Science@School | Book 6A

Adapting and surviving

Teacher's Guide

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The pupil book explained unit by unit

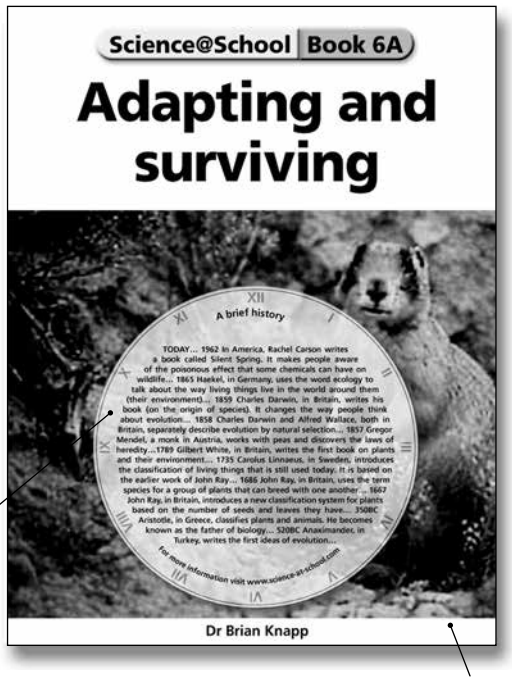
Although the pupil book – *Adapting and surviving* – is clear and simple, a great deal of care and thought has been given to the structure and the content of each double page spread or unit. The worksheets and activities in this *Teacher's Guide* also link directly to the pages in *Adapting and surviving*.

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

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

Title page

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



A time clock giving additional historical information about the topic.

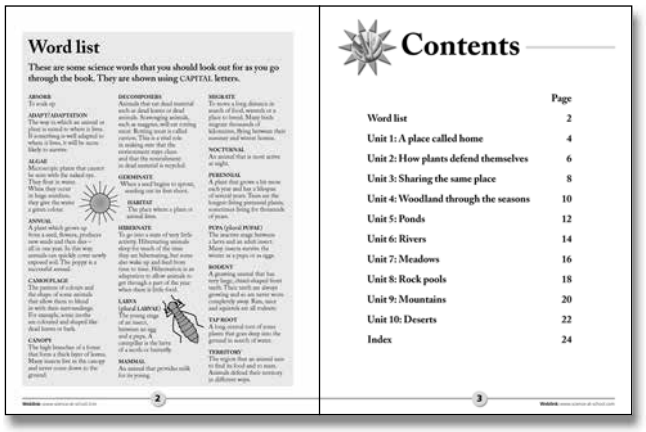
The picture shows a marmot.

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 given on page 3. The book is organised into double page spreads, each double page spread covering 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

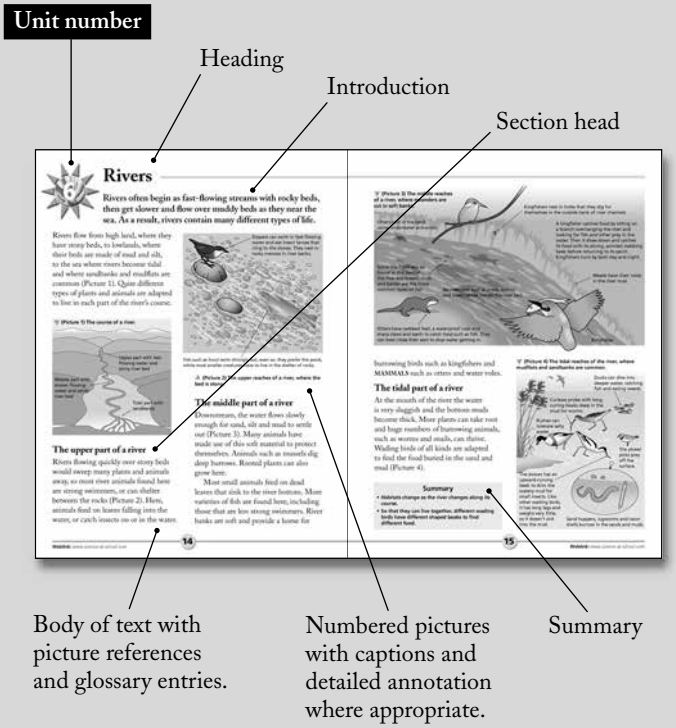
The main text of the page then follows in a straightforward, easy-to-follow, double column format.

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.



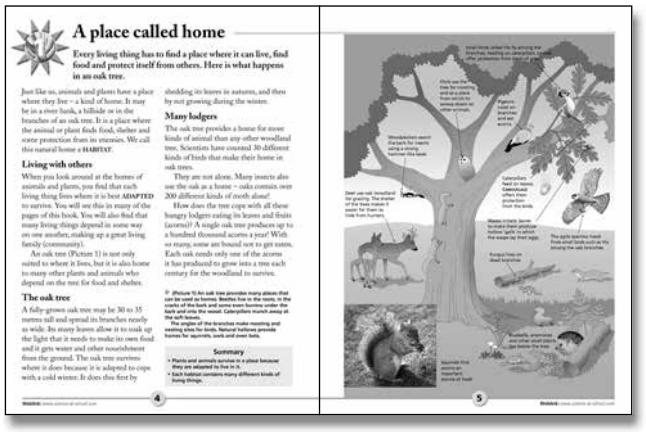
1 A place called home

Before you begin this unit you may like to discuss with the children their ideas about habitats and the examples they have studied previously. You may then move the discussion on to why an animal can survive in one habitat and not in another.

A simple reference to a fish out of water may help the children realise how the fish is adapted for aquatic life, but not for life on land. This illustrates how adaptation and survival are linked, which is the major theme running through the whole of the book.

A second theme in the book is that of interdependence. For example, rabbits feed on plants and in turn provide the plants with manure to help them keep growing. In studying the oak tree and the animals in the unit, the children will realise that the way organisms depend on each other is more complex than this, and they will be prepared for looking more closely at relationships between the organisms they find in each habitat.

In the supporting activity, the children learn how to use a key to identify trees, and how to make a survey of the different trees in their neighbourhood.


A place called home

Every living thing has to find a place where it can live, find food and protect itself from others. Here is what happens in an oak tree.

Just like us, animals and plants have a place where they live – a kind of home. It may be in a river bank, a hillside or in the branches of an oak tree. It is a place where the animal or plant finds food, shelter and some protection from its enemies. We call this natural home a HABITAT.

Living with others

When you look around at the homes of animals and plants, you find that each living thing lives where it is best ADAPTED to survive. You will see this in many of the pages of this book. You will also find that many living things depend in some way on one another, making up a great living family (community).

An oak tree (Picture 1) is not only suited to where it lives, but it is also home to many other plants and animals who depend on the tree for food and shelter.

The oak tree

A fully-grown oak tree may be 30 to 35 metres tall and spread its branches nearly as wide. Its many leaves allow it to soak up the light that it needs to make its own food and it gets water and other nourishment from the ground. The oak tree survives where it does because it is adapted to cope with a cold winter. It does this first by shedding its leaves in autumn, and then by not growing during the winter.

Many lodgers

The oak tree provides a home for more kinds of animal than any other woodland tree. Scientists have counted 30 different kinds of birds that make their home in oak trees.

They are not alone. Many insects also use the oak as a home – oaks contain over 200 different kinds of moth alone!

How does the tree cope with all these hungry lodgers eating its leaves and fruits (acorns)? A single oak tree produces up to a hundred thousand acorns a year! With so many, some are bound not to get eaten. Each oak needs only one of the acorns it has produced to grow into a tree each century for the woodland to survive.

Summary

- Plants and animals survive in a place because they are adapted to live in it.
- Each habitat contains many different kinds of living things.

This prepares the children for looking at animal life on other kinds of trees beside the oak.

In the complementary activities, the children can make their own tree key, based on studying the twigs, and use secondary sources to find out more about the adaptations of the animals covered in the unit.

2 How plants defend themselves

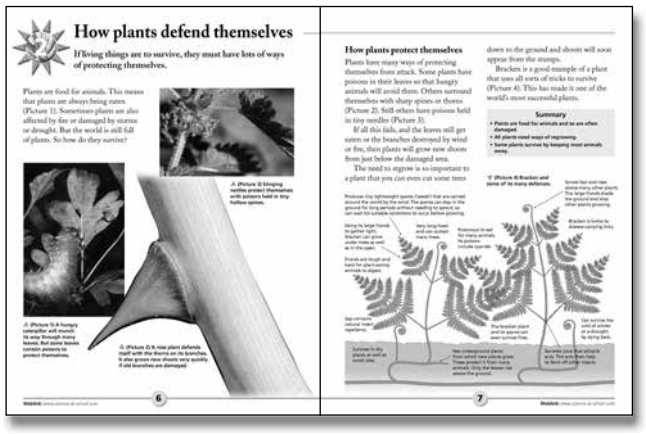
As you worked through the previous unit, you may have revised the concept of the food chain and helped the children realise how animals are dependent on plants. This unit takes a closer look at the way plants manage to survive when they are food for so many animals. It also discusses how storms and fire can damage plants.

Poisons, stings and thorns are three ways that plants deter animals from eating them, but plants also have to compete against other plants, and may grow above them to shade them out.

The bracken, a plant with a worldwide distribution, is featured in detail to show its many strategies for defending itself.

In the supporting activity, the children investigate the animal life on a branch, in order to appreciate the range and numbers of animals that may be present.

In the complementary work, the children can use secondary sources to find out how some plants grow


How plants defend themselves

If living things are to survive, they must have lots of ways of protecting themselves.

Plants are food for animals. This means that plants are always being eaten (Picture 1). Sometimes plants are also affected by fire or damaged by storms or drought. But the world is still full of plants. So how do they survive?

