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Helping plants grow well

Teacher's Resources Interactive PDF

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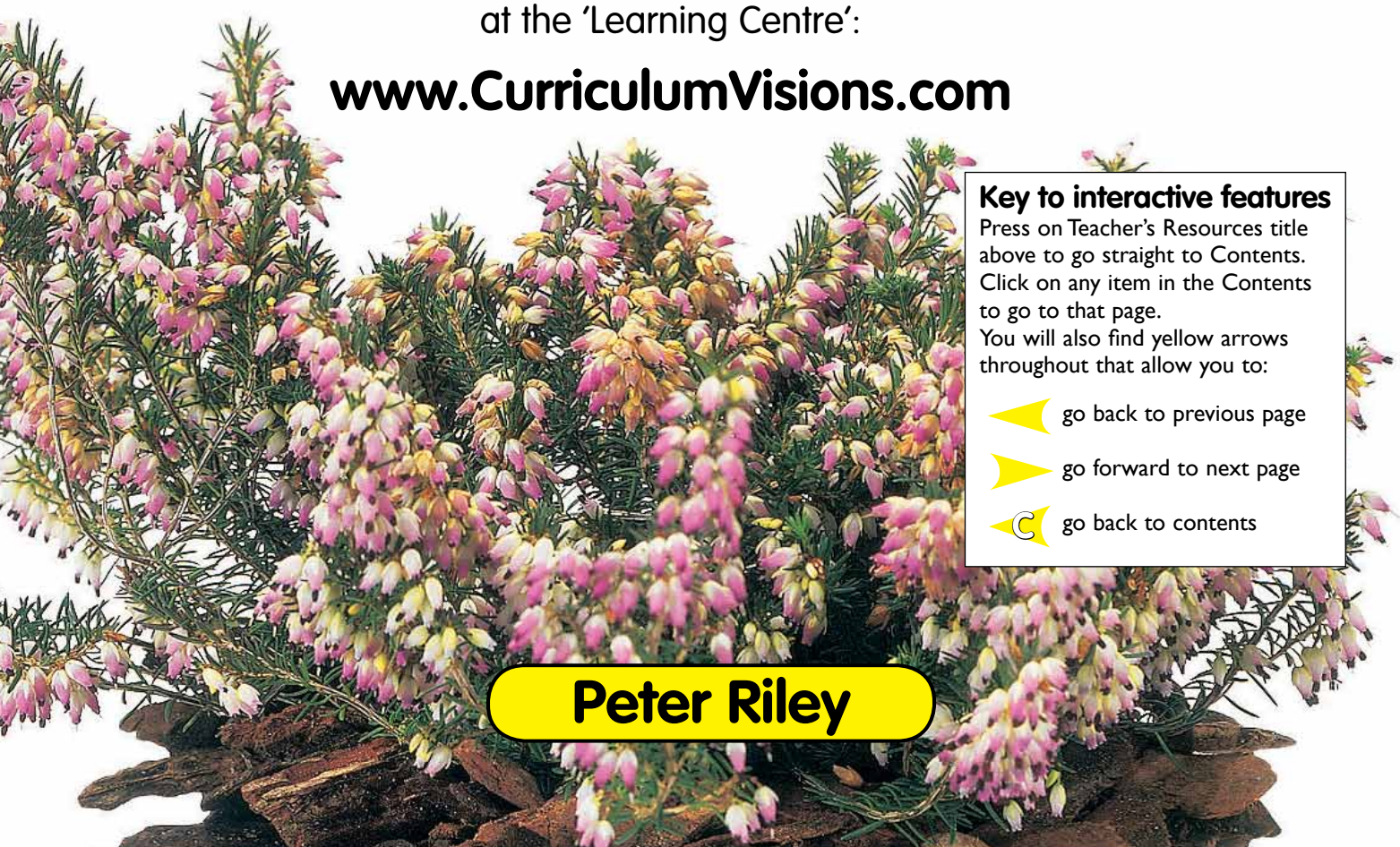

Key to interactive features

Press on Teacher's Resources title above to go straight to Contents.
Click on any item in the Contents to go to that page.
You will also find yellow arrows throughout that allow you to:

- go back to previous page
- go forward to next page
- C go back to contents

Peter Riley

Curriculum Visions

A CVP Teacher's Resources
Interactive PDF

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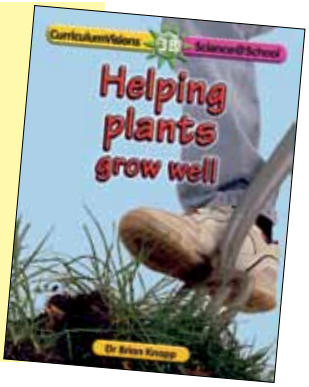
Contents

Section 1: Resources

Welcome to the Teacher's Resources for *Helping plants grow well*. The resources we provide are in a number of media:

1 The Helping plants grow well pupil book is the full-colour paperback book that introduces the principles of caring for plants. The book establishes that plants are living things and considers their need for water, nourishment from the soil, light, warmth and space to grow.



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

2 Our Learning Centre at

www.curriculumvisions.com

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

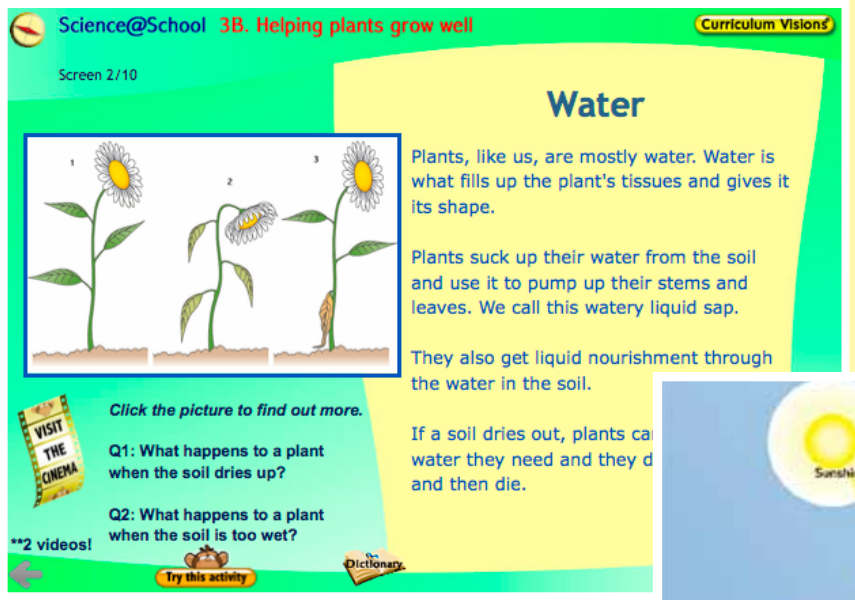
You can use support videos, e-books, picture and video galleries, plus additional Creative Topic books, graphic books called Storyboards, and workbooks. Together they cover all major curriculum areas.

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

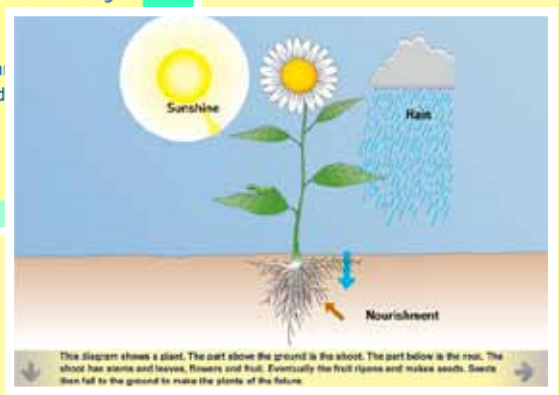
You can also use our printed student books online as part of your subscription to the Learning Centre. There page-turning versions of every printed Curriculum Visions book for use on your whiteboard.

▼ The Helping plants grow well home screen

▲ 'Classroom cinema' video



▲ Web site page

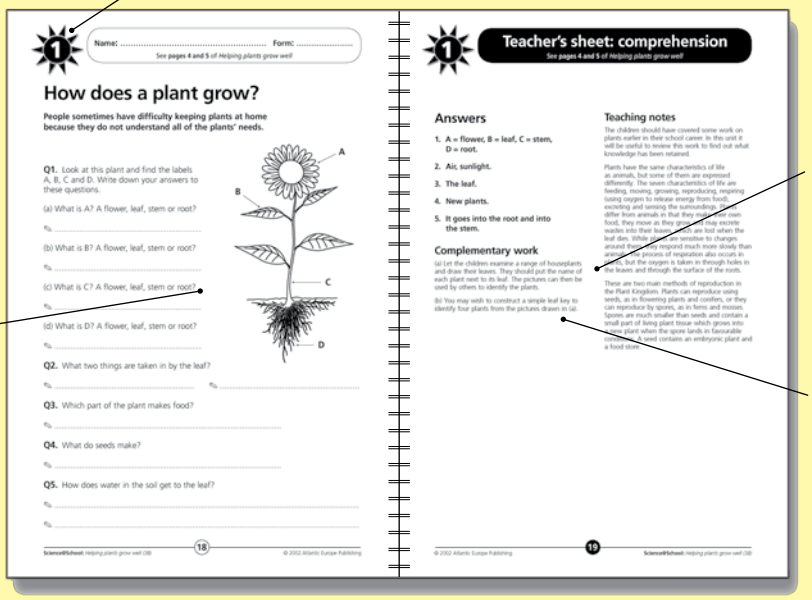


▶ Web site caption

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

Unit number.

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

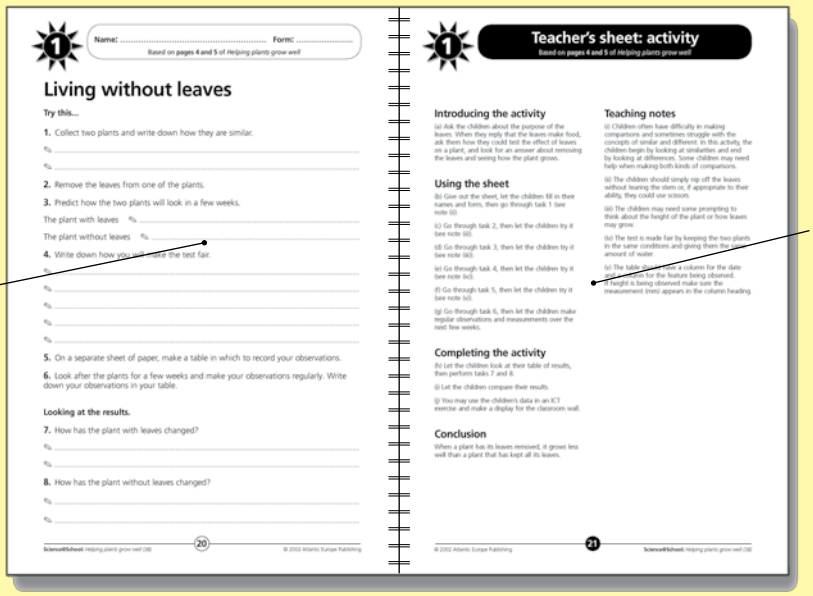


Left hand page is to photocopy and hand out to pupils.

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

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

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



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

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

Matching the curriculum

This book covers the helping plants grow well component of the curriculum in a way that is highly relevant to work in the lower junior classes at primary school. It complements the work done in *3A Food, teeth and eating* and *3D Rocks and soil* and provides a firm foundation for the work in *4B Habitats*.

In this book, earlier work done in Key Stage 1 is first reviewed, then gradually extended by looking at different aspects of keeping plants healthy.

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

The pack is fundamentally built around the idea that plants have certain needs and that these needs must be met if the plants are to grow well.

Section 2: The pupil book explained unit by unit

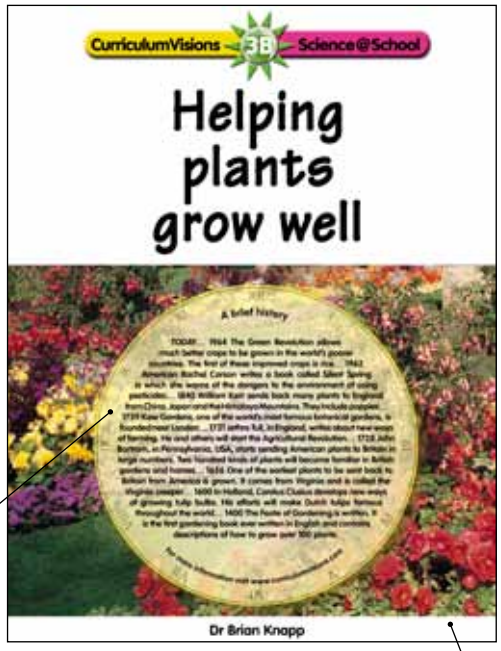
Although the pupil book – *Helping plants grow well* – is clear and simple, a great deal of care and thought has been given to the structure and the content of each double page spread or unit. The worksheets and activities in this *Teacher's Guide* also link directly to the pages in *Helping plants grow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

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

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

Title page

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



A time clock giving additional historical information about the topic.

This picture shows part of the gardens in Bath. The profusion of flowers is something we often take for granted but is the result of careful cultivation.

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

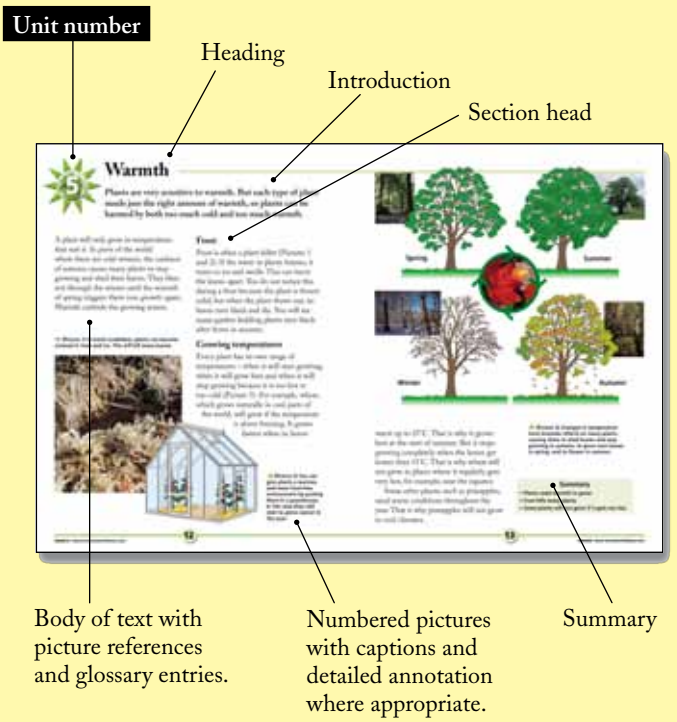
The main text of the page then follows in a straightforward, easy-to-follow, double column format.

