from their results.

Background

The class may have come across the term reflex action in the context of sport, such as a goalkeeper moving quickly to tip a ball over the cross bar. The use of the term here is incorrect, as a reflex action is one that does not involve conscious thought. For example, the beating of the heart or the movement of food along the intestines. Some reflex actions can be influenced consciously by the brain, such as the swallowing reflex, which sometimes has to be held at the dentists, or people may hold their breath in surprise, but generally these reflexes are left to work on their own. A well known reflex is the withdrawal of a hand from something hot enough to burn the skin. In a reflex action the signals in the nerves pass round a reflex arc. In the example of a hand withdrawing from a hot object, heat receptors in the hand send signals along a sensory nerve cell, or neurone, to the spinal cord. In the spinal cord, the signals are passed to a nerve cell called a relay neurone, which in turn passes them to a motor nerve cell or neurone. The neurone takes the signals to a muscle and causes the muscle to contract and move the hand away from the hot object.

The relay neurone also sends signals to the brain, which then decides to let the reflex take place or overrule it.

In the activity on this sheet the speed of reaction is investigated. It is not a reflex reaction. Receptors in the eye send signals along the optic nerve to the brain, which then sends signals down the spinal cord and out along a motor neurone in the arm to the muscles in the lower forearm.

In the analysis of the results, some groups may like to add the distances for each trial together to find a total drop of the right and left hand. If in some cases the student failed to catch any of the ruler, this must be scored as the maximum length of the ruler.

If some groups finish early they can be asked if the speed of the action is affected by closing one eye or the other.

Extending the work

In the analysis of the results some groups may like to add the distances for each trial together to find a total drop of the right and left hand. If this is done and in some cases there has been failure to catch the ruler this must be scored as the maximum length of the ruler.

If some groups finish early they can be asked if the speed of the action is affected by which eye is used.

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

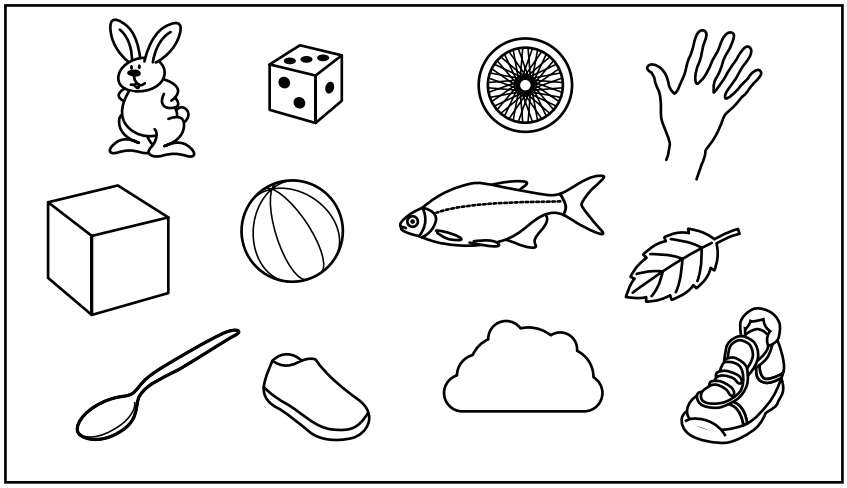
See **pages 32 and 33** of *The Body Book*

PRACTICAL D

Memory test

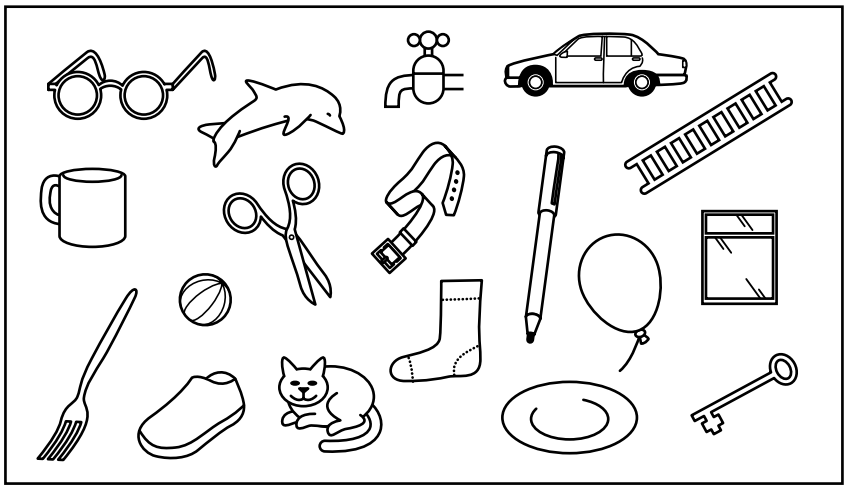
(1) Look at the objects in Box 1 for one minute, then cover the box and write down as many as you can.

Box 1



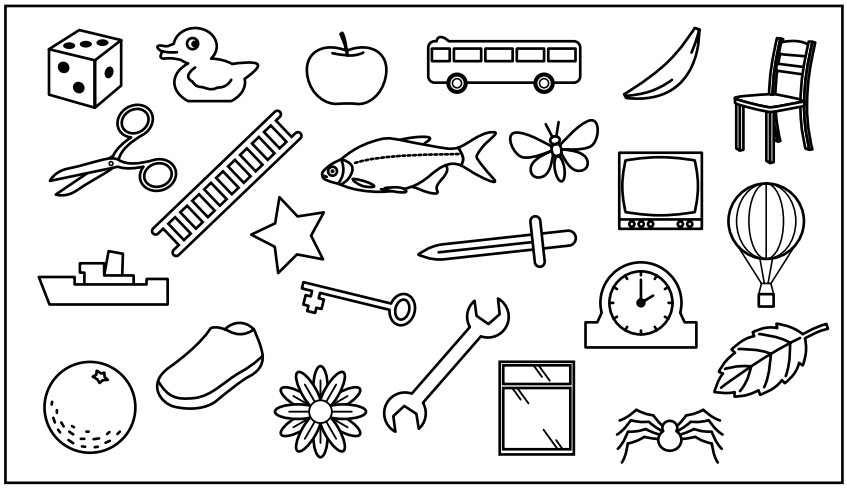
(2) Look at the objects in Box 2 for one minute, then cover the box and write down as many as you can.

Box 2



(3) Look at the objects in Box 3 for one minute, then cover the box and write down as many as you can.

Box 3



15 Teacher's sheet: Practical

See **pages 32 and 33** of *The Body Book*

Equipment

You may cut the copies into three and let each group have one picture at a time, starting with the simplest. You will also need a clock.

Introducing the work

Remind the students that memory plays an important part in our actions, and a simple way of testing the memory is to let the eyes look at some objects then see how good the brain is at storing the information. Give the students the picture with the least number of objects first and the most number of objects last.

Outcomes

The children:

- Can make observations.
- Can draw conclusions from their results.

Background

There is so much yet to be discovered about the brain. It is the least-well understood organ in the body. The map of the regions of the brain has been worked out from many experiments. These have involved volunteers having various regions of their brains stimulated by small amounts of electricity and being asked what they feel or see.

The activity here is to test the memory region of the brain. Memories are thought to be held in circuits of nerve cells. When you remember something, a circuit is set up. The brain has grey and white matter. The white matter is made of nerve fibres conducting signals to and from the grey matter. The grey matter is made from nerve cells which do not have a single long branch, but have many branches and form many connections. This occurs in the folded, uppermost part of the brain, called the cerebrum. It is folded to increase the surface area of grey matter in which many brain functions take place.

Extending the work

A half hour after the activity ask the students how many objects they can remember. Record the number of correct answers compared with the possible total of correct answers. Repeat this exercise at the beginning of the next lesson.

Answers

In Box 1 there are:

rabbit, dice, wheel, hand, cube, ball, fish, leaf, spoon, shoe, cloud, trainer. (Total 12.)

In Box 2 there are:

spectacles, mug, fork, dolphin, scissors, ball, shoe, cat, tap, belt, sock, pen, plate, car, ladder, balloon, window, key. (Total 18.)

In Box 3 there are:

dice, scissors, ship, orange, duck, ladder, star, shoe, flower, key, fish, apple, bus, sword, spanner, window, butterfly, banana, television, clock, spider, chair, hot air balloon, leaf. (Total 24.)

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

See **pages 34 and 35** of *The Body Book*

A new human life begins

Human life depends on passing on chemical instructions to new cells.

Q1. Draw an egg cell and a sperm cell in the boxes.

Egg cell	Sperm cell

Q2. Label the nucleus in each cell.

Q3. What does the sperm cell use to help it move? ✎ .....

Q4. What is the name for the chemical packages that carry instructions for making a person?

✎ .....

Q5. The chemical packages are found on threads. What are these threads called?

✎ .....

Q6. Where are the threads found in an egg cell, and a sperm cell?

✎ .....

Q7. What happens when a sperm fertilises an egg?

✎ .....

.....

.....

16 Teacher's sheet: Comprehension

See **pages 34 and 35** of *The Body Book*

ANSWERS

Introduction

You may introduce this work from the context of the school's PSHE programme, or you may precede it with work on cells. If you have been using the analogy of the body as a chemistry set, you may like to use it again here by introducing the most important chemical – DNA. The class may be familiar with the letters, due to the term 'DNA fingerprinting' being used in crime programmes, so it may be useful to build on this and set DNA in the context of reproduction. You could say that the DNA is located in tiny structures inside cells called genes, then let the students begin the spread.

Practical work

16A: Growth of a fetus

16B: How bodies cool down

Integrating the practical work

Introduce Practical 16A after the students have studied growing on page 35 of the *Students' Book*.

Remind the students of the need for babies to be kept warm, and introduce Practical 16B as a means of investigating the effect of body size on heat loss.

Extension worksheet

Pages 109 and 125.

Links

Cells, pages 8–9.

Background

DNA stands for deoxyribonucleic acid. It has a double helix structure and is capable of making copies of itself. It is made from a small number of chemical molecules linked together. The way they link together makes a code which other parts of the cell can read. For example, the sequence of molecules in a small part of the DNA might be 'ABCABBBACAB'. This could be an instruction for the cell to make a certain kind of protein to help it repair itself or grow. Sequences of molecules like this are called genes. When a cell is not dividing, the nucleus just forms a mass of material, but when it is dividing, it forms threads called chromosomes on which the genes are found.