How plants protect themselves

Plants have many ways of protecting themselves from attack. Some plants have poisons in their leaves so that hungry animals will avoid them. Others surround themselves with sharp spines or thorns (Picture 2). Still others have poisons held in tiny needles (Picture 3).

If all this fails, and the leaves still get eaten or the branches destroyed by wind or fire, then plants will grow new shoots from just below the damaged area.

The need to regrow is so important to a plant that you can even cut some trees down to the ground and shoots will soon appear from the stumps.

Bracken is a good example of a plant that uses all sorts of tricks to survive (Picture 4). This has made it one of the world's most successful plants.

Summary

- Plants are food for animals and so are often damaged.
- All plants need ways of regrowing.
- Some plants survive by keeping most animals away.

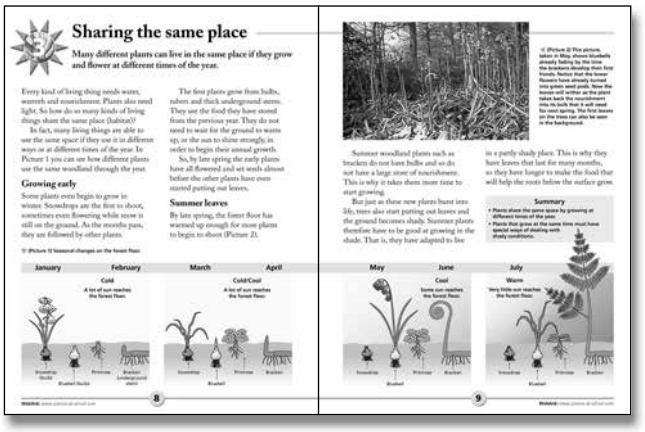
when their tissues are invaded by tiny animals, and how larger animals are deterred by spines on leaves and branches.

3 Sharing the same place

You may introduce the unit by showing the children some bulbs. Describe them as energy stores which allow plants to grow without strong light shining on them. These adaptations allow some plants to live in the same habitat as other plants by growing earlier in the year than those plants that grow from seeds or have woody stems.

If you are studying the unit in the autumn, you may like the children to plant some bulbs for flowering early in the following year. If you are studying the unit in the spring, you may show them some bulbs in leaf and flower.

In addition to bulbs, the unit also features root tubers and underground stems as stores of energy for plant growth. The sequence of plant growth in a wood is described by reference to the snowdrop, primrose, bluebell, bracken and trees. The advantages of early growth are discussed. By coming into leaf at different times of year, a large number of plants can survive in the same area, without competing with each other.


Sharing the same place

Many different plants can live in the same place if they grow and flower at different times of the year.

Every kind of living thing needs water, warmth and nourishment. Plants also need light. So how do so many kinds of living things share the same place (habitat)?

In fact, many living things are able to use the same space if they use it in different ways or at different times of the year. In Picture 1 you can see how different plants use the same woodland through the year.

Growing early

Some plants even begin to grow in winter. Snowdrops are the first to shoot, sometimes even flowering while snow is still on the ground. As the months pass, they are followed by other plants.

The first plants grow from bulbs, tubers and thick underground stems. They use the food they have stored from the previous year. They do not need to wait for the ground to warm up, or the sun to shine strongly, in order to begin their annual growth.

So, by late spring the early plants have all flowered and set seeds almost before the other plants have even started putting out leaves.

Summer leaves

By late spring, the forest floor has warmed up enough for more plants to begin to shoot (Picture 2).

Summer woodland plants such as bracken do not have bulbs and so do not have a large store of nourishment. This is why it takes them more time to start growing.

But just as these new plants burst into life, trees also start putting out leaves and the ground becomes shady. Summer plants therefore have to be good at growing in the shade. That is, they have adapted to live in a partly shady place. This is why they have leaves that last for many months, so they have longer to make the food that will help the roots below the surface grow.

Summary

- Plants share the same space by growing at different times of the year.
- Plants that grow at the same time must have special ways of dealing with shady conditions.

January February March April May June July

Cold A lot of sun reaches the forest floor.

Cold/Cool A lot of sun reaches the forest floor.

Cool Some sun reaches the forest floor.

Warm Very little sun reaches the forest floor.

8 9

In the supporting activity, the children find out about the animal life living in an area of ground by using pitfall traps.

In the complementary work, the children use secondary sources to find out how the animals they caught are adapted to their ways of life. In a second complementary activity, the children use secondary sources to find out how the large number of different animals on the African plains survive without competing.

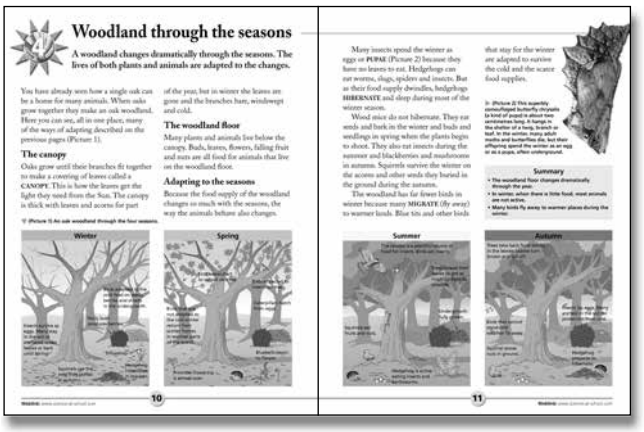
4 Woodland through the seasons

You may want to begin this topic by reminding the children of how the Earth moves around the Sun. You could enlist one child to be the Sun while another holds the Earth at the correct tilt and moves round the Sun as the other members of the class describe the change in seasons. You can now tie these cosmic events to the seasonal changes in the woodland habitat and their effect on the organisms that live there.

The unit begins by reminding the children of the single oak tree in Unit 1, and describing how oak trees form a woodland with its characteristic features of a canopy and a woodland floor.

Four pictures illustrate the changes in a wood over the year, and how these changes affect some of the plants and animals that live there. The text compares animals that hibernate, migrate or are otherwise adapted to stay active in the woodland through the harshest weather.

In the supporting activity, the children study the feeding capabilities of birds discussed in the text, by


Woodland through the seasons

A woodland changes dramatically through the seasons. The lives of both plants and animals are adapted to the changes.

You have already seen how a single oak can be a home for many animals. When oaks grow together they make an oak woodland. Here you can see, all in one place, many of the ways of adapting described on the previous pages (Picture 1).

The canopy

Oaks grow until their branches fit together to make a covering of leaves called a CANOPY. This is how the leaves get the light they need from the Sun. The canopy is thick with leaves and acorns for part of the year, but in winter the leaves are gone and the branches bare, windswept and cold.

The woodland floor

Many plants and animals live below the canopy. Bulbs, leaves, flowers, falling fruit and nuts are all food for animals that live on the woodland floor.

Adapting to the seasons

Because the food supply of the woodland changes so much with the seasons, the way the animals behave also changes.

Many insects spend the winter as eggs or PUPAE (Picture 2) because they have no leaves to eat. Hedgehogs can eat worms, slugs, spiders and insects. But as their food supply dwindles, hedgehogs HIBERNATE and sleep during most of the winter season.

Wood mice do not hibernate. They eat seeds and bark in the winter and buds and seedlings in spring when the plants begin to shoot. They also eat insects during the summer and blackberries and mushrooms in autumn. Squirrels survive the winter on the acorns and other seeds they buried in the ground during the autumn.

The woodland has far fewer birds in winter because many MIGRATE (fly away) to warmer lands. Blue tits and other birds that stay for the winter are adapted to survive the cold and the scarce food supplies.

Summary

- The woodland floor changes dramatically through the year.
- In winter, when there is little food, most animals are not active.
- Many birds fly away to warmer places during the winter.

Winter Spring Summer Autumn

10 11

scientifically modelling the actions of a seed-eating bird and an insect-eating bird to see how their beaks are adapted to their food.

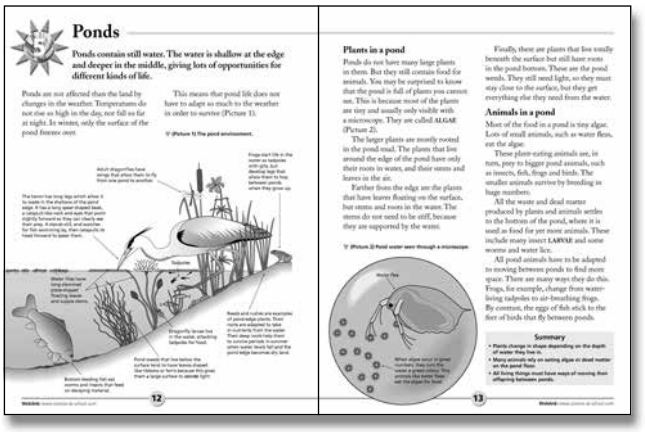
The complementary work draws on the activities of Units 1 and 3 to produce a year long investigation of seasonal change.

5 Ponds

Ponds are exciting places and you may want the children to visit a pond before they begin a formal study. The children could collect some pond life, such as water weed and snails, for the classroom aquarium tank. They could study the pond life while they are working through the unit, then return them to the pond on a second visit, when the children look at the pond again in the light of what they have learnt.

The unit begins by comparing the pond habitat with a habitat on land, then moves on to describe the arrangement of plants in a pond and the presence of the microscopic algae. A detailed illustration shows how some plants and animals are adapted for life in the pond, and the unit ends by describing how some pond animals move from one pond to the next.

The supporting activity studies the adaptation of algae to an aquatic life. The children make Plasticine models of algae and test their sinking speed. They


Ponds

Ponds contain still water. The water is shallow at the edge and deeper in the middle, giving lots of opportunities for different kinds of life.