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.

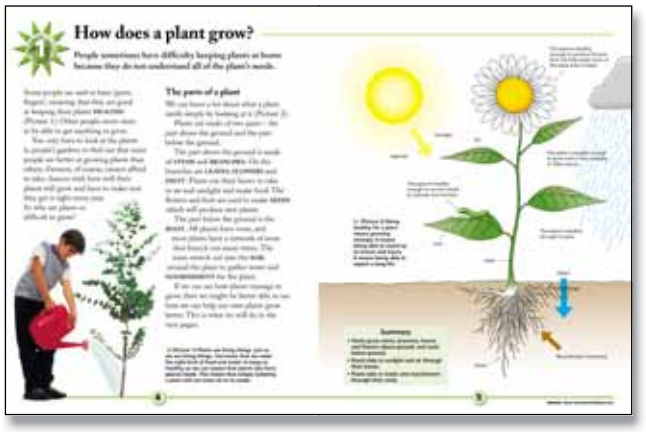


1 How does a plant grow?

You may like to begin by taking a large plant, which has flowers on it, into the classroom. Ask the children to describe what they see and look for words such as leaves, stem and flowers. Ask the children if the plant has any other parts which they cannot see and look for an answer mentioning the roots. Ask the children if the plant is a living thing, and when you find an answer that affirms this, ask the children what the plant needs to keep it alive. Look for answers mentioning sunlight, water and warmth. End by asking the children if they can tell if the plant is healthy and look for answers mentioning a lack of brown leaves.

The unit begins by describing the term 'green fingers' and challenges the children to think of people's gardens as a way to measure their skill in caring for plants. The text moves on to state that farmers must always have 'green fingers' – they must grow crops successfully every year.

Plants are introduced as living things that cannot move to get their requirements and so must make the best of where they grow. The relationship is made between plant health and a plant's ability to survive injury or disease. The needs of plants are compared with the needs of other living things, the parts of the plant are identified and their functions described. Throughout the unit the importance of plant health is emphasised. This is developed in the following units.



In the complementary work, the children can identify houseplants by their leaves. In the activity, the children investigate the effect of removing leaves on plant growth.

2 Water

This unit sets the scene for examining plant health which is the main focus of Units 2 to 7 and Unit 10.

A few days before the lesson you may like to acquire two bizzie lizzie plants, but only water one. By the time of the lesson the one without water should have wilted. Present both plants to the class and ask the children to compare them. Ask the children for a reason for the difference and for a suggestion to make the wilting plant healthy again. When the children suggest watering the wilting plant let someone in the class perform this task. While the children are studying the rest of the unit let them occasionally examine the wilted plants for signs of recovery.

The unit begins by introducing sap as the watery liquid found in plants. Water gives plants shape and carries nourishment around the plant. The process of wilting is described in detail, and illustrated clearly. The damage caused by extreme wilting is mentioned and the recovery from wilting by watering is explained. The adaptation of plants to dry climates is exemplified by the cactus and the adaptation of plants to wet conditions is exemplified by rice. The unit ends by considering the dangers of waterlogging, in which vital air in the soil is prevented from reaching the plant roots.

In the complementary work, the children can make three simple aquaria to observe water plants. In the activity, the children investigate the effect of different amounts of water on the growth of bean seedlings.

3 Nourishment

Having dealt with the relationship between water and health in the previous unit, this unit explores the nourishment which is dissolved in soil water.

You may like to hold up a clear plastic bag full of leaves and ask the children about the animals that feed on leaves. When they have named a few animals, ask the children about what they think happens to the huge amount of leaves which fall to the ground in the autumn. Look for answers such as disappear, or rot, then hold up a bag of leaf mould and say that these leaves become food for plants. They contain nourishment that plants need to keep healthy.

The unit opens by stating that plants make food from the world around them. Although the food is made in the leaves, an important source of nourishment is obtained from the soil. This introduction is followed by an explanation of how the nourishment is transported through a plant. The explanation is supported by a clear diagram and a striking photograph.

The text then moves on to describe where the nourishment comes from and the terms humus,

compost heap and fertiliser are introduced. The unit ends by describing how too little nourishment affects general growth, fruit production, leaf colour and susceptibility to disease.

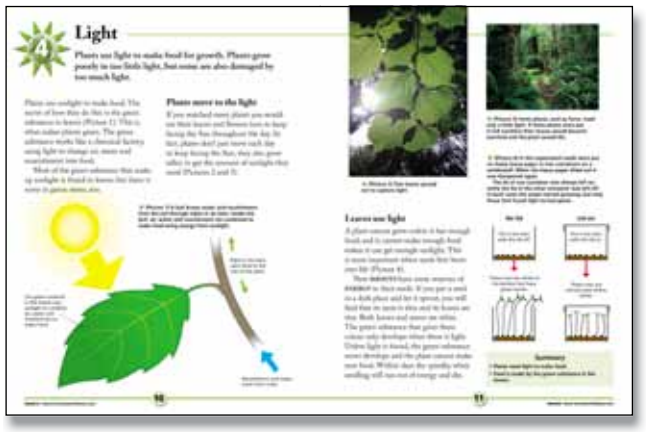
In the complementary work, the children could try the experiment shown in the pupil book, but using a wilting celery stalk so that work in the previous unit may be reviewed. In the activity, the children discover a way to compare the nourishment in three types of soil by mixing the soils with water.

4 Light

This unit builds on the two previous units to show how light is important to a plant's survival.

Before this lesson, you may like to dig up two pieces of turf and put each one in a plant pot. Water both but keep one in a cupboard so that it loses its colour. Make sure the children do not know what you are doing, then present them with the one that has been in the light. Tell the children that you have also been keeping one in the dark and ask them to predict how it may look. Look for an answer about the grass being brown, and an observation about how grass turns brown when covered with rocks or wood. Show the children the brown grass to confirm their prediction.

The unit begins by stating that the green substance in leaves and stems soaks up sunlight. The light is used to change air, water and nourishment from the soil into food. The ability of many plants to move their leaves to track the Sun across the sky is mentioned, and the ability of all plants to grow towards light is established and illustrated by



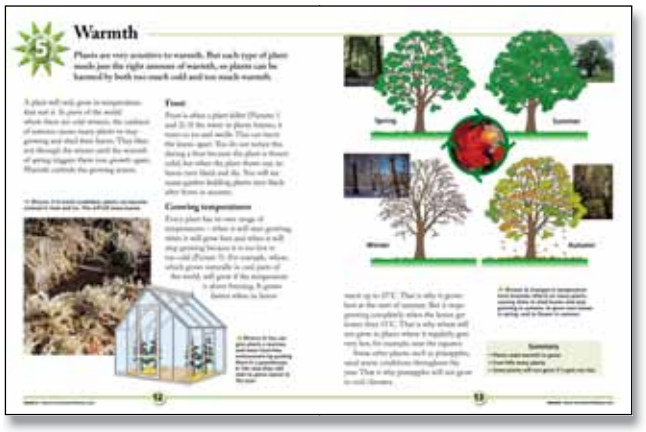
an experiment. The need for light to make the green substance is explained, and the unit ends by reference to ferns, which are examples of plants that can be damaged by too much light.

In the complementary work, the children can investigate how light shining through a window can cause the stems of pot plants to bend. In the activity, the children investigate how light shining from one side affects the growth of seedlings.

Warmth

Before the lesson put some lettuce leaves in a freezer for a day. Take them out and show them to the children, along with some lettuce leaves which have been kept at room temperature. Ask the children what they do if they feel cold. Look for an answer that mentions putting on clothes. Tell the children that plants such as the lettuce cannot do that, and hold up a lettuce and some lettuce leaves. Ask the children how the lettuce leaves may look when they have been frozen then, as they make suggestions, hold up the limp leaves from the freezer. Tell the children that the leaves of many plants, like lettuce, cannot survive in freezing conditions. These plants either lose their leaves, like many trees, or lose their shoots and die back and stay underground as roots and bulbs, or they die off completely and leave only seeds to survive through the cold winter weather.

The unit opens by stating that a plant will only grow when the temperatures are just right for that plant. The text then moves on to describe the effects of cool autumn and winter temperatures on plants. The effect of frost damage is explained, and the use of the greenhouse is advocated for starting



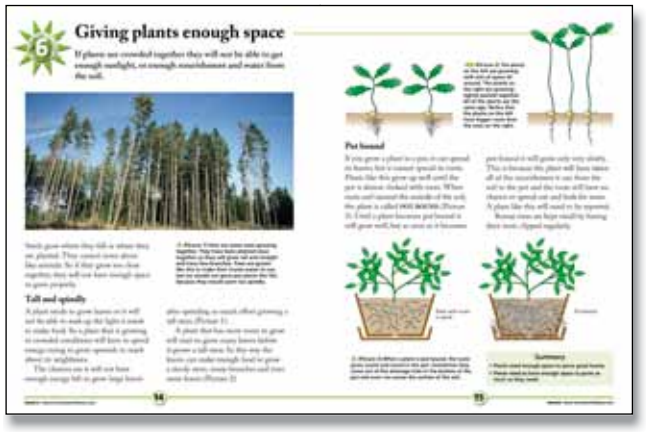
plant growth sooner in the year. It is explained that different plants, such as wheat and pineapple, have different temperature ranges in which they can survive. The unit ends with a large, colourful illustration of how trees change through the seasons of the year.

In the complementary work, the children can set up investigations on the effect of warmth on seeds and seedlings. In the activity, the children use a model greenhouse to investigate plant growth.

Giving plants enough space

You could begin by giving four children two large sheets of green paper each. Tell the children to spread out and hold out the paper because they are now 'plants' and the paper sheets are their 'leaves'. Now ask the children to put their arms down and move closer together, then hold out their 'leaves' again. They should find that one or both of their leaves are shaded by the 'leaves' of the others. Finally, ask the children to stand very close together so that they have even more difficulty holding out their leaves. Tell the class that when you plant seeds close together you are creating the same problems for the seedlings.

The unit opens with a large photograph showing trees planted close together in a forest. This clearly illustrates the problems that plants have when they do not have enough space to grow properly. The point is made that, unlike animals, plants cannot move about to find the space they need, so everything depends on where the seed comes to rest before sprouting. The effect of overcrowding on the way plants take up light is explained. The text then



moves on to consider how the health of a plant suffers when they do not have enough space. The pot bound condition is explained and illustrated and its remedy – by repotting – is mentioned. The unit ends by considering how bonsai trees are kept small.

In the complementary work, the children can examine pot bound plants and re-pot them. In the activity, the children observe the early development of roots.

7 Pests and diseases

Having established the needs for healthy plant growth in the previous units, this unit examines the dangers to plant health from the feeding activities of other living things.

You could begin by asking the children how they know when they feel ill. They may mention that they have a headache, feel sick or very hot. Tell the children that plants get ill too and they show it by the colour of their leaves, poor growth and lack of flowers and fruits. Point out that while most human diseases are caused by germs, plant health can also be affected by large numbers of animals feeding on them. If possible, show the children some caterpillars feeding on a leaf and tell the children that when animals like the caterpillars are feeding on plants we are growing for food or pleasure, we call the animals pests.

The unit begins by reminding the children that plants are food for other living things. Farming and gardening are introduced and the concept of a pest is clearly defined. Microbes are introduced as examples of living things that can be pests. The link is made between poorly growing plants and

their susceptibility to disease. The danger of one disease causing other infections is identified, and this is explained as the reason why infected plants must be treated quickly. Mildew, rust and some insects are described as major pests. The unit ends by showing how insecticide sprays are used to protect crops.

In the complementary work, the children can examine a mould grown on bread. In the activity, the children become 'plant doctors' to identify signs of ill health in houseplants.

8 Why we need plants to grow well

You may like to begin by producing a large shopping bag which contains oats, barley, rice, popcorn, lettuce, a carrot, an apple, an orange, a potato, a mango, a kiwi fruit, broccoli, asparagus and a sweet potato. As you take the foods out of the bag ask the class to group them into cereals, vegetables and fruit. Ask the children to think of other fruits and vegetables they eat, write their names on cards and add them to the correct groups. Hold up a bag of flour and tell them that one plant we eat in large amounts is made into this white powder. If the children are baffled by this, show them some grains of wheat and explain, or even demonstrate, how wheat is ground up into flour. Hold up a melon seed and ask the children if they can tell what it will grow into. When they have answered, hold up a melon and tell the children that it is the job of many farmers to change seeds into food for people.

The unit opens by stating that there are hundreds of thousands of different kinds of plants in the world yet only a small number are used by humans for food. The text then moves on to introduce the three

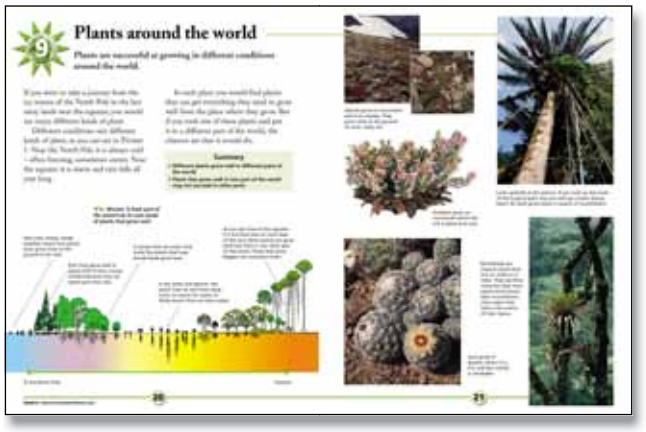
major groups of food plants and to provide examples of each group. The term 'pasture' is introduced as grassland for rearing animals, and the unit ends by considering farmland as a place where crops are grown and pasture is cultivated for animals.

In the complementary work, the children can grow salad crops and find out about how crops get from farms to shops. In the activity, the children make a 'bean farm' and tend it regularly for a week.

9 Plants around the world

You may like to begin by selecting a dozen children who would enjoy taking part in a short theatrical event. Provide a space with a carpet and large boxes, then get the children to stand in the middle of the 'stage'. Tell the children that they are explorers near the North Pole. Tell them to mime walking though the landscape, then say that a large storm is developing with the wind blowing from one direction. The rest of the class can make 'Shhh' sounds to simulate the gale. Tell the explorers it is too bad for them to continue so they must show us how they would survive the storm. They should curl up on the ground and hide behind the boxes. Hold up an alpine plant, sheltering behind a stone, and say that is just what plants do in cold conditions.

