Science@School | Book 5B

Life cycles

Teacher's Guide

Support material for the pupil book
can be found at the dedicated web site:

www.science-at-school.com

You can also consult our web site:
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The pupil book explained unit by unit

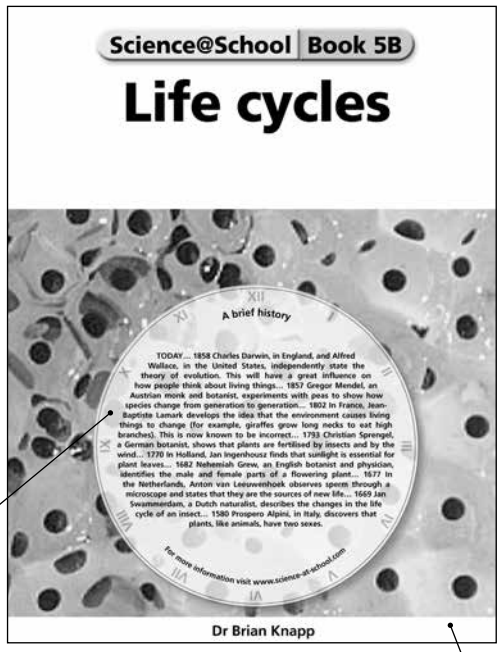
Although the pupil book – *Life cycles* – is clear and simple, a great deal of care and thought has been given to the structure and the content of each double page spread or unit. The worksheets and activities in this *Teacher's Guide* also link directly to the pages in *Life cycles*.

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

The units are arranged in sequence, to help you with your lesson planning. In this section, a brief description of the content of each unit is given, together with hints on how to start or support it. List 1 (Starting a unit with a demonstration) on page 11 sets out the resources that you could use to do the demonstrations where suggested. The activity associated with each unit is also briefly described to help you see how the unit and activity work together.

Title page

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



A time clock giving additional historical information about the topic.

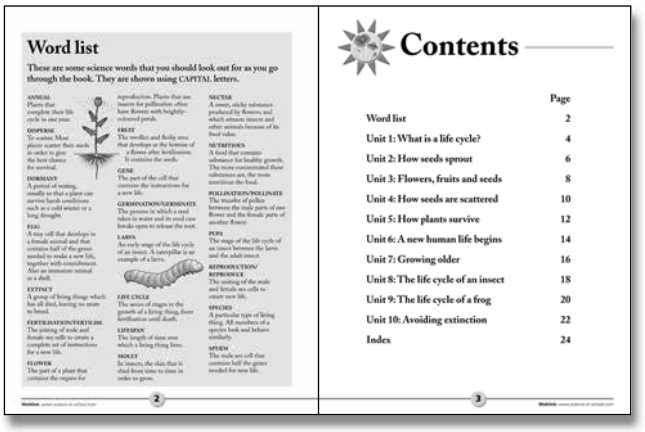
This picture shows a close up of frog spawn. The individual developing tadpoles are the black objects.

Word list and contents

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

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

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



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

The units

Heading and introduction

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

Body

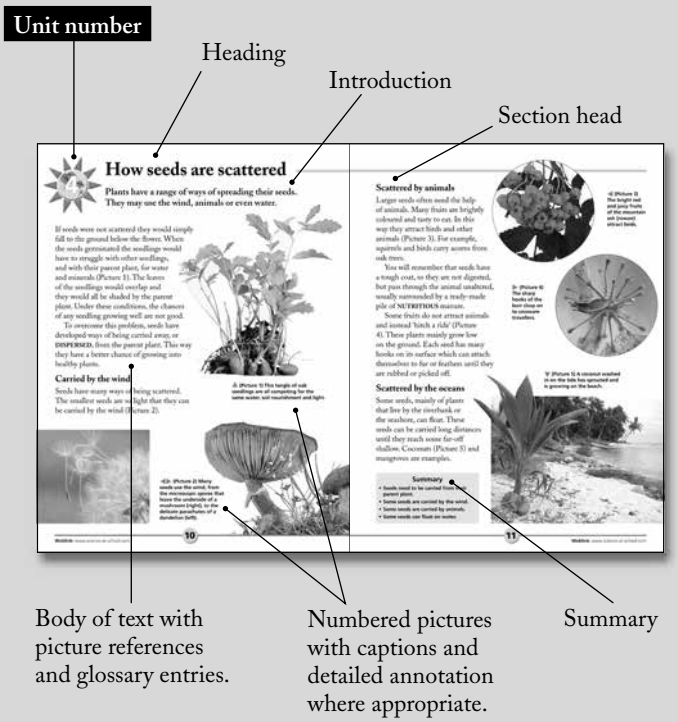
The main text of the page then follows in a straightforward, easy-to-follow, double column format.

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

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

Summary

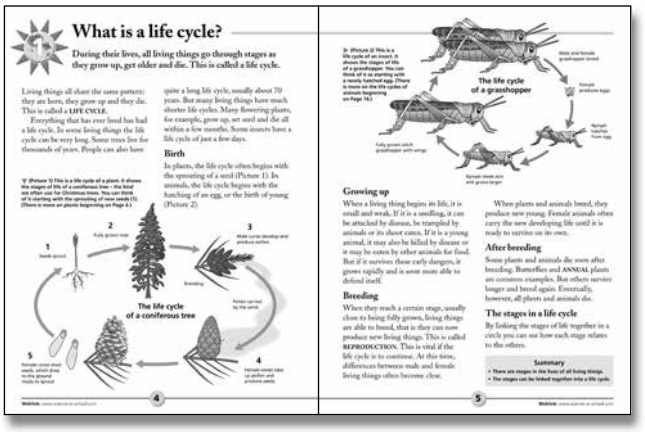
Each unit concludes with a summary, highlighting and reinforcing the main teaching objectives of the unit.



1 What is a life cycle?

You may like to begin by holding up a packet of seeds. Tell the children it is full of living things that are waiting to start their life cycles. Open the packet and let the children look at the seeds. Ask the children what they think is inside the seeds and look for answers about tiny plants with food stores. Ask the children how they could activate the life cycle of the tiny plant and look for an answer about adding water and soil. Let the children set up some plant pots of compost to hold the seeds. Let them sow the seeds and water them. Tell the children that as they study life cycles in this book they will be able to see how the plants in the pots develop in their own life cycle.

The unit begins by introducing the term life cycle, then the text builds on this to show the stages related to growth, breeding and later life. The life cycle of the conifer is given to provide contrast with the life cycle of the flowering plant which follows on page 12 of the pupil book. The life cycle of the grasshopper is presented to provide contrast with the more familiar insect life cycles, such as that of the butterfly, which is illustrated in Unit 8.



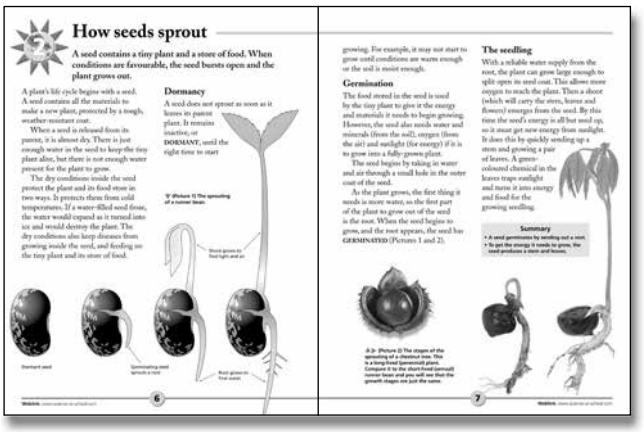
In the complementary work, the children can use secondary sources to find out about the life cycles of an earthworm, snail or slug, fish, turtle, bird, mould and mushroom. In the activity, they rearrange data about the life cycle of the locust and look for a pattern in the growth of the nymph.

2 How seeds sprout

You may like to begin by showing the children some dry broad bean seeds, and some that have been soaked overnight. Ask the children to compare them and look for answers about the soaked seeds being larger and having a smooth, rounded surface. Tell the children that when seeds are in the presence of water, they take it in and swell up. This suggests that water could be important in the sprouting of seeds.

The unit begins by stating that a plant's life cycle begins with a sprouting seed, then an explanation is given about why seeds need to be dry. The term *dormancy* is introduced and then the germination process is described. This is related to the needs of plants. The unit ends by explaining that seedlings need to grow leaves fast to provide energy for further growth as the seed's food supply is used up.

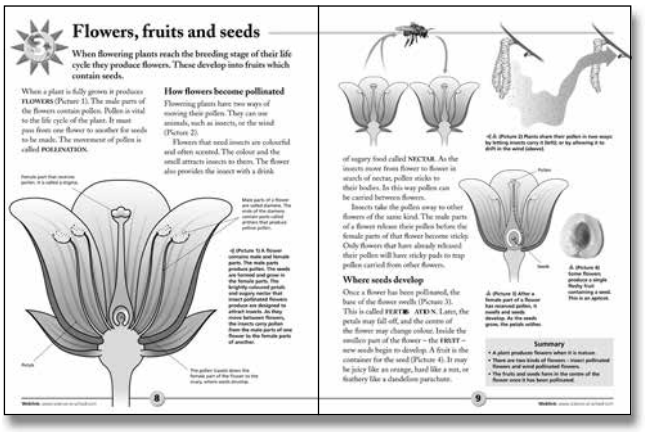
In the complementary work, the children can investigate how much water bean seeds take up, and how roots grow when seeds are upside down. In the activity, the children think about the different things which affect germination, then select one and plan a fair test. They then carry out a full investigation to test their ideas.



3 Flowers, fruits and seeds

If possible, begin by bringing in some cut flowers that are about to open. Try to select large flowers. Keep them in a warm place and let the children look at them in the course of the day before you begin this unit. When you begin the unit, show the children how the protective parts of the flower buds open to let out the flower. Tell the children that this is the most important part of the life cycle of the plant. It is the stage at which the plant reproduces. If a plant did not reproduce, it would not have any offspring, and the species of plant would die out.

The unit begins with a large, colourful picture of an insect pollinated flower with its parts clearly labelled. The mechanisms of attracting insects and of pollination are described in detail. Clear, colourful diagrams of pollination on page 9 will help the children remember the process. The unit ends by describing fertilisation and how this process leads to the formation of seeds and fruits.



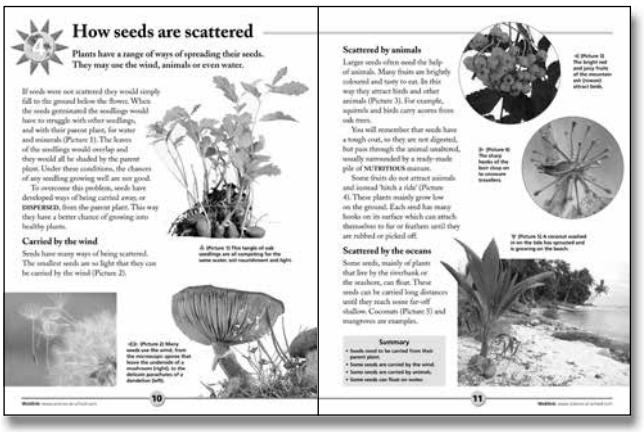
In the complementary work, the children can look at pollen from insect pollinated flowers under the microscope. They can also look at wind pollinated flowers found on catkins and grass heads, and examine their pollen under the microscope. In the activity, the children use a diagram of a typical flower to help them compare the flowers of a range of different insect pollinated plants.

4 How seeds are scattered

You may like to begin by putting a large tray on the floor. Pick up two handfuls of acorns and tell the children that you are an oak tree and here are the fruits that you have produced this year. Now drop the acorns and let them come to rest close together on the tray. Ask the children if that is a good way for a plant to disperse its seeds. Ask them to explain, and look for answers about reducing competition for light, water and minerals.

The unit begins by explaining why seeds must be dispersed, and this will help all the children consolidate the ideas they displayed in the introduction to the unit. The text then moves on to describe the dispersal of seeds by wind, animals and water. In addition to the dispersal of seeds the unit also describes how fungi use the wind to disperse their spores.

In the complementary work, the children can investigate how the hairs on parachute fruits help the fruits travel through the air. They can also visit alder

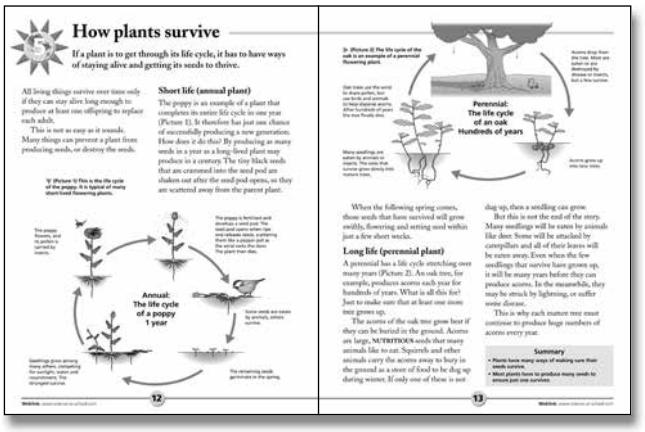


trees in winter to see how the alder fruits disperse by both the wind and by water. In the activity, the children follow instructions to make a very simple winged fruit by twisting a piece of paper. They are then invited to make other models based on the basic design and investigate how the size of the wings or body affect the way a fruit spins.

5 How plants survive

You could begin by giving each child in the class a number. Take them into the school hall and gather them round you. Tell them that they are seeds and in a moment they will be dispersed. Tell the children to spread out round the hall and sit down. Call out the numbers of half the class and tell them that they have landed where they cannot grow, so they die. Those children can lie down. Call out the numbers of a quarter of the class. Tell them that they are seeds that are eaten and let them lie down too. Tell the remaining children to stand up. They have germinated and grown into seedlings. Call out the numbers of half of these 'seedlings'. They are eaten by animals and die. Call out the numbers of all but one of the others and say they are attacked by disease or shaded by other plants and die. Tell the children that this is what happens to every group of seeds which leaves a plant.