Ponds are not affected than the land by changes in the weather. Temperatures do not rise so high in the day, nor fall so far at night. In winter, only the surface of the pond freezes over.

This means that pond life does not have to adapt so much to the weather in order to survive (Picture 1).

Plants in a pond

Ponds do not have many large plants in them. But they still contain food for animals. You may be surprised to know that the pond is full of plants you cannot see. This is because most of the plants are tiny and usually only visible with a microscope. They are called ALGAE (Picture 2).

The larger plants are mostly rooted in the pond mud. The plants that live around the edge of the pond have only their roots in water, and their stems and leaves in the air.

Further from the edge are the plants that have leaves floating on the surface, but stems and roots in the water. The stems do not need to be stiff, because they are supported by the water.

Animals in a pond

Most of the food in a pond is tiny algae. Lots of small animals, such as water fleas, eat the algae.

These plant-eating animals are, in turn, prey to bigger pond animals, such as insects, fish, frogs and birds. The smaller animals survive by breeding in huge numbers.

All the water and dead matter produced by plants and animals settles to the bottom of the pond, where it is used as food for yet more animals. These include many insect LARVAE and some worms and water lice.

All pond animals have to be adapted to moving between ponds to find more space. There are many ways they do this. Frogs, for example, change from water-living tadpoles to air-breathing frogs. By contrast, the eggs of fish stick to the feet of birds that fly between ponds.

Summary

- Plants change in shape depending on the depth of water they live in.
- Many animals rely on eating algae or dead matter on the pond floor.
- All living things must have ways of moving their offspring between ponds.

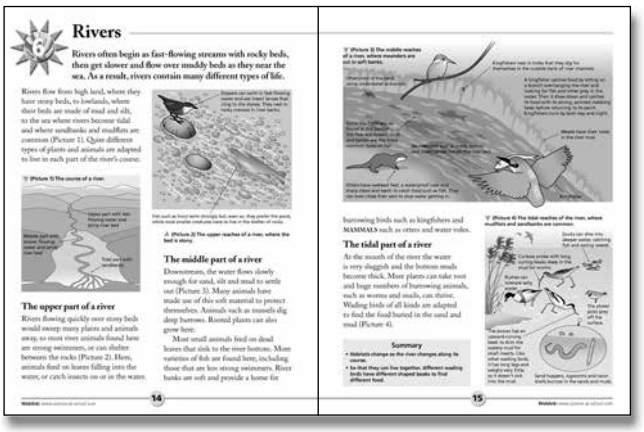
12 13

can relate the numbers of spines on an algae to its ability to stay in sunlit water. In the complementary work, a sample of pond water is sealed in a jar with some water weed, and changes to the water are observed through the year.

6 Rivers

The river is a long, narrow habitat, and children can have difficulty appreciating it in its entirety. To address this problem, the unit begins by showing a diagram of a complete river, then addresses the three major habitats within the river system.

You may like to help the children visualise these regions by building a model river. First mix some sand, gravel and clay in a jar and pour this down a gently sloping gutter. Let the children see how the particles separate out, with the larger ones at the top and the smaller ones at the bottom. Develop this observation further by preparing a short, steep piece of gutter with gravel in it (the upper reach), emptying into a longer, more gently sloping piece of gutter with a mixture of sand and small gravel in it (the middle reach), and this in turn emptying into a very slightly sloping tray of clay and fine sand. Allow some water to trickle through the system and let the children see how its speed changes in each part of the river. Refer back to the different parts of your model as you work through each part of the river in the unit.


Rivers

Rivers often begin as fast-flowing streams with rocky beds, then get slower and flow over muddy beds as they near the sea. As a result, rivers contain many different types of life.

Rivers flow from high land, where they have stony beds, to lowlands, where their beds are made of mud and silt, to the sea where rivers become tidal and where sandbanks and mudflats are common (Picture 1). Quite different types of plants and animals are adapted to live in each part of the river's course.

The upper part of a river

Rivers flowing quickly over stony beds would sweep many plants and animals away, so most river animals found here are strong swimmers, or can shelter between the rocks (Picture 2). Here, animals feed on leaves falling into the water, or catch insects on or in the water.

The middle part of a river

Downstream, the water flows slowly enough for sand, silt and mud to settle out (Picture 3). Many animals have made use of this soft material to protect themselves. Animals such as trumpet-dig deep burrows. Rooted plants can also grow here.

Most small animals feed on dead leaves that sink to the river bottom. More varieties of fish are found here, including those that are less strong swimmers. River banks are soft and provide a home for burrowing birds such as kingfishers and MAMMALS such as otters and water voles.

The tidal part of a river

At the mouth of the river the water is very sluggish and the bottom mud becomes thick. Most plants can take root and huge numbers of burrowing animals, such as worms and snails, can thrive. Wading birds of all kinds are adapted to find the food buried in the sand and mud (Picture 4).

Summary

- Habitats change as the river changes along its course.
- So that they can live together, different wading birds have different shaped beaks to find different food.

14 15

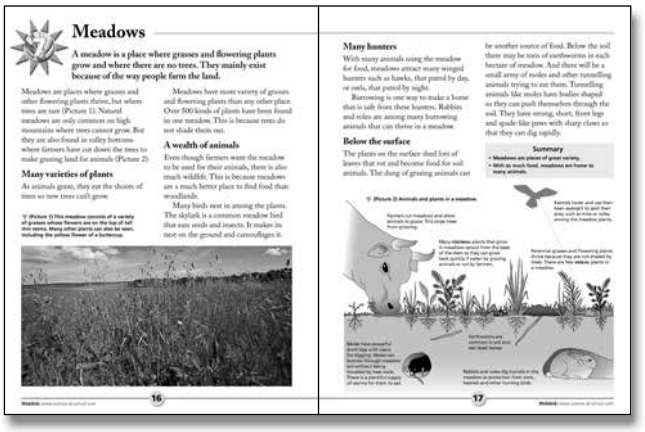
In the complementary activity, the children investigate the conditions for growth of a riverside plant – the liverwort. They may also try some scientific modelling of their own to find out how difficult it is for wading birds to extract their food from mud, by using a pair of chopsticks and a shell buried in sand.

7 Meadows

The major feature of a meadow is its range of grasses, so you may like to begin by showing the children a clump of grass (complete with its soil). Let them see that it is a tangle of grass roots and stems with leaves and flower stalks growing upwards. You may develop the idea of the meadow as food for farm animals by cutting your grass with a pair of scissors, until it is close cropped, and letting the children weigh the cuttings. Now water the grass and leave it in a sunny place. Let the children look for signs of re-growth, then cut and weigh the grass again to find out how productive it is.

The grass is also a habitat for tiny animals, and you may like to break up another piece of it over a white tray and let the children observe the animals that fall out.

This unit begins by pointing out that most meadows have been produced by human activity and natural meadows are only common on mountain sides. It continues by discussing the variety of plants and animals that are adapted to the conditions in the meadow, from kestrels hovering above the grass, to rabbits and moles burrowing through the soil.


Meadows

A meadow is a place where grasses and flowering plants grow and where there are no trees. They mainly exist because of the way people farm the land.

Meadows are places where grasses and other flowering plants thrive, but where trees are rare (Picture 1). Natural meadows are only common on high mountainsides where trees cannot grow. But they are also found in valley bottoms where farmers have cut down the trees to make grazing land for animals (Picture 2).

Many varieties of plants

As animals graze, they eat the shoots of trees so new trees can't grow.

Meadows have more variety of grasses and flowering plants than any other place. Over 500 kinds of plants have been found in one meadow. This is because trees do not shade them out.

A wealth of animals

Even though farmers want the meadow to be used for their animals, there is also much wildlife. This is because meadows are a much better place to find food than woodlands.

Many birds nest in among the plants. The skylark is a common meadow bird that eats seeds and insects. It makes its nest on the ground and camouflages it.

Many hunters

With many animals using the meadow for food, meadows attract many winged hunters such as hawks, that patrol by day, or owls, that patrol by night.

Burrowing is one way to make a home that is safe from these hunters. Rabbits and voles are among many burrowing animals that can thrive in a meadow.

Below the surface

The plants on the surface shed loss of leaves that rot and become food for soil animals. The dung of grazing animals can be another source of food. Below the soil there may be tons of earthworms in each hectare of meadow. And there will be a small army of moles and other tunnelling animals trying to eat them. Tunnelling animals like moles have bodies shaped so they can push themselves through the soil. They have strong, short, front legs and spade-like paws with sharp claws so that they can dig rapidly.

Summary

- Meadows are places of great variety.
- With so much food, meadows are home to many animals.

16 17

Late-sprouting seeds find that the grass has already grown and the ground surface is quite shady. In the supporting activity, the children investigate how plant shoots can find light even if it is shaded out by other plants.

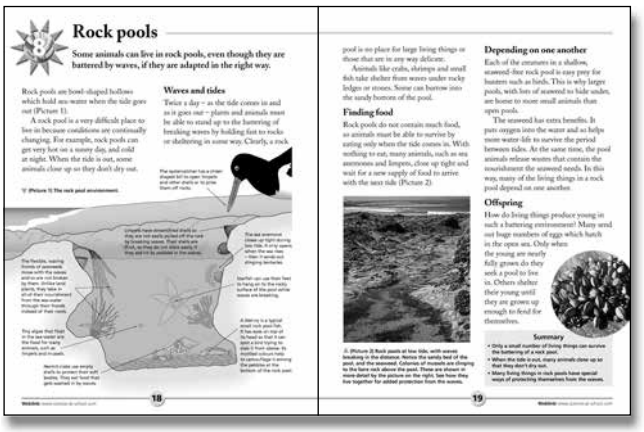
In the complementary activities, the children make camouflage patterns and test them against different grassy conditions.