There are 23 pairs of chromosomes in most human body cells, but when sperms and eggs are made, a special division takes place in the reproductive organs (testis, or testicles, in men and ovary in women) in which the new cells (the sperms and eggs) have only half of each pair of chromosomes. This happens so that when fertilisation takes place the embryo receives one set of genes from the mother and one from the father, and the chromosome number is restored. If this division did not take place, each generation would have more chromosomes than the last, and eventually the nucleus would be too large for the cell.

The correct name for DNA fingerprinting is DNA profiling. In this technique, cells from the saliva or blood of a person are treated to release their DNA. Further special treatments are applied to the DNA to separate it into different components. These form lines like a bar code which can be compared with the DNA of other people. People who are closely related have similar looking 'bar codes' or DNA profiles.

Answers

Q1. The egg cell is round, with a central nucleus. It is larger than the sperm cell. The sperm cell has a head, containing the nucleus, and a tail.

Q2. The nuclei should be labelled.

Q3. A tail.

Q4. Genes.

Q5. Chromosomes.

Q6. In the nucleus.

Q7. The head of the sperm enters the egg cell. The genes from the egg and sperm join together to make a complete set of instructions. The fertilised egg divides into a ball of cells, then grows into an embryo, then a fetus and eventually a baby.

16

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

See **pages 34 and 35** of *The Body Book*

PRACTICAL A

Growth of a fetus

After a human egg was fertilised it grew into a fetus which developed as shown in the table.

(1) Here are some descriptions of some of the developments of the fetus. Arrange them in order by using the information in the table:

Order

☐ (a) The chest grew larger and the body reached 48cm.

☐ (b) The fingernails and fingerprints developed at ten weeks.

☐ (c) All the organ systems had developed by the time the fetus was 2.5cm long.

Order	Age (weeks)	Length (cm)
1	8	2.5
2	10	6
3	14	12
4	20	19
5	25	25
6	30	28
7	38	48

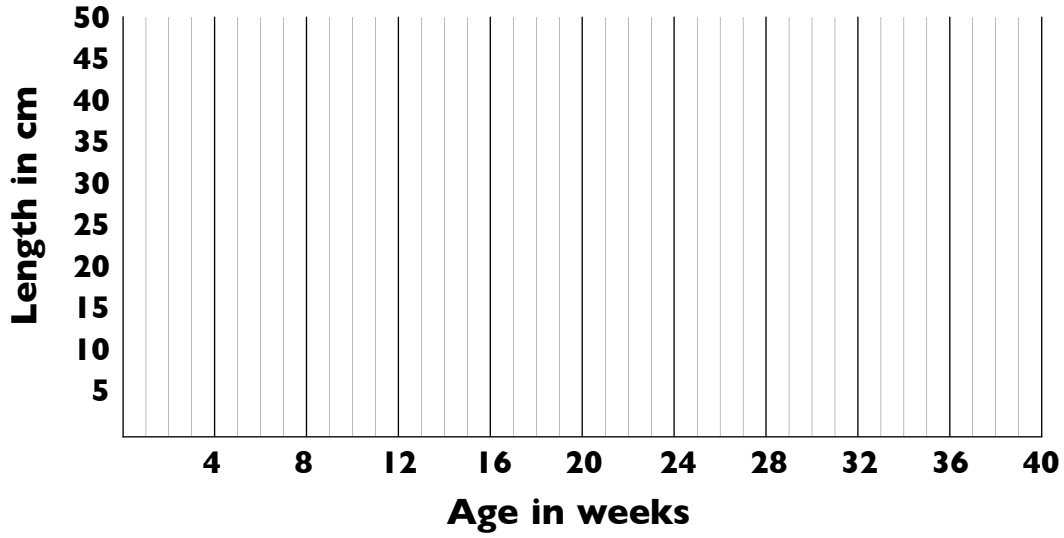
☐ (d) The eyes opened a little when the fetus was 25 weeks old.

☐ (e) The sex of the body could be told when the body reached 12cm.

☐ (f) The head contained hair by 30 weeks.

☐ (g) The toenails developed when the body was 19cm long.

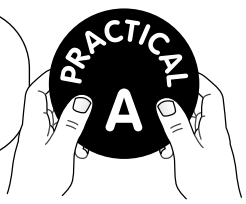
(2) Plot a line graph of the growth of the fetus.



(3) At 38 weeks the fetus turned upside down, ready to be born head first. Look at your graph and find out the length of the fetus at this time. ✎ .....

16 Teacher's sheet: Practical

See **pages 34 and 35** of *The Body Book*



Equipment

You will need Plasticine and graph paper.

Introducing the work

You may like to begin with the consequences of fertilisation, by considering what happens first to the fertilised egg. It begins to divide first into two cells then four and so on. At the first division, the two cells may, rarely, split apart. If this happens, identical twins will form. Fraternal or non-identical twins form when two eggs are fertilised by two different sperm at the same time. Following the first division, the other divisions take place and a ball of cells forms. To help the class to appreciate this you may want to issue each group with a ball of Plasticine, which they have to divide into two, then divide each half into two, then divide each of the new cells into two and so on, and arrange them as a ball of cells.

Issue the sheet and let the students work through it.

Outcomes

The children:

- Can extract information from a table.
- Can plot a line graph.

Background

When the ball of cells reaches the womb (uterus), seven days after fertilisation, it sinks into the wall of the uterus. It draws oxygen and nourishment from the blood in the wall. In time a disc of tissue forms, called the placenta, which continues to extract nourishment and oxygen, and also releases waste such as carbon dioxide and urea into the mother's blood. The mother's blood does not mix with that of the embryo (the embryo's heart starts to beat 20 days after fertilisation) because the pressure of the mother's blood would destroy the delicate embryonic tissues.

Different fetuses grow at different rates, but the sequence of development of the organs remains the same. This exercise helps the class appreciate how the fetus develops and grows.

Prior to birth the bag of water around the fetus bursts, then the walls of the uterus push on the baby so that it travels down the birth canal to the outside world. The umbilical cord which connects the baby to the placenta is cut and about 20 minutes later the placenta leaves the womb as the afterbirth.

Extending the work

The activity can be completed by considering the liquid which is contained in the bag around the fetus. During the development of a fetus, a bag of water forms round it which prevents the fetus from being squashed. You could demonstrate this effect by putting one of the Plasticine balls of cells in a plastic bag and putting a weight on it, then putting a second ball in a bag of water, sealing the bag and applying the same weight. In the second bag, pressure will be taken up by the liquid.

Answers

(1) (a) Order 7, (b) Order 2, (c) Order 1, (d) Order 5, (e) Order 3, (f) Order 6, (g) Order 4.

(2) You may let the class use the prepared axes here, or blank them out and then let the class construct their own graph, either on the sheet or on a separate piece of paper. If you do this, look for 'Age' along the bottom (X axis) and 'Length' up the side (Y axis). Look for the graph to use most of the space on the graph paper and not be small and in a corner. Look for the X axis labelled 'Age in weeks' and the Y axis labelled 'Length in cm', and a title like 'Growth of a fetus'. Check the plotting of points.

If you have given the dimensions of the axes, you could make a tracing of the graph and place it over each graph in turn to check plotting.

(3) 48cm.

16

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

See **pages 34 and 35** of *The Body Book*

PRACTICAL B

How bodies cool down

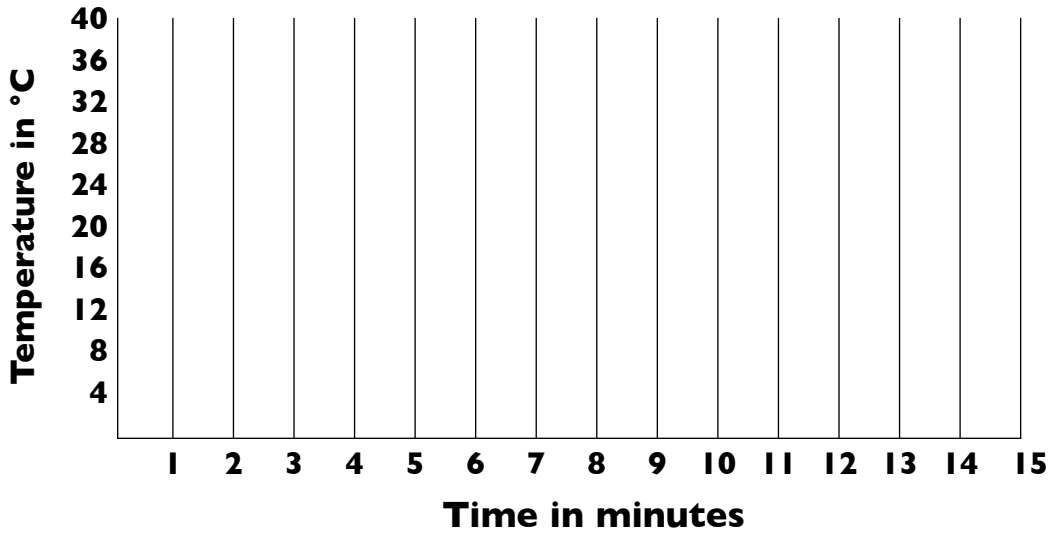
(1) Set up two containers of warm water and measure their temperatures.

(2) Start a stop clock and one minute later take the temperature of each flask again.

(3) Take the temperature of the water in each container every minute over a 15 minute period.

(4) Display your results in a table in this space (or use the back of this sheet).

(5) Plot line graphs of your results below.



(6) What can you conclude from this investigation?

✎ .....

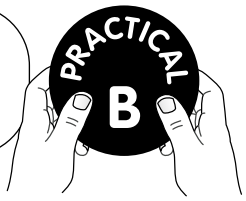
(7) How could you make this investigation more thorough?

✎ .....

.....

16 Teacher's sheet: Practical

See **pages 34 and 35** of *The Body Book*



Equipment

Each class group will need a large and a small container (made of the same material – preferably something that will lose heat quickly like plastic or metal), stop clock and spirit thermometer. For safety and tidiness you should go round the groups and fill the containers. ICT datalogging equipment could be used in this investigation.

Introducing the work

Members of the class who have babies in their families will know about the care taken to keep the baby warm. The reason for this is that babies lose heat much faster than adults. Ask the students for ideas about this and steer the discussion to the effect of body size. Instead of using real people, tell the students that they are going to use scientific modelling to test the idea. The different sized containers represent an adult and a baby.