The unit begins by stating that plants produce large numbers of seeds to ensure survival, and reasons are given why plants fail to survive. The life cycle of the poppy is described and illustrated as an



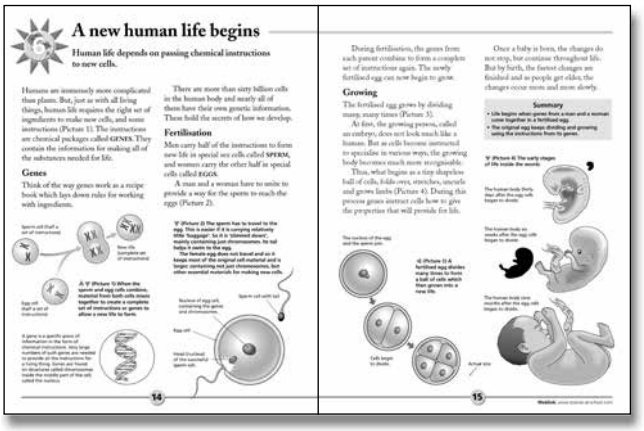
example of an annual plant. The life cycle of the oak tree is described and illustrated as an example of a perennial plant.

In the complementary work, the children can use secondary sources to find out about the life cycle of the daffodil. In the activity, the children investigate what happens to a dandelion root when it is cut up and placed back in the soil.

6 A new human life begins

The children may have heard of DNA and you could use this to provide a very simple demonstration to illustrate gene action. Ask five children to stand in a line. Give each one a different-coloured card. Each card has a word on the back. The words are skin, nose, eyes, hair and ears. Do not let the class see the words. Tell the class that the five people are a thread called a chromosome, which is made of DNA. Each person is a gene on the chromosome, and each gene carries an instruction for the body. Place drawings or cut-outs of the five parts of a face in a box. The 'skin' should show the outline of the face. Give similar-coloured cards without words to five people in the class. Tell the class that the body reads the instructions in the genes. Let the children go and collect their cards from the 'chromosome', starting with the skin. Each child reads the instruction, looks in the box and pulls out the appropriate part of a face. The children then assemble the other parts of the face.

The unit begins by providing a simple description of genes and their action. The structure of the egg and sperm are described and illustrated and the



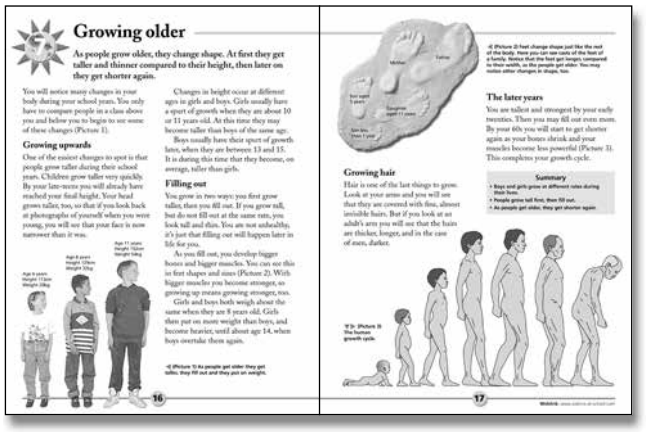
process of fertilisation is explained. The unit ends by tracing the development of a baby from conception until it is ready to be born.

In the complementary work, the children can examine ultrasound pictures of embryos and identify their features. In the activity, the children look at how the length of a baby changes as it grows inside its mother. They plot a line graph using the table and grid supplied in order to extract additional information about the baby's length.

7 Growing older

You could begin by making a collection of baby photographs. The collection should feature all the children in the class, and all the staff in the school. When the collection is complete let the children make a display. Use the display to ask the children how they think people change as they get older. While there may be few changes in the children in the class, the staff photographs should show many changes. From these photographs the children should be able to see how the head becomes taller and how this makes the face thinner.

The unit begins by inviting the reader to compare the heights of people in different classes in the school to see how humans grow. The growth rates of boys and girls are compared from childhood into adolescence, and the different growth spurts are identified. The text moves on to explain that after a period of growing taller the body has a period of filling out. The changes to hair on the arms is described and the unit ends by considering how the body changes and grows smaller in old age.


Growing older

As people grow older, they change shape. At first they get taller and thinner compared to their height, then later on they get shorter again.

You will notice many changes in your body during your school years. You only have to compare people in a class above you and below you to begin to see some of these changes (Picture 1).

Growing upwards

One of the easiest changes to spot is that people grow taller during their school years. Children grow taller very quickly. By your late-teens you will already have reached your final height. Your head grows taller, too, so that if you look back at photographs of yourself when you were young, you will see that your face is now narrower than it was.

Changes in height occur at different ages in girls and boys. Girls usually have a spurt of growth when they are about 10 or 11 years old. At this time they may become taller than boys of the same age.

Boys usually have their spurt of growth later, when they are between 13 and 15. It is during this time that they become, on average, taller than girls.

Filling out

You grow in two ways: you first grow taller, then you fill out. If you grow tall, but do not fill out at the same rate, you look tall and thin. You are not unhealthy, it's just that filling out will happen later in life for you.

As you fill out, you develop bigger bones and bigger muscles. You can see this in foot shapes and sizes (Picture 2). With bigger muscles you become stronger, so growing up means growing stronger, too.

Girls and boys both weigh about the same when they are 8 years old. Girls then put on more weight than boys, and become heavier, until about age 14, when boys overtake them again.

16

The later years

You are tallest and strongest by your early twenties. Then you may fill out even more. By your 60s you will start to get shorter again as your bones shrink and your muscles become less powerful (Picture 3). This completes your growth cycle.

Growing hair

Hair is one of the last things to grow. Look at your arms and you will see that they are covered with fine, almost invisible hairs. But if you look at an adult's arm you will see that the hairs are thicker, longer, and in the case of men, darker.

Summary

- Boys and girls grow at different rates during their lives.
- People grow tall first, then fill out.
- As people get older, they get shorter again.

17

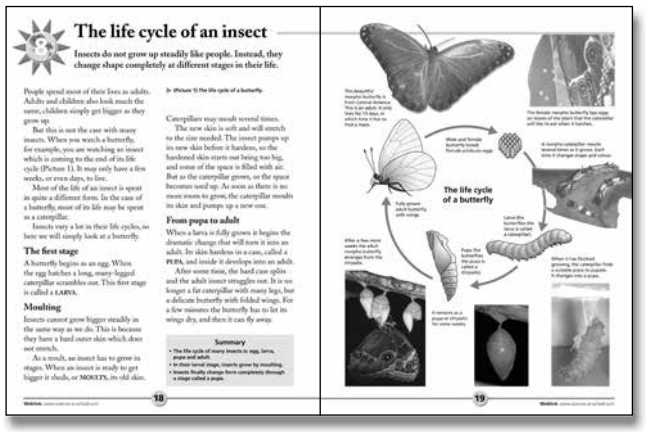
In the complementary work, the children could use data from the growth of pets to plot graphs. They could also use secondary sources to find out how a tree trunk increases in width. In the activity, the children use prepared data to construct line graphs and extract information from them.

8 The life cycle of an insect

You may like to begin by asking the children "What is an insect?" Look for answers about having six legs and wings and make sure the children can distinguish insects from spiders.

Ask for a volunteer to be fitted with insect arms. Produce some card and make it into cylinders which fit over the upper and lower arms. Join the cylinders loosely so that the volunteer can move their arms. Tell the children that insects have their skeletons on the outside of their body, and if they were an insect their arms would look much like the cylinders. Tell the children that this presents a problem with growth because the hard, firm skeleton will not let the body grow. The insect solves the problem by moulting. In most insects this occurs when they are larva.

The unit opens by explaining that a butterfly is the final stage of the life cycle and may not live long. The stages of the life cycle of a butterfly are illustrated with a large, clear diagram and intriguing colour photographs of the life cycle of the morpho


The life cycle of an insect

Insects do not grow up steadily like people. Instead, they change shape completely at different stages in their life.

People spend most of their lives as adults. Adults and children also look much the same, children simply get bigger as they grow up.

But this is not the case with many insects. When you watch a butterfly, for example, you are watching an insect which is coming to the end of its life cycle (Picture 1). It may only have a few weeks, or even days, to live.

Most of the life of an insect is spent in quite a different form. In the case of a butterfly, most of its life may be spent as a caterpillar.

Insects vary a lot in their life cycles, so here we will simply look at a butterfly.

The first stage

A butterfly begins as an egg. When the egg hatches a long, many-legged caterpillar scrambles out. This first stage is called a **LARVA**.

Moulting

Insects cannot grow bigger steadily in the same way as we do. This is because they have a hard outer skin which does not stretch.

As a result, an insect has to grow in stages. When an insect is ready to get bigger it sheds, or **MOULTS**, its old skin.

Caterpillars may moult several times.

The new skin is soft and will stretch to the size needed. The insect pumps up its new skin before it hardens, so the dramatic change that will turn it into an adult. Its skin hardens in a case, called a **PUPA**, and inside it develops into an adult.

After some time, the hard case splits and the adult insect struggles out. It is no longer a fat caterpillar with many legs, but a delicate butterfly with folded wings. For a few minutes the butterfly has to let its wings dry, and then it can fly away.

From pupa to adult

When a larva is fully grown it begins the

Summary

- The life cycle of many insects is: egg, larva, pupa and adult.
- In their larval stage, insects grow by moulting.
- Insects finally change form completely through a stage called a pupa.

18

The life cycle of a butterfly

19

butterfly from Central America. The illustrations are supported by an informative text in which the process of moulting is examined in detail. Pupation and the emergence of the adult is described.

In the complementary work, the children can investigate stick insects and caterpillars. In the activity, the children make a maggot and fly from Plasticine and compare their body structures.

9 The life cycle of a frog

As the frog is such a well known animal, you may like to begin by asking the children what they can tell you about frogs. This may include personal anecdotes. These may be useful in finding out where adult frogs can be found. Some children may be surprised that frogs may be found away from water as long as the conditions are damp. The children may ask why frogs need dampness, and you can tell them that their skin does not let them hold onto water like ours does. If conditions are dry the frog dries out and dies.

You may like to write down on the board some of the facts you are given and then link them together into a sequence which represents part of the life cycle. You may be able to link all the facts to make a life cycle, then introduce the unit to check the children's ideas.

The unit begins by stating that part of a frog's life cycle is spent in water and part on land. The text then describes the feeding habits and breathing processes of the tadpole. This is supported by a clear

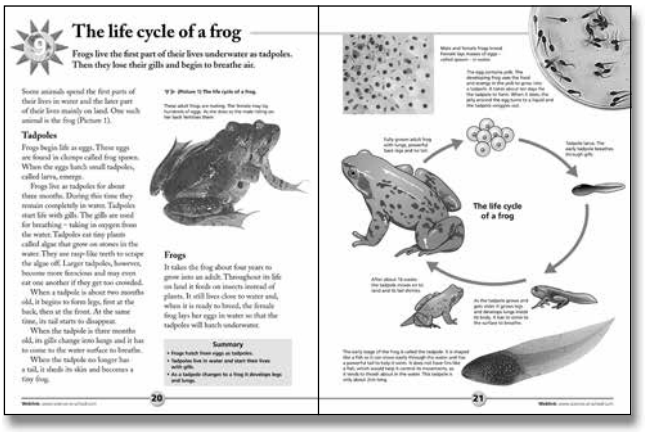


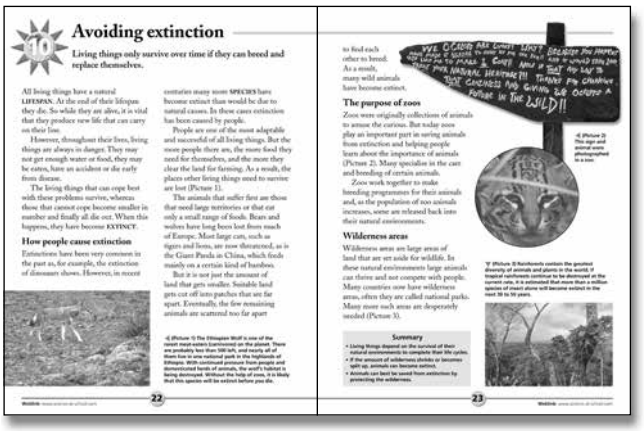
diagram of the frog's life cycle and photographs of key stages. The unit ends by describing the life of the frog on land, as it grows in preparation for breeding.

In the complementary work, the children can find out about toads, newts and salamanders. In the activity, the children make an extensive study of the development of the tadpole.

10 Avoiding extinction

You may like to begin by placing ten wooden blocks on each pan of a pair of scales. Tell the children that this represents a population in balance. Add a block to one side and show how the scales tip. This represents a population growing. Now remove two blocks from the other pan. This tipping represents a population declining. Keep taking blocks off until there are none left. This represents extinction.

The unit begins by describing the lifespan of a living thing and explaining why, during the lifespan, the living thing must breed. The dangers to survival are enumerated and the concept of extinction is built up. Examples of animals under the threat of extinction are given and the point is made that it is not just the reduction in an animal's range that is threatening, but the fragmentation of the range makes it more difficult for animals to meet in order to breed. The change in the role of zoos over time is described and the unit ends by expressing the great need for more wilderness areas to prevent further extinction of many living things.



In the complementary work, the children can find out about the success rates of zoos in preventing the extinction of various animals. The children could also find out if wilderness areas can be found on every continent. In the activity, the children perform calculations on the imaginary population of the pando to see how birth rates and death rates affect the size of a population and its chances of survival.

Index

There is an index on page 24.