8 Rock pools

You may like to begin this work by looking at ocean life and by showing the children a video of life on a coral reef, or of exploration of the sea floor. If possible, follow this by looking at specimens from the sea. You may be able to borrow some from a local museum or secondary school. Some children may have collected shells and dried starfish on a trip to the seaside which could also form part of a display. The children could look at how the animal's features (shell) help them adapt to sea life.

Rockpools are a convenient place to look at sea life during a field trip. The unit looks at the problems sea creatures face as they try to survive on a rocky shore. The problems of drying out, rising temperatures and the battering of breaking waves are described, along with the wait for food on the incoming tide, and the close relationship between the seaweed and animals that live in the pools.

The supporting activity features two investigations about the conditions organisms face when they try to cross habitat boundaries. In the first


Rock pools

Some animals can live in rock pools, even though they are battered by waves, if they are adapted in the right way.

Rock pools are bowl-shaped hollows which hold sea-water when the tide goes out (Picture 1).

A rock pool is a very difficult place to live in because conditions are continually changing. For example, rock pools can get very hot on a sunny day, and cold at night. When the tide is out, some animals close up so they don't dry out.

Waves and tides

Twice a day – as the tide comes in and as it goes out – plants and animals must be able to stand up to the battering of breaking waves by holding fast to rocks or sheltering in some way. Clearly, a rock pool is no place for large living things or those that are in any way delicate.

Animals like crabs, shrimps and small fish take shelter from waves under rocky ledges or stones. Some can burrow into the sandy bottoms of the pool.

Finding food

Rock pools do not contain much food, so animals must be able to survive by eating only when the tide comes in. With nothing to eat, many animals, such as sea anemones and limpets, close up tight and wait for a new supply of food to arrive with the next tide (Picture 2).

Depending on one another

Each of the creatures in a shallow, seaweed-free rock pool is easy prey for hunters such as birds. This is why larger pools, with lots of seaweed to hide under, are home to more small animals than open pools.

The seaweed has extra benefits. It puts oxygen into the water and so helps store water-life to survive the period between tides. At the same time, the pool animals release wastes that contain the nourishment the seaweed needs. In this way, many of the living things in a rock pool depend on one another.

Offspring

How do living things produce young in such a battering environment? Many send out huge numbers of eggs which hatch in the open sea. Only when the young are nearly fully grown do they seek a pool to live in. Others shelter their young until they are grown up enough to fend for themselves.

Summary

- Only a small number of living things can survive the battering of a rock pool.
- When the tide is out, many animals close up so that they don't dry out.
- Many living things in rock pools have special ways of protecting themselves from the waves.

18 19

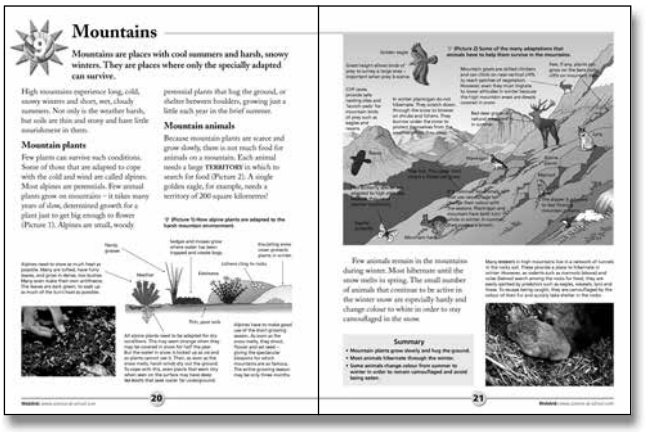
activity, the children set up their own rock pools and study how water temperatures change. In the second activity, they study how salt water affects the growth of land plants.

9 Mountains

You may want to begin by reviewing what the children know about mountains and mountain life. You may find that it is useful to develop the discussion by showing a video about mountaineering which shows the cold, windy and inhospitable conditions. In contrast, you could also show a video of people who live in the mountains and compare how their lives are different from people who live at lower altitudes. This should set the scene for looking at how plants and animals survive in mountain conditions.

The unit addresses the survival of plants and animals in some detail. For example, some plants can survive the cold, dry conditions by making their own antifreeze and having deep tap roots.

Animals need to have large territories in which to find the sparse food. The lives of prey animals such as mountain hares are contrasted with predators such as the golden eagle and the lynx.



The adaptations of both plants and animals to the harsh conditions in the habitat are clearly presented in words and pictures.

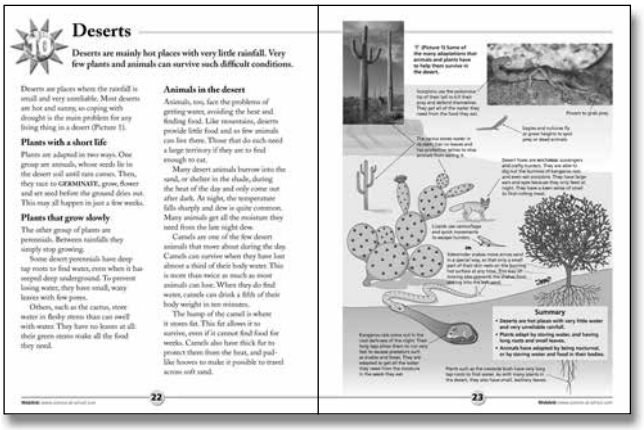
In the supporting activity, the children compare mountain soil with soil from the lowlands. In complementary work, they make a survey of mountain life from around the world and look at the lives of some plants and animals in detail.

10 Deserts

Children have a good idea about what a desert is, so build on this by comparing the climate of a desert with that of the local climate. Show the children the annual change in temperature and rainfall for your locality and compare this to the annual change in temperature and rainfall for a desert such as the Sahara. (On our web site www.curriculumvisions.com, click on world weather, then weather stations, then make a choice.)

You could also find the current time of year and compare how the conditions would be different in the desert. It is important to remind the children that deserts may be very hot during the day but they are also cold at night, so the daily range of temperature is also greater than here.

The unit begins by comparing two strategies that plants use for survival – a short life cycle of a few weeks, or a long life cycle in which plants simply stop growing when the desert is dry. Many desert animals are nocturnal, which helps them to get water from the dew that forms as the air temperature falls.



The large picture features a creosote bush and a cactus. In the same illustration, reptiles and mammals seek food and protection under the eye of a bird of prey.

The supporting activity develops the text in the unit relating to the camel and provides the chance for the children to design and carry out an investigation showing how feet are adapted for walking across sand.

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

Starting a unit

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

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

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

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

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

Using the comprehension worksheets

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

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

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

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

Using the activity worksheets

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

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

Planning to use a unit

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

Safety

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

Resources

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

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

List 1 (Starting a unit with a demonstration)

▼ UNIT

1. –
2. –
3. Bulbs, bulb bowls and bulb fibre (optional).
4. Sun model, globe.
5. Access to a safe pond, pond nets, collecting equipment, aquarium tank.
6. A short piece of gutter, a long piece of gutter, a tray, sand, gravel and clay mixture, gravel, sand and gravel, clay and fine sand, supports, beaker for pouring water down 'river', bucket for collecting water.
7. Clump of grass, scissors, seed tray for growing grass, white tray, collecting equipment, magnifying glasses.
8. Video of coral reef or ocean exploration, specimens of marine life from a museum or secondary school, shells and dried starfish.
9. Video of mountaineers or people who live in the mountains.
10. Weather charts for local area; for a desert use www.curriculumvisions.com.

List 2 (Complementary work)

Each group will need the following items:

▼ UNIT

1. Winter twigs of willow, ash, horse chestnut, lime, oak, beech, sycamore. Secondary sources about deer, woodpecker, owl, blue tit, wasp, caterpillar, sparrow hawk, squirrel.
2. Secondary sources about plant galls, on oak, lime and sycamore, oak apples, robin's pin cushion, witches' broom. Secondary sources about rose, holly, gorse, thistle, hawthorn, teasel and sea holly.
3. Secondary sources about centipedes, millipedes, snails, slugs, ground beetles, hunting spiders. Secondary sources about mammals that live on the African plains.
4. Access to hedgerow, pitfall traps, white sheet and beater, thermometer, windspeed and direction recorder. Secondary sources about the migration of the swallow.
5. Screw top jar, pond water and water weed. Pond nets, collecting equipment, access to a safe pond.
6. Chopsticks, sand, periwinkle shell or similar. Pipe cleaners, sand, slotted masses (from educational suppliers).
7. Paper, paint and brushes. Pit fall traps, collecting equipment, turf. Pictures of manure spreading, fertiliser packets, secondary sources about fertilisers.
8. Secondary sources about how tides form. Brine shrimp eggs, salt water, jars, yeast suspension.
9. Secondary sources about mountain ranges and the animals that live there. Alternatively, secondary sources about Douglas fir, grizzly bear, big horn sheep, cougar, torrent duck, spectacled bear, vicuna, giant lobelia, hyrax, duiker, edelweiss, Apollo butterfly, alpine chough, rhododendron, snow leopard, yak and bar headed goose.
10. Secondary sources about the major deserts of the world. Alternatively, secondary sources about the yucca, prickly pear, rattlesnake, kangaroo rat, cottontail rabbit and kit fox, palm trees, lanner falcon, addax, fennec, sandgrouse, saxoul shrubs, bactrian camel, jerboa, stone curlew, desert oak, spinifex grass, moloch, red kangaroo and stump-tailed skink.