This unit begins by inviting readers to take a journey from the North Pole to the equator. This is supported by a large, colourful diagram which gives comprehensive cover to the major regions of vegetation which would be encountered on such a journey. Concise captions describe the conditions in each region, while the main text makes the point



that if the plants were moved to different regions, it is unlikely that they would survive. The diagram is supported by five clear photographs which show plants from around the world that are not grown in or around many people's homes.

In the complementary work, the children can make a houseplant survey. In the activity, the children make and present observations on plants from around the world.

10 Can you be too kind to a houseplant?

You may like to introduce this unit by making a display of houseplants. The parents of children in the class, and the school staff, may be asked to contribute plants for a few days. You could group the plants according to the way they grow, or by their special features. For example, the plants could be grouped as upright plants, trailing plants, climbing plants, palms, ferns, spiny stems, succulents and plants with flowers. The grouping will depend on the plants that are collected. Build on the ideas in the previous unit about the form of the plant being related to its way of life, and use this to make the children think about how they should care for the plants.

The unit begins by explaining that houseplants are not simply garden plants in pots. They need to be treated differently because of the different conditions found inside homes. The text then moves on to explain the importance of care labels, and ends by

considering plants that are easy to keep and those that are hard to keep.

In the complementary work, the children can examine and raise a variety of small plants. In the activity, the children learn how to grow a plant from a plantlet and a cutting.

Index

There is an index on page 24.

Section 3: Using the pupil book and photocopiable worksheets

Introduction

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

Starting a unit

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

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

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

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

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

Using the comprehension worksheets

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

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

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

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

Using the activity worksheets

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

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

Planning to use a unit

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

Safety

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

List 1 (Starting a unit with a demonstration)

▼ UNIT

1. A large plant that is in flower.
2. Two bizzie lizzie (*Impatiens*) plants acquired a few days before the lesson. One kept well watered, and the other allowed to wilt.
3. Transparent bag of leaves, transparent bag of humus-rich soil.
4. Two plant pots, each containing a piece of turf. One pot has been kept in darkness for some days until the grass has turned brown, the other has been kept in the light.
5. Some lettuce leaves which have been kept in a freezer for a day. Some fresh lettuce leaves kept in the fridge or at room temperature.
6. Eight large sheets of green paper, four children.
7. Caterpillars (make sure they are not very hairy ones) feeding on leaves. Return the caterpillars to their food plant after the lesson.
8. A bag of shopping which contains oats, barley, rice, popcorn, lettuce, a carrot, an apple, an orange, a potato, a mango, a kiwi fruit, broccoli, asparagus and a sweet potato. Bag of flour, bag of wheat grains. Mortar and pestle (optional).
9. A 'stage' with a carpet and large boxes to simulate rocks in the Arctic.
10. A collection of houseplants gathered by parents and staff. Make sure that the plant called dumb cane, or *Dieffenbachia*, is not allowed into the collection as it has poisonous sap. Check any unfamiliar plants in appropriate books for their suitability for use in school.

Resources

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

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

List 2 (Complementary work)

Each group will need the following items:

▼ UNIT

1. A selection of five houseplants.
2. Three different kinds of cold water plants from an aquarist shop, three plastic containers (jars or bottles), gravel, a stick, sunny place to store containers.
3. A celery stalk from near a celery heart (let this wilt a little), coloured water, beaker.
4. (a) and (b) A potted houseplant such as a geranium or fuchsia, a marker, a sunny window.
5. (a) Two dishes of soil, two boxes, seeds, a cold place and a warm place (light not necessary); (b) Two trays of seedlings, a warm place and a cold place (light necessary at both places).
6. (a) Seedlings from the activity, small pots, compost, larger pots; (b) Selection of houseplants, some of which are pot bound, larger pots, compost.
7. Secondary sources about animal communities around the world (especially on the African plains).
8. (a) Facilities for growing radishes and lettuce; (b) Secondary sources about the life of farmers; (c) Secondary sources about countries which produce crops for export; (d) Secondary sources about the transport of crops.
9. –
10. Strawberry geranium, piggyback plant, good luck plant (*Bryophyllum diagremontianum*), plant pots, compost and spoon.

List 3 (Activity worksheets)

Each group will need the following items:

▼ UNIT

1. Two pot plants such as geraniums, space in sunlight for several weeks, measuring cylinder, beaker, ruler.
2. Four yoghurt pots, each containing a bean seedling. (You may like to collect pots, beans and compost a week or more before the lesson and let the children plant the bean seeds.) Measuring cylinder, beaker, ruler, space to store seedlings in a light, warm position.
3. Three soils with different amounts of humus. The first should have a moderate amount, the second should have only a little humus and the third should be rich in humus and contain some dead leaves. A jar or beaker, a spoon for handling the soil and stirring it with water, a clock.
4. A cardboard box large enough to hold a small dish or a tin lid. It should be about ten centimetres high with a hole about two centimetres square near the top of one side. Cotton wool, cress seeds, space facing a window, scissors (optional).
5. Two plant pots of soil, labelled A and B, a plastic jar or bottle cut to make a model greenhouse, seeds, sunny windowsill, ruler (optional).
6. Glass or plastic jar, blotting paper, pea seeds soaked for a day, sheets of drawing paper, camera (optional).
7. Five different kinds of houseplant, labelled 1 to 5 on their pots, magnifying glass (optional).
8. Plastic cup with rigid sides, piece of muslin, elastic band, ten soaked mung beans, dark warm place to store cup of beans.
9. Small alpine plant, a heather larger than the alpine plant, a cactus (in flower if possible), a rainforest plant such as a philodendron, rubber plant, Swiss cheese plant or bromeliad, also called an urn plant (in flower if possible), 'living stone' plant, Venus flytrap, pitcher plant (optional).
10. Large spider plant with plantlets, plant pot, compost, spoon, ruler, geranium cutting, jar of water, well lit place for pot and jar.

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

- Plants are living things.
- Plants have a stem, leaves, flowers and roots.
- Plants make food from air and sunlight.
- The roots take in water and nourishment.

Unit 2

- Plants need a certain amount of water to survive.
- Plants wilt if they have too little water.
- Waterlogged soil stops many plants growing and can eventually kill them.

Unit 3

- Plants get some nourishment from the soil.
- The nourishment travels in the sap, from the root throughout the plant.
- Lack of nourishment affects the growth and health of the plant.

Unit 4

- Plants need light to make food.
- The green substance in plants is needed for food production.
- Air, water and nourishment from the soil are needed to make food.

Unit 5

- Plants need warmth to grow.
- Frost can kill many plants.
- Different plants have different temperature ranges in which they can survive.

Unit 6

- Closely growing plants cannot get enough light to make all the food they need.
- The roots of closely growing plants cannot take up enough water and nourishment for healthy growth.
- Pot bound plants can be re-potted to bring them back to full health.

Unit 7

- Plant diseases can be caused by living things that feed on plants.
- Plant health can be damaged by microbes and insects.
- Plants can be treated with chemical sprays to control disease.

Unit 8

- Plants used for food are divided into three groups: cereals, fruit and vegetables.
- Pasture is land used to provide food for farm animals.
- Farmland is land used for growing food for humans and animals.

Unit 9

- Different plants grow well in different parts of the world.
- There are different environmental conditions in different parts of the world.
- Plants from one part of the world may not thrive if moved to another part of the world.

Unit 10

- Every houseplant needs certain conditions for good health.
- Houseplants can be kept in good health by giving them the amount of light, warmth and water that they need.

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

- Make predictions.
- Devise a fair test.
- Carry out an investigation over a long period of time.
- Compare results with predictions.

Unit 2

- Fill in a table.
- Measure the volume of water.
- Measure the height of a seedling.

Unit 3

- Make observations.
- Make a prediction.
- Give a reason for a prediction.

Unit 4

- Use simple equipment and materials safely.
- Make careful observations.
- Record an observation as a diagram.

Unit 5

- Plan an investigation.
- Make observations.
- Carry out an investigation over a long period of time.

Unit 6

- Make accurate observations.
- Fill in a table.
- Draw conclusions from data.

Unit 7

- Make accurate observations.
- Fill in a table.
- Extract information from a table.

Unit 8

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

Unit 9

- Make accurate observations.
- Record observations in a variety of ways.

Unit 10

- Use data in making plans.

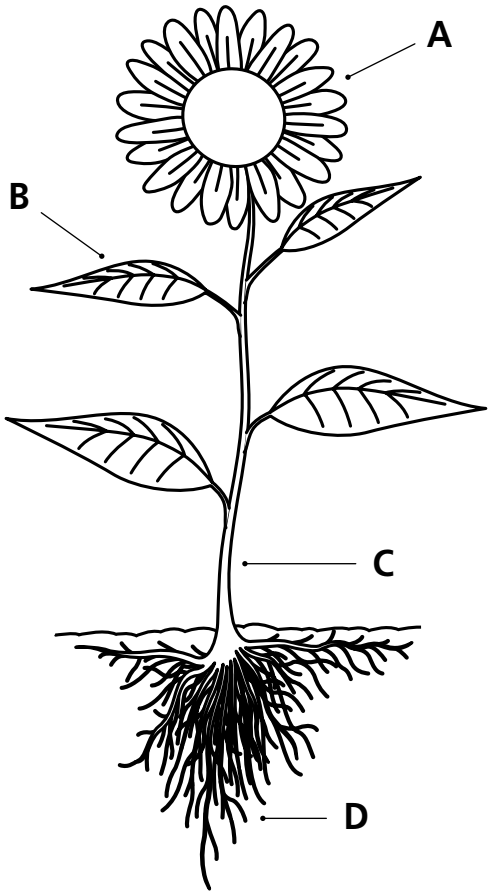
C 1

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

See **pages 4 and 5** of *Helping plants grow well*

How does a plant grow?

People sometimes have difficulty keeping plants at home because they do not understand all of the plants' needs.



Q1. Look at this plant and find the labels A, B, C and D. Write down your answers to these questions.

(a) What is A? A flower, leaf, stem or root?

✎.....

(b) What is B? A flower, leaf, stem or root?

✎.....

(c) What is C? A flower, leaf, stem or root?

✎.....

(d) What is D? A flower, leaf, stem or root?

✎.....

Q2. What two things are taken in by the leaf?

✎..... ✎.....

Q3. Which part of the plant makes food?

✎.....

Q4. What do seeds make?

✎.....

Q5. How does water in the soil get to the leaf?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 4 and 5** of *Helping plants grow well*

Answers

1. **A = flower, B = leaf, C = stem, D = root.**
2. **Air, sunlight.**
3. **The leaf.**
4. **New plants.**
5. **It goes into the root and into the stem.**

Complementary work

(a) Let the children examine a range of houseplants and draw their leaves. They should put the name of each plant next to its leaf. The pictures can then be used by others to identify the plants.

(b) You may wish to construct a simple leaf key to identify four plants from the pictures drawn in (a).

Teaching notes

The children should have covered some work on plants earlier in their school career. In this unit it will be useful to review this work to find out what knowledge has been retained.

Plants have the same characteristics of life as animals, but some of them are expressed differently. The seven characteristics of life are feeding, moving, growing, reproducing, respiring (using oxygen to release energy from food), excreting and sensing the surroundings. Plants differ from animals in that they make their own food, they move as they grow and may excrete wastes into their leaves, which are lost when the leaf dies. While plants are sensitive to changes around them, they respond much more slowly than animals. The process of respiration also occurs in plants, but the oxygen is taken in through holes in the leaves and through the surface of the roots.

There are two main methods of reproduction in the Plant Kingdom. Plants can reproduce using seeds, as in flowering plants and conifers, or they can reproduce by spores, as in ferns and mosses. Spores are much smaller than seeds and contain a small part of living plant tissue which grows into a new plant when the spore lands in favourable conditions. A seed contains an embryonic plant and a food store.

C 1

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

Based on **pages 4 and 5** of *Helping plants grow well*

Living without leaves

Try this...

1. Collect two plants and write down how they are similar.

✎.....

✎.....

2. Remove the leaves from one of the plants.

3. Predict how the two plants will look in a few weeks.

The plant with leaves ✎.....

The plant without leaves ✎.....

4. Write down how you will make the test fair.

✎.....

✎.....

✎.....

✎.....

✎.....

5. On a separate sheet of paper, make a table in which to record your observations.

6. Look after the plants for a few weeks and make your observations regularly. Write down your observations in your table.

Looking at the results.

7. How has the plant with leaves changed?

✎.....

✎.....

8. How has the plant without leaves changed?

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 4 and 5** of *Helping plants grow well*

Introducing the activity

(a) Ask the children about the purpose of the leaves. When they reply that the leaves make food, ask them how they could test the effect of leaves on a plant, and look for an answer about removing the leaves and seeing how the plant grows.

Using the sheet

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

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

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

(e) Go through task 4, then let the children try it (see note (iv)).

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

(g) Go through task 6, then let the children make regular observations and measurements over the next few weeks.

Completing the activity

(h) Let the children look at their table of results, then perform tasks 7 and 8.

(i) Let the children compare their results.

(j) You may use the children's data in an ICT exercise and make a display for the classroom wall.

Conclusion

When a plant has its leaves removed, it grows less well than a plant that has kept all its leaves.

Teaching notes

(i) Children often have difficulty in making comparisons and sometimes struggle with the concepts of similar and different. In this activity, the children begin by looking at similarities and end by looking at differences. Some children may need help when making both kinds of comparisons.

(ii) The children should simply nip off the leaves without tearing the stem or, if appropriate to their ability, they could use scissors.

(iii) The children may need some prompting to think about the height of the plant or how leaves may grow.

(iv) The test is made fair by keeping the two plants in the same conditions and giving them the same amount of water.

(v) The table should have a column for the date and a column for the feature being observed. If height is being observed make sure the measurement (mm) appears in the column heading.

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

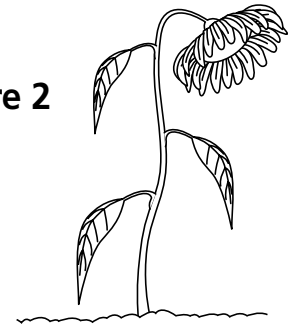
See **pages 6 and 7** of *Helping plants grow well*

Water

Plant roots collect water and air from the soil. They suffer if there is too little or too much water.

Picture 1

Picture 2



Q1. Pictures 1 and 2 show the same plant.

(i) Why is picture 2 different from picture 1?