Using the pupil book and photocopiable worksheets

Introduction

There is a wealth of material to support the topic of life cycles in the pupil book and in the *Teacher's Guide*. On this and the following three pages, suggestions are made on how to use the worksheets and their associated teacher's sheets, and how to integrate them for lesson planning. On the page opposite you will find the resource lists for introductory demonstrations, the complementary work and the activity worksheets. The learning objectives are shown on pages 12 and 13.

Starting a unit

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

The first part of the main text introduces the content, which is then developed in the headed sections. The illustrations are closely keyed to the main text, and the captions of the illustrations develop the main text content.

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

You can find the learning objectives for each unit of this *Teacher's Guide*.

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

Using the comprehension worksheets

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

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

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

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

Using the activity worksheets

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

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

Planning to use a unit

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

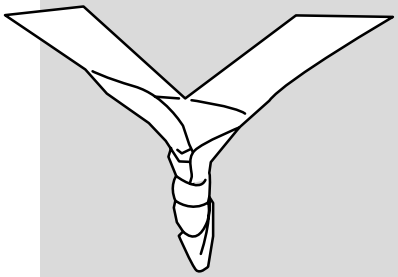
Safety

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

Resources

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

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



▲ *Investigating winged fruit with paper 'wings' in Unit 4.*

List 1 (Starting a unit with a demonstration)

▼ UNIT

1. A packet of seeds which germinate quickly, such as radish or spring onion, plant pots, compost, a safe place to store the pots and display the seedlings as they germinate.
2. Dry broad bean seeds and broad bean seeds that have been soaked overnight.
3. Large cut flowers that are about to open, warm place in class where flowers will open.
4. A tray, two handfuls of acorns.
5. A numbered card for each member of the class, the school hall.
6. Two sets of five cards in the following colours – red, yellow, blue, green, orange. On the back of one card of each colour is written one of these words: skin, nose, eyes, ears, hair. A box containing the outline of a face (this is the skin) and pictures or drawings of a nose, eyes, ears and hair.
7. A collection of baby photographs of the children in the class and all the staff in the school.
8. Four sheets of card, sticky paper.
9. –
10. A pair of scales, 20 wooden blocks.

List 2 (Complementary work)

Each group will need the following items:

▼ UNIT

1. Secondary sources about the life cycle of an earthworm, snail or slug, fish, turtle, common bird and a mould or mushroom.
2. Dry broad beans, scales, beaker of water, paper towels.
3. (a) Insect pollinated flowers, microscope and slides. (b) Catkins, grass flowers, microscope and slides.
4. Parachute fruits, such as those of the dandelion, scissors. Alder seeds or a visit to alder trees in winter.
5. Secondary sources about the life cycle of the daffodil.
6. Photographs of embryos taken by an ultrasound scanner.
7. Data supplied by children about how their pets grow. Secondary sources about tree growth.
8. (a) Colony of stick insects. Privet, rose and blackberry leaves. Binocular microscope optional.
9. Secondary sources about toads, newts and salamanders.
10. Secondary sources about the success rates of zoos in saving animals from extinction. Secondary sources about wilderness areas on each continent.

List 3 (Activity worksheets)

Each group will need the following items:

▼ UNIT

1. –
2. Large seeds, such as peas, a range of appropriate containers, sand, soil, cotton wool, thermometer, measuring cylinder, places to store seeds which are warm, cold, in the light and in the dark.
3. Wallflower, selection of flowers with a single ovary in the centre of the flower and petals which are easy to count (not a daffodil, which has fused petals). Flowers such as buttercups, with many ovaries in the centre, magnifying glass. Daisy or dandelion for teacher's introduction.
4. Paper, scissors, ruler.
5. Dandelion with tap root, knife (used by teacher), plant pot, compost, warm and light place to store plant pot.
6. –
7. Graph paper.
8. Plasticine.
9. Frog spawn, tank with pond water and pond weed, magnifying glass.
10. –

Learning objectives

Comprehension worksheets

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

Unit 1

- There are different stages in the lives of all living things.
- These stages can be linked together to form a life cycle.

Unit 2

- A seed contains a tiny plant and a food store.
- When conditions are favourable, a seed germinates.
- After germination, a seedling forms.

Unit 3

- A mature plant produces flowers.
- Flowers are pollinated by insects and the wind.
- Fertilisation follows pollination.
- Seeds and fruits form after fertilisation.

Unit 4

- Seeds are dispersed to reduce competition between plants of the same species.
- Seeds are dispersed by animals, the wind and water.

Unit 5

- Some plants may have a short life cycle in which they produce a large number of seeds.
- Some plants have very long life cycles.
- Plants have ways of ensuring their seeds survive.

Unit 6

- Life depends on instructions in genes.
- Eggs and sperm carry genes.
- A human life begins when the genes from a man and woman join together in a fertilised egg.
- A human body forms as a fertilised egg divides into cells.

Unit 7

- Boys and girls grow at different rates throughout their lives.
- People grow by increasing in height first, and then filling out.
- Fully grown people get shorter again as they get older.

Unit 8

- In the life cycle of many insects there are four stages – egg, larva, pupa and adult.
- In the larval stage, the insect grows by moulting.
- In the pupal stage, the insect makes a complete change of form.

Unit 9

- Tadpoles hatch from frog spawn.
- Tadpoles change in shape as they grow.
- A tadpole is an aquatic animal, which changes into a frog, which can live on land.

Unit 10

- Living things need their own territory to survive.
- Extinction is caused in a variety of ways.
- Zoos and national parks have a part to play in preventing the extinction of living things.

Learning objectives

Activity worksheets

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

Unit 1

- Present data in a table.
- Recognise a pattern in data.
- Recognise data which does not fit a pattern.

Unit 2

- Plan and carry out a fair test.
- Make a table and record data in it.
- Draw conclusions from results.

Unit 3

- Make careful observations.
- Make comparisons.
- Fill in a prepared table.

Unit 4

- Use equipment safely.
- Make systematic observations.
- Draw conclusions.

Unit 5

- Use equipment safely.
- Make a prediction and match it with results.
- Carry out an extensive investigation.

Unit 6

- Plot a line graph from data.
- Extract information from a line graph.

Unit 7

- Construct a line graph from data.
- Extract information from a line graph.

Unit 8

- Use materials safely.
- Make observations and comparisons.

Unit 9

- Make careful observations.
- Record observations as diagrams.
- Perform an extended investigation.

Unit 10

- Perform calculations on data.

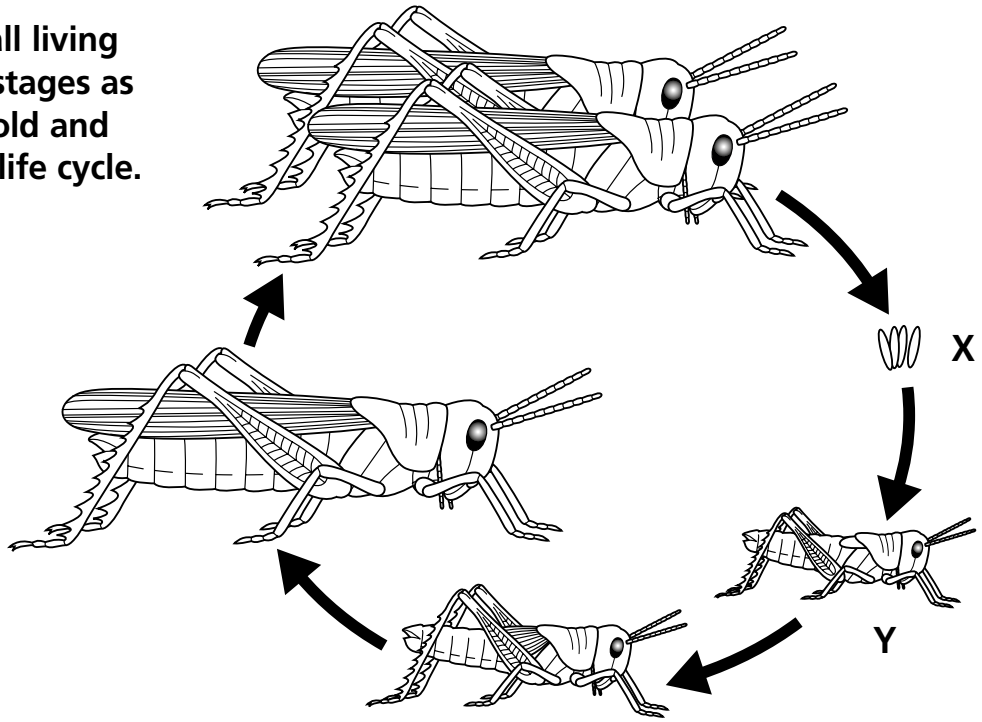
1

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

See **pages 4 and 5** of *Life cycles*

What is a life cycle?

During their lives, all living things go through stages as they grow up, get old and die. This is called a life cycle.



Q1. The diagram shows the life cycle of the grasshopper. (a) Colour in the adults.

(b) What is labelled X? ✎..... (c) What is labelled Y? ✎.....

Q2. How does the life cycle of most plants begin?

✎.....

Q3. How does the life cycle of animals begin?

✎.....

Q4. Name two ways in which young living things may die early.

✎..... ✎.....

Q5. What is vital if the life cycle is to continue?

✎.....

Q6. What do the life cycles of butterflies and annual plants have in common?

✎.....

Teacher's sheet: comprehension

See **pages 4 and 5** of *Life cycles*

Answers

1. **(a) The single adult and the pair should be coloured in.**

   (b) X = eggs.

   (c) Y = nymph.

2. **Sprouting of seed.**

3. **Hatch from eggs, birth of young.**

4. **Plants may be attacked by disease, trampled by animals, or have their shoots eaten. Animals may die from disease or may be eaten by other animals. Plants and animals may also die from drought and other natural disasters.**

5. **Reproduction, or breeding.**

6. **The adults die soon after breeding.**

Complementary work

(a) Let the children use secondary sources to find out about the life cycle of an earthworm, snail or slug, fish, turtle and a common bird. They could also find out about the life cycle of a mould, or mushroom, which would prepare them for work on microbes.

Teaching notes

There are stages in the life of every living thing. First, there is the stage when the living thing comes into being. For plants this is usually when a seed germinates. In animals that lay eggs, it takes place when the egg hatches. For animals that give birth, it is the moment the baby is born. Although living things were present before, in embryo form, for life cycle purposes birth is considered the first stage of a life cycle.

The following stages of the life cycle are related to growth. In the case of plants, where growth usually involves simply getting larger, there may be no more stages until the production of reproductive organs. In the case of animals, such as mammals, there may be other stages, such as when the eyes open, or when the young are weaned. In frogs, there can be many stages, such as the gill stage, or the stage at which the back legs grow.

A major stage in all life cycles is the reproductive stage. Plants undergo a period of pollination and fruit formation, followed by the dispersal of fruits.

On page 4 of the pupil's book, the life cycle of the conifer is presented to give contrast to the life cycle of flowering plants which feature in future units. The organs of reproduction in the conifer are cones. There are male cones, which release pollen, and female cones, which receive it. Fertilisation inside the female cones results in the production of seeds.

In the insect life cycle, there is a complete change of form from early to later stages in the life cycle. Locusts and cockroaches share the style of life cycle shown by the grasshopper. The nymph has a very different form from the adult grasshopper. Nymphs grow by moulting. Several moults take place as the young insect grows up. Some adult parts emerge after each moult. This type of gradual development in insects is called incomplete metamorphosis.

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

Based on **pages 4 and 5** of *Life cycles*

The growth of a locust nymph

Try this...

1. Read the following passage.

The locust is like a large grasshopper. It lives in hot places around the world. When a locust egg hatches, a nymph about 9mm long climbs out. Over the next few weeks the nymph moults and grows in stages. At the second stage it is 12mm long. At the third stage it is 19mm long. At the fourth stage it is 23mm long and at the fifth stage it is 32mm long.

2. Record the growth of the locust nymph in a table.

3. Answer these questions about the growth of the nymph.

(i) By how much did the nymph grow after its first moult? ✎.....

(ii) By how much did the nymph grow after its second moult? ✎.....

(iii) By how much did the nymph grow after its third moult? ✎.....

(iv) By how much did the nymph grow after its fourth moult? ✎.....

4. Describe how the nymph grew as it moulted.

✎.....

✎.....

5. Draw lines to show the body lengths of the five nymphs.

Teacher's sheet: activity

Based on **pages 4 and 5** of *Life cycles*

Introducing the activity

(a) Begin by looking, with the children, at the diagram of the grasshopper life cycle on page 5 of the pupil's book. Turn to page 18 of the pupil's book and read, with the children, the section on how insects grow by moulting.

Using the sheet

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

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

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

(e) Go through task 4 (see note (iii)).

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

Completing the activity

(g) The children can compare their tables, subtractions and descriptions of the pattern of growth.

(h) The children could use secondary sources to find out more about the life of the locust.

Conclusion

The nymph grew 3mm after its first moult. The nymph grew 7mm after its second moult. The nymph grew 4mm after its third moult. The nymph grew 9mm after its fourth moult. As the nymph moulted, it tended to grow by a larger amount each time. The exception to this was after the third moult when it grew by only 4mm.

Teaching notes

(i) Some children may still need help with tables. There should be two columns. The left hand column is headed 'Nymph stage' and is numbered 1 to 5. The second column is headed 'Length (mm)' (see example below).

(ii) Some children may need to be reminded that they have to make subtractions.

(iii) The children should look at how much the nymph grew at each stage. You can ask them to look for a pattern in the way the nymph grows, and to look for any result that does not fit the pattern.

(iv) Tell the children they need to make accurate measurements, using a ruler.