In the practical work

Look for the table being constructed with column titles of 'Time (mins)', 'Temp small container (°C)' and 'Temp large container (°C)'.

You may let the class use the axes given here or blank them out and let the class construct their own graphs, either on this sheet or a separate piece of paper. Look for the time presented on the X axis of the graph and the temperature on the Y axis. Look for labelling of the axes and a title. Look for carefully plotted points and lines distinguished in some way, perhaps by a colour code.

Look for the ease with which the class plotted two sets of data on one graph. Some class members may have difficulty with this.

The class should find that the smaller container, the 'baby', cools down faster than the larger container, the 'adult'.

In the evaluation of the investigation, the investigation could have been made more thorough by taking more frequent readings (perhaps at 30 second intervals) and by using more containers of different sizes.

Outcomes

The children:

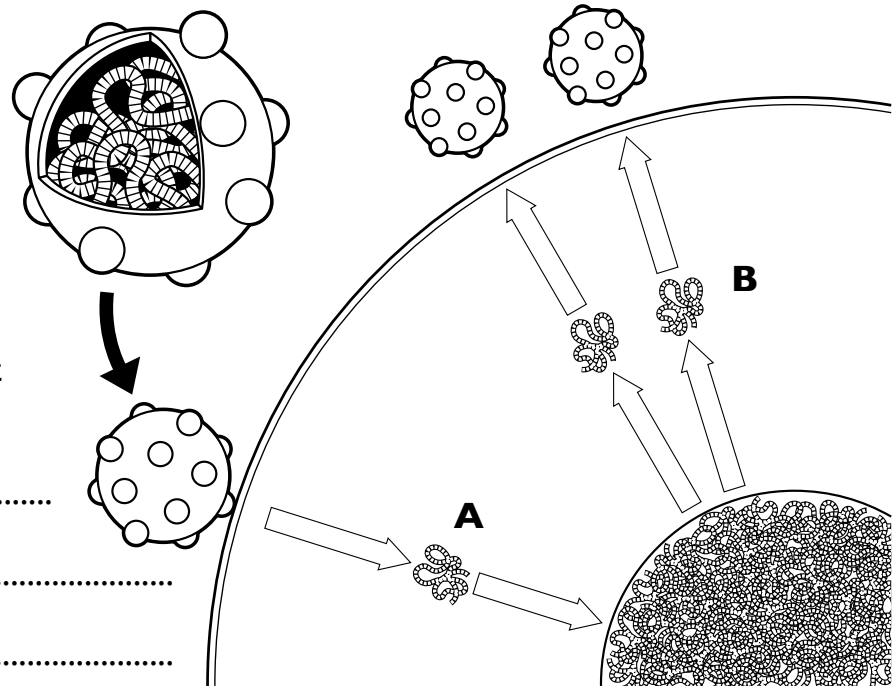
- Can use simple equipment carefully.
- Can make a fair test.
- Can construct a table and fill it in.
- Can construct a line graph from their results.
- Can draw a conclusion from their results.
- Can suggest improvements to their investigation.

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

See **pages 36 and 37** of *The Body Book*

Bacteria and viruses

Bacteria and viruses are two kinds of tiny organisms that attack the body and cause disease.



Q1. In the diagram, what is happening at point A?

✎ .....

.....

.....

Q2. In the diagram, what is happening at point B?

✎ .....

.....

Q3. In what ways may bacteria and viruses enter the body?

✎ .....

.....

.....

Q4. What are the main attackers of micro-organisms inside the body?

✎ .....

Q5. How do these attackers destroy bacteria and viruses?

✎ .....

.....

17 Teacher's sheet: Comprehension

See **pages 36 and 37** of *The Body Book*

ANSWERS

Introduction

Tell the students that diseases seem to come from nowhere. We can feel the effects of the microbes that cause them but cannot easily see them. In a similar way, food in a fruit bowl or bread in a bread bin can suddenly go mouldy. We can easily see this and it also seems to come from nowhere. A feature which connects disease and moulds is that they are both caused by micro-organisms, and these travel unseen (in the air in the case of moulds and some bacteria and viruses) because they are so small. If you wish to illustrate your introduction with mouldy food make sure they are sealed in a bag before they are brought to school and are kept sealed during their stay in school.

Moulds are fungi and you may add that fungi can attack the skin (e.g. athlete's foot) or moist surfaces of the body (e.g. thrush in the mouth and throat).

In ideal conditions a bacterium will reach full size and divide into two every 20 minutes. So at the end of one hour a single bacterium will have become eight individuals. You may like the class to calculate how many would be present after a further two, three, four or five hours. You could invite the class to speculate how many bacteria there may be if there were not one but 100 bacteria beginning to breed at the same time as they invaded the body.

Extension worksheet

Page109 and 126.

Links

Cells, pages 8–9; **Getting immunity**, pages 38–39.

Background

Bacteria range in size from 100 to 2,000 micrometres (a micrometre is a thousandth of a millimetre) and viruses have sizes ranging from 10 to 300 nanometres (a nanometre is a millionth of a millimetre).

Bacteria travel as spores, like fungi, but viruses take on a crystal form outside cells and do not show properties of living things. They can even be stored in jars, like sugar crystals.

The body has a line of defence before the white cells are brought into action. In the first line of defence, bacteria destroying substances are secreted by the skin in the oil in the sweat, tears, which keep the eye moist, and the saliva. The stomach contains hydrochloric acid which kills bacteria. The mucus lining the tubes in the respiratory system traps microbes, and the ciliated cells in the windpipe move mucus up to the throat, where it is swallowed and enters the stomach, where it comes into contact with the acid. When a cut bleeds it swills out invading microbes before the clot forms. Even sneezing and coughing removes microbes, while setting them free to infect other people.

If the microbes penetrate the first line of defence they are attacked by the second line of defence. The main part of this defence are the white blood cells. There are two kinds – the antibody producing cells called lymphocytes which are made in the glands of the immune system (see page 38 to 39 of the *Students' Book*), and the phagocytes which are made in the bone marrow and eat bacteria.

Most viruses are not attacked by white blood cells because they soon leave the blood and enter the cells. However, the cells produce a substance called interferon when they are attacked, and this is released into the blood and affects the body's temperature regulating system. It makes the body temperature rise (producing a fever) which helps to stop the microbe attack, as many microbes can only live in a very narrow temperature range.

A sore throat, caused by a rush of white blood cells to the early site of infection, and a runny nose, caused by excess mucus produced to help flush out the infection, are common symptoms of a range of virus attacks.

In bacterial attack, it is the toxins or poisons released by the bacteria which cause the symptoms of disease as they damage or kill certain kinds of body cells. In a virus attack, it is the destruction of the cells that causes the symptoms of disease.

Answers

Q1. The genes from the virus go inside the cell.

Q2. The virus genes begin to copy themselves.

Q3. In any order: through the air, in droplets of moisture from a sneeze or cough, in food and water, through a cut in the skin.

Q4. White blood cells.

Q5. The white blood cells eat the micro-organisms.

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

See **pages 38 and 39** of *The Body Book*

Getting immunity

The body has a defence system to destroy harmful germs. Scientists have found ways to give our defence system extra help in fighting disease.

Q1. What may enter the cut in the skin?

✎ .....

Q2. What will anti-bacterial ointment do?

✎ .....

Q3. What do antibiotics do?

✎ .....

Q4. Mark has got a viral infection. Jane says he needs an antibiotic. Is she right? Explain your answer.

✎ .....

.....

Q5. What happens if germs breed faster than the body can kill them?

✎ .....

.....

Q6. What is in a vaccine?

✎ .....

Q7. What does a vaccine do?

✎ .....

.....

18 Teacher's sheet: Comprehension

See **pages 38 and 39** of *The Body Book*

ANSWERS

Introduction

You may like to begin by talking about the medicines that people take when they have a cold or flu. These medicines help to relieve the symptoms while the body fights the microbes that are causing it. The students need to be reminded that the medicines should only be taken as prescribed, as the chemicals themselves may harm the body if taken in too large a dose. The students should realise that these medicines do not make them immune. The body can build up its own immunity after it has had a disease, but it can be given immunity from very dangerous diseases by vaccination. Once the students realise that the body has a defence system, which can be helped by medicines and vaccines, let them begin the spread.

Supporting work

18A: Edward Jenner's experiment

18B: Alexander Fleming's discovery

Integrating the supporting worksheets

Use the worksheets 18A and 18B at the end of the study of the spread. Introduce them by saying that many things we take for granted today have come about from the work of scientists in the past. One half of the class could study Jenner and the other half could study Fleming. Each half could then report to the other. Alternatively, the students could study Jenner first, followed by Fleming.

Extension worksheet

Pages 109 and 127.

Links

Bacteria and viruses, pages 36–37; **Taking risks**, pages 44–45.

Background

Micro-organisms have substances called antigens on their surfaces. These cause the white cells produced by the lymph glands (also called nodes) to produce antibodies. Each type of micro-organism has a particular type of antigen and this stimulates the cell to produce a particular type of antibody to attack it. The antibody is not effective against other kinds of micro-organisms so, to build up immunity to a range of diseases, a number of different vaccines have to be taken. The same vaccine may be given more than once over a period of time. The first vaccination builds up a little immunity, and a follow-up vaccination greatly increases immunity. For example, babies receive immunisation against diptheria, tetanus, whooping cough, polio and meningitis at ages 2, 3 and 4 months in the United Kingdom. This is followed by immunisation against measles, mumps and rubella at 12 to 18 months and follow-up vacccinations later. At 13 to 14 years old young people are immunised against tuberculosis.

Additional vaccines are needed by people visiting certain parts of the world where diseases such as typhoid, cholera and yellow fever are common.

The antigens present on transplanted organs can cause a rejection reaction by the body receiving the organ. The reaction can be reduced by selecting an organ which has tissues closely matching those of the body receiving the organ (perhaps coming from a relative) and by taking drugs to make the body produce fewer antibodies.

Antigens on pollen, feathers, fur and other substances can cause the production of antibodies that set up an allergic response.

Answers

Q1. Bacteria (harmful germs).

Q2. Kill bacteria.

Q3. Kill bacteria inside the body.

Q4. No. Antibiotics only kill bacteria.

Q5. You get a disease produced by the germs. It may kill you.

Q6. Weakened or killed germs or their poisons.

Q7. Causes the body to produce defences against the germs, and remain sensitive to the germs, so the body will kill them again if they return.