✎.....

(ii) Which of these words best describes the plant in picture 2?

falling **wilting** **willing** **bending** ✎.....

(iii) What should be done to the plant in picture 2 to help it survive?

✎.....

Q2. What is the pale green liquid in the stem called? ✎.....

Q3. Which part of a plant loses water? ✎.....

Q4. Name a plant that can survive a long time in dry soil. ✎.....

Q5. Name a plant that lives in a swamp. ✎.....

Q6. (i) What is a waterlogged soil?

✎.....

(ii) Why do many plants stop growing in a waterlogged soil?

✎.....

Teacher's sheet: comprehension

See **pages 6 and 7** of *Helping plants grow well*

Answers

1. **(i) Plant 2 has not got enough water; (ii) Wilting; (iii) The plant should be watered.**
2. **Sap.**
3. **The leaf.**
4. **Cactus.**
5. **Rice.**
6. **(i) It is a soil full of water; (ii) There is no air in the soil for the plants to use.**

Complementary work

(a) The children could grow some water plants. Each group could be given three different plants from an aquarist shop and allowed to set up each one in a separate plastic jar or bottle. The floor of the container should be covered in gravel, and the plant roots may need to be pushed into position with a stick. The plants should be set up in a sunny window and the children could draw pictures of them every few days to illustrate how they grow.

Teaching notes

Huge numbers of plants are killed in the home every year due to over-watering. A soil or compost is made up of lumps which have spaces between them. When the soil is dry, the spaces contain air. The lumps contain a substance called humus which is made from the decomposition of dead plants and, to a much smaller extent, the decomposition of dead animals. The humus acts as a sponge and soaks up some of the water as it passes through the soil. The plant roots take in the water from the humus. They do not need all the spaces to be full of water in order to draw in the water they need.

Plants draw in water through their roots without using energy. This works because there are more dissolved substances in the plant's sap than in the soil water. This difference in the concentration of dissolved substances, and the way they are separated from each other by the skin of the root, causes water to flow into the plant root naturally by a process called osmosis. The children do not need to know this.

The soil water contains minerals, or nourishment, much smaller amounts of minerals and nutrients than are in the plant sap. This means that the plant has to use energy to draw in more minerals. The root takes in oxygen from the air in the soil. Oxygen helps the plant release energy from its food so it can take in the minerals that are needed. When the soil is waterlogged, the roots cannot get the oxygen, the minerals are not taken up and the plant suffers and may eventually die.

C

2

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

Based on **pages 6 and 7** of *Helping plants grow well*

Beans and water

Try this...

1. Collect four pots each containing a bean seedling.

2. Write out the following labels and stick one on each pot.

Seedling1 no water	**Seedling 2 5cm³ water**	**Seedling 3 20cm³ water**	**Seedling 4 50cm³ water**

3. Write the date in the first row of the table. Then measure the height of each bean seedling and record the height under each column.

Date	Seedling 1 no water	Seedling 2 5cm³ water	Seedling 3 20cm³ water	Seedling 4 50cm³ water

4. Every two days, measure the heights of the seedlings, then add the correct amount of water to seedlings 2 to 4, but not to seedling 1.

Looking at the results.

5. What do the results show?

✎.....

6. How could the investigation be improved?

✎.....

Teacher's sheet: activity

Based on **pages 6 and 7** of *Helping plants grow well*

Introducing the activity

(a) Tell the children that many people think they can keep their plants healthy by giving them plenty of water. This idea can be tested by an investigation which the children can try.

Using the sheet

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

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

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

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

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

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

Completing the activity

(h) Let the children compare their results and their suggestions.

(i) Pool the children's results to produce a table for the class. (This could be an ICT exercise.) Emphasise the need for a large number of results to test an idea, and if a pattern or trend is shown in the class data, make sure that the children are aware of it.

Conclusion

If a bean seedling does not receive water it stops growing and dies. If a bean seedling receives too much water it may also stop growing and die. Bean seedlings only need a certain amount of water to grow healthily.

Teaching notes

(i) It is essential that the bean seeds are sowed some time before the lesson and that they are about two centimetres tall when the lesson begins. You may like the children to collect yoghurt pots and sow the seeds themselves.

(ii) You may wish to use other quantities than those described here. The purpose of using specific amounts of water is to provide an investigation which can be extended, for example trying other quantities of water later or using more seedlings.

(iii) Make sure the children always write in the date each time they make their measurements. You may wish to measure in centimetres or millimetres, depending on the ability of the children. Make sure they record the units they are using in the table.

(iv) Some children may need help in interpreting the data shown in the table.

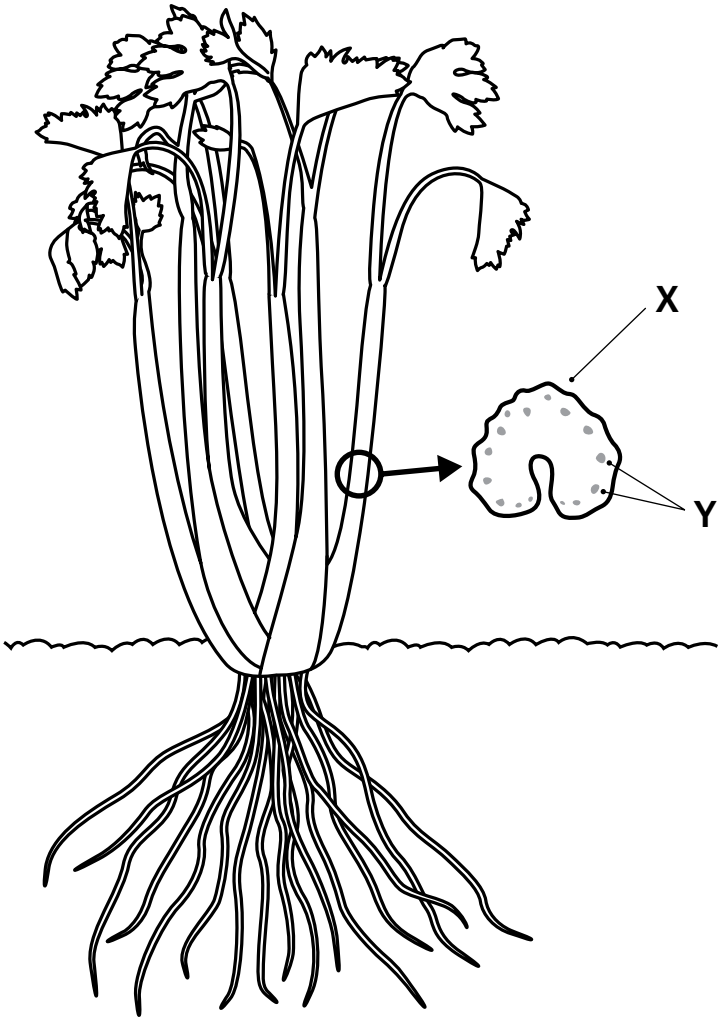
(v) The children may need to be encouraged to make suggestions.

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

See **pages 8 and 9** of *Helping plants grow well*

Nourishment

Plant roots grow down to get liquid food from the soil.



Q1. (i) Draw arrows to show the path of water and nourishment through the plant in the diagram.

(ii) X shows the inside of a stalk. What are the circles labelled Y?

✎.....

✎.....

Q2. What is humus made from?

✎.....

✎.....

Q3. What is the liquid food given to pot plants in the home?

✎.....

Q4. Why don't people give compost to their pot plants in the home?

✎.....

Q5. How does a plant grow if it gets too little food?

✎.....

Q6. If a plant does not get enough food, how could its flowers and leaves be affected?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 8 and 9** of *Helping plants grow well*

Answers

1. **(i) The arrows should go up through the root, stalk and into the leaf; (ii) Water-carrying pipes.**
2. **Rotting dead plants.**
3. **Fertiliser.**
4. **Because compost smells.**
5. **It grows slowly and poorly.**
6. **Its flowers will be small and its leaves may be a funny colour.**

Complementary work

(a) You may like to try the experiment with the celery as shown in the pupil book. You could link this activity with the work on wilting in the previous unit. Present the children with a bendy piece of leafy celery from near the celery heart. Ask the children what they think will happen when the celery is put in coloured water. They should answer that it will become less bendy and the pipes in the stalk will become red.

Teaching notes

Although plants make their own food from air, sunlight and water, they also need other substances from the soil. These substances can be called nourishment at this level. Later in their school course the children can learn that this nourishment is due to chemicals that are sometimes called nutrients or minerals.

The major mineral in this nourishment is nitrogen (in the form of nitrates) which helps make substances called proteins that all living things – both plants and animals – need for growth and repair of their bodies. Phosphorus and sulphur are also important in protein formation. Potassium is another mineral that is needed to help the plant form protein, and to help form the green substance in leaves and stems. The chemicals are mentioned here in case you wish to show the children empty packets of fertiliser which may list some of these minerals.

The leaves of trees, and the shoots of herbaceous plants which die back in winter, are broken down by small animals such as woodlice, fungi such as moulds and microbes called bacteria. These bacteria do not cause disease, and receive the nourishment and energy they need by breaking up the dead remains of plants and animals. There are not as many dead animals in the humus because there are much fewer of them compared to plants. Animal waste, called manure, is also used to make humus.

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

Based on **pages 8 and 9** of *Helping plants grow well*

Finding nourishment in the soil

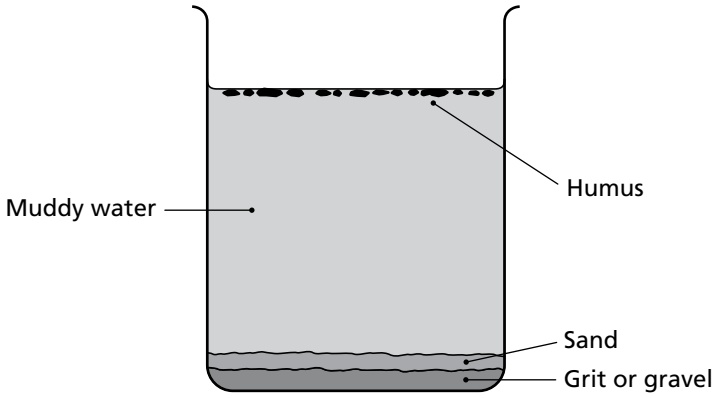
Try this...

1. Take a sample of soil and put it in a jar or beaker.

2. Pour water into the jar until it is about three-quarters full.

3. Stir the soil and water together for a minute, then let the mixture settle.

4. The nourishment in the soil is called humus, and it floats on the water as the diagram below shows. Look for humus in your soil and water mixture.



5. Take a second sample of soil and repeat steps 2 and 3.

6. How does the humus in the two soils compare?

✎.....

✎.....

7. Look at the third sample of soil and predict if it will have more or less humus than the other soils.

8. Give a reason for your prediction.

✎.....

9. Try steps 2 and 3 with the third sample of soil.

10. How does your prediction compare with the result?

✎.....

Teacher's sheet: activity

Based on **pages 8 and 9** of *Helping plants grow well*

Introducing the activity

(a) You may begin by asking the children what happens to autumn leaves when they fall into puddles. Look for an answer that mentions floating and say that when the leaves rot to become nourishment for plants, the nourishment, called humus, floats too.

Ask the children how they could test a soil sample to see if it has any humus, and look for an answer which mentions mixing soil and water then looking for floating humus.

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) Go through tasks 2 and 3, then let the children try them.

(d) Let the children try task 4 and help them identify the humus.

(e) Let the children try task 5 (see note (ii)).

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

(g) Go through tasks 7, then let the children try it (see note (iv)).

(h) Let the children try task 8 (see note (v)).

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

(j) Let the children try task 10 (see note (vii)).

Completing the activity

(k) Let the children compare their results.

(l) If there are dog-free areas around the school, let the children collect soil samples and assess how much nourishment there is for the plants growing in the school grounds.

Conclusion

The amount of nourishment in the soil can be assessed by looking at the amount of humus which floats when the soil is mixed with water.

Different samples of soil may have different amounts of nourishment for plants.

Teaching notes

(i) You should have three kinds of soil ready for this activity, all of them collected from areas which have not been fouled by dogs. The soil for the first sample should contain a moderate amount of humus, which will form a layer over the water perhaps a few millimetres thick. The second sample should have very little humus in it and the third sample should have plenty of observable leaf mould in it to help with the prediction.

(ii) Make sure that this soil has less humus than the first. Also make sure that there is the same amount of soil in the second sample as in the first.

(iii) Some children may need help in making a comparison.

(iv) The children should look at the soil before adding the water.

(v) Some children may need help in supporting their prediction with a reason.

(vi) Make sure the same amount of soil is used as in the other two samples.

(vii) Some children may need help in making the comparison.

C

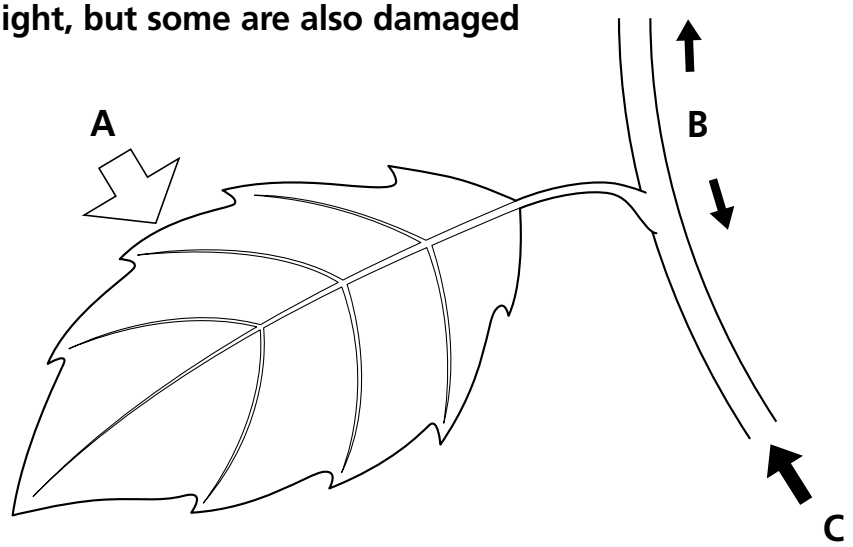
4

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

See **pages 10 and 11** of *Helping plants grow well*

Light

Plants use light to make food for growth. Plants grow poorly in too little light, but some are also damaged by too much light.



Q1. In the diagram, which arrow (or arrows):

(i) shows the path of sunlight? ✎.....

(ii) shows the path of water and nourishment? ✎.....