Nymph stage	Length (mm)
1	
2	
3	
4	
5	

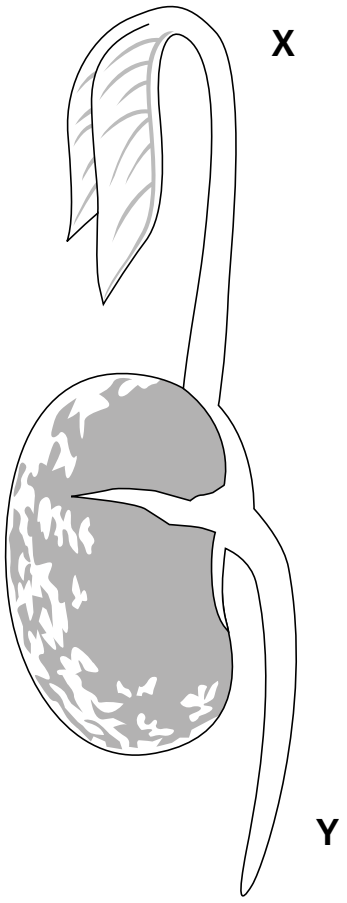
2

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

See **pages 6 and 7** of *Life cycles*

How seeds sprout

A seed contains a tiny plant and a store of food. When conditions are favourable, the seed bursts open and the plant grows out.



Q1. What is X and what is it growing up to find?

✎.....

✎.....

Q2. What is Y and what is it growing down to find?

✎.....

✎.....

Q3. What is an inactive seed called?

✎.....

Q4. What is the name of the process in which the seed swells up and sprouts a root?

✎.....

Q5. Where does the seed get the energy to sprout?

✎.....

Q6. (a) What happens to the energy supply as the seed sprouts?

✎.....

(b) How does the plant get a new energy supply?

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 6 and 7** of *Life cycles*

Answers

1. **X = shoot. It finds light and air.**
2. **Y = root. It finds water.**
3. **Dormant.**
4. **Germination.**
5. **From food stored in the seed.**
6. **(a) It is used up.**

   (b) It grows a stem with leaves, and the leaves use a green-coloured chemical to trap energy from sunlight.

Complementary work

(a) The children can weigh a group of beans that are dry, and then leave them to soak overnight. They can then weigh the soaked beans and calculate how much water they have taken up.

(b) The beans can be sowed in many different positions, and the children can predict which way the roots and shoots will grow. As the seeds germinate and turn into seedlings, the children can check their predictions.

Teaching notes

Each seed grows from an ovule in the ovary. During pollination a pollen tube attaches itself to the ovule and the male sex cell enters the ovule so that fertilisation can take place. A tiny hole, called a micropyle (meaning 'little gate'), develops at the place where the pollen tube enters the ovule. The male sex cell passes through this hole and into the ovule. After fertilisation, the ovule grows into a seed or seeds.

When the seed germinates, it takes in water through the micropyle. The water is used to dissolve food (sugars) in the seed's food store. The dissolved sugars can then be easily transported to the tiny plant. The food is used to provide energy and materials so the plant can grow. As the plant has a store of food, but also needs water to transport it, the plant grows a root first to help it find more water.

There is enough food in the seed to allow the plant to grow a root and a shoot. The depth of the seed in the soil is critical. If it is sown too deep, the seedling will use up all its food store before the shoot can sprout leaves above the ground which make food by using sunlight.

2

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

Based on **pages 6 and 7** of *Life cycles*

Investigating germination

Try this...

1. What may affect the germination of a seed? Write down as many things as you can.

✎.....

✎.....

2. Pick one of the things that you think affects the germination of a seed and write it down here.

✎.....

3. Plan an investigation to test your idea.

✎.....

✎.....

✎.....

✎.....

4. Make a table here in which to record your results.

5. If your teacher approves, try your investigation.

Looking at the results.

6. What do your results show?

✎.....

Teacher's sheet: activity

Based on **pages 6 and 7** of *Life cycles*

Introducing the activity

(a) Ask the children how plants reproduce and look for an answer about producing seeds. Show the children some large seeds, such as broad beans, and ask how they can become plants. Look for an answer about sprouting and introduce the word germination (see note (i)).

Using the sheet

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

(c) Go through tasks 2 to 4, then let the children try them (see note (iii)).

(d) Let the children try task 5 (see note (iv)).

(e) Let the children try task 6 (see note (v)).

Completing the activity

(g) Let the children present an account of their investigation to the rest of the class so they may compare their work.

(h) When the investigations are complete, draw together the results to show the conditions that are needed for germination.

Conclusion

Water and warmth are needed for germination. Seeds will germinate in both dark and light. Seeds will germinate in other substances (for example, cotton wool or sand) besides soil.

Teaching notes

(i) The children may have come across germination before. They may need to know that they can also use it as a verb.

(ii) You may want to hold up a broad bean and ask the children what it needs to become a plant. Make sure the children do not call out but write their answers on the sheet. You may like to check that the children have included light, water, warmth and soil in their lists.

(iii) You may ask the children to think about how they would make their investigation while they are choosing. It may help them to choose.

(iv) Make sure they have picked one of the following: the effect of warmth, water, light or soil. They should also show how they plan to make a fair test by using the same number of seeds for each part of the investigation and keeping all conditions the same except for the one being investigated.

(v) In addition to describing the results, look for ways in which the children have evaluated their investigation and whether they have included suggestions for how they could improve it.

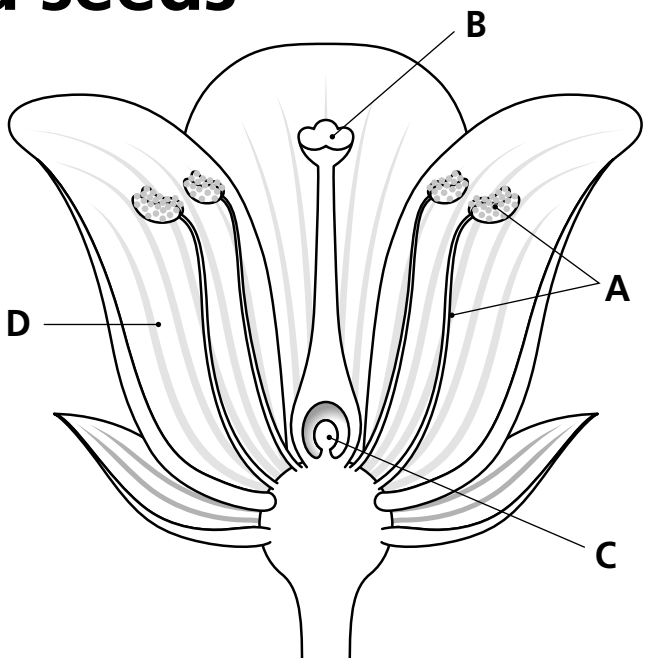
3

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

See **pages 8 and 9** of *Life cycles*

Flowers, fruits and seeds

When flowering plants reach the breeding stage of their life cycle they produce flowers. These develop into fruits which contain seeds.



Q1. (a) Name the parts of the flower labelled A to D.

A ✎.....

B ✎.....

C ✎.....

D ✎.....

(b) Which part of the flower produces pollen? ✎.....

Q2. Name two ways in which pollen is moved.

✎..... ✎.....

Q3. What is nectar?

✎.....

Q4. What is the name of the movement of pollen from flower to flower?

✎.....

Q5. What is fertilisation?

✎.....

✎.....

Q6. What happens to a flower after fertilisation?

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 8 and 9** of *Life cycles*

Answers

1. **(a) A = stamen; B = stigma; C = ovary; D = petal.**

   (b) A, stamen.

2. **By insects and the wind.**

3. **A sugary liquid that insects drink.**

4. **Pollination.**

5. **When the base of the flower swells. (Some children may also have found the answer from the word list on page 2, which is: 'The joining of male and female sex cells to create a complete set of instructions for a new life'.)**

6. **Petals may fall off, centre may change colour, fruit forms and seeds develop.**

Complementary work

(a) If there are no children in your class who are allergic to pollen you could let the children look at some pollen under a microscope. Tap the yellow, swollen end of the stamen (called the anther) on a microscope slide and look for a yellow powder. Put this on the microscope and focus to show the spiky pollen. The spikes help the pollen grip the hairs on insect bodies. When using a microscope, never use the mirror to collect light from the Sun.

(b) In early spring, let the children look at catkins and tap them to release pollen. In summer, show the children wind pollinated grass plants with their stamens sticking out. Place some of this pollen on a microscope slide to show that it is smaller than pollen carried by insects and also lacks spikes.

Teaching notes

Insect pollinated flowers have strong stamens that can stand up to insects brushing past them on their way to find nectar. The stamen is divided into two parts. The swollen tip is called the anther. This is the part where the pollen is made. The stalk which supports the anther is called the filament.

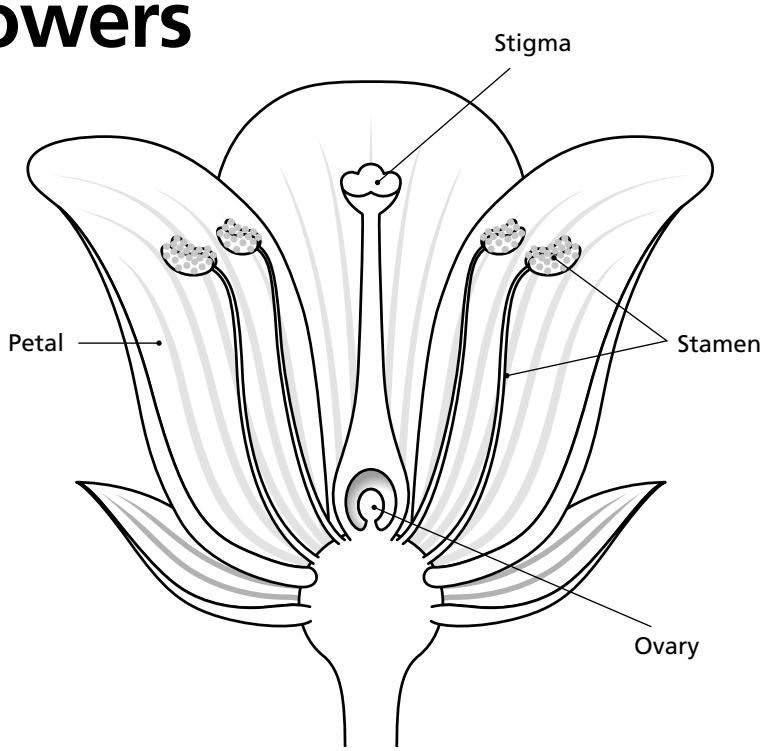
In many flowers, the ovary is a bottle-shaped structure. It contains egg-shaped structures called ovules which hold the female sex cells. When the pollen lands on the stigma, each grain grows a tube down through the stigma. Between the stigma and the ovary is a stalk which may be long or short. It is called the style. The pollen tubes grow through the style and enter the ovary where they reach the ovules. Inside each pollen grain is a male reproductive cell. It travels down the pollen tube and enters the ovule. Here, it joins with a female reproductive cell in the process of fertilisation. After fertilisation, the ovule becomes a seed and the ovary becomes the fruit. The purpose of the seed is to grow into the next generation of the species. The purpose of the fruit is to disperse the seed so that it stands a better chance of growing to maturity.

3

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

Based on **pages 8 and 9** of *Life cycles*

The parts of flowers



Try this...

1. Look at this diagram. It shows you the main parts of a flower. Read the notes about the diagram.

Notes

Some flowers do not have a single ovary as shown here. They have a group of small ovaries. Each one has a stigma.

Some flowers, such as the daisy and dandelion, have a different structure from the flower shown in the diagram.

2. Look at different flowers and, for each one, record the number of sepals, petals and stamens in the table. Also record whether there is a single ovary in the middle of the flower ('s') or a group of ovaries ('g'). If you cannot identify the flower, give it a letter such as A or B, and enter that in the table.

Flower	No. of sepals	No. of petals	No. of stamen	Ovary 's' or 'g'

Looking at the results.

3. What do the results show?

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 8 and 9** of *Life cycles*

Introducing the activity

(a) You may wish to begin by showing the children a daisy and a dandelion. Tell them that although we think of them as individual flowers, each one is really a group of flowers on one stalk. You could pull individual florets off a dandelion to illustrate the point. Tell the children that they are going to look at the structure of different flowers (see note (i)).

Using the sheet

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

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

(d) Let the children try task 3.

Completing the activity

(e) If the children have been examining the same kinds of flowers they can compare their results. They may find that different flowers of the same kind have different numbers of parts. If the children have each been examining different kinds of flowers, they can present their results to the rest of the class.

(f) You may wish to extend the activity by grouping the flowers according to their colour. You may also wish to compare the shapes of the petals of the various flowers that the children have examined.

Conclusion

Each kind of plant has a distinctive flower. The flowers may vary in the number of parts they have.

Teaching notes

This practical is for the more able children only.

(i) Daisies, dandelions, sunflowers and many garden plants have 'flowers' which are really made up of a group of flowers on one stalk. It is important for children to know this at the outset so they do not attempt to examine flowers which are really flower heads.

(ii) For simplicity, the ovary and stigmas are described separately. In fact, together with the style they form a unit called a carpel. Some secondary sources may refer to this.

(iii) Let the children start with a flower, such as the wallflower, which is large and shows the structures clearly. If you wish the children to look at the flowers of weeds, such as the shepherd's purse, let them use magnifying glasses.

Some flowering plants, such as daffodils, do not have sepals but instead emerge from a protective sheath of green tissue.

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

See **pages 10 and 11** of *Life cycles*

How seeds are scattered

Plants have a range of ways of spreading their seeds. They may use the wind, animals or even water.

Q1. (a) In box A draw two seedlings growing apart. Show them as bushy plants with roots that do not mix.

(b) In box B draw four seedlings growing together. Show them as spindly plants next to one another, with their roots sharing the same space.

(c) From these drawings, explain why it is an advantage for seeds to spread out?

A	**B**

✎.....

✎.....

✎.....

Q2. What word is used to describe seeds being carried away from a plant?

✎.....

Q3. Why are fruits attractive to animals?

✎.....

Q4. Why are seeds not digested by animals?

✎.....

Q5. How can fruits hitch a ride?

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 10 and 11** of *Life cycles*

Answers

1. **(a) The two seedlings should be drawn as described.**

   (b) The four seedlings should be drawn as described.