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

See **pages 38 and 39** of *The Body Book*

Edward Jenner's experiment

Smallpox was once a very common disease. Sometimes it occurred in a mild form and sometimes it was so deadly that one person in every three people who caught it died. One of the major symptoms of smallpox was the development of scabs on the skin. A fever followed which could kill.

Those that survived had pock marks on their skin for the rest of their lives, but they did not catch smallpox again.

Edward Jenner (1749–1823) was a doctor who worked in the country districts of Gloucestershire in England. In that area it was known that milkmaids did not get smallpox when the disease struck a village. Cattle suffered from a disease called cowpox which was milder than smallpox. Milkmaids got cowpox from the infected cattle they milked. It was believed that milkmaids were immune to smallpox because they had cowpox first. Jenner set about testing this theory with an experiment.

He knew that in the past people had tried to protect themselves from smallpox by rubbing the scab of smallpox sufferer into a cut in their skin. If the scab contained a mild form of the disease, the person who received it lived. If the form of the disease was virulent, they died.

Jenner planned his experiment so that he would take the scab from a cowpox sufferer and rub it into the skin of someone who had not had either cowpox or smallpox. Later he would rub the scab of a smallpox sufferer into the person he had innoculated with cowpox. If the theory was correct, smallpox would not develop.

Jenner performed his experiment in 1796 on a boy called James Phipps. After he had given James the contents of the cowpox scab James had a mild attack of cowpox but was soon healthy again. Jenner then gave James the contents of the smallpox scab but the disease never developed.

Q1. If a village of 90 people was struck by a deadly form of smallpox how many would die? ✎ .....

Q2. What do you think the word 'virulent' means?

✎ .....

Q3. What two pieces of information did Jenner use in his plan?

✎ .....

.....

.....

Q4. How old was Jenner when he tried his experiment? ✎ .....

Q5. From what human source do you think Jenner took the cowpox scab?

✎ .....

Q6. If the belief had been wrong, what do you think might have happened to (a) James Phipps, and (b) Jenner.

(a) ✎ ..... (b) ✎ .....

Q7. If 100 people in a village were innoculated with cowpox before smallpox struck how many people would die? ✎ .....

18 Teacher's sheet: Comprehension

See **pages 38 and 39** of *The Body Book*

ANSWERS A

Background

In China about 3,000 years ago it was the custom to expose young people to those suffering from a mild form of smallpox. This was based on the knowledge that if you survived the disease you would not get it again. This approach led to many deaths as sometimes healthy people were mistakenly exposed to a virulent strain, and members of their families who came into contact with them also died. The approach was refined by taking pus from scabs and inserting it into cuts in the skin, or up a person's nose. In time the practice crossed many countries and arrived in Europe. The practice was known to Jenner and formed part of his background knowledge in devising his experiment. It is thought that he began collecting information for his experiment in 1775, so it took 21 years before it seems he was confident enough to try his experiment. He repeated his experiment two years later. The delay was partly due to the time it took to find someone with cowpox. He used the term vaccination to describe his procedure. The word comes from the Latin word for cowpox – vaccinia.

Today smallpox has been eradicated from everywhere on the planet and the practice of vaccination has been developed to treat a wide range of diseases through using weakened or dead micro-organisms or harmless forms of their poisons.

Answers

Q1. 30.

Q2. Very strong, poisonous or dangerous, deadly.

Q3. People who got cowpox did not get smallpox. Smallpox could be caught by rubbing a scab into a cut on the skin.

Q4. 47.

Q5. A milkmaid or other person who had cowpox.

Q6. (a) Died, (b) Tried for murder.

Q7. None.

18

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

See **pages 38 and 39** of *The Body Book*

B

Alexander Fleming's discovery

Alexander Fleming (1881–1955) studied bacteria. They were grown on jelly which had been set in shallow glass dishes. If Fleming was studying the bacteria from a boil, for example, he would use a clean piece of wire to take some of the pus from the boil, then spread it over the surface of the jelly. He would put a lid on the dish then leave the dish in a warm place. The bacteria would feed on the jelly and breed so much that they formed spots which could be easily seen.

One day in 1928, Fleming was clearing away some dishes that he no longer needed when he noticed that on one dish a mould was growing. This was not particularly unusual as mould spores sometimes entered the dish when the lid was taken off. However Fleming noticed something unusual around this particular mould. The area of jelly around it was clear of spots. Fleming immediately thought that something from the mould was entering the jelly and killing the bacteria. He began to test his idea with a series of experiments. He took a range of different bacteria and grew them on separate dishes of jelly. He introduced a piece of the mould into each dish and left the bacteria to feed and breed. When he looked at the dishes again he found that the mould had killed off some of the different kinds of bacteria.

Fleming then realised that the substance made by the mould could be useful if it could be separated from the mould. He decided that perhaps it could be separated by filtration. To use filtration, the substance had to be in a liquid, so he tried to grow the mould in a kind of meat soup called a broth. The mould grew well and when Fleming filtered the broth he found that the filtrate killed bacteria.

The mould that Fleming investigated was called Penicillium and the substance that he extracted from it was named penicillin.

Fleming then wondered how penicillin affected living cells. He reasoned that if penicillin killed both bacteria and cells then it could not be used to treat bacteria in the body, but if it did not harm the cells in the body then it could be used to kill bacteria which cause disease. He tested penicillin on bacteria and white blood cells and found that the bacteria died but the cells were unharmed. He had discovered a way to kill bacteria in the body.

Penicillin is called an antibiotic. Fleming's work lead to the discovery of more antibiotics and the successful treatment of a wide range of diseases.

Q1. How old was Fleming when he (a) made his discovery ✎..... (b) died? ✎.....

Q2. How could you tell if bacteria had grown in the jelly?

✎ .....

Q3. Why do you think he put the dishes in a warm place?

✎ .....

Q4. What was unusual about the Penicillium mould?

✎ .....

Q5. Does penicillin kill all bacteria? ✎ .....

Q6. What is a filtrate?

✎ .....

Q7. If penicillin had killed white blood cells could it have been used to fight disease? Explain your answer. Use the back of this sheet if you need more room.

✎ .....

Q8. How much did luck play a part in Fleming's discovery? Explain your answer. Use the back of this sheet if you need more room.

✎ .....

Teacher's sheet: Comprehension

See **pages 38 and 39** of *The Body Book*

ANSWERS B

Background

This example of scientific work shows the importance of luck, but also the importance of observation and interpretation. Mould on the jelly in the dishes (called Petri dishes) was not uncommon, so there was no reason for Fleming to pay particular attention to the Penicillium mould, he just happened to do so. Having seen the clear space he immediately put forward a possible explanation based on the fact that bacteria grows in jelly but it did not grow close to the mould. He would have had some background knowledge about the process of diffusion by which one substance moves through another (e.g. cooking smells from the kitchen can diffuse through the air to other parts of the home) and thought that something was diffusing from the mould into the jelly to kill the bacteria.

He followed scientific procedure by repeating the experiment with a range of bacteria and recording the results. He then decided to refine his experiment to see if the substance in the jelly would work away from the mould. Before he could do this he had to apply background knowledge, this time about filtration, to separate the substance before he could perform the test.

When he saw that there was a possible application for his work in curing disease he then designed an experiment with that in mind in which he tested the penicillin on cells.

The next stage in developing the penicillin for use in the body was to discover which chemicals it contained and how they were linked together into a chemical structure. Fleming was a bacteriologist and not a chemist so he did not have the background knowledge to perform the next step. In fact, when he published his work it was ignored by other scientists until it was read by Ernst Chain, who was looking for a way to kill bacteria in the wounds of soldiers in the second world war. Chain was a biochemist who was working on his project with Howard Florey, a pathologist. Together they had the background knowledge to take the study further and were joined by Dorothy Hodgkin, who was developing a technique to study crystals with X-rays to find their structure.

For their work on penicillin Fleming, Chain and Florey were awarded the Nobel Prize for medicine in 1945, and for her work on discovering the structures of chemicals using X-rays, Dorothy Hodgkin was awarded the Nobel prize for chemistry in 1964.

Answers

Q1. (a) 47, (b) 74.

Q2. Spots developed on the jelly.

Q3. Because the bacteria feed and breed faster in the warmth.

Q4. A clear space developed around it in which there were no spots of bacteria.

Q5. No, only some kinds.

Q6. A substance that has been filtered (passed through filter paper).

Q7. No, because white blood cells help the body fight disease and also if it killed one type of cell it may have killed others and been poisonous to the whole body.

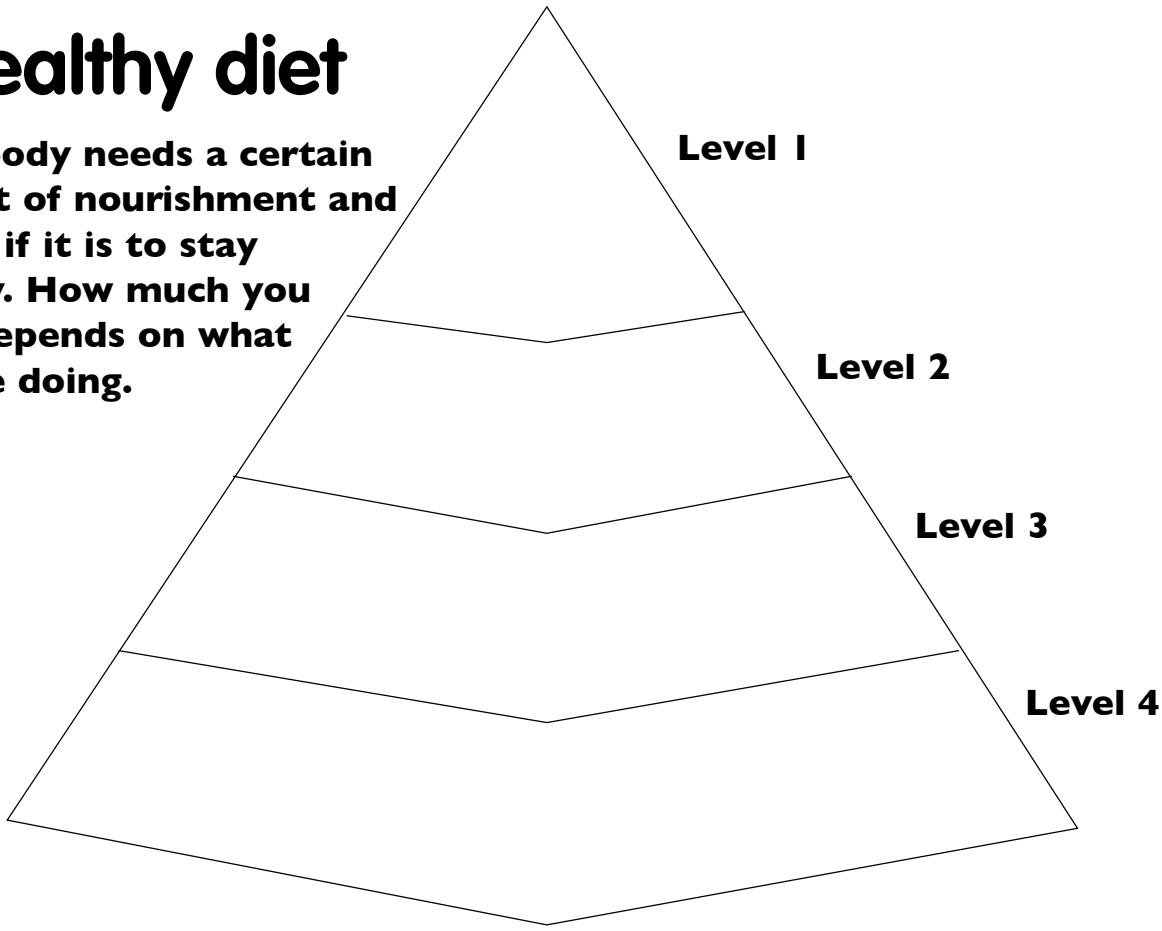
Q8. It played a large part. Moulds on jelly were not unusual, but Fleming happened to notice the clear space around the Penicillium mould.