List 3 (Activity worksheets)

Each group will need the following items:

▼ UNIT

1. Leaves of willow, ash, horse chestnut, lime, oak, beech and sycamore. Access to trees of the types from which the leaves have come.
2. Large white sheet, beater, collecting jars, magnifying glass, pooter (optional).
3. Plastic jars, wood squares, pebbles, steep sided dish or bowl.
4. Pointed forceps, blunt forceps, two dishes, cress seeds, stop clock.
5. Plasticine, long clear plastic tube with stopper, non-allergic wallpaper paste, stop clock.
6. Liverworts from river bank or damp wall or pavement, Petri dish, felt tip pen or crayon, gravel.
7. Shoe box with hole in one end, cardboard, sticky tape, black paint, brush, pea or bean seedling in a pot.
8. Selection of dishes and bowls – some small and some very large, thermometer, cress seedlings, measuring cylinder, salt.
9. Soil made by mixing small gravel, coarse and fine sand and a little humus, a local loam, filter funnel, stop clock, pot with drainage holes.
10. Rods of wood of different thicknesses. A half kilogram mass or similar, sand, pipe cleaners, slotted masses.

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 and animals survive in a place because they are adapted to live in it.
- Each habitat contains many kinds of living thing.
- Food passes between different organisms in a chain.
- Plants and animals in a habitat depend on each other.

Unit 2

- Plants have developed defensive mechanisms to prevent them from being eaten by animals.

Unit 3

- Some plants are adapted to sharing the same habitat by growing at different times of year.
- Some plants are adapted for living in shady conditions.

Unit 4

- Plants and animals are adapted to survive through the seasons.
- Food passes between different organisms in a chain.

Unit 5

- A pond habitat has different conditions from a wood.
- Plants are adapted for living in water.
- Some animals are adapted for spending the whole or part of their lives in water.
- Food passes between different organisms in a chain.

Unit 6

- A river has three distinct aquatic habitats.
- Plants and animals are adapted to live in the different habitats along a river.
- The animals that live in running water have different adaptations from those that live in still water.

Unit 7

- The meadow habitat has different features from the woodland habitat.
- Food passes between different organisms in a chain.
- In the complementary activity: fertilisers help plants to grow well.

Unit 8

- A range of organisms are adapted to the changing conditions on a rocky shore.

Unit 9

- A range of plants and animals are adapted to the harsh conditions near mountain tops.

Unit 10

- A few plants and animals are adapted to the hot, dry conditions in a desert.

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 systematic observations.
- Use observations to draw conclusions.

Unit 2

- Make systematic observations.
- Make a table and record results in it.
- Use simple equipment appropriately and safely.

Unit 3

- Use simple equipment appropriately and safely.
- Make a table and record results in it.
- Use observations to draw conclusions.

Unit 4

- Design a fair test.
- Record data in a prepared table.
- Perform simple calculations.
- Use measurements to draw conclusions.

Unit 5

- Use simple equipment appropriately and safely.
- Make a table and record results in it.
- Use measurements to draw conclusions.

Unit 6

- Use simple equipment appropriately and safely.
- Use diagrams to record results.
- Plan and carry out an investigation.

Unit 7

- Use simple equipment appropriately and safely.
- Use diagrams to record results.

Unit 8

- Make systematic measurements.
- Make and test a prediction.
- Make a table and record results in it.
- Plan and carry out an investigation.

Unit 9

- Communicate observations in writing and with drawings.
- Plan and carry out a fair test.
- Use scientific knowledge to explain results.

Unit 10

- Use simple equipment appropriately and safely.
- Plan and carry out an investigation.
- Make a table and record results in it.
- Draw conclusions from observations and measurements.

1

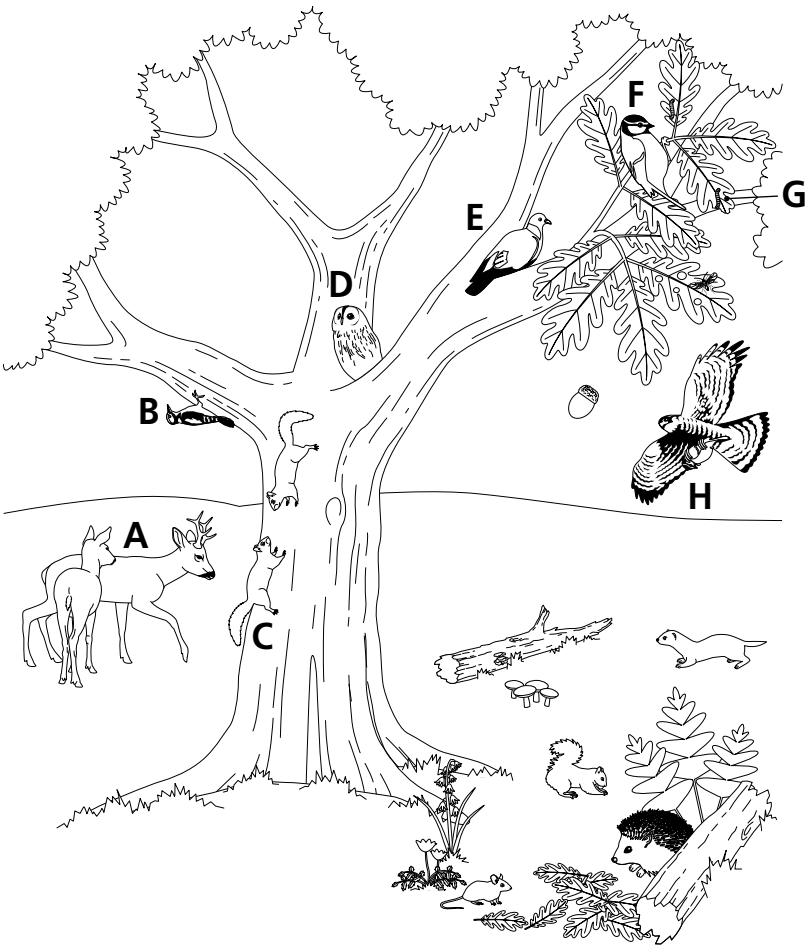
Name: ..... **Form:** .....

See **pages 4 and 5** of *Adapting and surviving*

A place called home

Every living thing has to find a place where it can live, find food and protect itself from others.

Q1. Write in the names of the animals labelled A-H in the diagram.



A ✎.....

B ✎.....

C ✎.....

D ✎.....

E ✎.....

F ✎.....

G ✎.....

H ✎.....

Q2. What is the name of the natural home of a living thing?

✎.....

Q3. Name three things that the oak tree needs to make food?

1 ✎..... 2 ✎..... 3 ✎.....

Q4. Which part of the tree makes the food?

✎.....

Q5. (i) What is the food of animal C? (ii) Write a food chain of the animal and its food.

(i) ✎..... (ii) ✎.....

Q6. Write a food chain linking the oak tree to animals F, G and H.

✎.....

Teacher's sheet: comprehension

See **pages 4 and 5** of *Adapting and surviving*

Answers

1. **A = deer, B = woodpecker, C = squirrel, D = owl, E = pigeon, F = blue tit, G = caterpillar, H = sparrowhawk.**
2. **Habitat.**
3. **Air, water and light.**
4. **The leaves.**
5. **(i) Acorns; (ii) Oak (or acorn) ➔ squirrel.**
6. **Oak (or leaves) ➔ caterpillar ➔ blue tit ➔ sparrowhawk.**

Complementary work

(a) After the children have worked on the activity, they could construct a key of their own based on the appearance of twigs in winter.

(b) The children can use secondary sources to find out how each animal featured in the unit is adapted to getting its food, protecting itself from predators and to surviving in the weather conditions in its habitat.

Teaching notes

In earlier work in school the children will have studied the requirements of a green plant and may have begun to use the terms prey and predator, herbivore, carnivore and omnivore. You may wish to remind them now about their earlier work. Green plants need light, water and warmth for growth. Children may confuse plant growth with germination and this may need clarifying. Germination occurs when a seed sprouts. Water and warmth are needed for this but light is not.

When you have covered the requirements of plants and their position on the planet as food makers, you may like to build up the concept of the food chain by starting with the terms prey and predator. Many animals which feed on plants are prey animals. They are preyed upon by predators. A predator is an animal that eats another animal. Some prey animals are also predators. For example, a blue tit preys on caterpillars and is itself prey for the sparrowhawk. The children may have used the terms herbivore (an animal that only eats plants), carnivore (an animal that only eats other animals) and omnivore (an animal such as a bear or a wild boar that eats both plant and animals). When you have covered these terms, make sure that the children make their food chains by always drawing the arrow from the food to the feeder.