   (c) Seeds that spread out can get the most from the soil and light and so develop strong roots and leaves.

2. **Dispersed.**

3. **They are brightly coloured and tasty to eat.**

4. **Because they have a tough coat.**

5. **By growing hooks on their surfaces which can attach themselves to fur or feathers.**

Complementary work

(a) The children can examine parachute fruits with a magnifying glass and see how far they go when they are given a gentle blow. Some of the hairs of the parachute could be removed, and the seed blown again to see how the hairs help the seed move.

(b) The children could visit alder trees in the winter time. Alders grow near water. They are unusual in that they are flowering plants, but they produce their seeds in cones. In winter the cones open and the seeds fall out. Each seed is a tiny nut with two hollow wings. The wings help the seed to move through the air and float on water so it can be dispersed in two ways.

Teaching notes

There are three kinds of fruits – false fruits, succulent fruits and dry fruits. A false fruit has a fleshy part made from the top of the flower stalk, or receptacle. It grows up around the ovary. Apples and pears are false fruits. Succulent fruits are true fruits. Some succulent fruits (called drupes) contain a single seed enclosed in a woody case called a stone. This is surrounded by juicy flesh. The plum and the peach are examples of drupes. Some succulent fruits (called berries) do not have a stone, but have many seeds. The orange and the tomato are examples of berries.

Dry fruits are also called true fruits. Some dry fruits split open when they are ripe. The lupin and poppy are examples of this kind of fruit. Other dry fruits do not split open. Some dry fruits, such as the acorn and hazel, are called nuts. Buttercup fruits are dry fruits. They form a knobbly cluster at the centre of the flower. Cereal grains are also dry fruits.

The poppy is also an example of a wind-dispersed fruit, although it does not have a wing or a parachute. The top of the fruit opens as the fruit swings about in the wind. As it swings it releases seeds like pepper from a pepper pot.

Some dry fruits split open as they mature. The force generated by the splitting fruit spits out the seeds. These fruits are sometimes called explosive fruits. The lupin and the balsam are examples of explosive fruits.

4

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

Based on **pages 10 and 11** of *Life cycles*

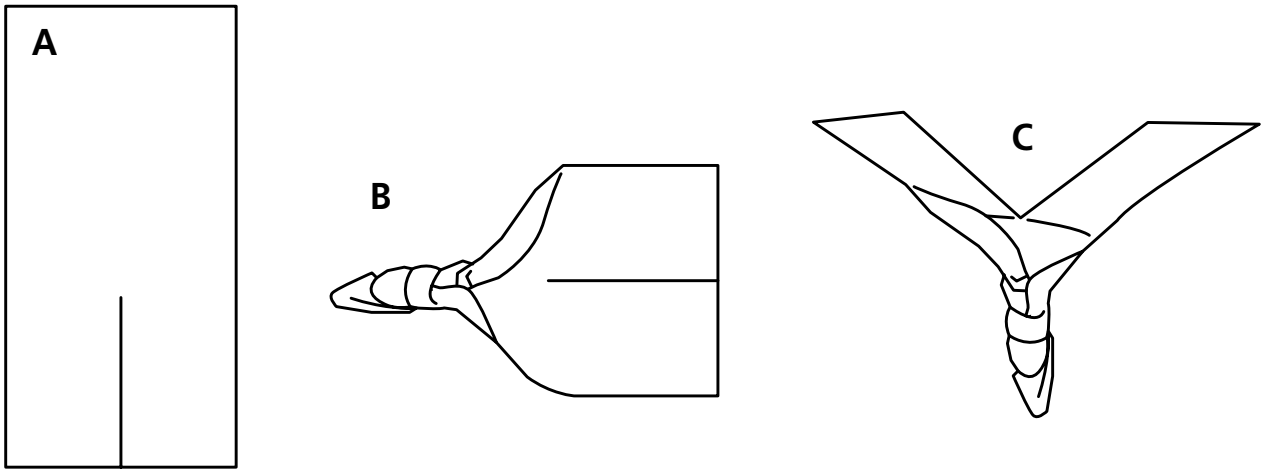
Investigating winged fruit

Try this...

1. You can make models of winged fruits in the following way.

First cut out a piece of paper 8cm long by 4cm wide.

2. Measure 2cm in from one end, and draw a line 3cm long, as in Diagram A.



3. Cut down the 3cm line.

4. Twist the remaining 5cm of paper as in Diagram B. This makes the body of the fruit.

5. Bend the two 'wings' round as shown in Diagram C. Make sure each one is twisted slightly upwards.

6. Hold up the model above the ground and let it go. For how much of its flight does it spin?

7. Repeat step 6 twice more and record your observations.

8. Repeat steps 1 to 7 using models with the same wing width but different wing and body lengths.

Looking at the results.

9. What do your results show?

✎.....

Teacher's sheet: activity

Based on **pages 10 and 11** of *Life cycles*

Introducing the activity

(a) Ask the children if they have seen any fruits spin as they leave a plant. Look for answers about the spinning fruits of the sycamore or the lime. Tell the children that spinning helps to keep the fruit in the air and increase its chances of being blown away by the wind. Tell the children that scientists sometimes make models when they are making investigations and in this activity they are going to make model winged fruits which may spin.

Using the sheet

(b) Give out the sheet and let the children fill in their names and form, then go through tasks 1 to 5 (see note (i)).

(c) Let the children perform tasks 1 to 5.

(d) Go through task 6, then let the children try it (see note (ii)).

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

(f) Let the children try tasks 8 and 9.

Completing the activity

(g) Let the children present their results to the class, perhaps with demonstrations of good and poor spinners.

Conclusion

The model prepared from the sheet is a good spinner but its wings need to be twisted a little. Some models with smaller wings and bodies did not spin as well. Some models with longer wings and bodies did not spin as well.

Teaching notes

(i) This is a very simple spinner which does not need a paperclip weight. The children need to take care when they are twisting up the body so that they do not tear the paper around the wings. It is important to twist the wings as the diagram shows. Later in the activity you could ask children to see if flat wings work better – they don't.

(ii) The children should express their answer as for half the time, a quarter of the time, and so on. The model may only spin in the last half or quarter of its flight and the children should make a note to this effect.

(iii) You may feel the need to stress the importance of repeating investigations. The children could record their observations in a table (see example below), adding additional rows for task 8.

Wing length (cm)	Trial	Length of spin
3	1	
3	2	
3	3	

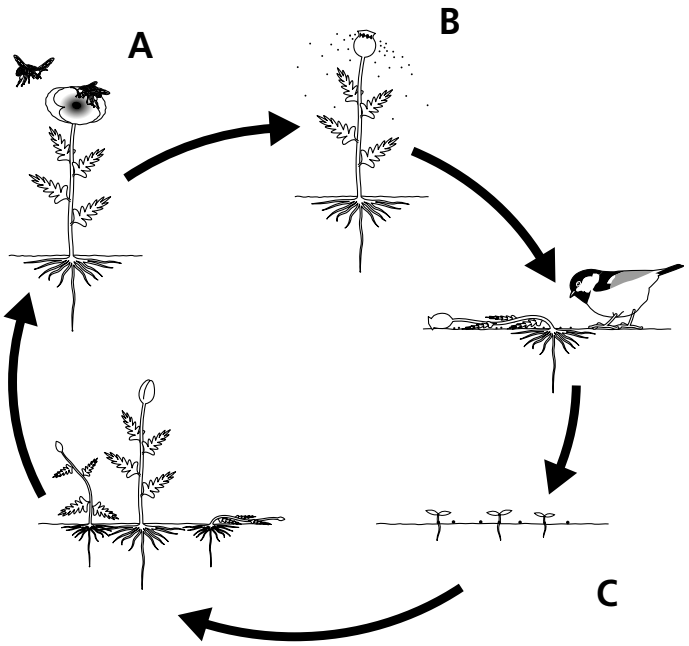
5

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

See **pages 12 and 13** of *Life cycles*

How plants survive

If a plant is to get through its life cycle, it has to have ways of staying alive and getting its seeds to thrive.



Q1. What processes take place at A?

✎.....

✎.....

✎.....

Q2. What processes take place at B?

✎.....

✎.....

✎.....

Q3. What processes take place at C?

✎.....

Q4. What kind of plant has a life cycle that stretches over many years?

✎.....

Q5. What animals help to disperse acorns?

✎.....

Q6. What may damage or destroy an oak seedling as it grows?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 12 and 13** of *Life cycles*

Answers

1. **The plant flowers and pollen is transferred by insects.**
2. **The poppy is fertilised, the seed pod grows and the seeds are dispersed by wind.**
3. **Germination.**
4. **A perennial plant.**
5. **Squirrels and birds.**
6. **It may be eaten by deer and caterpillars.**

Complementary work

(a) The children can use secondary sources to find out how daffodils survive from year to year.

Teaching notes

Some plants have life cycles which only last a few weeks. They are called ephemerals. Weed plants, such as the shepherd's purse, are ephemerals.

Many plants are annuals. They complete their life cycle in one year and the seed is left behind to begin its life cycle in the following year.

A few plants are biennials. They take two years to complete their life cycle. In the first year the plant produces leaves and stores its food in part of its body such as the root. This body part then survives through the winter. In the following year the food stored in the root is used to produce leaves and flowers. The plant then sets seed and dies. The carrot, parsnip and beet are examples of biennials.

Many plants are perennials. They have a life cycle that lasts for many years. Some perennials have shoots that die back in the autumn, and they survive underground as bulbs, corms (a short, thick stem, similar to a bulb) or tubers which all contain food stores. Each year they use the stored food to grow new shoots. The grass plant is a perennial which does not die back completely and stays in leaf all year round. Trees are perennials which keep their food stores above ground in the wood in their trunks and branches.

5

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

Based on **pages 12 and 13** of *Life cycles*

Can a dandelion survive?

Try this...

1. Collect a dandelion and its long tap root. In the space below draw what you see.

2. Draw lines across your drawing to divide the root into four pieces.

3. Ask your teacher to cut up your dandelion root using the lines on your drawing as a guide.

4. Plant the four pieces of dandelion root in a pot of soil. Next to each piece place a stick to mark its position.

5. Make a prediction about what will happen to the pieces of dandelion root.

✎.....

6. Give a reason for your prediction.

✎.....

7. Add water regularly over the next few weeks to make sure the soil does not dry out.

8. Check the plant pot regularly and record any changes that you see on the surface of the soil.

Looking at the results.

9. What conclusions can you draw from your investigations?

✎.....

Teacher's sheet: activity

Based on **pages 12 and 13** of *Life cycles*

Introducing the activity

(a) Remind the children of the dangers a plant faces as it tries to complete its life cycle. Ask the children what happens when a plant gets cut to pieces, and look for an answer about it being killed. Present the children with a dandelion plant which has a long tap root. Tell them that the plant stores food in its root and they are going to find out what happens when a root is cut up and buried.

Using the sheet

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

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

(d) Let the children try task 3 (see note (i)).

(e) Go through task 4 and let the children try it.

(f) Let the children try tasks 5 and 6 (see note (ii)).

(g) Let the children perform tasks 7 and 8, as appropriate.

(h) Let the children try task 9.

Completing the activity

(i) Let the children compare their conclusions.

Conclusion

If a dandelion root is cut up, the pieces are capable of growing into new plants.

Teaching notes

(i) You may let the children do this for themselves if they are mature enough and the correct level of supervision can be given.

(ii) Look for the children predicting that the root will grow a new shoot because it has a store of food it can use. Some children may say that the root may grow into new plants because the dandelion is a difficult weed to remove from a garden.

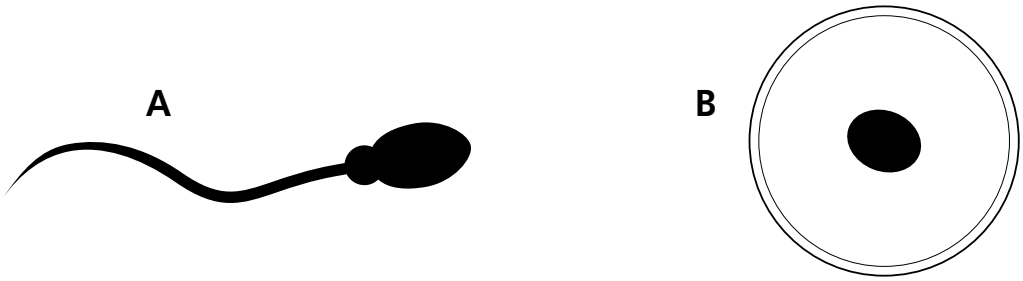
6

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

See **pages 14 and 15** of *Life cycles*

A new human life begins

Human life depends on passing chemical instructions to new cells.



Q1. (a) What are A and B? A ✎..... B ✎.....

(b) Which one is produced by a male and which one is produced by a female?

Male ✎..... Female ✎.....

Q2. What is the round object in A and inside B? ✎.....

Q3. The round object contains thread-like structures. What are these structures?

✎.....

Q4. The thread-like structures contain instructions for making new humans. What are the instructions called?

✎.....

Q5. What happens to A and B in the process of fertilisation?

✎.....

✎.....

✎.....

✎.....

✎.....

Q6. What happens after fertilisation?

✎.....

✎.....

6 Teacher's sheet: comprehension

See **pages 14 and 15** of *Life cycles*

Answers

1. **(a) A = sperm; B = egg.**

   (b) Male – sperm; female – egg.

2. **Nucleus.**

3. **Chromosomes.**

4. **Genes.**

5. **The sperm swims to the egg. The nucleus of the sperm fuses with the nucleus of the egg. The genes from each parent combine to form a complete set of instructions.**

6. **The fertilised egg divides to produce cells and eventually a baby.**

Complementary work

(a) The children can look at photographs of embryos taken with an ultrasound scanner and see if they can identify parts of the body.