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

See **pages 40 and 41** of *The Body Book*

A healthy diet

Your body needs a certain amount of nourishment and energy if it is to stay healthy. How much you need depends on what you are doing.



Q1. The diagram shows a food pyramid. Look at the names of the food in this list and write them in the correct level of the food pyramid.

Bread, cheese, orange, potato, banana, fish, butter, eggs, sugar, carrot, rice.

Q2. Colour in blue the level in which the foods can be eaten in the largest amounts.

Q3. Colour in red the level in which the foods can be eaten in the smallest amounts.

Q4. In which food level do you find foods that help the body grow and repair itself? ✎ .....

Q5. In which level do you find foods which contain large amounts of vitamins, minerals and fibre? ✎ .....

Q6. If you want a healthy diet what kinds of food should you avoid ?

✎ .....

.....

19 Teacher's sheet: Comprehension

See **pages 40 and 41** of *The Body Book*

ANSWERS

Introduction

Begin by saying that one of the major keys to good health is good diet, so it is useful to revisit this topic again. On worksheets 4 (pages 29 to 32 in this *Teacher's Guide*) the topic was addressed by considering the body as a chemistry set. This time it is considered from a more practical point of view, to help the class establish a way of judging their diet and providing them with a formula for eating a healthy diet. This objective may be given to the class as they study pages 40 and 41. If you have stored the class work from comprehension worksheet 4 (page 29) you may issue it to the class as they work through the practical.

Practical work

19: A healthy diet

Integrating the practical work

Start the students on the practical work after they have read through the spread.

Extension worksheet

Pages 109 and 128.

Links

Food, pages 10–11; **Keeping fit**, pages 42–43.

Answers

Q1. Level 1 – Butter and sugar.
Level 2 – Cheese, fish and egg.
Level 3 – Orange, banana and carrot.
Level 4 – Bread, potato and rice.

Q2. Level 4 is coloured blue.

Q3. Level 1 is coloured red.

Q4. Level 2.

Q5. Level 3.

Q6. Fatty foods and foods with a large amount of sugar in them.

19

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

See **pages 40 and 41** of *The Body Book*

A healthy diet

Food	Meat & eggs	Dairy products	Cereals	Peas & beans	Vegetables	Fruit

(1) Enter each food you eat in the course of a day in the left hand column. Look across the other columns in the table and enter the number of portions of each food that you eat.

As a guide to what amount of food is a portion, an apple would be a good size portion. A hamburger may be considered as a portion of meat and cereals, and if it also has cheese on it, you could also enter one portion of dairy products.

(2) How healthy is your diet? Explain your answer.

✎ .....

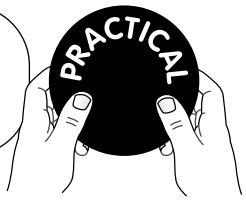
.....

.....

19

Teacher's sheet: Practical

See **pages 40 and 41** of *The Body Book*



Introducing the work

You may like to begin this activity by showing the class one or two meals, each featuring two courses. You may show one meal that is balanced and one loaded with fats. From this introduction, issue the class work from the study of food on worksheet 4 (page 29) and let the class members familiarise themselves with it. If it has been some time since this work was done, the students may like to examine the diet they are following now.

Outcomes

The children:

- Can fill in a table.
- Can use scientific knowledge to evaluate their data.

Background

The following may help in assessing diets. It is more important to look for trends in the diet, rather than an absolute analysis, so that the class members can reflect on their eating habits and try to take remedial action if necessary.

A portion of food is generally considered to have a weight of 80g. So an average apple, at 100g, would be a good sized portion of fruit. This apple calibration can also be used when considering other foods.

Manufactured foods present a problem but are generally rich in cereals. Chocolate can be grouped with dairy products as fat is its main constituent.

Soups may be considered in terms of content of the main ingredients, but diet sodas and tea, even with milk, could be left out unless large amounts are drunk. Non-diet sodas should be counted as sugar.

Potato crisps should also be considered as fat, although made from vegetables, as they have a very high fat content, especially if more than 80g. Also, potatoes are both starch and vegetable.

Identifying many of the foods will be quite straightforward, but manufactured food such as snack biscuits or pies need to be studied in more detail. Biscuits will contain cereals and sugar and fat, especially if they also contain chocolate. In pies, the pastry is made of cereals and may contain fat. The content of the pies may be either meat or vegetables.

It is important to also mention that foods such as fish and chips may contain more fat than protein and are not very healthy if eaten more than once in a while.

You might also want to point out that many processed foods, even savoury ones, contain a lot of sugar and salt, which are not healthy in large quantities.

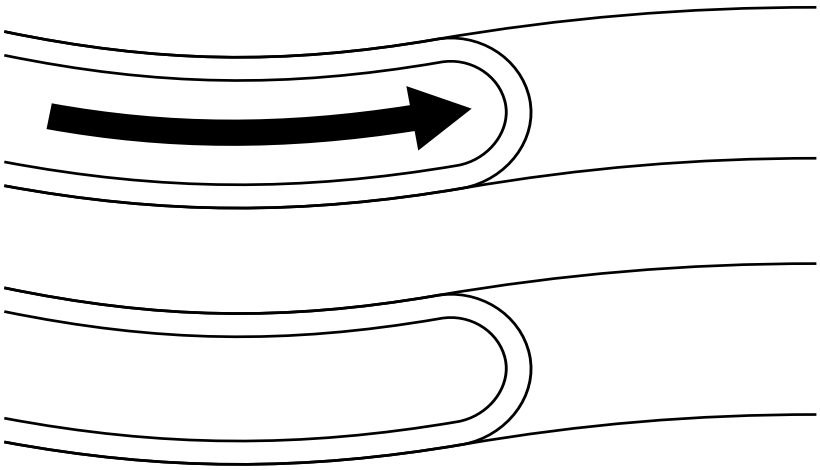
Name: ..... Form: .....

See **pages 42 and 43** of *The Body Book*

Keeping fit

The body only works well if it gets enough exercise and has the right balance of foods.

Q1. The diagram on the right shows two arteries. The top artery is healthy, and the arrow shows a strong, fast blood flow. The bottom artery is unhealthy. Draw in where the fatty substances form and draw in arrows to show how the blood flows.



Q2. What can happen if a person has unhealthy arteries?

✎ .....

.....

Q3. How can a heart be kept healthy?

✎ .....

.....

Q4. What happens to muscles that are not exercised?

✎ .....

Q5. How does exercise help growing people?

✎ .....

Q6. How does exercise help the lungs stay healthy?

✎ .....

.....

20 Teacher's sheet: Comprehension

See **pages 42 and 43** of *The Body Book*

ANSWERS

Introduction

As you introduce the concept of keeping fit you may also like to review the children's previous work on many parts of the body such as the muscles and skeleton, the heart and circulation, breathing and the care needed with diet. Although this can be used for revision purposes you should try and show how all the separate areas of knowledge the class has studied can be brought together to contribute to this most vital of topics.

Supplementary work

The class members can be set a project such as writing an essay or making a small book on topics such as, 'My recipe for a healthy life' or 'How to stay healthy'. In the books, the points to follow for a healthy life should be backed up with some knowledge about how the body works, presented in words and perhaps some illustration.

Extension worksheet

Pages 109 and 129.

Links

Breathing, pages 16–17; **The heart**, pages 20–21; **How blood circulates**, pages 22–23; **The skeleton**, pages 26–27; **Muscles**, pages 30–31; **A healthy diet**, pages 40–41.

Answers

Q1. There should be lumps on the walls and the arrows should be wavy, as in Diagram 2, page 43, of the *Students' Book*.

Q2. Heart disease. If the fatty lumps block an artery a heart attack can happen.

Q3. By taking exercise and eating a balanced diet.

Q4. They become smaller and weaker.

Q5. It helps the bones to grow properly.

Q6. It makes us use the lower parts of our lungs, which we do not normally use.

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

See **pages 44 and 45** of *The Body Book*

Taking risks

We sometimes choose to override the body's defences. Doing this occasionally may cause little damage, but doing it often can cause permanent harm.

Q1. What is the drug in cigarettes that people become addicted to?

✎ .....

Q2. How does this drug affect the heart?

✎ .....

.....

Q3. Smoke contains 40 carcinogens. What can they do to the body?

✎ .....

Q4. How does the tar in cigarettes affect the smoker?

✎ .....

.....

Q5. How does carbon monoxide in cigarette smoke affect the body?

✎ .....

.....

Q6. Which parts of the body do the following substances damage?

(a) Solvents ✎ .....

(b) Drugs such as LSD (acid) and heroin ✎ .....

(c) Alcohol ✎ .....