1

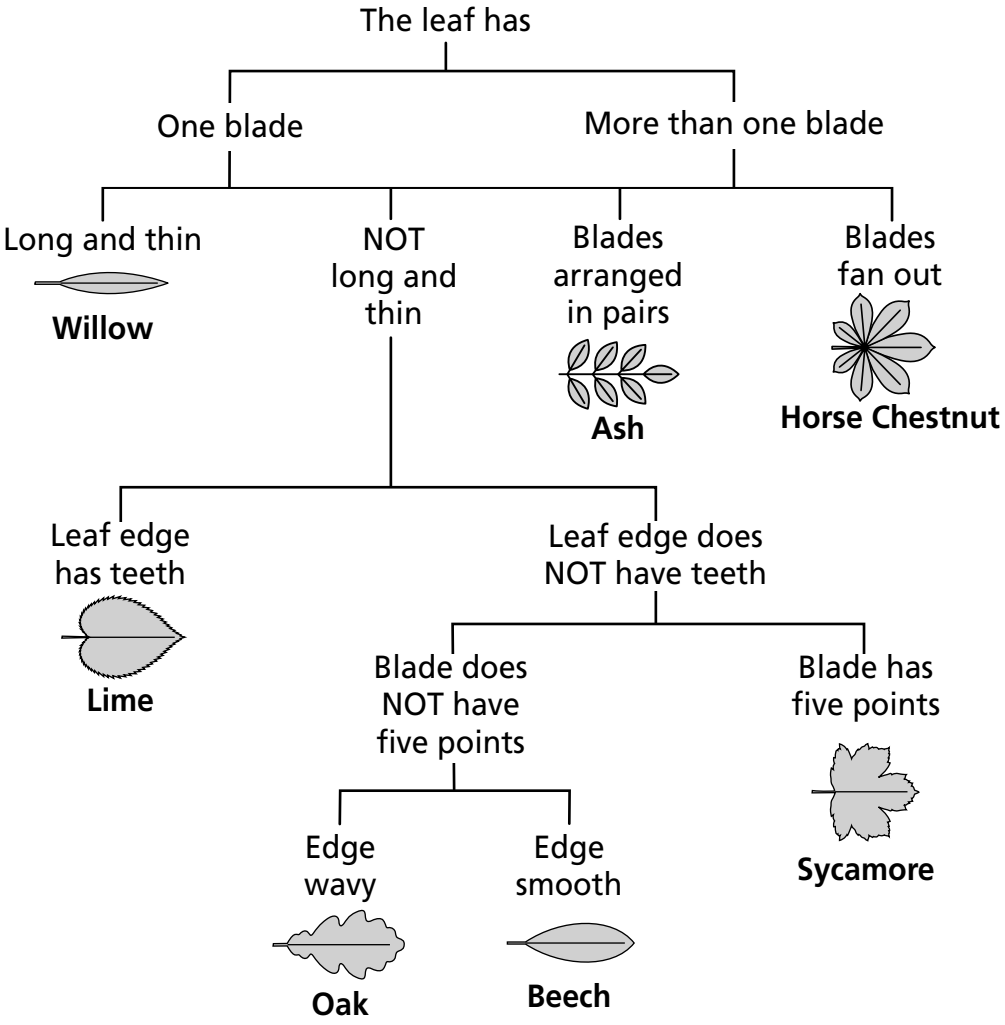
Name: ..... **Form:** .....

Based on **pages 4 and 5** of *Adapting and surviving*

The tree key

Try this...

1. Collect the leaves labelled A to G and use this key to identify each one.



2. Write down the tree which each leaf came from.

A ✎..... B ✎..... C ✎.....

D ✎..... E ✎..... F ✎..... G ✎.....

3. Use the tree key to identify trees in your neighbourhood.

4. Make a table on a separate sheet in which to record your results.

5. Write down the number of trees of each kind that you find.

Looking at the results.

6. Which is the most common kind of tree in your neighbourhood?

✎.....

Teacher's sheet: activity

Based on **pages 4 and 5** of *Adapting and surviving*

Introducing the activity

(a) Begin by saying that the oak is just one of many kinds of tree that is a habitat for animals. Trees can be identified quite easily by studying the appearance of their leaves. One way of identifying things quickly is to use a key (see note (i)).

Using the sheet

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

(c) Let the children try tasks 1 and 2 then check their answers.

(d) Go through tasks 3 to 5 with the children and let them construct the table (see note (iii)).

(e) Let the children try task 6.

Completing the activity

(f) Let the children compare their results. They may find the trees growing in the gardens of older houses and that other, ornamental trees are grown in newer gardens on housing estates.

Conclusion

Trees can be identified by the appearance of their leaves.

A key can be used to provide quick identification when living things are studied in their habitats.

Teaching notes

(i) This key only provides a means of identifying a few common trees. It allows the children to learn how to use a key and extend their work on the unit.

(ii) You will need to collect leaves from willow, ash, horse chestnut, lime, oak, beech and sycamore trees. Collect enough samples so that each child or group can have one of each type of leaf. You will need to label the leaves A to G. Alternatively, the children could collect their own leaves.

(iii) You may like to take the children on a supervised visit to a park or woodland or you may set the activity for homework and restrict its use to garden trees or trees growing by the pavement. In either case, when the children find a tree that cannot be identified by the key, they could make a drawing of the leaf and use secondary sources to identify it later back in school.

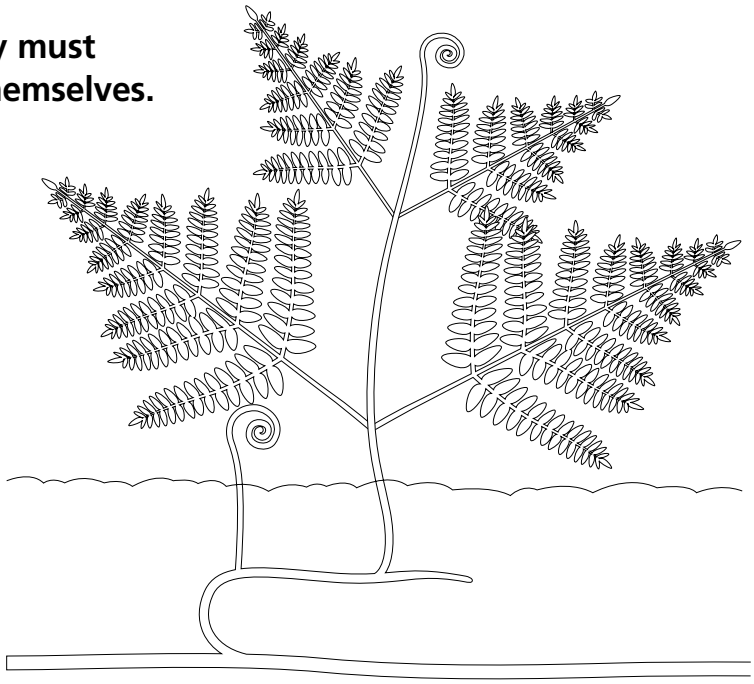
2

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

See **pages 6 and 7** of *Adapting and surviving*

How plants defend themselves

If living things are to survive, they must have lots of ways of protecting themselves.



Q1. On the diagram label a main stem and a frond.

Q2. How does the main stem help the plant survive?

✎.....

✎.....

Q3. How does bracken stop other plants growing near it?

✎.....

✎.....

Q4. Why do some animals avoid bracken?

✎.....

✎.....

Q5. How does a rose plant defend its branches?

✎.....

Q6. Why do plants need to defend themselves?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 6 and 7** of *Adapting and surviving*

Answers

1. **The main stem is the horizontal structure growing underground. There are four fronds sticking out to the side.**

2. **It is protected from being eaten by many animals. It can survive winter cold and summer drought.**

3. **Large fronds shade the ground so there is not enough light for other plants to grow.**

4. **The fronds are tough and hard to digest, they are poisonous, they have disease carrying ticks, they contain insect repellents, and they have ants to defend them.**

5. **With thorns.**

6. **They contain food animals need. If they have no defences the animals would eat so much of them that the plants could not survive.**

Complementary work

(a) The children can use secondary sources to find out about plant galls on the leaves of the oak, lime and sycamore. They can find out about oak apples, the robin's pin cushion on the wild rose tree and the witches' broom on the silver birch.

(b) The children can use secondary sources to find out about how the rose, holly, gorse, thistle, hawthorn, teasel and sea holly defend themselves.

Teaching notes

This unit allows you to link the food-making process of plants with ways they have adapted to defend themselves from herbivores. You may like to set the scene by saying that the Earth is just the correct distance from the Sun for plants to make use of the light and heat it receives. If it was much nearer it would be too hot and if it was much farther away it would be too cold. The presence of water is essential for plant growth and the Earth is unusual in having large amounts. The plants then use the light, air and water to make food to grow.

Children can find plants uninteresting, but if they think of them in terms of aliens, which have grown up on a planet and have developed strong defensive mechanisms, they might be more motivated to study them. In this context the bracken can be seen as a very successful plant which is so well adapted to many conditions that it can be thought of as trying to take over the planet.

In the complementary work, the children can find out how seemingly defenceless plants, such as oak, respond when they are invaded by small animals. The children can also study plants with spines and perhaps follow up the research by investigating plants with unusual or painful spines – for example, some cacti have spines which are barbed so they are difficult to pull out of the skin. Do not bring in examples of plants with spines or thorns for safety reasons. You may let the children look at hawthorn and brambles if you take them out on a walk but do not let them touch these plants.