Teaching notes

DNA stands for deoxyribonucleic acid. DNA forms long strands which contain lines of chemicals that form messages or instructions for the cell. DNA forms the chromosomes, which are found in the centre of the cell, called the nucleus. Copies are made of the instructions on the chromosomes and these are taken outside the nucleus to structures in the cell called ribosomes. These structures 'read' the instructions and assemble chemicals, such as proteins, which are used to build up parts of the body. In the introductory activity to the unit this action was greatly simplified, but it shows the children the link between DNA and body structure and function.

When a cell divides it makes copies of the chromosomes so that the two daughter cells get the same instructions. All the cells in the body have the same set of instructions. Each cell only uses certain instructions. Those in the skin, for example, only use instructions which make them into skin cells.

Everyone has their own individual set of DNA. This is why DNA can be used as a kind of fingerprint to identify people.

6

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

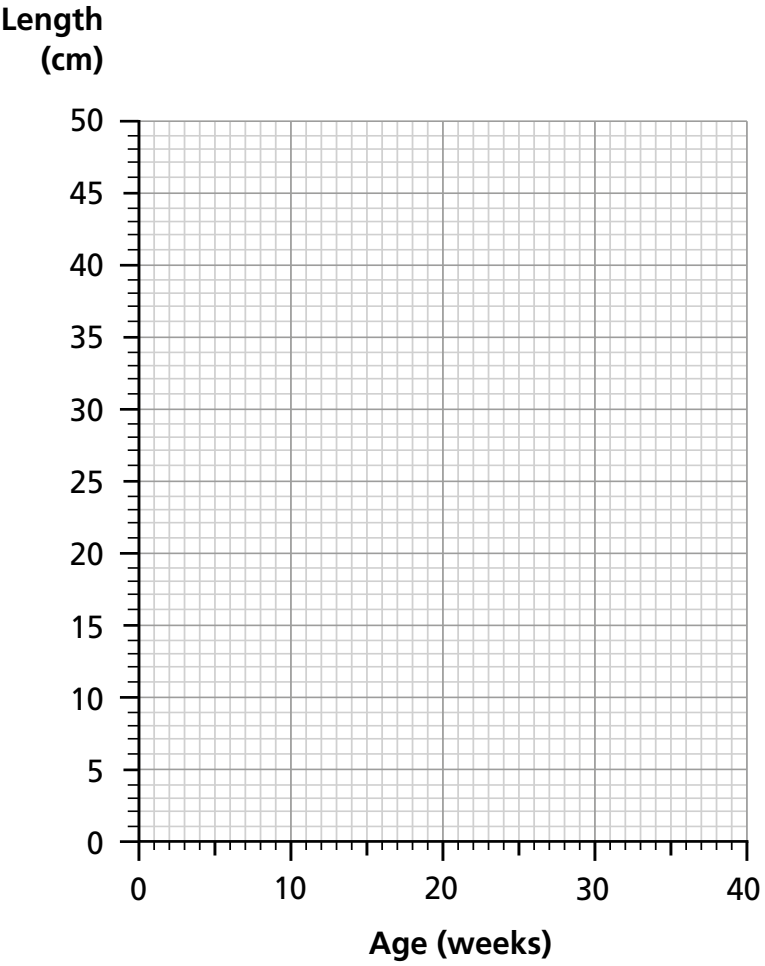
Based on **pages 14 and 15** of *Life cycles*

The growth of a baby

Try this…

1. The table shows how the length of a baby's body changed as it grew inside its mother.

Age (weeks)	Length (cm)
0	0
8	2
10	6
20	20
30	28
38	48



Answer these questions about the table above.

(i) How much did the baby grow between week 8 and week 10?

✎.....

(ii) How much did the baby grow between week 20 and week 38?

✎.....

2. Mark on the graph above the length of the baby at weeks 0, 8, 10, 20, 30 and 38. Draw a line joining up the points you have marked.

3. Answer these questions about the graph.

(iii) At age 15 weeks, what was the length of the baby? ✎.....

(iv) At age 25 weeks, what was the length of the baby? ✎.....

(v) At age 35 weeks, what was the length of the baby? ✎.....

Teacher's sheet: activity

Based on **pages 14 and 15** of *Life cycles*

Introducing the activity

(a) Tell the children that the baby develops inside its mother in a structure called the womb (see note (i)). You may add that the baby gets its food from its mother's blood and uses the food to grow. Remind the children that they may have a growth chart in their home on a wall which they use to measure their own growth and now they are going to look at some data which records the growth of a baby in the womb.

Using the sheet

(b) Give the children the sheet, let them write their names and form on it, then go through task 1 with them.

(c) Let the children carry out task 1.

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

(e) Go through task 3.

(f) Let the children try task 3.

Completing the activity

(g) Let the children compare their answers.

(h) If some children have a record of their growth on a chart at home ask them to bring the charts in. You may wish them to convert the data on their charts into line graphs if each height has a date. The children could then extract data from their graphs to reinforce the skills they have acquired in answering questions (iii) to (v).

Conclusion

(i) 4cm.

(ii) 28cm.

(iii) 13cm

(iv) 24cm

(v) 40cm.

Teaching notes

(i) Some children may think that the baby develops in the stomach and they will need guidance on where it actually forms.

(ii) You may have to show them how to plot the graph and how to find the answers to question 3 if they have not done work of this kind before.

7

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

See **pages 16 and 17** of *Life cycles*

Growing older

As people grow older, they change shape. At first they get taller and thinner compared to their height, then later on they get shorter again.

Age	Height (cm)	Weight (Kg)
6		
8		
11		

Q1. The table above has been set up to record the heights and weights of three people. Their heights and weights have been mixed up below. Sort them out and fill in the table correctly.

Heights – 152cm, 113cm, 129cm **Weights – 32kg, 54kg, 20kg**

Q2. Why does your face get narrower as you get older?

✎.....

Q3. (a) When do girls start to grow quickly? ✎.....

(b) When do boys start to grow quickly? ✎.....

Q4. As you grow, your size and shape change in two ways. What are they?

✎..... ✎.....

Q5. How do your feet change as you get older?

✎.....

Q6. How does the body of a person in their twenties compare with the body of a person in their sixties?

✎.....

✎.....

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 16 and 17** of *Life cycles*

Answers

1. **The heights in column 2 should be arranged downwards as 113, 129, 152. The weights in column 3 should be arranged downwards as 20, 32, 54.**
2. **The head grows taller.**
3. **(a) 10 or 11 years old, (b) 13 to 15 years old.**
4. **You grow tall then fill out.**
5. **They get longer compared to their width.**
6. **A person in their twenties is at their tallest and strongest. A person in their sixties is getting shorter, as the bones shrink and the muscles become less powerful.**

Complementary work

(a) If any children have young pets such as puppies, kittens, or guinea pigs, they may like to weigh them at home regularly and provide data on their growth for the class to use in plotting graphs.

(b) The children could use secondary sources to find out how a tree trunk grows thicker.

Teaching notes

As children grow at different rates, this topic needs treating with sensitivity. It is important to stress that variation is natural.

There are four types of growth:

1. Some living things grow to a certain body size, or stop growing when they reach a certain age. Among plants, annuals have this type of growth. Mammals and birds are examples of animals with this type of growth.

2. Some living things continue growing throughout their lives and may become very large. Trees, bushes, coral, fish and reptiles are examples of living things with this type of growth.

3. Some animals grow in stages. Insects and crustaceans (such as crabs and lobsters) grow in this way.

4. In some living things, one part grows at a different rate, or at a different time, to other parts. For example, when a plant is mature, its flowers grow faster than its leaves. In humans, the reproductive organs grow rapidly in the early teens.

7

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

Based on **pages 16 and 17** of *Life cycles*

Comparing growth

Try this…

1. Read the following passage.

From the age of nine, Arthur and Belinda's heights are measured every year until they are sixteen. The results of these measurements are recorded in this table.

Age (years)	Arthur's height (cm)	Belinda's height (cm)
10	140	138
11	144	145
12	149	152
13	155	157
14	163	160
15	168	162
16	171	163

2. Make a line graph of Arthur's height.

3. On the same graph, make a line graph of Belinda's height.

4. Use the graph to find out when Belinda began to grow taller than Arthur. Write down Belinda's age at this time here. ✎.....

5. Use the graph to find out when Arthur began to grow taller than Belinda again. Write down Arthur's age at this time here. ✎.....

Teacher's sheet: activity

Based on **pages 16 and 17** of *Life cycles*

Introducing the activity

(a) Ask the children if any of them have measured their own growth. Look for answers that some children have used a growth chart on their bedroom wall (see note (i)). Tell the children they are going to study the growth of a boy and a girl from age 9 to 16 (see note (ii)).

Using the sheet

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

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

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

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

Completing the lesson

(f) Let the children compare their answers to tasks 4 and 5.

Conclusion

Both children were growing at nearly the same rate between ages nine and 10. Between the age of 10 and 11, Belinda had grown to the same height as Arthur, and continued to grow taller than him for about three years. During Arthur's thirteenth year, he grew to the same height as Belinda, and from that time onwards he continued to grow taller than Belinda. Belinda only grew a small amount after age 13, while Arthur grew by a large amount.

Teaching notes

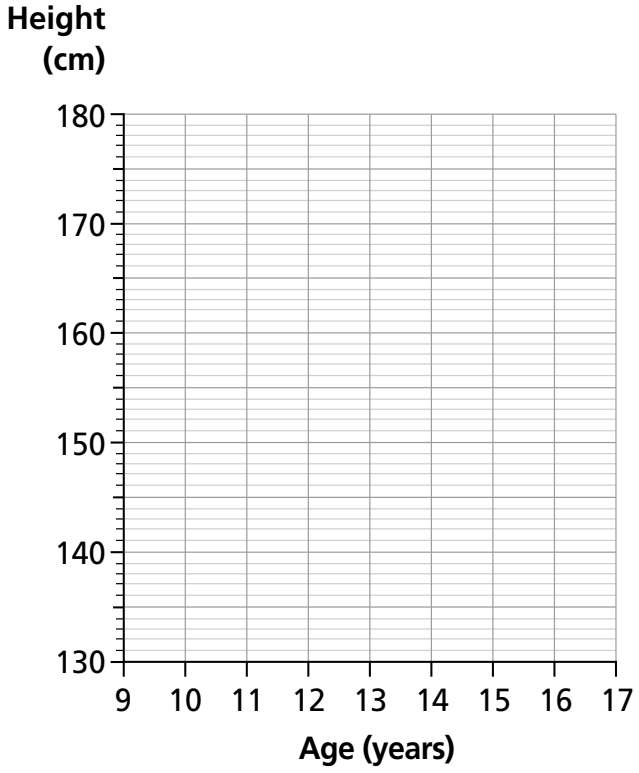
(i) If any children have kept a record of their changes in height ask them to bring in their data and talk about how frequently they were measured and how they were measured (against a wall, with a tape measure, etc).

(ii) The children are made-up but their heights follow the average trend of growth of people at this time in their life. It is important to stress that there is a great deal of variation in height among the people in a class and that this is natural. Also, different people have growth spurts at different times, and this is natural too.

(iii) The X axis could start at 130cm and the Y axis at 9 years (see example below).

(iv) Some children have difficulty adding a second line to a graph and may need help. Make sure that the two lines are different colours.

(v) Some children may have difficulty reading information from a graph and may need help.



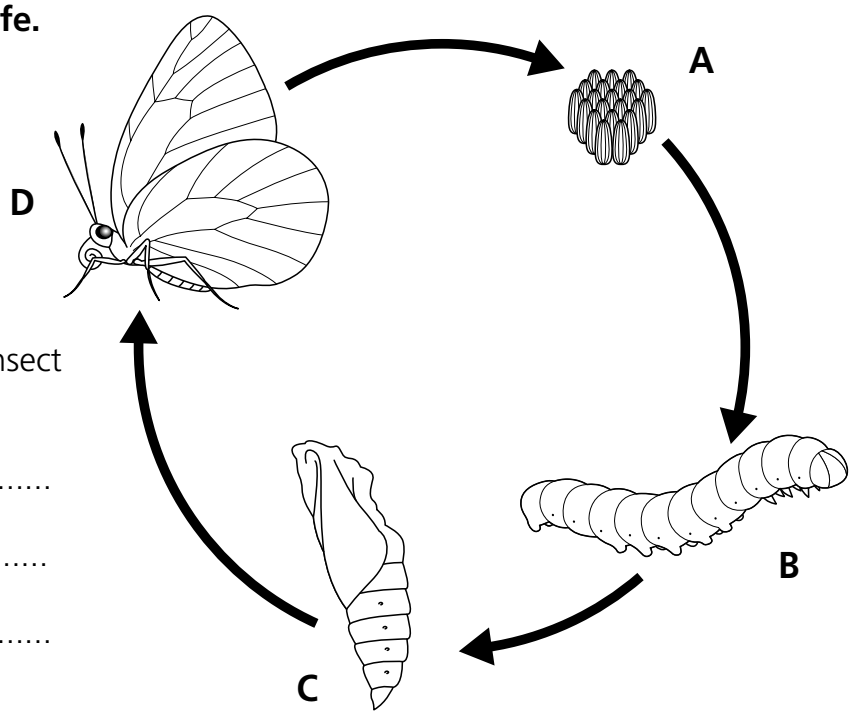
8

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

See **pages 18 and 19** of *Life cycles*

The life cycle of an insect

Insects do not grow up steadily like people. Instead, they change shape completely at different stages in their life.



Q1. Name the stages of the insect life cycle labelled A to D.

A ✎.....

B ✎.....

C ✎.....

D ✎.....

Q2. In what form does a butterfly spend most of its life?

✎.....

Q3. Why can't insects grow steadily like we do?

✎.....

✎.....

Q4. What happens when an insect moults?

✎.....

Q5. Why does an insect pump itself up after it moults?

✎.....

Q6. What does a newly formed butterfly do before it flies away?

✎.....