(iii) shows the path of food? ✎.....

Q2. State two places where the green substance is found in plants.

✎..... ✎.....

Q3. What does the green substance use to make food?

✎.....

Q4. Why do leaves on a tree spread out?

✎.....

Q5. Name a plant that is damaged by too much light. ✎.....

Q6. Many plants have leaves which turn to different parts of the sky during the day. Why do the leaves do this?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 10 and 11** of *Helping plants grow well*

Answers

1. **(i) A; (ii) C; (iii) B.**
2. **Leaves and stems.**
3. **Air, water, nourishment and sunlight.**
4. **To catch the sunlight.**
5. **A fern.**
6. **The leaves turn to face the Sun so they can catch as much light as possible.**

Complementary work

(a) Put a pot plant, such as a geranium or a fuchsia, in a sunny window. Mark the side of the pot facing the window so the pot can always be put back in the correct position if it is removed for watering. Ask the children to look at the stems every few days, and perhaps draw them. They should find that the stems bend towards the light.

(b) Ask the children what they think would happen if the pot plant was turned round. Let the children investigate and discover that the stems then bend in the new direction of the light.

Teaching notes

The green substance in plants is called chlorophyll. The children do not need to know this, but some children may be curious. Light is a form of energy, and the chlorophyll absorbs some of this light energy from the Sun and stores it. This energy is then used to make food. The raw materials for making food are air, water and the minerals from the soil.

The trapped energy is first used to change carbon dioxide in the air, and water from the soil, into sugars and oxygen. The plant releases the oxygen it does not need for this process (respiration) into the air, and the sugar may be converted into starch and stored in the plant. Secondly, the energy is used to join minerals, such as nitrogen, to the sugars to make proteins. Thirdly, energy is used to change some sugars into oils. You may like to simplify this information and use it when the children are studying *3A Food, teeth and eating* in this series.

The process of making food (sugar) from light energy is known as photosynthesis.

The way that carbon dioxide gets into a leaf, and oxygen gets out, is through tiny holes on the underside of leaves. In leaves that stand vertically, the holes are on both sides.

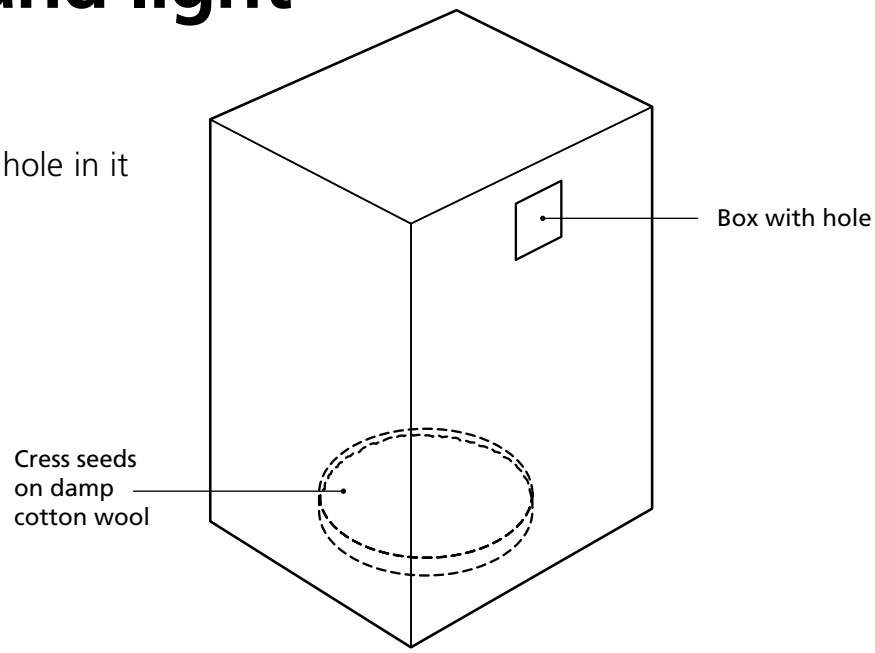
Name: ..... Form: .....

Based on **pages 10 and 11** of *Helping plants grow well*

Seedlings and light

Try this...

1. Take a box which has a hole in it like the one in the picture.



2. Put some cotton wool in a dish and moisten it.

3. Sprinkle some cress seeds on the cotton wool.

4. Put the dish of seeds in the box as the diagram above shows.

5. Look at the cress seedlings on display and see how their leaves grow at the top of their stems.

6. Go back to the diagram at step 1 and draw in how you think the cress seedlings will grow inside the box.

7. Check the cotton wool in the box every few days and add some water if it feels dry.

8. After about two weeks, see how the seedlings have grown. Draw how they have grown in the space provided.

9. Compare how the seedlings have grown with your drawing.

✎.....

Teacher's sheet: activity

Based on **pages 10 and 11** of *Helping plants grow well*

Introducing the activity

(a) You may like to use this activity after introducing the unit, but before studying the pupil book. Alternatively, you may like to use it after studying the work in the pupil book to extend the experiment that is shown there.

Tell the children that they are going to find out what happens to seedlings when light shines on them from just one direction.

Using the sheet

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

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

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

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

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

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

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

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

Completing the activity

(j) Let the children compare their results and the accuracies of their predictions.

(k) Ask the children to draw a conclusion from the activity.

Conclusion

When light only shines from one side onto seedlings, they grow towards the light.

Teaching notes

(i) If the children have the ability, you may like them to bring in a box from home and cut a hole in it. The box should be large enough to hold a small dish or a tin lid. It should be about ten centimetres high and the hole should be about two centimetres square. Alternatively, you could collect the boxes and make the holes in them before the lesson.

(ii) The cotton wool should be damp, but not too soggy or waterlogged.

(iii) About twenty seeds could be spread evenly over the cotton wool.

(iv) The purpose of this task is to let the children see how cress seeds grow so they can draw their shapes accurately in task 6. You should prepare the cress seeds about a week in advance.

(v) In this task, the children illustrate their prediction by making a drawing. You may like to point this out to the children.

(vi) The cotton wool will need checking every day at first, as the rate of drying will depend on the surrounding temperature. Later it may only need checking every two days. The children may like to work out a rota for this work.

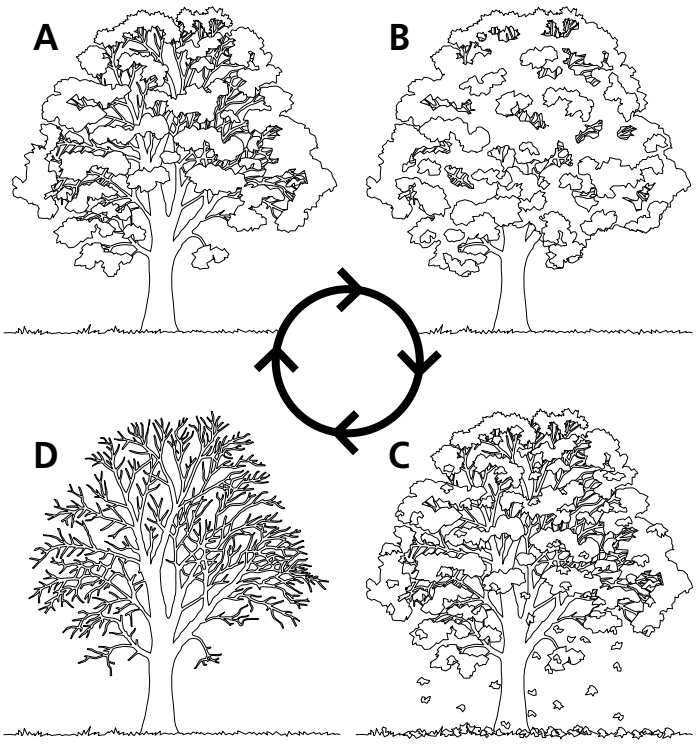
(vii) Task 8 is the recording of the result. It is compared with the prediction in task 6.

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

See **pages 12 and 13** of *Helping plants grow well*

Warmth

Plants are very sensitive to warmth. But each type of plant needs just the right amount of warmth, so plants can be harmed by both too much cold and too much warmth.



Q1. What season is shown in picture:

A? ✎.....

B? ✎.....

C? ✎.....

D? ✎.....

Q2. What happens to the water in a plant when it freezes?

✎.....

✎.....

Q3. How does the frozen water affect the leaves?

✎.....

Q4. Name a season when there may be a frost.

✎.....

Q5. How can you get plants to start growing sooner in the year?

✎.....

Q6. Why can't you grow wheat and pineapples together?

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 12 and 13** of *Helping plants grow well*

Answers

1. **A = spring; B = summer; C = autumn; D = winter.**
2. **It turns to ice and swells.**
3. **They burst apart.**
4. **Autumn (you could also accept winter and spring).**
5. **Put them in a greenhouse.**
6. **Wheat grows in cool parts of the world. Pineapples need warm conditions all year.**

Complementary work

(a) The children could set up two dishes of seeds in damp sand or soil, and put each one in a box. One box could be put in a warm place and the other in a cold place. Predictions about which ones will grow better could be made and compared with the results.

(b) Two trays of seedlings could be set up, one in a cool place and one in a warm place. Both places should have the same amount of illumination. This experiment could be set as a challenge to the children to devise a fair test.

Teaching notes

All the processes of life that take place inside a plant involve chemical changes. The speed at which these changes take place depends on their temperature. This means that if a plant is in warm conditions, the speed of the changes will be faster than if the plant was in a cold place.

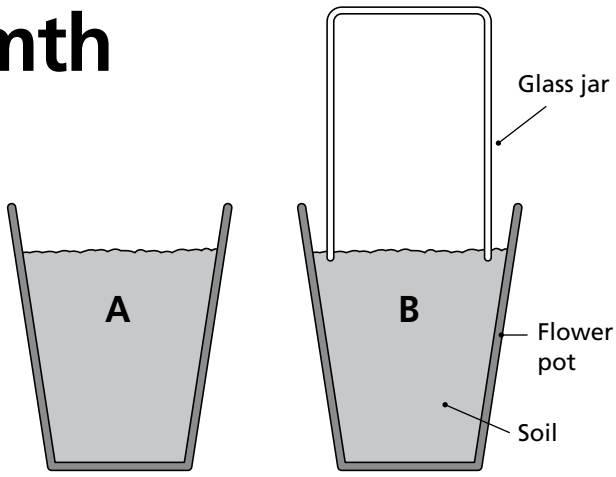
As plants contain large amounts of water, if the temperature drops to 0°C the water inside the plant can freeze, expand and kill it. Plants have various strategies to avoid this. Trees and bushes have bark to insulate their stems and branches. Herbaceous plants have shoots which simply die at the end of the growing season, and the plant remains alive as a bulb or tuber in the ground where it is insulated from the cold. Seeds survive very cold conditions because they have an insulating seed coat, and also because they contain very little water. This both keeps down their weight when they are being dispersed, and keeps moulds away while they rest in the soil waiting for warm conditions to develop.

The heat builds up in a greenhouse in the following way. Some of the energy released from the Sun is in the form of heat waves, or rays. These have enough energy to pass through glass. When rays of heat strike surfaces inside the greenhouse, they lose some of their energy, and when they are reflected they have less power. This means they do not have the power to pass out through the glass again and so remain in the air and warm it up.

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

Based on **pages 12 and 13** of *Helping plants grow well*

Investigating warmth



Try this...

1. Here is some equipment that you can use to test how warmth affects seeds and seedlings.

2. How could you set up a test? Answer these questions to make a plan.

(i) Where would you put the seeds? ✎.....

(ii) How many seeds would you use? ✎.....

(iii) Where would you put the pots? ✎.....

(iv) How would you look after the seeds and seedlings?

✎.....

(v) How often would you make your observations? ✎.....

3. Make a prediction about the seeds and seedlings in each pot by completing the sentences.

I predict the seeds in pot A ✎.....

I predict the seeds in pot B ✎.....

4. If your teacher approves, try your investigation.

Looking at the results.

5. Write down what you found out by completing the sentences.

In pot A ✎.....

✎.....

In pot B ✎.....

✎.....

Teacher's sheet: activity

Based on **pages 12 and 13** of *Helping plants grow well*

Introducing the work

(a) The sheet for this activity is designed so that you may use it in different ways (see note (i)). Use the activity after studying the work in the pupil book and show the children some seeds. Ask the children how they could make a model greenhouse to see if its warmth affected the way the seeds sprouted and the seedlings grew.

Using the sheet

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

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

(d) Let the children try task 4 (see note (iv).

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

Completing the activity

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

(g) Let the children compare their work (see note (v)).

Conclusion

The seeds in pot B sprout earlier than those in pot A. The seedlings in pot B grow faster than those in pot A. The length of the seedlings in pot B is greater than the length of the seedlings in pot A.

Teaching notes

(i) The first three tasks set out the structure of the investigation, which may help the weaker pupils and will help more able ones to set out their work in an orderly way. Task 4 may simply be to carry out the plan as outlined in the answers to task 2, or it may be extended to allow the children to construct tables and record observations, or even to measure the lengths of the seedlings and compare their growth quantitatively. If this is done, the data may be used in an ICT exercise.

(ii) The answers to the questions should be: (i) In the soil in both pots; (ii) Five or ten seeds, depending on the size of the seeds; (iii) In a sunny window; (iv) Check daily that the soil has not dried out and water, if necessary, to keep it damp; (v) Every day.

(iii) An example may be: The seeds in pot A will sprout later and the seedlings grow well. The seeds in pot B will sprout earlier and the seedlings grow larger.

(iv) The complexity of the investigation may depend upon the ability of the children as outlined in note (i).

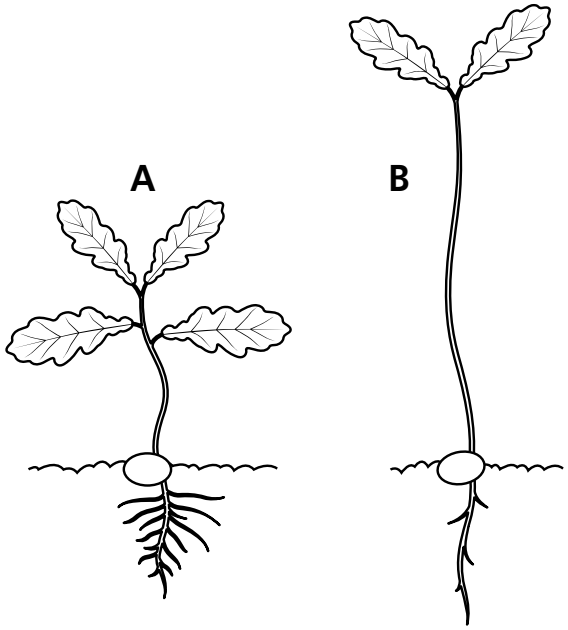
(v) If the children have made tables of data these could be displayed.