2

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

Based on **pages 6 and 7** of *Adapting and surviving*

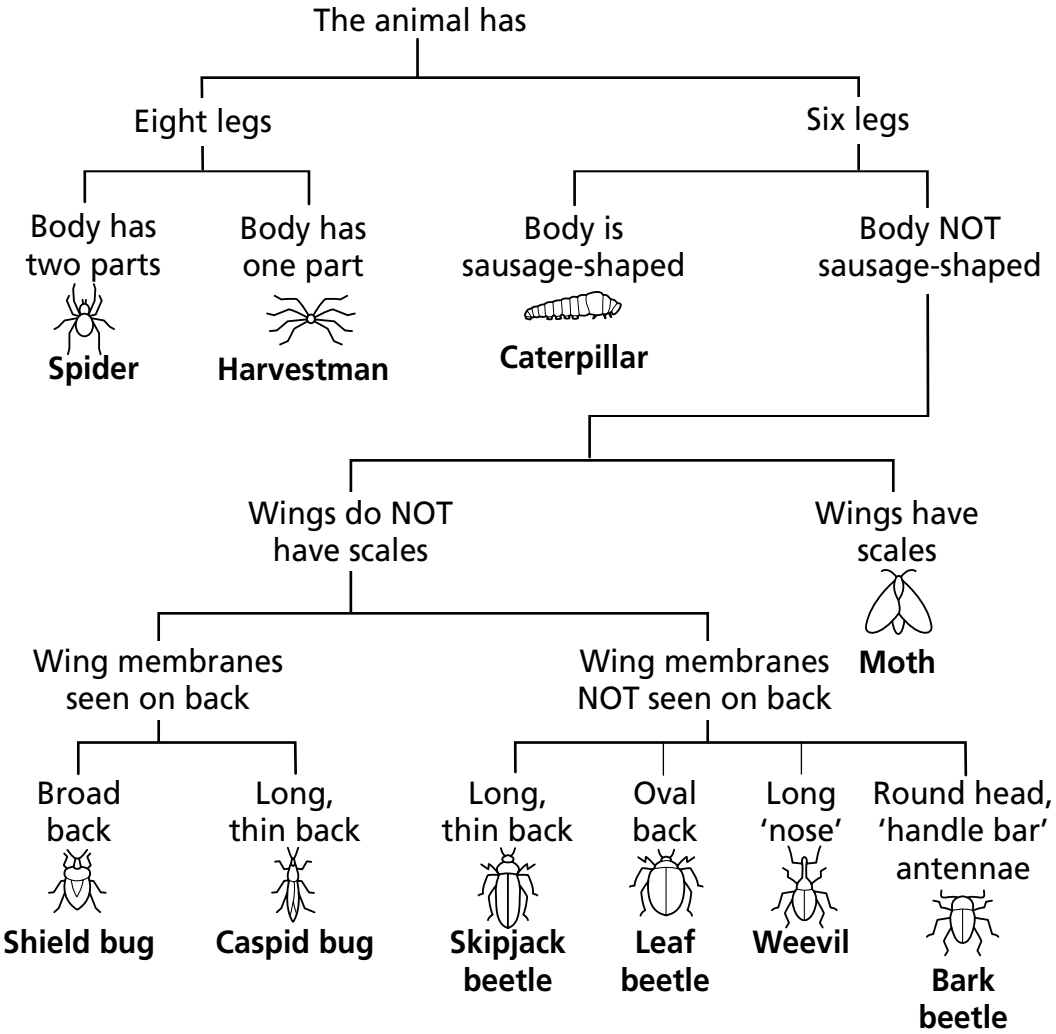
A key to tree animals

Try this...

1. Put a white sheet under a low branch then shake the branch or beat it a few times with a stick.

2. Look for small animals falling onto the sheet. If a lot of animals fall onto the sheet you may wish to collect them before they move away.

3. Use this key to identify the animals on the sheet.



4. Make a table on a separate sheet and record how many animals of each kind you found.

Looking at the results.

5. Which animal was the most numerous on the branch?

✎.....

Teacher's sheet: activity

Based on **pages 6 and 7** of *Adapting and surviving*

Introducing the activity

(a) Begin by saying that when people look at plants casually the plants do not seem to be teeming with animal life, so a plant's need for defences may not seem obvious.

(b) Tell the children that they are going to find out if there is any animal life on a branch (see notes (i) and (ii)).

Using the sheet

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

(d) Make sure the children know how to use the key and let them prepare a table on a separate sheet of paper.

(e) Let the children try tasks 1 to 4 (see note (iii)).

(f) Let the children try task 5.

Completing the activity

(g) Let the children compare their results (see note (iv)).

Conclusion

A branch may be the home to many small animals including spiders, harvestmen, caterpillars, moths beetles and bugs (see note (v)).

Teaching notes

(i) If appropriate, you may relate this to one of the trees the children studied when applying the leaf key.

(ii) You will need a large white sheet, some collecting jars and magnifying glasses. You may also want the children to use pooters.

(iii) Make sure that the children are supervised in accordance with your employer's guidelines. All the animals must be released after they have been identified. The children must not touch any hairy caterpillars. Descriptions can be made of animals which cannot be identified with the key. The descriptions (including drawings) can be used to try and identify the animals back in school.

(iv) The children may have been working on different kinds of trees, or on different sides of the same tree. This may provide different sets of data. You may suggest to the children that this exercise could be tried at different times of year. It can also be used to support Unit 4.

(v) Other animals that may be found are snails, slugs, ants, crane fly, hover fly, longhorn beetles and ladybirds.

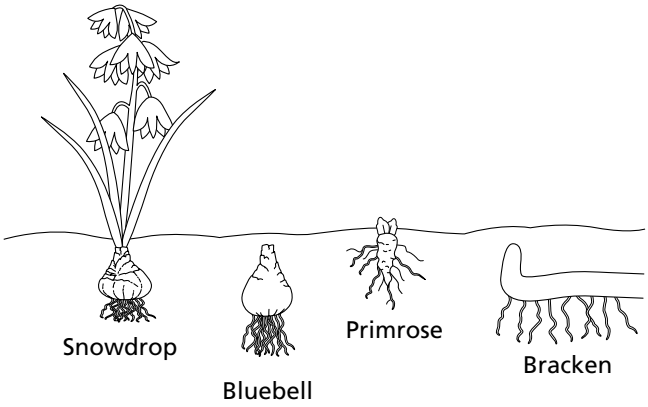
3

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

See **pages 8 and 9** of *Adapting and surviving*

Sharing the same place

Many different plants can live in the same place if they grow and flower at different times of year.



Q1. What time of year is it when the snowdrop is flowering?

✎.....

Q2. Write down the order in which the other plants grow.

✎.....

Q3. Which of the plants above does not produce flowers?

✎.....

Q4. How can these plants grow so well when there is little sunlight to make food?

✎.....

✎.....

Q5. What would happen if all four plants tried to grow at the same time of year?

✎.....

✎.....

Q6. Why do these flowering plants grow so early in the year?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 8 and 9** of *Adapting and surviving*

Answers

1. **Winter, January – February.**
2. **Primrose, bluebell, bracken.**
3. **Bracken.**
4. **They use food they have stored underground.**
5. **They would compete for water and sunlight and grow less well. The bracken being the larger plant, it may shade out the others and kill them.**
6. **So they can use the sunlight that reaches the woodland floor to make food. Later, when the trees come into leaf, it is too dim for them to make food.**

Complementary work

(a) The children can use secondary sources to find out about the animals they have caught in their pitfall traps.

(b) The children can use secondary sources to find out about how the different kinds of large mammals survive together on the African plains.

Teaching notes

Plants can store food in various parts of their bodies. The snowdrop and the bluebell store food in the bases of their leaves. These are attached to a flat disc-like stem. The food is moved from the leaf bases to a growing bud on the stem. The leaves and flowers grow from this bud. The primrose has a short, vertical underground stem, which looks rather like a tap root, in which it stores food. The bracken has an underground stem in which food is stored. It is important to note that the bracken is not a flowering plant but a fern.

You may want to make the children aware of the structure of a bulb by showing them a small onion which has been cut open. In earlier years, they may have grown a small onion on the top of a water-filled bottle. If they have not done this you may like them to set up some onions and measure the growth of their roots and shoot. The onions could be set up in light, dark and dim conditions to compare how they grow.

In the activity, the children find out about the animals that share the ground. The animals have different adaptations from life on the ground. Most are active at the same time of year and the same time of day. Many reduce competition between themselves by eating different foods. Two animals which feed on flying insects are swallows and bats. They can share the same habitat – the edge of a wood – because the swallow feeds by day and the bat feeds by night.

3

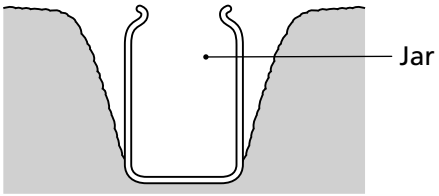
Name: ..... **Form:** .....

Based on **pages 8 and 9** of *Adapting and surviving*

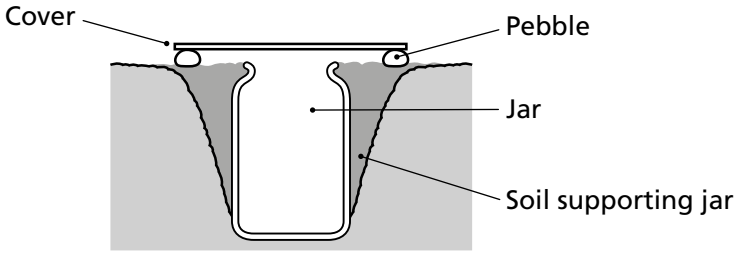
How to use a pitfall trap

Try this...

1. Dig a hole and put a jar in it.



2. Set up four pebbles next to the trap and put a cover over them.

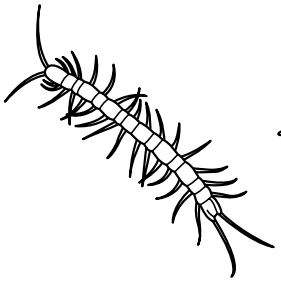


3. Set up three more traps.

4. Leave the traps overnight.

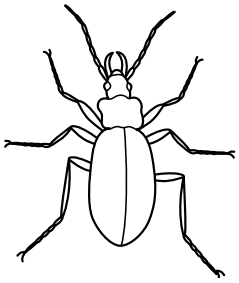
5. In the morning, empty each trap in turn into a steep sided dish or bowl.

6. Identify the animals using the pictures here to help you.

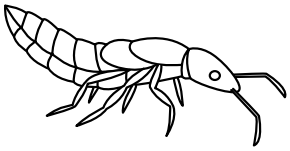


Centipede

Millipede



Ground beetle



Rove beetle

7. On a separate piece of paper, make a table and record your results.

Looking at the results.

8. What do the results show?

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 8 and 9** of *Adapting and surviving*

Introducing the activity

(a) Challenge the children to think of a way of finding out about the small animals that live on the ground in a hedge. Steer them towards the idea of a small pitfall trap.

Using the sheet

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

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

(d) Go through tasks 5, 6 and 7, then let the children try them (see note (ii)).

(e) Let the children try task 8.