Teacher's sheet: comprehension

See **pages 18 and 19** of *Life cycles*

Answers

1. **A = egg; B = larva; C = pupa; D = adult.**
2. **As a caterpillar.**
3. **They have a hard outer skin that does not stretch.**
4. **It gets rid of (sheds) its old skin.**
5. **To stretch its new skin before it hardens.**
6. **Lets its wings dry for a few minutes.**

Complementary work

(a) The children could keep a colony of stick insects. The common stick insect feeds mainly on privet, roses and blackberry leaves. The eggs can be told apart from the droppings because they look like little barrels with a light coloured top.

When the eggs hatch, the children could carefully measure the lengths of the nymphs. They could measure their lengths every week as they grow. If a binocular microscope is available, the children could use it to look at the skins after they are shed.

(b) The children could look under nasturtium leaves in a garden for the eggs and larvae of the small, white butterfly. They could make regular observations on the growth of the caterpillars.

Teaching notes

It may be useful to think of insects in terms of their evolution. The first insects had a life cycle, similar to the grasshopper, in which the young hatched from the egg and were similar in body to the adults, but without wings and reproductive organs. This is called incomplete metamorphosis. This type of immature insect is called a nymph. They grow by moulting their skin (which is also their skeleton). With each moult they grow some adult organs. On the last moult they receive their reproductive organs and full wings. Examples of insects with this 'primitive' life cycle are cockroaches, grasshoppers and locusts. Aquatic insects such as the dragonfly and may fly also have young in the form of nymphs.

In complete metamorphosis, the insect changes its form completely between the larva stage and the adult stage of life. These more 'modern' insects have a life cycle like that of the butterfly. Other insects with this type of life cycle include beetles, moths and flies. In these insects the larva eats a lot to store energy, then builds a cocoon and, inside the cocoon, changes into the adult form. Adults generally reproduce and then die shortly after.

The greenfly, or aphid, grows by incomplete metamorphosis, but the greenfly has taken it a stage further. The eggs hatch inside the female greenfly and the nymphs feed on the mother's body.

The stick insect also grows by incomplete metamorphosis. In some kinds of stick insects, the females can produce fertile eggs without mating, and males are rare. The common stick insect kept in classrooms is an example of this kind.

Children must not examine hairy caterpillars as some of them are poisonous.

8

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

Based on **pages 18 and 19** of *Life cycles*

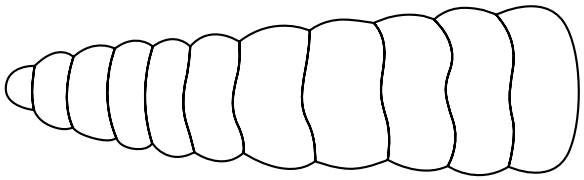
Making model insects

Try this…

1. Diagram 1 shows the larva of a fly. It is called a maggot.

Use Plasticine to make a model maggot. To do this, make up 11 discs of Plasticine and then stick them together.

Diagram 1



2. Diagrams 2 and 3 show you how to make a fly from Plasticine. First make up three oval pieces and stick them end to end. Then roll out some long rods and use them to make the six legs. Lastly, flatten two pieces and stick them to the top to make wings. Use a picture of a fly to help you see what it looks like.

Diagram 2

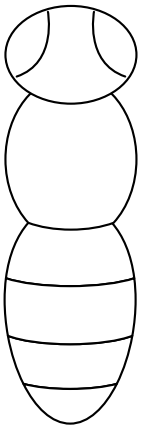
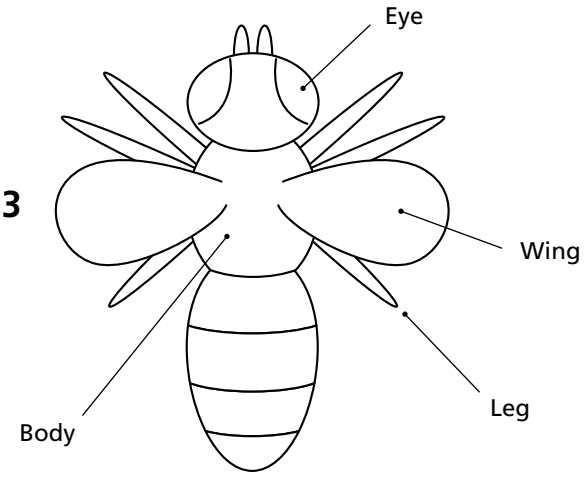


Diagram 3



3. Look at the two models and write down how the insect body changes as it grows from a larva to an adult.

✎.....

✎.....

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 18 and 19** of *Life cycles*

Introducing the activity

(a) Tell the children they are going to study maggots and flies but are not going to touch either of them.

Using the sheet

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

(c) Let the children try task 1.

(d) Go through task 2 with the children and then let them try it.

(e) Go through task 3 with the children and let them try it (see note (ii)).

Completing the activity

(f) The children could make a display of their models. They could use secondary sources to find out about the other two stages in the life cycle of the fly and make models of them. All four models could then be arranged in a life cycle.

Conclusion

A maggot has a body made up of eleven segments. It has a pointed head end and a wider back end. It does not have any legs or wings (see note (iii)). When a maggot changes into an adult fly its body forms a head, a thorax and an abdomen. On the head are a pair of large eyes and a pair of antennae. On the underside of the thorax are three pairs of long legs. On the top of the thorax are a pair of wings (see note (iv)).

Teaching notes

(i) The models that are made will not be natural size. Choose a size to fit the ability of the children.

(ii) You may like to use the word feeler instead of antennae. In the fly the antennae are only short and not used for feeling the way, as are the antennae of some other insects, such as cockroaches.

(iii) The maggot is wedge-shaped. This shape helps it burrow into its food. The maggot does not have eyes, but instead has a light sensitive patch which it uses to sample light by swinging its head to and fro.

(iv) Some children may notice from photographs that the abdomen is divided into parts called segments which look a little like the segments in a maggot. The thorax is divided into three segments, but they are more difficult to see. A pair of legs is attached to each segment and the wings are attached to the middle segment. The head is made of a number of segments which have been fused together.

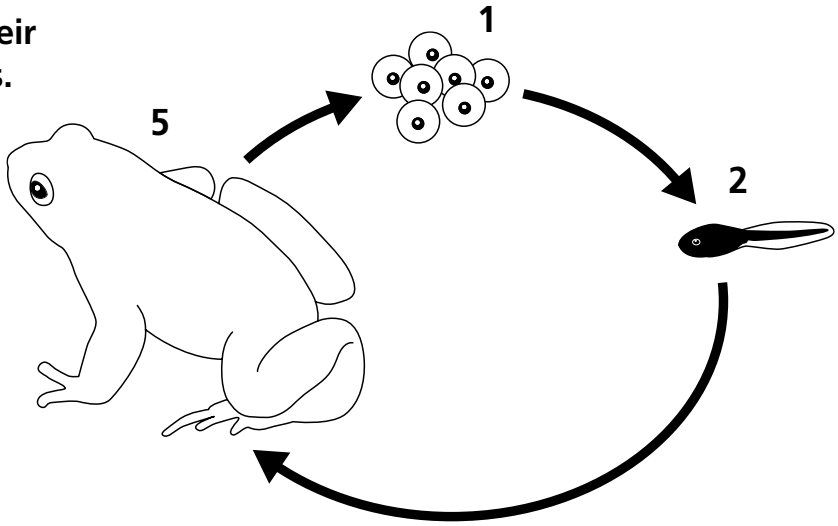
9

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

See **pages 20 and 21** of *Life cycles*

The life cycle of a frog

Frogs live the first part of their lives underwater as tadpoles. Then they lose their gills and begin to breathe air.



4

3

Q1. The diagram shows the life cycle of the frog. Draw how the frog appears at stages 3 and 4.

Q2. What is a clump of frog eggs called?

✎.....

Q3. (a) How long does it take a tadpole to form inside an egg? ✎.....

(b) How long do frogs remain in water as tadpoles? ✎.....

(c) How long does it take for a frog to grow into an adult? ✎.....

Q4. What is the first food of tadpoles? ✎.....

Q5. When a frog grows legs, which legs grow first? ✎.....

Q6. Why does a tadpole thrash about as it swims, rather than moving like a fish?

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 20 and 21** of *Life cycles*

Answers

1. **The stage 3 tadpole should have four limbs and a long tail. The stage 4 tadpole should have four limbs and a shorter tail.**
2. **Frog spawn.**
3. **(a) 10 days; (ii) about three months; (c) four years.**
4. **Algae.**
5. **The back legs grow first.**
6. **It does not have fins like a fish. The fins help the fish control its movements.**

Complementary work

(a) The children could use secondary sources to find out about toads, newts and salamanders.

Teaching notes

The frog belongs to a group of animals called Amphibia. Other members of this group are toads, newts, salamanders and some snake-like creatures, called caecilians, which live in the soil on the floors of tropical rainforests.

It is easy to tell the difference between frog and toad spawn. Frogs lay their spawn in clumps and toads lay their spawn as long threads. Newts lay single eggs on a leaf, and wrap the leaf around it for protection.

The jelly in the spawn protects the developing tadpoles by making it difficult for predators to eat the spawn. Should the spawn temporarily come to rest on land, the jelly keeps the developing tadpoles moist.

Some amphibians, such as the midwife toad, keep their eggs with them until they hatch. In the case of the midwife toad, the eggs are kept on the male's back until they hatch.

Tree frogs are a common animal in tropical rainforests, even though there are no pools or lakes nearby for breeding. Some rainforest plants which grow high on the branches of the trees have leaves which form in a container-shape and hold water. The tree frogs lay their eggs in this water and the tadpoles develop there.

9

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

Based on **pages 20 and 21** of *Life cycles*

Studying tadpoles

Try this…

1. Your teacher will provide you with some frog spawn. Look at the frog spawn and draw one of the eggs here.

2. After a few days, look at the frog spawn again and draw an egg again.

3. Draw a tadpole when it has newly hatched.

4. Draw a tadpole when it is one week old.

5. Draw a tadpole when it is three weeks old.

6. Make a chart to record how quickly the tadpole grows and begins to form legs. Examine the tadpoles frequently and make a record in your chart each time you make an observation. Try to measure the tadpole's length, but be careful that you do not touch them (you could hold a ruler above the tadpole).

7. Use your chart to describe how a tadpole changes into a frog.

✎.....

✎.....

9 Teacher's sheet: activity

Based on **pages 20 and 21** of *Life cycles*

Introducing the activity

(a) Show the children some frog spawn. Tell them that only a small amount has been collected and that in the next few weeks they are going to study the development of the tadpoles, then return them to the wild (see note (i)).

Using the sheet

(b) Give out the sheet and let the children write their names and form, then go through task 1 and let the children try it (see note (ii).

(c) Let the children try tasks 2 to 5 at appropriate times (see note (iii)).

(d) Go through task 6, then let the children try it (see note (iv)).

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

Completing the activity

(f) If the children have been studying separate tanks of tadpoles as groups, each group could report their findings to the whole class. If they have been using the same tank, they could make a display of their work (see note (vi)).

Conclusion

You can see a tadpole developing inside the frog spawn. When the tadpole hatches it has suckers to hold it in place and grows gills on the outside of its body. By the time the tadpole is a week old it has a well-developed tail and a spiral intestine on its underside. (This is used for digesting its food.) By three weeks of age the tadpole has lost its suckers and the gills on the outside of the body.

Teaching notes

(i) You may like to use this activity in connection with the next unit – 'Avoiding extinction'. You could use it to introduce the next unit, or as an example of helping to improve the chances of tadpoles reaching maturity by keeping them away from predators at an early stage in their life cycle.

At first the tadpoles will eat their jelly, then feed on algae growing on water plants. When the legs begin to develop they need to be offered a small piece of meat. This should be removed when the tadpoles are not feeding and replaced with a fresh piece.

(ii) The children will need to use magnifying glasses in all their observations. The frog spawn needs to be quite fresh, so the eggs appear as black dots.

(iii) The children should see the spawn becoming comma shaped, or even see the tadpoles inside the jelly.

(iv) They could make a chart in the form of a calendar. It will need to cover the next eight or nine weeks.

(v) The children should write about the development of the legs. They may also describe the change in head shape. If they can measure the length of the tadpoles, they can record this, too.

(vi) The children should use secondary sources to check their observations on how a frog develops. Briefly, the hind legs grow at about 8 weeks, the front left leg at 10 to 11 weeks and the front right leg at 12 weeks.

10

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

See **pages 22 and 23** of *Life cycles*

Avoiding extinction

Living things only survive over time if they can breed and replace themselves.

Animal	Lifespan (years)
Red fox	8
Boa constrictor snake	40
African elephant	75

Q1. Use the information in the table above to draw a bar chart of lifespans.

Q2. State three things which can cause an animal to die early.

✎..... ✎..... ✎.....

Q3. What word describes a group of animals that have died out? ✎.....

Q4. What kind of animal suffers first when humans move into an area to make farms and towns?

✎.....

✎.....

Q5. (a) What was the original purpose of zoos?

✎.....

(b) What are the purposes of zoos today?

✎.....

✎.....

Q6. What is a wilderness area?

✎.....

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 22 and 23** of *Life cycles*

Answers

1. **The lengths of the bars should be accurate (see example below).**
2. **Lack of food, lack of water, eaten by animals, accident, attacked by disease.**
3. **Extinct.**
4. **Animals that need large territories or eat only a small range of foods.**
5. **(a) They were collections of animals to amuse curious people; (b) They save animals from extinction and educate people about the importance of animals.**
6. **A large area of land set aside for wildlife. In these areas large animals do not compete with people and so can thrive.**

Complementary work

(a) The children can use secondary sources to find out about the success rates of zoos in avoiding the extinction of various species.

(b) The children can use secondary sources to find out about wilderness areas in other continents.

Teaching notes

It is important to make it clear that a species, or kind of living thing, exists as populations. This is the total number of individuals of the species in a given area.