21 Teacher's sheet: Comprehension

See **pages 44 and 45** of *The Body Book*

ANSWERS

Introduction

Having built up a concept of a healthy life style by studying pages 40 to 43 of the *Students' Book*, tell the students that they are now going to look at ways in which people threaten their health by smoking, drinking excess alcohol and taking drugs. This topic should be considered in the way that it damages the body. It may be helpful to review the respiratory system, and also the brain and nervous system where alcohol, drugs and solvents disrupt the transmission of signals and can produce life-threatening effects.

Alternatively, you may wish to use this spread as part of a PSHE programme.

Extension worksheet

Pages 109 and 130.

Links

Breathing, pages 16–17; **The brain**, pages 32–33.

Answers

Q1. Nicotine.

Q2. Puts extra strain on the heart which in time may lead to heart disease.

Q3. Cause cancers.

Q4. A smoker may get colds and bronchitis more frequently, as well as other lung diseases.

Q5. It stops red blood cells from supplying oxygen to parts of the body.

Q6. (a) Lungs and brain, (b) Brain, (c) Liver.

Section 5: Extension work for The Body Book

Each page in this section supports one of the spreads in the *Students' Book*. The pages are linked to the comprehension worksheets and practical sheets by sharing the same number. The page reference to the *Students' Book* is also given.

The first question on every page in this section is a cloze exercise. The students can do them either while studying the page, after work on the practical or as a revision exercise. Answers to these questions are on pages 131 and 132. When the student has successfully completed this question it can be placed in the student's workbook for further revision purposes later in the year.

The second question may involve some simple practical activity, or may be work directly related to the page in the *Students' Book*. The sheets which need resources, together with a list of the resources, are featured below.

Some activities provide an opportunity to use ICT skills and these are simply marked (ICT) in the list below. The extent of the ICT work you wish to do, such as preparing spreadsheets, databases or making graphs, will depend on the time and facilities you have available and the ability of the students.

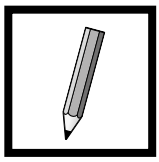
In the ***Go further*** section the children are challenged to use a range of secondary sources such as books, CD-ROMs and web sites to find information related to the topic and present it either to the class or to the teacher.

Extension worksheets which need resources and those which are suitable for ICT work:

1. A prepared meal, weighing scales or balance. (ICT.)
2. Ruler or tape measure.
4. Survey of class or part of school. (ICT.)
5. Survey of class. (ICT.)
11. Ruler or tape measure. (ICT.)
12. Tape measure. (ICT.)
13. Cooking oil.
14. Tape measure.
18. Pamphlets on immunisation of children.
19. Packets of ready-prepared meals.
20. Survey of class or whole school. (ICT.)
21. Leaflets on smoking, alcohol and drug abuse.

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

See **pages 4 and 5** of *The Body Book*



Introduction (part 1)

Q1. Here is some information about the body but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The body is like a _____ set. It is made from chemicals and chemical reactions keep it _____. The chemicals are found in the _____ which are the tiny building blocks of the body.

Food and drinks contain chemicals that the body needs. These chemicals are called nutrients. We use them to build our body and to give us _____. The body breaks down or _____ food so the nutrients in it can be released for the body to use. After digestion the nutrients are _____ into the body so that the _____ can use them.

When we breathe we take in _____. This is used to release energy from food. We use the _____ for the chemical reactions which keep us _____.

The blood carries the digested food and oxygen round the _____ to the cells. It is pushed round the _____ by the pumping of the _____. The movement of blood around the body is called the _____.

The organs which digest food, allow us to breathe and circulate the blood are supported by a _____ of bones. If the organs were not supported by the _____ they would be squashed by their own _____ and would not work.

Word list: **skeleton, oxygen, weight, digests, heart, cells, chemistry, alive, circulation, energy, body, absorbed.**

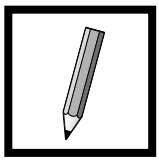
Q2. Weigh the food in a meal (do not include drinks). Estimate from this the weight of food that you might eat in a day and a week. Do not be surprised at the amount. It has been estimated a healthy person will eat over 20 tonnes of food in a lifetime!

Go further

Find out what the chemicals are that make up the human body.

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

See **pages 6 and 7** of *The Body Book*



Introduction (part 2)

Q1. Here is some more information about the body but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The control centre of the body is the _____. It gathers information from the sense organs like the _____ and _____ and sends instructions to the _____ so the body can move. The joints in the _____ help the muscle move part of or the whole body.

The body can be attacked by _____. They enter our body when we _____ ourselves or breathe _____ in which someone has sneezed. Inside the body the germs can _____ quickly and cause _____. The body has a defence against _____. It is called the _____ system. We can help the body stay healthy by eating a _____ diet and taking _____ regularly. The body can also be damaged by smoking, _____ alcohol or taking certain _____. All these must be _____.

Word list: **air, exercise, disease, muscles, brain, drinking, multiply, immune, cut, skeleton, eye, germs, ear, balanced, drugs, avoided.**

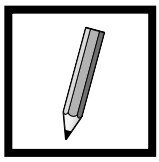
Q2. Some people think that the length of your foot is the same as the length of your forearm. Plan an investigation to test this idea. If your teacher agrees, try your investigation, record and present your results and write your conclusion here.

Go further

Find out how astronauts on a space station keep their bodies fit.

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

See **pages 8 and 9** of *The Body Book*



Cells

Q1. Here is some information about cells but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The body is made up of [ ] of cells. The are so small that you need a [ ] to see them. Each cell is full of a material like [ ] . Almost all cells have a control centre called the [ ] . The cells which do not have a [ ] are the red [ ] cells. They are packed with a material that helps them carry [ ] .

The surface of the [ ] has [ ] , dead cells. They [ ] the living cells below them. The gut has cells which help [ ] food. Some cells make hard materials in the body such as [ ] and [ ] . Hair is made from [ ] cells. If the cells were alive it would be [ ] to have a haircut.

Word list: **jelly, blood, nucleus, oxygen, skin, microscope, flat, bones, digest, protect, nails, painful, billions, dead.**

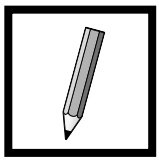
Q2. Draw a cell and label the cell membrane and nucleus. Shade in and label the part filled with a jelly-like material.

Go further

Find out about the cells that line the windpipe. How do they help to keep the lungs clean?

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

See **pages 10 and 11** of *The Body Book*



Food

Q1. Here is some information about food but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

There are five groups of nutrients. Energy is provided by _____ and _____. New parts of the body are made by _____, _____ and _____. Two good sources of carbohydrate are _____ and _____. Fats are found in _____ and _____. Two foods which are very rich in protein are _____ and _____. Vegetarians can get protein from _____ and _____. Fruit and vegetables are rich in _____, while minerals are found in _____, _____ and _____.

There are two kinds of carbohydrate that we digest. They are starch and sugar. _____ dissolves in water easily but _____ has to be digested by the body before the body can use it.

Word list: **fruit, vegetables, starch, vitamins, proteins, cheese, beans, minerals, potatoes, carbohydrates, fish, fats, butter, peas, sugar.**

Q2. Some people think that school pupils do not eat enough vegetables. Make a survey to find out how many people ate the following vegetables in the last three days – carrots, cabbage, cauliflower, broccoli, peas, spinach, parsnips, onions. Record your results in a table and a graph and draw a conclusion. Write your conclusion here.

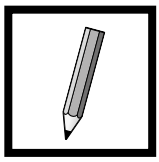
Go further

Find out how much water the body needs each day to keep healthy.

Find out what is fibre in food and why it is needed.

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

See **pages 12 and 13** of *The Body Book*



The mouth

Q1. Here is some information about the mouth but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The two parts of the mouth that stop food falling out are the _____ .
They are also sensitive to food that is too _____ or too _____
for our mouths. The first teeth that our food meets are the _____ . Each one is shaped like a _____ and cuts into the food when we bite. Next to these teeth are the _____ . They are more pointed and _____ the food. At the back of the mouth are the _____ . They _____ the food.

The food is moved about by a wedge shaped muscle called the _____ .
It also has _____ which check the chemicals in food to make sure the food is fit to eat. The watery liquid that is made in the mouth is called _____ .
It helps break down _____ and also helps you to _____ it.

Word list: **food, incisors, hot, taste buds, tear, cold, swallow, molars, lips, chisel, canines, tongue, crush, saliva.**

Q2. What toothpastes do people in your class use? Is one type of toothpaste more popular than the others? Make a survey and present your results. Write your conclusion here.

Go further

Find out about fluoride. How can it affect the health of teeth?
Find out what causes bad breath and how it can be cured.

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

See **pages 14 and 15** of *The Body Book*

Digestion

Q1. Here is some information about digestion but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

Digestion begins in the [ ] . Large lumps of [ ] are broken down into smaller pieces by the [ ] . The [ ] begins the chemical process of breaking down the [ ] . When the food leaves the [ ] it goes to the [ ] . Here it mixes with [ ] which kills [ ] and breaks down protein. As the [ ] moves into the small intestine it mixes with juices from the [ ] and [ ] . In the juices are chemicals which break down proteins, [ ] and [ ] . In the small intestine the digested food seeps into the [ ] . The digested food is said to be [ ] by the body.

The undigested food leaves the small intestine and enters the [ ] . Here [ ] is removed from the undigested food. One of the undigested foods is [ ] . It helps the muscles of the [ ] push the food along and keeps the gut healthy. Eventually the undigested [ ] is released from the body when we visit the toilet.

Word list: **stomach, food, large intestine, mouth, fats, teeth, liver, germs, acid, pancreas, carbohydrates, blood, water, absorbed, saliva, fibre, gut.**

Q2. Make a drawing of the digestive system and label its parts.

Go further

Find out how rabbits and cows digest grass.

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

See **pages 16 and 17** of *The Body Book*

Breathing

Q1. Here is some information about breathing but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

When you breathe in the ribs move [ ] and the diaphragm moves [ ]. This makes the space inside the chest [ ] and [ ] rushes in through the nose and mouth to fill it. As the [ ] passes through the nose, hairs filter out [ ]. A sticky substance in the nose also traps [ ]. At the back of the mouth the air enters a tube which takes it down into the chest. This tube is called the [ ]. The air moves from here into the [ ]. A gas in the air called [ ] enters the [ ] from the [ ]. A gas called [ ] leaves the [ ] and enters the [ ].

When you breathe out the ribs go [ ] and the diaphragm goes [ ]. This makes the space in the chest [ ] and [ ] is pushed out of the nose and mouth.