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

See **pages 14 and 15** of *Helping plants grow well*

Giving plants enough space

If plants are crowded together they will not be able to get enough sunlight, or enough nourishment and water from the soil.



Q1. State three ways in which plant A is different from plant B.

(i) ✎.....

(ii) ✎.....

(iii) ✎.....

Q2. Which plant in the diagram did not have enough space to grow properly?

✎.....

Q3. Why does a plant need to grow leaves?

✎.....

Q4. (i) What is a plant called that has roots that run round and round inside its pot?

✎.....

(ii) How can the plant be helped to grow well again?

✎.....

Q5. Why do bonsai trees have their roots clipped?

✎.....

Q6. (i) Why are trees planted close together in a forest that will be harvested for its wood?

✎.....

(ii) How do you think the trees would grow if they were planted far apart?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 14 and 15** of *Helping plants grow well*

Answers

1. **(i) A has more leaves; (ii) A has a shorter stem; (iii) A has more roots.**
2. **B.**
3. **So it can make food.**
4. **(i) Pot bound; (ii) Re-pot it.**
5. **To keep the trees small.**
6. **(i) So the trunks will grow tall, straight and with few branches; (ii) They would have shorter trunks with more branches and larger leaves.**

Complementary work

(a) The pea seedlings from the activity in this unit could be planted in small pots. When they become pot bound, one could be re-potted and its growth compared with the growth of the plant that remained in the small pot.

(b) The children could examine a selection of houseplants (perhaps those already growing in places in school, such as near the entrance) to see if they are pot bound. Any pot bound plants could then be re-potted in larger pots.

Teaching notes

Most children are familiar with the spinning winged fruits of the sycamore. At the end of the wing is a single seed. The purpose of the wing is to disperse the seed and move it away from others of its kind. Most plants have modified fruits to help them disperse their seeds. Even oaks, which drop acorns around their roots, rely on squirrels and jays to carry some seeds away. These animals bury the seeds to eat throughout the winter, but then forget about some of the stored seeds. These seeds can then produce seedlings without overcrowding.

Different kinds of plants can live in the same place because they do not compete directly for light, water and nutrients. In a woodland, the plants grow roots at different levels in the soil, so they take water and nutrients from different places. The shoots grow to different heights so the leaves do not overlap. Even where one plant shades another, the plant in the shade may be adapted to cope with less light.

Problems of overcrowding occur when seeds are sown by humans. This is why there are instructions on seed packets to prevent seeds being planted too close together. On farms, seeds are planted by seed drills which automatically release a certain number of seeds as the drill is moved across the field. This allows the crop plants plenty of space to get all the light, water and nourishment that they need before harvesting.

6

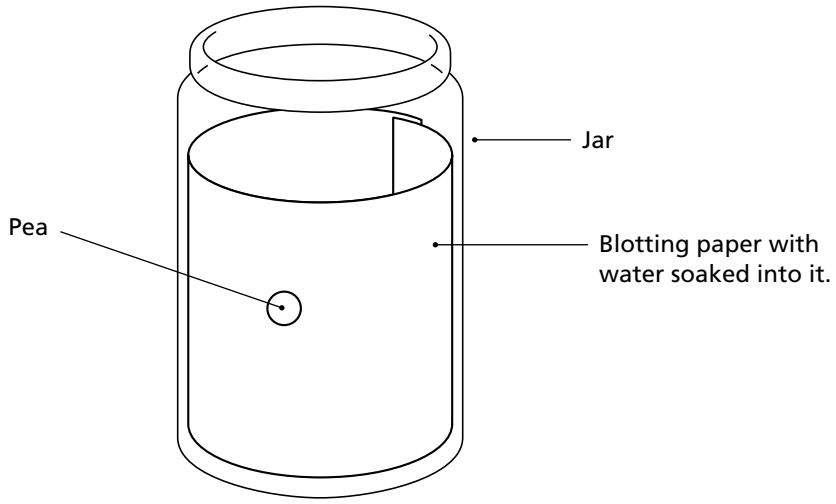
Name: ..... Form: .....

Based on **pages 14 and 15** of *Helping plants grow well*

Looking at root growth

Try this...

1. Look at the jar which has been set up like the one in the diagram. It is a jar with a piece of blotting paper holding a single pea against the wall of the jar. There is a little water in the jar and this has soaked up into the blotting paper.



2. Draw the pea in your jar on a sheet of paper. Write the date next to it.

3. Look at the pea every day and if there has been a change, make another drawing on a new piece of paper and write the date next to it.

4. After two weeks, look at your pictures and see if you can answer these questions.

(a) On which day did the seed break open? ✎.....

(b) On which day did the root start to appear? ✎.....

(c) On which day did the root produce a side root? ✎.....

(d) After ten days, where were the longest side roots found? ✎.....

(e) How long was the longest root after two weeks? ✎.....

(f) What did you find covering part of the roots?

✎.....

Teacher's sheet: activity

Based on **pages 14 and 15** of *Helping plants grow well*

Introducing the activity

(a) Tell the children that the growth of a plant shoot is easy to see, but the growth of a root is more difficult because it is hidden in the ground. One way to watch a root grow is to grow a seed against a transparent wall. Tell the children that they are going to watch carefully how the root of a plant grows during the first weeks of a plant's life.

Using the sheet

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

(c) Let the children carry out task 2 (see note (ii)).

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

(e) Let the children try task 4 (see note (iv)).

Completing the activity

(f) Let the children compare their results.

Conclusion

The root of a seedling can be investigated by growing the seedling against a transparent wall. By observing the root at regular intervals over two weeks the pattern of its growth can be worked out. Different pea seedlings produce the same growth pattern.

Teaching notes

(i) The jar could be glass or plastic. The pea seeds should be soaked for a day before use. It is tricky to get them into place so you may like to set them up before the lesson. The blotting paper should be placed in the jar so that it presses against the jar's side. Water can be carefully poured into the bottom of the jar and this will spread through the blotting paper and moisten it. The peas may then be carefully slipped between the paper and jar until they are about half-way down the jar. You may put four seeds in a jar so that they can be examined by different children at the same time. Add a small amount of water to the bottom of the jar over the two weeks to keep the blotting paper moist.

(ii) You may like the children to divide their paper up into six or eight pictures before they start their work on the pea. You may also like to take photographs of the pea and store them on the computer.

(iii) It is important to move the jars as little as possible to prevent the peas falling out of place.

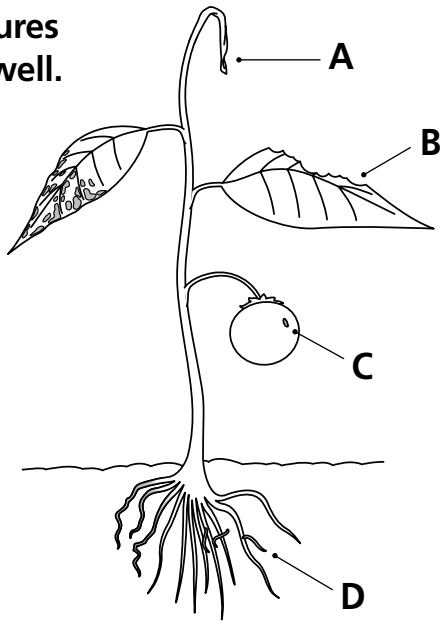
(iv) The answers may be (a) day 2; (b) day 4; (c) day 8 depending on temperature; (d) Near the top of the root; (e) This will depend on the temperature which affects the rate of growth; (f) tiny white hairs.

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

See **pages 16 and 17** of *Helping plants grow well*

Pests and diseases

Plants are food for many animals, including tiny creatures called microbes. These can stop plants from growing well.



Q1. (i) What has attacked the plant stem at A?

✎.....

(ii) What has eaten the leaf at B?

✎.....,.....

(iii) What could eat the fruit at C?

✎.....

(iv) What is D? ✎.....

(v) What does D eat? ✎.....

Q2. What do we call animals that eat our farm and garden plants? ✎.....

Q3. (i) What do plants have to stop an attack by disease?

✎.....

(ii) Which plants are most likely to be affected by disease?

✎.....

Q4. Name two common diseases of plants.

✎..... ✎.....

Q5. How can insects be removed from plants?

✎.....

Q6. Why can disease damage large numbers of cultivated plants?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 16 and 17** of *Helping plants grow well*

Answers

1. **(i) Fungus; (ii) Caterpillars; (iii) Grub; (iv) Wireworm; (v) Roots.**
2. **Pests.**
3. **(i) Natural defences; (ii) Plants that are not growing well.**
4. **Mildew and rust.**
5. **By spraying with chemicals called insecticides.**
6. **Because they are grown close together in large numbers and the disease can spread easily between the plants.**

Complementary work

You may wish to show the children some moulds. You could grow them using the following method. Moisten a slice of bread and put it in a clear plastic bag. Make a few tiny holes in the bag with a pin. Show the children the bread daily and point out any mould that begins to grow. Tell the children that moulds also grow on many plants if they get too damp, or on seedlings which are over-watered. Dispose of the mould in accordance with your school policies.

Teaching notes

Microbe is a term used to describe bacteria, viruses and some fungi, such as moulds. Fungi are included because they produce spores which are microscopic in size and are carried on air currents in a similar way to bacteria and viruses. The moulds are unusual for microbes in that they are large enough to be easily seen without a microscope.

Not all bacteria cause disease. Some cause materials in the soil to break down and make humus.

Not all insects cause disease. In fact, ladybirds feed on greenfly and can be introduced into a greenhouse to kill this pest. This is an example of biological control. In addition to greenfly, plants can also be infested with blackfly, which have the same structure but a different colour.

Whiteflies look like tiny moths. Scale insects have waxy shells and look like tiny tortoises. Mealy bugs look like tiny white splodges of matter on a leaf, and have a covering of cotton-like fibres. They feed on sap. The red spider mite bites at its leafy food. It belongs to the spider (arachnid) group.

You may wish to present organically grown food as an alternative to food raised by treating with sprays. Organically grown food is raised without chemical fertilisers, using manure; weeds are removed by hand without the use of weed killers; and insects are kept away by planting insect repellent plants next to food crops, instead of using insecticides.

7

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

Based on **pages 16 and 17** of *Helping plants grow well*

Are the leaves healthy?

Try this…

1. If a leaf is not healthy you may see one or more of these things:

The leaf is brown; The edges of the leaf are eaten; There are dark or white marks on the leaf; There are tiny animals on the leaf.

2. Look at a plant and draw the shape of its leaf in the second column of the table.

3. Look at the leaves on your plant and, in the other columns of the table, write down the number of leaves that are brown, the number that have edges eaten, the number that have dark or white marks, and the number that have tiny animals.

4. Repeat steps 2 and 3 with each of the other four plants.

Plant	Leaf shape	Brown leaves	Eaten edges	Dark/white mark	Tiny animals
1					
2					
3					
4					
5					

Looking at the results.

5. Which plant has the most signs of ill health? ✎.....

6. Which plant is the most healthy? ✎.....

Teacher's sheet: activity

Based on **pages 16 and 17** of *Helping plants grow well*

Introducing the activity

(a) Remind the children of how a doctor treats them when they are ill. The doctor asks questions to find out the cause of the illness. Tell the children that they can be plant doctors by trying to find out if a plant is healthy or ill (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 (see note (ii)).

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

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

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

(f) Go through tasks 5 and 6, then let the children try them.

Completing the activity

(g) Let the children compare their results.

(h) You may extend the activity by pooling the results from each group so that you collate information about all the type 1 plants, type 2 plants, and so on (see note (v)).

Conclusion

In this activity, four ways of recognising causes of plant ill health were identified. Depending on the plants used, some plants may have been completely healthy while others may have had more than one sign of ill health. Certain types of plants may all show the same signs of ill health, while other types of plants may show different signs of ill health.

Teaching notes

(i) There are many causes of plant ill health and the purpose of this activity is to help the children realise that observation can give a clue to plant healthiness. The observations are not intended to be used in plant treatment. For example, brownness may be caused by draughts, sun scorch, over-watering, over-feeding and rot.

(ii) Brownness may be caused by a variety of things (see note (i)), the edges are eaten by caterpillars, the dark marks may be caused by fungus, white marks might be mealy bug, the tiny animals may be greenfly, whitefly, scale insects, mealy bugs or red spider mites.

(iii) Let the children select a healthy leaf. Each group of children could have the same five kinds of plants numbered in the same way. This could help you extend the activity as described in 'Completing the activity'.

(iv) You may make a copy of the table on the board and fill in a line about a fictitious plant so the children can see how their data will look.

(v) This information could be used in an ICT exercise.

C

8

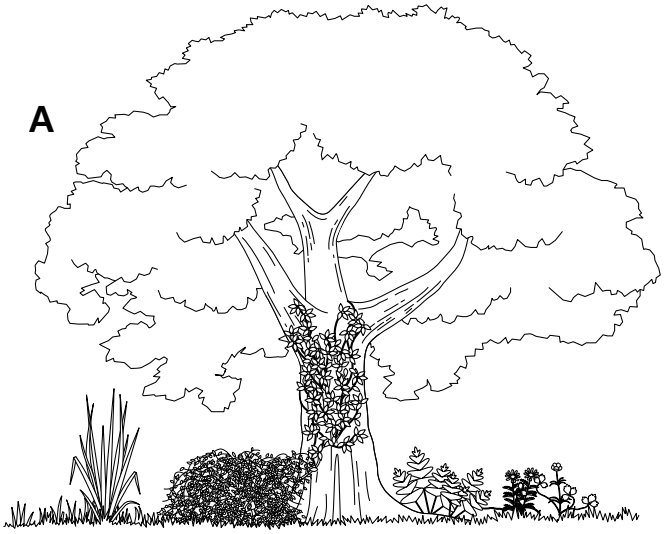
Name: ..... Form: .....

See **pages 18 and 19** of *Helping plants grow well*

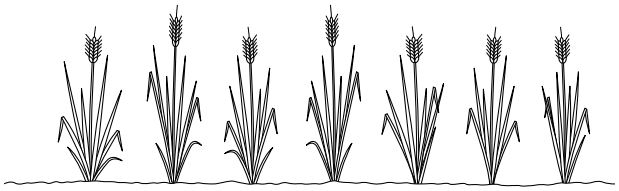
Why we need plants to grow well

Plants are an important source of food for people. This is why we need to make sure that our food plants grow well.