The size of a population depends on the birth and death rates of the population, on the size of the area it has to live in, and on the availability of food. If the birth rate exceeds the death rate the population grows. If the two rates are the same the population stays the same, but if the death rate exceeds the birth rate, the size of the population falls. There are many species on the planet which have populations that are falling.

Living things which cannot breed quickly enough to replace the dead members of the population will face extinction.

Living things which need large territories to move around in are at risk now more than in the past. Some animals need large territories to find enough food or to mate, but much of the territory may be taken over by people.

If the territory is split up, individuals in each part may not be able to meet and breed.

In a larger population, the genes which make up the species are widely spread. In every species there are combinations of genes which produce defects which may cause an individual to die early. In a large population these genes are so widely spread that they rarely meet. As a population shrinks there is a greater chance of the genes combining to produce defects, and further increasing the death rate.

10

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

Based on **pages 22 and 23** of *Life cycles*

Saving the pando

Try this…

1. Read the following sentences about an imaginary animal, then calculate how its population will change.

The pando is an imaginary species of mammal. There are only 100 pando left in the world. In one year 20 pandos die and ten are born.

(i) What is the size of the population at the end of the year? ✎.....

In the following year twenty pandos die but only five are born.

(ii) What is the size of the population at the end of the year? ✎.....

It is expected that the pandos will lose 25 animals every year, and not breed from now on because they are too spread out in their habitat.

(iii) How long will it take for the pando to become extinct? ✎.....

2. Read the following sentences and answer the questions.

Twenty pandos are taken from the wild and bred in zoos. In the next five years the twenty pandos produce 5 offspring a year and none of the pandos in the zoos die.

(iv) How many pandos will be in zoos at the end of five years? ✎.....

The eighty pandos left in the wild are placed in a national park. In the next five years only five pandos die each year and twenty pandos are born each year.

(v) How many pandos are present in the national park after five years. ✎.....

(vi) What is the total world population of pandos after five years of breeding them in zoos and protecting them in a national park? ✎.....

Teacher's sheet: activity

Based on **pages 22 and 23** of *Life cycles*

Introducing the activity

(a) Tell the children they are going to make a study on the plight of the pando. This is an imaginary animal, but its name is based on two very real animals which are threatened with extinction. Ask the children to name them. Look for panda and rhino in the answer (see note (i)).

Using the sheet

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

(c) Let the children try task 1 (see note (ii)).

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

Completing the activity

(e) If the children have worked on their own, let them compare their results.

(f) Tell the children that the plight of the pando is not really fiction. There are thousands of animals and plants in danger of extinction at this moment, and for some it will be their final year of existence.

(g) Ask the children if they would like to become involved in a conservation exercise and organise a class group to set it up (see note (iii)).

Conclusion

(i) The size of the pando population after one year fell to 90.

(ii) The size of the pando population in the following year fell to 75.

(iii) The pando will be extinct in three years.

(iv) 45 pandos will be in zoos at the end of five years.

(v) 155 pandos will be in the national park in five years.

(vi) The world population of pandos will be 200 after five years.

Teaching notes

(i) There are several species of rhino and all are at risk of extinction. Some rhinos, such as the Java rhino (about 70 individuals) which live in rainforests, may become extinct while the children finish their education.

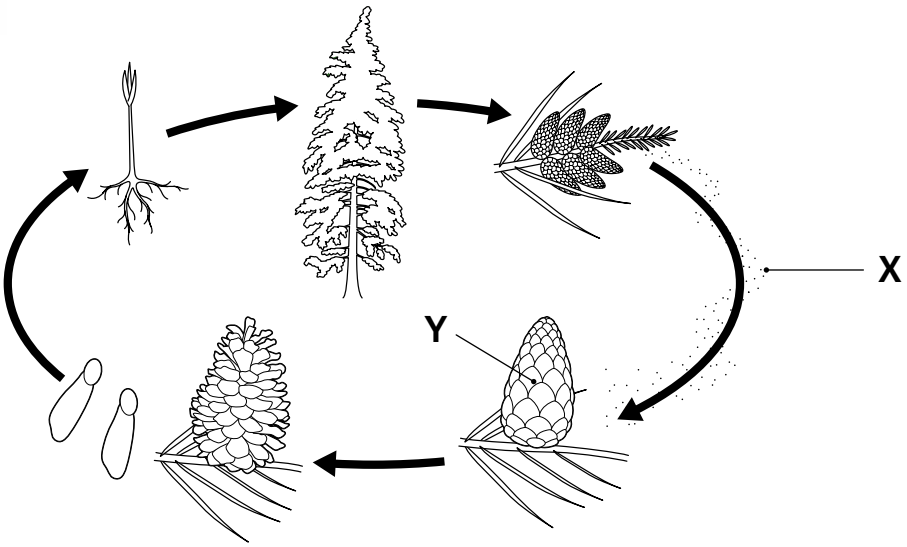
(ii) You may have to go through each exercise in task 1 with the children and stop and check their calculations at each stage.

(iii) The children may wish to sponsor a species at a zoo, help conserve a local area or become involved in a fundraising activity for conservation in another part of the world.

QUESTIONS

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

Q1.



(i) What is X? ✎.....

(ii) What is Y? ✎.....

(iii) On which kind of plant does Y grow? ✎.....

(iv) What develops inside Y? ✎.....

Q2. A seed falls to the ground and lands upside down. After a while it swells up.

(i) Why did the seed swell up?

✎.....

(ii) The seed coat splits open and the root grows out. What is the process that has taken place?

✎.....

(iii) Which way will the root grow?

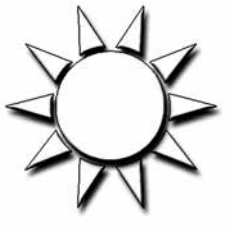
✎.....

(iv) What grows out of the seed after the root?

✎.....

(v) What is in the seed that allows the plant to grow?

✎.....



QUESTIONS

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

Q3. What is the male part of a flower called?

Tick one box: Petal ☐ Stamen ☐ Stigma ☐ Ovary ☐

Q4. Name one substance found in nectar.

Tick one box: Sugar ☐ Salt ☐ Acid ☐ Milk ☐

Q5. When does pollination take place? *Tick one box*:

☐ When a flower releases pollen.

☐ When pollen moves through the air.

☐ When an insect carries pollen.

☐ When pollen travels from one flower to another.

Q6. When does fertilisation take place? *Tick one box*:

☐ When a flower opens.

☐ After a flower has received pollen.

☐ Just after a seed has sprouted.

☐ When a plant dies.

Q7. What grows after fertilisation?

Tick one box: Pollen ☐ Petals ☐ An ovary ☐ Seeds ☐

Q8. A plant disperses its seeds.

(i) What happens to the seeds when they are dispersed?

✎.....

(ii) Why are seeds dispersed?

✎.....

✎.....

QUESTIONS

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

Q9. A seed is dispersed by the wind. Name something the seed may have to help the wind move it along.

✎.....

Q10. Jane has bought an annual plant and Ben has bought a perennial plant.

(i) Whose plant will live longer? ✎.....

(ii) Explain your answer.

✎.....

✎.....

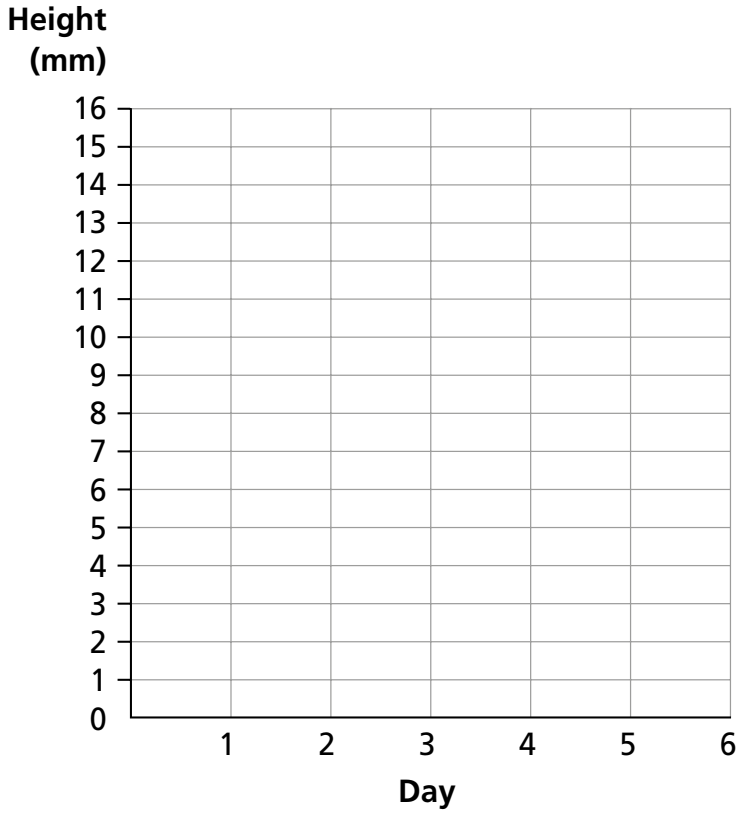
Q11. Arif grows a plant from a seed. He measures the height of the seedling every day for five days.

Day	Height (mm)
1	0
2	3
3	6
4	9
5	12

(i) Plot the results on this graph.

(ii) How tall would you expect the plant to be on day 6?

✎.....



QUESTIONS

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

Q12. Mina and Ben measured their heights each year for four years. They put their results in a table.

Year	Mina (cm)	Ben (cm)
1	122	124
2	128	130
3	133	134
4	139	139

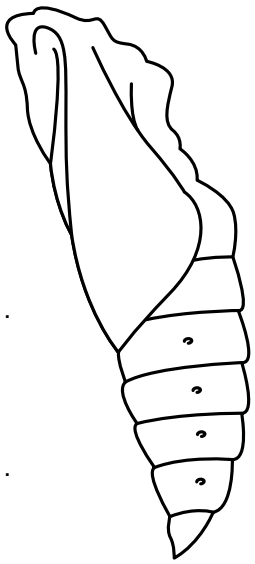
(i) What is the difference in height between Mina and Ben in year 1? ✎.....

(ii) How much did Mina grow between year 1 and year 2? ✎.....

(iii) Between which two years did Ben grow the most? ✎.....

(iv) Who grew the most between year 3 and 4? ✎.....

Q13.



(i) What is the object in the diagram?

✎.....

(ii) What made the object?

✎.....

(iii) What is going on inside the object?

✎.....

✎.....

(iv) In a few weeks the object will break open. What will come out?

✎.....

QUESTIONS

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

Q14. A butterfly and a caterpillar are feeding on the same plant.

(i) What is the food of the butterfly? ✎.....

(ii) What is the food of the caterpillar? ✎.....

(iii) One of them is about to lay some eggs. Which one is it?

✎.....

Q15. Jane measures the length of a stick insect. After the insect moults she measures it again. A little while later the insect moults again and Jane makes her third measurement. She recorded her measurements in a table.

Measurement	Length (mm)
1	12
2	18
3	29

(i) Present this data as a bar chart using this grid.

(ii) How much did the insect grow while Jane was studying it?

✎.....

QUESTIONS

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

Q16. (i) Where does a female frog lay her eggs?

✎.....

(ii) What process must take place for the eggs to develop into tadpoles?

✎.....

(iii) Arif watches young tadpoles and never sees them come to the water surface. How do they breathe underwater?

✎.....

(iv) A few weeks later Arif sees the tadpoles coming to the water surface and opening their mouths to breathe. What has happened to the tadpoles?

✎.....

Q17. Ben and Jane go to a zoo and see that the zoo is caring for a group of monkeys. This species of monkey is in danger of extinction.

(i) What will happen to the monkeys if they become extinct?

✎.....

Ben and Jane see that there are 12 monkeys in the group. The zoo keeper tells them that she expects the monkeys to produce 3 monkeys a year for the next three years, then five monkeys in the fourth year.

(ii) How many monkeys does the zoo keeper expect to have in four years time?

✎.....

ANSWERS

1. (i) Pollen. *1 mark*
(ii) Female cone. *1 mark*
(iii) Conifer *1 mark*
(iv) Seed. *1 mark*

2. (i) Because the seed took in water. *1 mark*
(ii) Germination. *1 mark*
(iii) Down. *1 mark*
(iv) Shoot. *1 mark*
(v) Food store. *1 mark*

3. Stamen. *1 mark*

4. Sugar. *1 mark*

5. When pollen travels from one flower to another. *1 mark*

6. After a flower has received pollen. *1 mark*

7. Seeds. *1 mark*

8. (i) They spread out. *1 mark*
(ii) So seedlings do not compete with each other for light, water and minerals. *3 marks*

9. A wing or a parachute. *1 mark*

10. (i) Ben's plant. *1 mark*
(ii) An annual plant completes its life cycle in one year. A perennial plant lives for many years. *2 marks*

11. (i) Each point accurately plotted and line going through each point. *5 marks*
(ii) 15mm. *1 mark*

12. (i) 2cm. *1 mark*
(ii) 6cm. *1 mark*
(iii) Years 1 and 2. *1 mark*
(iv) Mina. *1 mark*

13. (i) A pupa or chrysalis. *1 mark*
(ii) A caterpillar or larva. *1 mark*
(iii) The larva is changing into a butterfly. *1 mark*
(iv) A butterfly. *1 mark*

14. (i) Nectar in the flower. *1 mark*
(ii) The leaves. *1 mark*
(iii) The butterfly. *1 mark*

15. (i) The X axis captioned 'Measurement' and labelled 1, 2 and 3, all three bars to the correct height. *4 marks*
(ii) 17mm. *1 mark*

16. (i) In water. *1 mark*
(ii) Fertilisation. *1 mark*
(iii) They breathe with gills. *1 mark*
(iv) They have grown lungs. *1 mark*

17. (i) The monkeys will have died out completely. *1 mark*
(ii) 26. *1 mark*
(iii) There will be more monkeys ready to breed. *1 mark*

Total marks: 51