Word list: **air, up, dust, down, windpipe, oxygen, larger, lungs, bacteria, blood, carbon dioxide, smaller.**

Q2. Draw how the lungs, windpipe, mouth and nose are connected to each other.

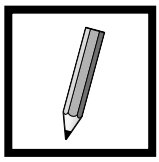
Go further

Find out about bronchitis and asthma.

8

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

See **pages 18 and 19** of *The Body Book*



Blood

Q1. Here is some information about the blood but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The movement of the blood around the body is called the _____. The blood takes _____ from the lungs to all parts of the body. It also takes food from the _____ to all parts of the body. The blood also spreads _____ around the body and takes _____ from all parts of the body to the lungs where it is released.

There are two parts to the blood – the liquid part and the solid part. The liquid part of the blood is called _____ and its colour is _____. In the solid part are two kinds of cells. The _____ blood cells carry oxygen and the _____ blood cells fight disease.

Red blood cells are made by the _____ inside bones. They live for about _____ months. Every second a _____ old red cells in the blood are replaced. In one cubic millimetre of blood there are five _____ red cells.

Word list: **white, carbon dioxide, yellow, heat, million, red, marrow, circulation, small intestine, oxygen, plasma, three.**

Q2. Draw a red blood cell and a white blood cell. Describe how they are different from each other.

Go further

Find out about giving blood.

Find out how blood is stored in a blood bank.

9

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

See **pages 20 and 21** of *The Body Book*

The heart

Q1. Here is some information about the heart but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The heart is found in the _____ . It is about the size of a clenched _____ . The heart is _____ . Its walls are made of _____ . The heart is divided into two _____ and each one is divided into an upper and lower chamber. Between each pair of chambers there is a _____ . Each _____ allows the blood to flow just one way through the heart. The upper chambers on both sides of the heart take in blood and the lower chambers on both sides _____ it out.

Blood which enters the upper chamber on the right is _____ in oxygen. The blood passes to the lower chamber and is _____ to the _____ . Blood which enters the upper chamber on the left is _____ in oxygen. The blood passes to the lower chamber and is _____ to the other parts of the _____ .

Word list: **fist, valve, muscle, chest, lungs, hollow, rich, push, halves, poor, body, sent.**

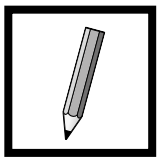
Q2. Copy a diagram of the heart then, on your own, colour the chambers containing oxygen-poor blood blue and oxygen-rich blood red. Draw in arrows showing how the blood enters and leaves the heart.

Go further

Find out how an artificial pacemaker works.

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

See **pages 22 and 23** of *The Body Book*



How blood circulates

Q1. Here is some information about how blood circulates but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The blood is pumped round the body by the _____. When blood leaves the _____ it enters tubes called _____. The blood then moves into much narrower tubes called _____. Eventually the blood moves into larger tubes again which lead towards the _____. These tubes are called _____.

When the blood leaves the right side of the _____ it travels along an _____ to the _____. Here the blood releases _____ and takes up _____ from the _____. The blood leaves the _____ and travels along a _____ to the left side of the _____. When the blood leaves this side of the heart it travels through an _____ to the rest of the _____.

Word list: **air, capillaries, oxygen, heart, arteries, body, carbon dioxide, veins, artery, lungs, vein.**

Q2. Draw how the valves in a vein open and close and describe why they do this.

Go further

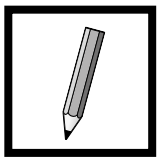
Find out about the first heart transplant.

Find out about artificial hearts.

11

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

See **pages 24 and 25** of *The Body Book*



Bones

Q1. Here is some information about bones but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

There are long bones in the _____ and the _____ . These bones are shaped like _____ . Between the two _____ ends of these bones is a _____ shaft. In adults the shaft is filled with _____ marrow and in children the shaft is filled with _____ marrow. Inside the ends of the bone it looks like a _____ . The spaces in the _____ are filled with _____ marrow. The ends of the bone are covered in _____ . This protects the bone from _____ and acts like a rubbery _____ to protect the bone from sudden _____ .

Bones are _____ but they are light in _____ because they are _____ . The main part of a bone may be as _____ as iron, but only a third of its _____ .

Word list: **jolts, dumbbells, legs, weight, bulbous, honeycomb, yellow, hollow, cushion, arms, red, cartilage, wear, strong.**

Q2. Are people who have long shin bones taller than people who have shorter shin bones? Work out an investigation to find out. If your teacher agrees, try out your investigation. Present your results and draw a conclusion from them if you can. Write your conclusion here.

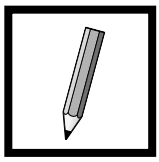
Go further

Find out how X-rays are used to examine bones inside the body.

Find out about rickets.

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

See **pages 26 and 27** of *The Body Book*



The skeleton

Q1. Here is some information about the skeleton but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

When the skeleton first forms in a baby the bones are _____. As the bones grow they become _____. The bones stop growing when a person reaches about _____ years of age. At the top of the skeleton is the _____. It is made from flat curved _____ which protect the _____. Another set of flat curved _____ form a cage which protects the _____ and _____. These bones are called the _____.

The top of the upper arm bone forms a joint with two other bones. These bones are the _____ bone and the shoulder _____. The top of the upper leg bone makes a joint with the _____ bone.

Bones are a store of _____, particularly _____. If the body has a low level of a particular _____ the skeleton will release some to make up the loss.

Word list: **soft, skull, hard, ribs, bones, minerals, blade, mineral, hip, lungs, calcium, brain, eighteen, heart, collar.**

Q2. Do girls have larger skulls than boys? Work out an investigation to find out. If your teacher agrees try out your investigation. Present your results and draw a conclusion from them if you can. Write your conclusion here.

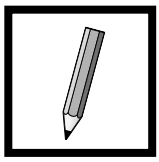
Go further

Find out how people with suspected broken bones should be treated by first aid.

Find out why people need bone marrow transplants.

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

See **pages 28 and 29** of *The Body Book*



Joints

Q1. Here is some information about joints but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The place where two bones meet is called a [ ] . In a few places in the [ ] the bones at a [ ] do not move. These are called immovable joints. These are found between the bones in the [ ] . Other joints are movable joints. One kind of movable joint is the hinge joint. It is found at the [ ] and [ ] . It allows a bone to move in only two [ ] such as [ ] and [ ] . Another kind of joint is the [ ] and [ ] joint. It is found at the [ ] and [ ] . The allows a bone to move in [ ] directions.

Bones are held in a [ ] by fibres called [ ] . In the spine they are separated from each other by [ ] which act as shock absorbers. In many joints there is a [ ] which acts like oil. It reduces [ ] on the [ ] which covers the bones.

Word list: **joint, discs, hip, socket, knees, skeleton, cartilage, down, shoulder, directions, elbows, skull, up, all, ligaments, liquid, wear, ball.**

Q2. Rub a finger and thumb together a few times then put some cold cooking oil on them and try it again. Write down what difference the oil made.

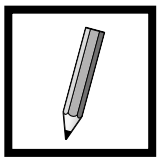
Go further

Find out about artificial joints.

Find out about joint diseases in old people.

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

See **pages 30 and 31** of *The Body Book*



Muscles

Q1. Here is some information about muscles but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

There are over six [ ] muscles in your body. They account for about [ ] your body [ ] . Muscles contain [ ] and [ ] vessels. The [ ] connect the muscle to the [ ] so that the muscle can be controlled. The [ ] vessels bring [ ] and [ ] to the muscle so that it can work. Heart muscle has its own internal [ ] which keeps it beating. The [ ] controls it by speeding it [ ] or slowing it [ ] .

Muscles are arranged in [ ] . When one muscle contracts and moves a bone the other muscle [ ] . If the bone is to be moved in the opposite direction the second muscle then [ ] and the first muscle [ ] . In the arm, the muscle which raises the forearm is the [ ] and the muscle which lowers it is the [ ] .

Word list: **half, triceps, hundred, down, blood, weight, pacemaker, pairs, oxygen, nerves, up, food, brain, relaxes biceps, contracts.**

Q2. How much thicker does your upper arm get when your biceps is contracted? Work out an investigation to find out. If your teacher agrees try out your investigation. Write down what you did and what you found out.

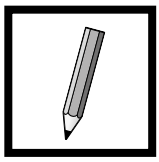
Go further

Find out what causes muscle cramps.

Find out how muscles move food along your intestine.

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

See **pages 32 and 33** of *The Body Book*



The brain

Q1. Here is some information about the brain but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The brain receives [ ] from sense organs such as the [ ], [ ] and [ ]. The information is sent by [ ] to the brain. In the brain information about past events are stored in the [ ]. The brain uses the [ ] from the sense [ ] and the [ ] to help it make instructions to send out to the [ ]. When the [ ] receive their instructions they may make part of the body move. For example, if you feel something hot with your hand your [ ] sends [ ] to your brain which then sends instructions to your [ ] to move your [ ]. The information and instructions travel along [ ] in the form of [ ] signals.

Word list: **nerves, muscles, eye, information, memory, ear, organs, electrical, skin, hand.**

Q2. Ask at home to see if anyone can remember how old you were the first time you could sit up, stand up, walk, use a cup, feed yourself, tie your shoe, ride a bike and swim. Compare these times with those of your friends or brothers and sisters. Is there a great deal of variation? Write your conclusions here.

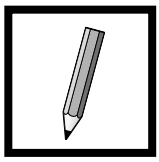
Go further

Find out about optical illusions which fool your brain.

16

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

See **pages 34 and 35** of *The Body Book*



A new human life begins

Q1. Here is some information about how a new human life begins but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

Two cells are needed for a new human life to begin. They are an _____ cell and a _____ cell. The _____ cell is much larger than the _____ cell. The _____ cell has a tail which it uses to _____ towards the _____ cell. Inside each cell there is a control centre called the _____ . It contains threads called _____ . On each _____ are chemical packages called _____ . They contain the _____ for making new cells and new people.

Half the instructions are carried in a _____ cell and half are carried in an _____ cell. When the two cells meet the head of the _____ cell, which contains the nucleus, goes inside the _____ cell. The two nuclei join together in a process called _____ . The _____ egg cell _____ many times to form a _____ of cells. This grows into a tiny head and body and four _____ form. It takes a baby _____ months to develop before it is _____ .