A



B



Q1. (i) What is shown in:

Picture A? ✎.....

Picture B? ✎.....

(ii) Which place provides food for many people? ✎.....

Q2. What do we call the plants we grow to eat? ✎.....

Q3. Name three cereal plants.

✎..... ✎..... ✎.....

Q4. Which cereal do half of the world's people depend on? ✎.....

Q5. Name three places where a vegetable may store its food.

✎..... ✎..... ✎.....

Teacher's sheet: comprehension

See **pages 18 and 19** of *Helping plants grow well*

Answers

1. **(i) A = Natural forest; B = farmland; (ii) B or farmland.**
2. **Crops.**
3. **Wheat, barley, rice, maize (corn).**
4. **Rice.**
5. **In the roots (tubers), stem or leaves.**

Complementary work

(a) If you can provide suitable facilities, the children could grow salad crops such as radishes and lettuce.

(b) The children could use secondary sources to find out about the life of a farmer.

(c) The children could use secondary sources to find out the countries which export fruit, vegetables and cereals.

(d) The children could use secondary sources to find out how plant produce is transported from farms to shops.

Teaching notes

For most of human history, people have been hunter-gatherers. They moved through their environment feeding on the plants and animals that they found. The men hunted large animals while women and children gathered fruits, nuts, roots and edible fungi.

About ten thousand years ago people began to practise agriculture. They may have started to do this because other foods were in short supply, or the human population increased and could not be sustained by hunting and gathering. Some people still live a hunter-gatherer lifestyle today (for example, in rainforests and deserts). They live in places where food is easy to gather, or where crops do not grow well (too wet or too dry).

Over time, farmers have bred plants and animals to provide more food. In plants, this has involved the production of larger fruits, seeds, leaves and roots. Along the way, other changes have taken place. For example, the plant from which the carrot was developed had yellow or purple roots.

Farming was first practised in the Middle East, the Americas and Asia. It arose independently in these places. Farming practice spread from the Middle East to Europe. Farm crops such as the onion, cabbage, carrot and lettuce originated in the Mediterranean; the potato, tomato and maize came from South America while Asia has provided foods such as rice, soy beans and bamboo shoots. The mung bean grows naturally in tropical Asia and has been cultivated for thousands of years in India and China.

8

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

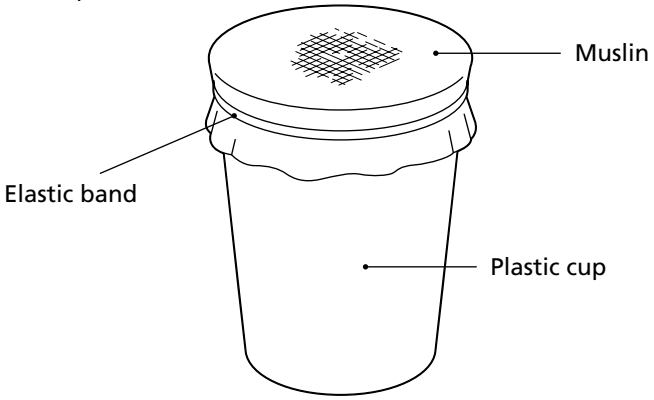
Based on **pages 18 and 19** of *Helping plants grow well*

Farming mung beans

Try this...

1. Take one soaked mung bean and draw it here.

2. Put ten soaked mung beans into a plastic cup. Cover the cup with muslin and an elastic band as in the picture.



3. Put the cup of beans in a cupboard that is dark and warm.

4. The next morning (Day 1) take off the muslin, fill the cup with water, put the muslin back on and pour out the water carefully.

5. In the afternoon take off the muslin, take out a sprouting bean, draw a picture of it in the table below, then replace it. Then fill the cup with water, put the muslin back on and pour out the water carefully.

6. Repeat steps 4 and 5 for Day 2, Day 3 and Day 4.

Day 1	Day 2	Day 3	Day 4		

7. On which day do you think the mung beans are ready for eating?

✎.....

Teacher's sheet: activity

Based on **pages 18 and 19** of *Helping plants grow well*

Introducing the activity

(a) Tell the children that in this activity they are going to be mung bean farmers. They are also going to make a record of how their mung bean crop grows (see note (i)).

Using the sheet

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

(c) Let the children try task 1.

(d) Go through tasks 2 and 3, then let the children try them.

(e) Go through task 4, then let the children try it (see note (ii)).

(f) Let the children try task 5 (see note (iii)).

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

(h) Let the children try task 7 (see note (v)).

Completing the activity

(i) Let the children compare their results.

(j) The investigation could be extended by repeating it, but storing the beans in cool conditions.

Conclusion

Soaked bean sprouts can be ready for eating in three to four days, depending on the temperature of the surroundings.

Teaching notes

(i) The purpose of this activity is to help the children realise that there is a daily routine in farming which must be followed if the crop is to be raised successfully. You may like to set up bean farms of your own, but tend to them irregularly, and perhaps neglect one altogether to show how poorly your crops grew compared to the rest of the class. You will need to begin this activity on a Monday so it can be completed by Friday, or you may like to extend it over a weekend to provide extra data.

It is important to stress at the outset that, as strict hygienic conditions will not be met (due to the children having to take out sprouting seeds and returning them), the food crop cannot be eaten. You may, however, wish the children to take the sheet home and ignore the drawing exercise so they can rear their own bean sprouts and eat them.

(ii) If the children pour the water off too quickly it can pull off the muslin cover and the beans will escape too.

(iii) The children may need help at first in realising that this is a two-stage process.

(iv) The children may need help in setting up this routine. You may like to extend the investigation over the weekend and use the extra spaces provided in the table.

(v) You may like to have some commercially prepared bean sprouts for comparison.

C

9

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

See **pages 20 and 21** of *Helping plants grow well*

Plants around the world

Plants are successful at growing in different conditions around the world.

Q1. (i) In which region is there a desert – A, B, C or D? ✎.....

(ii) In which region is the weather very cold, snowy and windy? ✎.....

(iii) In which region is the weather hot and rainy? ✎.....

(iv) Label a pine tree on the diagram.

Q2. What are the weather conditions like near the North Pole?

✎.....

Q3. What are weather conditions like near the equator?

✎.....

Q4. What kind of plant grows close to the ground on poor rocky soil? ✎.....

Q5. Name a plant which grows in hot, dry conditions. ✎.....

Q6. (i) What would happen if you took a bromeliad from a rainforest and planted it in a desert? ✎.....

(ii) Explain your answer.

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 20 and 21** of *Helping plants grow well*

Answers

1. **(i) C; (ii) A; (iii) D; (iv) any of the three pine trees between regions A and B.**
2. **Cold, freezing, snowy.**
3. **Warm and rain falls all year round.**
4. **Alpines.**
5. **Cactus.**
6. **(i) The bromeliad would die;**
   (ii) The conditions are different from the rainforest. It cannot survive because the desert is too dry.

Complementary work

(a) The children could make a survey of houseplants. They could find out how many plants are in their homes, how many of these plants have flowers, how many are cacti, and so on. They could find out in which rooms people keep plants, such as hall, living room, kitchen.

Teaching notes

The purpose of this unit is to introduce the children to a wide variety of plant forms and to make accurate observations about them. In the introduction, the point of the 'play' was to show that plants are living things and subject to the same environmental conditions as animals. While animals can sometimes move away to avoid the most extreme conditions in their environment, a plant must adapt its body to cope with all the conditions in its surroundings.

The concept of adaptation need not be developed at this stage, as it is dealt with thoroughly in *6A Adapting and surviving*. However children may ask some "Why?" questions about the plants they are observing, so the following information might be useful.

Alpine and Arctic plants need to keep out of the wind as it will rip them and dry out their leaves. They are small and grow close to the ground, to shelter from the wind, and have small leaves which lose little water. These plants are also in danger of being frozen, so some have woolly fibres to provide insulation.

Heathers grow on mountain sides and are subject to strong winds, so they are small and grow close to the ground and have small leaves. The stems form a bush which provides some insulation to the middle of the plant.

Cacti store water to stop it from leaving the plant. They have tiny leaves which are very difficult to see, and so cacti are often described as leafless. This also helps conserve water. They have a stem with a waxy coat which prevents water escaping, and they have spines which prevent animals from biting into them to get at the water.

If plants become too wet, mould may grow on them and kill them. In a rainforest, water pours down for a part of most days, so it is important that the plants do not have any standing water on their leaves. They have wax that makes the water move quickly across the leaf, and drip tips which direct the water quickly off the leaf. Bromeliads are unusual in that they have a circle of leaves which have bases that can stand up to the water and make a pool which the plant can use.

C

9

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

Based on **pages 20 and 21** of *Helping plants grow well*

Looking closely at plants

Try this…

1. Collect an alpine plant. Make some notes and drawings about it in this space.

2. Collect a heather. Make some notes and drawings about it in this space.

3. Collect a cactus. Make some notes and drawings about it in this space.

4. Collect a rainforest plant. Make some notes and drawings about it in this space.

Teacher's sheet: activity

Based on **pages 20 and 21** of *Helping plants grow well*

Introducing the activity

(a) You may like to introduce this activity by telling the children about the great journeys of discovery that were made on sailing ships in the past. Tell them that many of these ships had a scientist who studied plants, and the scientist would examine and draw the plants in the new lands that were discovered. In this activity the children are going to make notes, just as the plant-studying scientists did. You may tell the children that plant-studying scientists today still make notes in a similar way (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 (see note (ii)).

(c) Let the children try task 1.

(d) Let the children try task 2.

(e) Let the children try task 3 (see note (iii)).

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

Completing the activity

(g) Let the children compare their observations.

(h) Present the children with some unusual plants, such as 'living stones', Venus flytrap and pitcher plants. Ask for volunteers to examine the plants under your supervision and make observations for the rest of the class.

Conclusion

Plants from different parts of the world differ in a wide variety of ways (see note (v)).

Teaching notes

(i) In the previous activities, the children have followed specific instructions to build up their knowledge. In this activity they can use their observational and presentation skills more freely, just as botanists do. Although botanists now use cameras, they still make drawings to help them focus on the detail of the plant's structure.

(ii) Suggest that the children may take some measurements such as height, size of leaf and flower. They may draw a leaf or flower to show its structure, and describe the colours and markings they see. Tell them that they should make and record similar observations with the other plants in this activity.

(iii) Remind the children not to touch the spines. If possible, have some cacti which are in flower.

(iv) Select a plant with waxy leaves which helps water run off it and has a point on its leaf (a drip tip) which helps water leave the leaf. If you select a bromeliad (urn plant) try to have one in flower.

(v) Later in the course the children will look at how these differences are adaptations to their habitat. At this stage it is important to make the children aware that great differences exist.

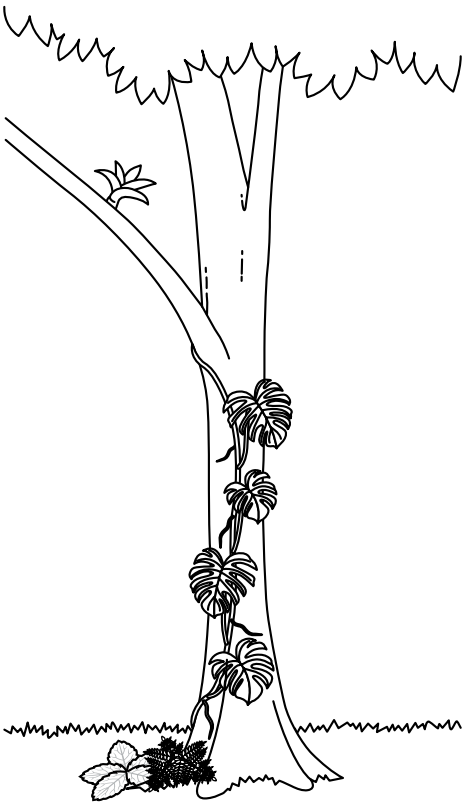
C

10

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

See **pages 22 and 23** of *Helping plants grow well*

Can you be too kind to a houseplant?



Plants need the correct amount of sunlight, water, warmth and nourishment. You can kill them with 'kindness'.

Q1. (i) Where is this tree growing? Underline one word to answer:

mountain **woodland**

desert **rainforest**

(ii) Shade in a place where you may find ferns growing.

Q2. What happens to a houseplant if the air is too dry?

✎.....

Q3. What happens to a houseplant if you give it too much water?

✎.....

Q4. Name a plant you could keep on a sunny windowsill.

✎.....

Q5. Some plants need moist air all the time. Which part of the world do these plants come from?

✎.....

Q6. When you put a houseplant outside, the conditions around it change in two ways. What are these changes?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 22 and 23** of *Helping plants grow well*

Answers

1. **(i) Rainforest; (ii) Around the base of the tree.**
2. **The leaves get brown tips.**
3. **The stem will rot.**
4. **Cactus or spider plant.**
5. **Near the equator.**
6. **There is more light. The air is moister.**

Complementary work

The children could examine the strawberry geranium, piggyback plant and the succulent called the good luck plant to see how they produce plantlets. They could try and rear some plantlets in a similar way to the rearing of the plantlet of the spider plant in this unit's activity.

Teaching notes

Some plants can reproduce by making copies of themselves. In the case of the spider plant and the strawberry geranium, the small copies, or plantlets, grow out on stalks. They grow from the leaves of the piggyback plant and the good luck plant. In the good luck plant, the plantlets grow around the edges of the leaves, and when they are large enough, they fall into the soil around the parent plant. This can provide an example of overcrowding and can be used in Unit 6.

The children can carefully remove the plantlets, separate them and grow them up in separate plant pots. This form of reproduction, in which a plant makes a copy of itself, is called vegetative propagation and occurs naturally. The plants that are produced are clones of their parent. This type of reproduction allows a plant that is successfully growing in a habitat to colonise the habitat steadily without having to produce flowers and seeds. The disadvantage of this method of reproduction is that there is no variation in the offspring which could allow them to survive in slightly different environments and give rise to new species. This is the reason why it is not very widespread.

The taking of cuttings is called artificial propagation. It is used where copies are needed of a particularly attractive or useful plant. Many plants can be copied by taking cuttings of their stems and leaves.

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

Based on **pages 22 and 23** of *Helping plants grow well*

Can you make them grow?

Try this…

1. Take a plant pot and fill it with soil to about two centimetres of the top.

2. Look at a spider plant and find a plantlet growing off a stalk.

3. If the plantlet has a few roots, remove it from the stalk.

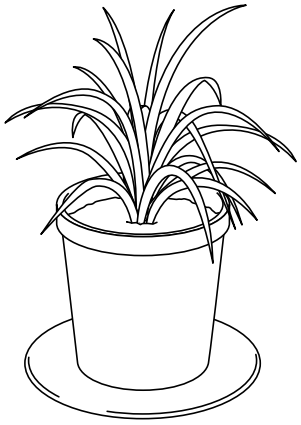
4. Dig a small hole in the soil in the pot.

5. Plant the spider plantlet in the hole and cover its roots with soil.

6. Press down the soil a little so the plant is firmly in the soil.

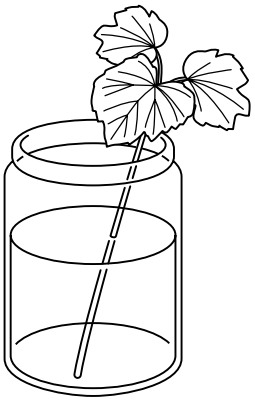
7. Put a dish under the plant pot and water the plant.

8. Put the plantlet in a well-lit place.



9. Keep a log book of when you watered your plant. Measure it every week to find out if it is growing.

10. Take a cutting from a geranium plant and put it in a jar of water as the diagram shows.



11. Keep the cutting in a well-lit place and look at it every few days. What do you find?

✎.....

Teacher's sheet: activity

Based on **pages 22 and 23** of *Helping plants grow well*

Introducing the activity

(a) Tell the children that some plants make small copies of themselves which grow out on stalks. Show them a spider plant with stalks carrying plantlets, and tell the children that their task is to try and rear the baby plants. Show the children a large geranium plant and tell them that they might also be able to raise baby plants from this larger plant, although it does not have any plantlets on stalks.

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 (i)).

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

(e) Go through tasks 4 to 6, then let the children try them (see note (iii)).

(f) Go through tasks 7 and 8, then let the children try them (see note (iv)).

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

(h) Go through tasks 10 and 11, then let the children try them (see note (vi)).

Completing the activity

(i) Let the children compare the growth and health of their spider plants. Let them compare the root growth of their cuttings.

(j) Let the children plant their geranium cuttings in another plant pot. The children now have two plants to start their houseplant collection.

Conclusion

A spider plant can be reared from a plantlet. A new geranium plant can be reared from a cutting.

Teaching notes

(i) Some children tend to only half-fill their plant pots. Make sure that they have a well-filled pot ready for the plantlet.

(ii) You may like to remove the plantlets for the children, or if they are able they can remove them by nipping off the stalk or by using scissors.

(iii) Check that the children do not plant the spider plant too deeply, or place it too close to the surface.

(iv) The soil should be watered with the equivalent of about three or four teaspoons of water. Make sure the children do not waterlog the plant.

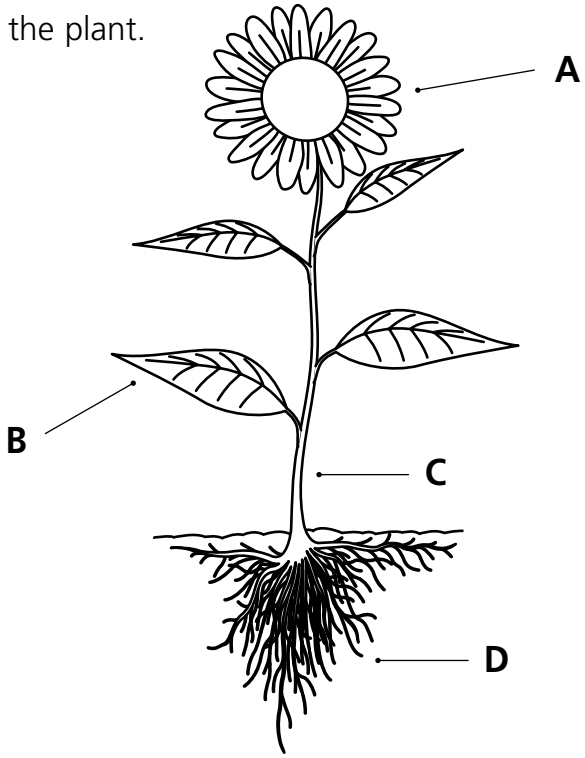
(v) The children could choose to measure the length of one leaf every few days over the coming weeks.

(vi) You should use a knife to take the cutting. It should be about 5 centimetres long. You should remove the lower leaves and keep just two or three at the top to let the cutting make food. Small roots should sprout from the stem over the course of the next few weeks.

REVISION QUESTIONS

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

Q1. Here are four parts of the plant.



Answer (i) and (ii) by putting a letter in the box.

(i) Which part makes food? ☐

(ii) Which part takes in water and nourishment? ☐

Answer (iii) and (iv) by writing the names of the correct parts of the plant.

(iii) What is the part labelled A? ✎.....

(iv) What is the part labelled C? ✎.....

Q2. Which of these things does a plant need to make food?

Tick two boxes: Air ☐ Rock ☐ Light ☐ Darkness ☐

Q3. (i) Which part of the plant makes seeds? ✎.....

(ii) What do seeds make? ✎.....

REVISION QUESTIONS

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

Q4. Arif and Jane each had a plant. They measured the heights of their plants. Jane pulled the leaves off her plant. Arif and Jane let their plants grow for 10 days and measured the heights of their plants two more times They wrote all their results in this table:

Day	Arif's plant height (cm)	Jane's plant height (cm)
1	5	5
5	8	6
10	11	6

(i) How much did Arif's plant grow from day 1 to day 5? ✎.....

(ii) How much did Jane's plant grow from day 1 to day 5? ✎.....

(iii) How can you tell Jane's plant stopped growing?

✎.....

(iv) On day 10 how much taller was Arif's plant than Jane's plant? ✎.....

Q5. Mina watered her plant and measured its height. It was 20 centimetres tall. Mina put the plant in a sunny window and left it for three days. She measured the height of the plant again. It was now 18 centimetres tall.

(i) How had the height of the plant changed?

✎.....

(ii) Mina said the plant had wilted. What had happened to it?

✎.....

(iii) How could Mina cure the wilted plant?

✎.....

Q6. Which part of the soil has the nourishment plants need?

Tick one box: Stones ☐ Sand ☐ Humus ☐ Grit ☐

REVISION QUESTIONS

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

Q7. Paul grew some seedlings in the light. The stems were short and sturdy and the leaves were green. Arif grew some seedlings in a box. When Arif opened his box he saw that his seedlings were not like Paul's seedlings.

(i) How do you think the stems of Arif's seedlings looked?

✎.....

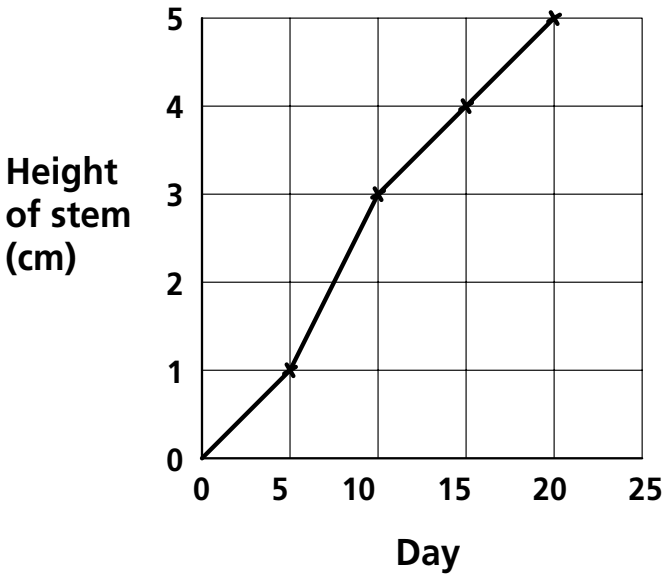
(ii) How do you think the leaves of Arif's seedlings looked?

✎.....

(iii) Why do you think Arif's seedlings were different?

✎.....

Q8. Mina grew a plant and measured it several times as it grew. Here is a graph of the plant's growth.



(i) What was the height of the stem on day 5? ✎.....

(ii) When did the stem grow fastest?

Tick one box: Between day 0 and day 5 ☐ Between day 5 and day 10 ☐

Between day 10 and day 15 ☐ Between day 15 and day 20 ☐

(iii) When was the stem 4cm high? ✎.....

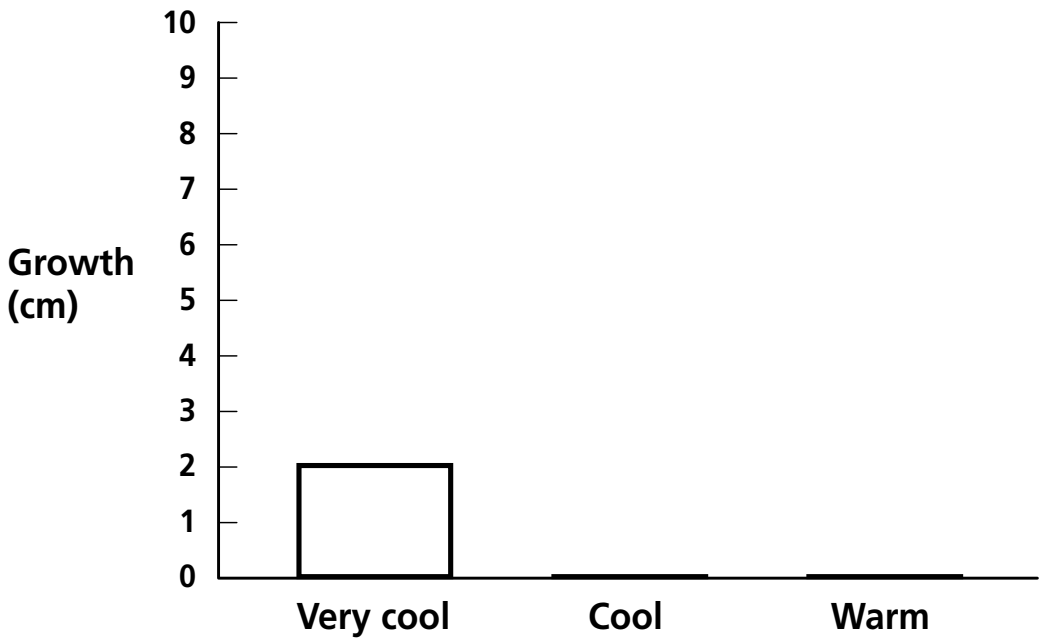
Name: ..... Form: .....

Q9. Jane, Mina and Paul each had a plant. They measured the heights of their plants, then put them in the places shown in the table.

They kept the plants in these places for two weeks, then measured the growth of the stems. They recorded their measurements in the table.

Plant	Place	Growth (cm)
Jane	very cool	2
Mina	cool	4
Paul	warm	9

(i) Make a bar chart of the results. The first bar has been done to help you.



(ii) How does warmth affect the way plants grow?

✎.....

Q10. Arif grew five plants in a large pot. Paul grew twenty plants in the same size pot. Paul complained that his plants were more spindly than Arif's plants.

Why do you think they had not grown well?

✎.....

REVISION QUESTIONS

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

Q11. Three plants were set up in different condtions.

This table shows the conditions for each plant:

Conditions	Plant A	Plant B	Plant C
Warmth	✓	✘	✘
Light	✓	✓	✘
Water	✓	✓	✓

(i) How many plants were kept warm? ✎.....

(ii) How many plants had water? ✎.....

(iii) Which plant do you think was the healthiest plant? ✎.....

(iv) Which plant was the least healthy plant? ✎.....

(v) How could the least healthy plant be made well?

✎.....

✎.....

Q12. Paul looked at the leaves of four plants for pests and diseases. Here is a table of his results:

Plant	Number of leaves with		
	caterpillars	fungus spots	greenfly
A	4	5	2
B	1	3	0
C	2	6	1
D	3	0	5

(i) Which plant is the healthiest? ✎.....

(ii) Which plant has the worst health? ✎.....

(iii) Which plant could be cured by spraying it with insecticide? ✎.....

REVISION QUESTIONS

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

Q13. Mina grew some mung beans. She measured one seed every day.
Here are her results:

	Day					
	0	**1**	**2**	**3**	**4**	**5**
Length (mm)	0	5	10	15	20	

(i) Predict the length of the mung bean on day 5. ✎.....

(ii) Which group of foods do beans belong to?

Tick one box: Cereals ☐ Vegetables ☐ Fruit ☐

Q14. Match each plant with the conditions it needs to survive.

Draw a line between the plant and the conditions it needs.

Palm tree	**Poor, rocky soil**
Heather	**Hot and rainy**
Alpine plant	**Damp, acid soil**

Q15. Which two houseplants need shady conditions?

Tick two boxes: Cactus ☐ Fern ☐ Begonia ☐ Spider plant ☐

ANSWERS
REVISION QUESTIONS

1. (i) B. *1 mark*
(ii) D. *1 mark*
(iii) Flower. *1 mark*
(iv) Stem. *1 mark*

2. Air, light. *2 marks*

3. (i) The flower. *1 mark*
(ii) New plants. *1 mark*

4. (i) 3cm. *1 mark*
(ii) 1cm. *1 mark*
(iii) It was the same height on day 5 and day 10. *1 mark*
(iv) 5cm. *1 mark*

5. (i) It was 2cm shorter. *1 mark*
(ii) It wilted and became floppy, bent or sagged. *1 mark*
(iii) She could water it. *1 mark*

6. Humus. *1 mark*

7. (i) Long and spindly. *1 mark*
(ii) White. *1 mark*
(iii) They had not had any light. *1 mark*

8. (i) 1cm. *1 mark*
(ii) Between day 5 and day 10. *1 mark*
(iii) Day 15. *1 mark*

9. (i) The 'cool' bar should reach the 4cm line, the 'warm' bar should reach the 9cm line. *2 marks*
(ii) It makes them grow more (faster). *1 mark*

10. They did not have enough space. *1 mark*

11. (i) 1. *1 mark*
(ii) 3. *1 mark*
(iii) Plant A. *1 mark*
(iv) Plant C. *1 mark*
(v) Give it warmth and light. *2 marks*

12. (i) B. *1 mark*
(ii) A. *1 mark*
(iii) D. *1 mark*

13. (i) 25mm. *1 mark*
(ii) Vegetables. *1 mark*

14. Palm tree ➔ hot and rainy; Heather ➔ damp, acid soil; Alpine ➔ poor, rocky soil. *3 marks*

15. Fern, begonia. *2 marks*

Total marks: 42