Word list: **chromosomes, born, egg, sperm, fertilisation, limbs, nucleus, divides, genes, instructions, ball, nine, fertilised, swim, chromosome.**

Q2. Look at the diagrams of the actual size of a baby at 30 days after fertilisation and six weeks after fertilisation. Compare them to your body. Write down your comparison.

Go further

Find out how identical and non-identical twins are formed.

Find out about premature babies and how they are helped to survive.

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

See **pages 36 and 37** of *The Body Book*

Bacteria and viruses

Q1. Here is some information about bacteria and viruses but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

Bacteria are [ ] things. They form tiny capsules called [ ] . Inside its [ ] a bacterium cannot be killed by [ ] or [ ] out. A virus does not appear to be a [ ] thing. You may take in bacterial [ ] and viruses when you breathe in. They may be on water droplets that have been expelled when someone [ ] or [ ] . You can take them into your body with [ ] , [ ] or through a [ ] in your skin.

Two conditions in your body make bacteria break out of their [ ] . These conditions are [ ] and [ ] . Viruses need the contents of the [ ] . When a virus enters a [ ] it makes [ ] of itself. The large number of bacteria and viruses which develop in a body cause [ ] . The body fights back by producing large numbers of [ ] blood cells which [ ] the harmful microbes.

Word list: **drying, food, moisture, destroy, spores, heat, disease, cell, sneezed, cut, living, spore, coughed, water, cells, warmth, copies, white.**

Q2. Draw how a white blood cell destroys a bacterium.

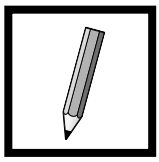
Go further

Find out about two diseases caused by bacteria.

Find out about two diseases caused by viruses.

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

See **pages 38 and 39** of *The Body Book*



Getting immunity

Q1. Here is some information about immunity but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The body has an [ ] system to protect it from disease. Sometimes the [ ] system mistakes a harmless substance for an [ ]. When this happens the body develops an [ ]. The [ ] system destroys [ ] that cause [ ] by producing [ ] blood cells to attack them. Sometimes the [ ] breed fast. When this happens the body cannot produce [ ] blood cells fast enough and the large numbers of [ ] cause [ ].

The body can be helped by [ ]. A [ ] contains germs that have been [ ] or [ ]. Some vaccines contain [ ] produced by the germs. The contents of a [ ] help the body build up its defences so that when it is invaded by germs they can be [ ] quickly and a [ ] does not develop.

The body can also be helped by [ ] that kill germs around a cut in the skin and [ ] which kill bacteria inside the body.

Word list: **white, immune, infection, poisons, vaccination, weakened, allergy, microbes, disease, killed, vaccine, antiseptics, antibiotics, destroyed.**

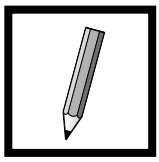
Q2. Find out what young people are immunised against as they grow up. State the disease and the ages when immunisation takes place.

Go further

Find out about the diseases that people get in other countries.

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

See **pages 40 and 41** of *The Body Book*



A healthy diet

Q1. Here is some information about eating a healthy diet but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The food that you eat over a period of _____ is called your _____. There are two important parts to your _____. They are the _____ you need to build and repair your body and _____ to provide the power for all your _____ processes. A diet which gives you the right amounts of _____ and _____ is called a _____ diet. When adults eat a _____ diet they do not gain or lose _____. When young people eat a _____ diet they gain weight because they are _____ and this is natural and healthy.

When you eat a _____ diet you should eat only small amounts of _____ and _____ and larger amounts of _____, _____ and _____.

Word list: **life, nourishment, vegetables, diet, energy, dairy products, growing, fruit, balanced, time, cereals, weight, meat.**

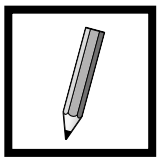
Q2. Convenience foods are ready-prepared meals that people simply microwave or thaw out and cook to provide them with a meal. Look at the packets of a selection of ready-made meals and see if they provide a balanced meal. Write down your findings here.

Go further

Find out about the leaflets and other information that is available for young people to read about balanced diets. Rate each one on how well they help you eat healthily.

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

See **pages 42 and 43** of *The Body Book*



Keeping fit

Q1. Here is some information about keeping fit but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

You can keep fit in two ways. You must eat a _____ diet and you must take _____. When you take _____ your muscles become _____ and _____. If you do not take _____ your muscles become _____ and _____. The heart is made of _____ and _____ makes it stronger and better able to _____ blood around the _____. While you are growing _____ also helps your _____ to form properly.

Arteries carry _____ from the heart to other parts of the _____. If you eat large amounts of _____ food for many years the walls of the arteries become lined with _____ substances which prevent the healthy flow of _____. If you eat a _____ diet and take exercise, the _____ substances will not build up in your arteries.

We only use the top of our _____ when we breathe while resting. It is then that dust and dirt can collect in the bottom part of the _____. When we _____ we use all the parts of our _____ and clear out the dust and dirt from the lower parts.

Word list: **larger, weaker, fatty, exercise, smaller, bones, stronger, body, muscle, balanced, blood, pump, lungs.**

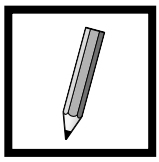
Q2. How do people take exercise in your school? Make a survey of the pupils and the staff. Make a table of your results. How could it be used in a "Take more exercise" campaign? Write down your ideas here.

Go further

Find out how people who take part in professional sport such as footballers, tennis players and athletes keep themselves fit.

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

See **pages 44 and 45** of *The Body Book*



Taking risks

Q1. Here is some information about taking risks with your health but there are gaps in the text. Fill in the gaps from the word list. You may use some words more than once.

The body has a defence system to keep it _____. There are some activities which can stop the defence system from working and _____ damage the body. These activities are _____ tobacco, drinking _____, sniffing _____ and taking certain _____.

When a person smokes they take in an addictive drug called _____ and a gas called _____ which stops _____ blood cells taking up _____ in the _____. They also take in _____ which coats the airways and makes the _____ more likely to become diseased. Tobacco smoke also contains _____ substances which cause _____. In time, a person's _____ cannot cope with all these damaging substances and the person becomes _____.

Alcohol is an addictive drug which can destroy the _____. The _____ can be damaged by sniffing _____ and taking certain _____.

Word list: **oxygen, ill, red, brain, forty, healthy, smoking, carbon monoxide, permanently, alcohol, nicotine, drugs, lungs, liver, tar, cancer, solvents.**

Q2. Ask your teacher for some leaflets about the dangers of smoking, alcohol and drug abuse. Write down information that you did not already know. How useful were the leaflets? Discuss this with your teacher and other people in the class.

Go further

Find out about people who have become ill through smoking and the medical treatment they have.

Answers

1. chemistry, alive, cells, energy, digests, absorbed, cells, oxygen, energy, alive, body, body, heart, circulation, skeleton, skeleton, weight.

2. brain, eye, ear, muscles, skeleton, germs, cut, air, multiply, disease, germs, immune, balanced, exercise, drinking, drugs, avoided.

3. billions, microscope, jelly, nucleus, nucleus, blood, oxygen, skin, flat, protect, digest, nails, bones, dead, painful.

4. carbohydrates, fats, proteins, vitamins, minerals, bread, potatoes, cheese, butter, meat, fish, peas, beans, vitamins, cheese, fruit, vegetables, sugar, starch.

5. lips, hot, cold, incisors, chisel, canines, tear, molars, crush, tongue, taste buds, saliva, food, swallow.

6. mouth, food, teeth, saliva, food, mouth, stomach, acid, germs, food, liver, pancreas, fats, carbohydrates, blood, absorbed, large intestine, water, fibre, gut, food.

7. up, down, larger, air, air, dust, bacteria, windpipe, lungs, oxygen, blood, lungs, carbon dioxide, blood, lungs, down, up, smaller, air.

8. circulation, oxygen, small intestine, heat, carbon dioxide, plasma, yellow, red, white, marrow, three, million, million.

9. chest, fist, hollow, muscle, halves, valve, valve, push, poor, sent, lungs, rich, sent, body.

10. heart, heart, arteries, capillaries, heart, veins, heart, artery, lungs, carbon dioxide, oxygen, air, lungs, vein, heart, artery, body.

11. arms, legs, dumbbells, bulbous, hollow, yellow, red, honeycomb, honeycomb, red, cartilage, wear, cushion, jolts, strong, weight, hollow, strong, weight.

12. soft, hard, eighteen, skull, bones, brain, bones, lungs, heart, ribs, collar, blade, hip, minerals, calcium, mineral.

13. joint, skeleton, joint, skull, elbows, knees, directions, up, down, ball, socket, shoulder, hip, all, joint, ligaments, discs, liquid, wear, cartilage.

14. hundred, half, weight, nerves, blood, nerves, brain, blood, food, oxygen, pacemaker, brain, up, down, pairs, relaxes, contracts, relaxes, biceps, triceps.

15. information, eye, ear, skin, nerves, memory, information, organs, memory, muscles, muscles, skin, information, muscles, hand, nerves, electrical.

16. egg, sperm, egg, sperm, sperm, swim, egg, nucleus, chromosomes, chromosome, genes, instructions, sperm, egg, sperm, egg, fertilisation, fertilised, divides, ball, limbs, nine, born.

17. living, spores, spore, heat, drying, living, spores, coughed, sneezed, food, water, cut, spores, warmth, moisture, cells, cell, copies, disease, white, destroy.

18. immune, immune, infection, allergy, immune, microbes, infection, white, microbes, white, microbes, disease, vaccination, vaccine, killed, weakened, poisons, vaccine, destroyed, disease, antiseptics, antibiotics.

19. time, diet, diet, nourishment, energy, life, nourishment, energy, balanced, balanced, weight, balanced, growing, balanced, meat, dairy products, fruit, vegetables, cereals.

20. balanced, exercise, exercise, stronger, larger, exercise, smaller, weaker, muscle, exercise, pump, body, exercise, bones, blood, body, fatty, fatty, blood, balanced, fatty, lungs, lungs, exercise, lungs.

21. healthy, permanently, smoking, alcohol, solvents, drugs, nicotine, carbon monoxide, red, oxygen, lungs, tar, lungs, forty, cancer, lungs, ill, liver, brain, solvents, drugs.

Note: In some instances, there may be more than one word from the word list which is appropriate, for example, under 18: 'The immune system destroys microbes that cause *infection* or *disease* ...' and so on.