Completing the activity

(f) Let the children compare their results (see note (iii)).

Conclusion

A jar may be used as a pitfall trap to catch small invertebrates (see note (iv)).

Teaching notes

(i) You will need trowels, plastic jars and wooden squares to serve as covers. The children should be able to find pebbles on the site. The traps could be set up in a hedge or under a bush. Make sure the children are supervised at all times in accordance with your employer's guidelines.

(ii) The traps must be set during the afternoon and emptied the following morning. The animals should be released once they have been examined. The table should have three columns headed – trap number, site (e.g. north side of hedge) and animals found (see example below).

(iii) The results may vary widely. Ground beetles and woodlice are two common animals that may be trapped. Earthworms, snails and slugs may also be found. The violet ground beetle is a large beetle which may cause some excitement. The children may extend this work to see how the catch changes from night to night. Open grassland (where people or animals will not walk) may be compared with woodland.

(iv) You may use this activity as an opportunity to teach about grouping animals and discuss that the animals in the trap are invertebrates. The invertebrates are distinguished from other animals, the vertebrates, by the absence of a backbone. Make sure that the traps are removed when no longer in use. Warn children that an empty bottle can be a deadly trap for mice, voles and shrews.

Trap No	Site	Animals found
1		
2		
3		
4		

4

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

See **pages 10 and 11** of *Adapting and surviving*

Woodland through the seasons

A woodland changes dramatically through the seasons. The lives of both plants and animals are adapted to the changes.

Q1. (i) Which season in the wood does the diagram show? (ii) How can you tell?

(i) ✎.....

(ii) ✎.....

✎.....

Q2. (i) What is animal X? and (ii) what does it eat?

(i) ✎.....

(ii) ✎.....

Q3. (i) What will animal X do in the next season? (ii) Why will it do this?

(i) ✎.....

(ii) ✎.....

Q4. Some woodland birds are not adapted to winter conditions there. What do they do?

✎.....

Q5. How do many insects survive the winter?

✎.....

Q6. A woodmouse eats a blackberry and then is eaten by an owl. Write a food chain using this information.

✎.....

Teacher's sheet: comprehension

See **pages 10 and 11** of *Adapting and surviving*

Answers

1. **(i) Summer, (ii) trees and undergrowth are in full leaf.**
2. **(i) Hedgehog, (ii) insects, earthworms, spiders and slugs.**
3. **(i) Prepare to hibernate, (ii) because there is not enough food to eat.**
4. **Migrate.**
5. **As eggs or pupae.**
6. **Blackberry ➔ Woodmouse ➔ Owl.**

Complementary work

(a) If you have access to a woodland or hedgerow, you may like the children to set pitfall traps and beat selected branches once a month and record their data, which can then be used to make graphs. At the time of these investigations, measurements of weather features could also be made and plotted on separate graphs and the data compared.

(b) The children can use secondary sources to find out about the migration of the swallow and willow warbler.

Teaching notes

If you have covered the previous unit recently, you may want to develop the idea of how the woodland changes through time, by considering the woodland animals featured here. Birds can be divided into insect eaters and seed eaters. Among the insect eaters are the wren, robin, blue tit, great tit and long-tailed tit. All these birds are resident throughout the year. In the spring and summer they are joined by migrants from Africa which include the willow warbler and spotted flycatcher. Swallows may also feed around the woodland edge or above the canopy. Chaffinch and greenfinch are two seed-eating birds which remain through the year. In the winter, redwing and fieldfare eat the berries. They belong to the thrush family and are omnivores.

Few insects fly in the woodland in winter. The adults die in the autumn and the future generations survive in their eggs or pupae until the following spring. Although they may be in a location which protects them from the weather, they may still be eaten by foraging insectivorous birds.

Before an animal such as a hedgehog or a bat hibernates it gorges itself on any food it can find and builds up a store of fat. In the winter, it reduces its body temperature and remains inactive. If it were to be disturbed and woken up it may not have enough fat reserves left for it to complete its hibernation. Squirrels do not hibernate, but they may remain sheltering in their dreys in periods of particularly harsh weather.

4

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

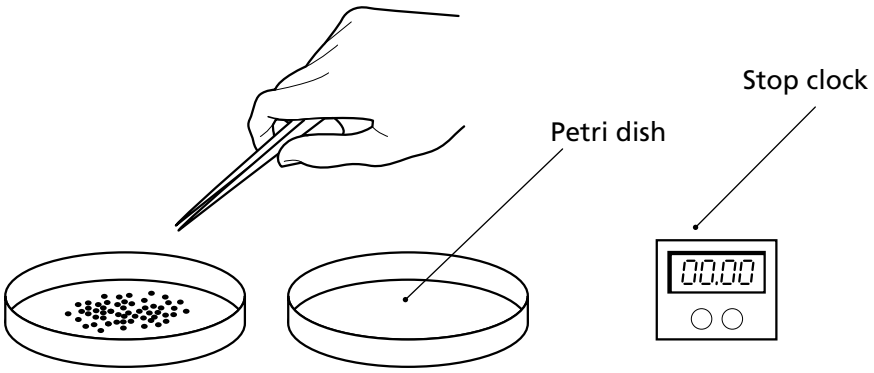
Based on **pages 10 and 11** of *Adapting and surviving*

Testing model beaks

Try this...

1. Cover the bottom of a dish with cress seeds and place an empty dish close by.

2. Set the stop clock running and in one minute try and move as many seeds as you can to the second dish, using a fine pair of forceps or tweezers.



3. Enter the number of seeds in the top box of the Trial 1 column of the table.

	Number of seeds transferred				
	Trial 1	Trial 2	Trial 3	Total	Average
Pointed forceps					
Blunt forceps					

4. Repeat 1 to 2 twice more. Each time record the result in the appropriate box.

5. Repeat 1 to 4 with a pair of blunt forceps.

6. Add up the totals of both sets of three trials and enter them in the table.

7. Calculate the average number of seeds picked up with each pair of forceps and enter it in the table.

Looking at the results.

8. What do the results show?

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 10 and 11** of *Adapting and surviving*

Introducing the activity

(a) Remind the children about insect-eating birds such as wrens and warblers. Show them some pictures of insect-eating woodland birds (see note (i)).

(b) Show the children some pictures of seed-eating woodland birds such as the chaffinch and greenfinch (see note (ii)).

(c) Tell the children that each kind of bird has a beak adapted for a particular way of feeding, and the usefulness of the beak for eating different foods can be tested by an exercise in scientific modelling.

Using the sheet

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

(e) Let the children try tasks 1 to 3 (see note (iv)).

(f) Let the children try tasks 4 to 6.

(g) Make sure that the children can calculate an average, then let them try task 7.

(h) Check the calculations before letting the children try task 8.

Completing the activity

(i) Let the children compare their results (see note (v)).

Conclusion

Insect-eating birds have pointed beaks which are not suitable for collecting seeds. Seed-eating birds have blunt beaks which are suitable for collecting seeds.

Teaching notes

(i) These birds have fine, pointed beaks for picking up insects from under leaves or hidden in cracks in the bark.

(ii) These birds have blunter beaks for picking up seeds and crushing them.

(iii) You may like to demonstrate how to pick up and move the seeds.

(iv) Make sure that the children 'peck' downwards and do not put their tweezers horizontal with the seeds to try and scoop them up.

(v) Ask the children about the usefulness of repeating the experiment. They should find that the results from three trials are more reliable than the results from just a single trial each.

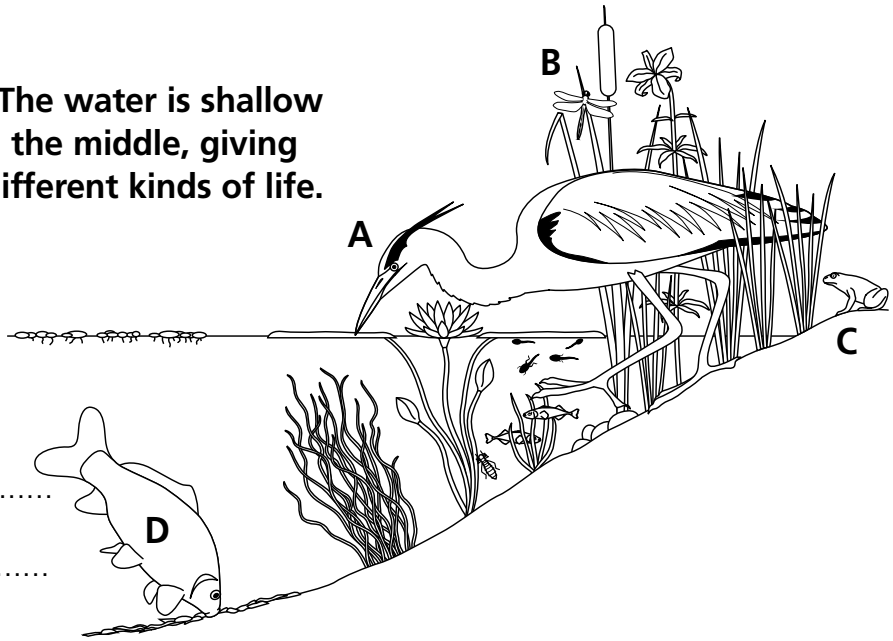
5

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

See **pages 12 and 13** of *Adapting and surviving*

Ponds

Ponds contain still water. The water is shallow at the edge and deeper in the middle, giving lots of opportunities for different kinds of life.



Q1. Name the animals labelled A, B and C.

A ✎.....

B ✎.....

C ✎.....

Q2. Which of the animals labelled A-D spend their early lives in the pond ?

✎.....

Q3. (i) What is the food of animal D? (ii) Make a food chain using animal D and one other animal in the diagram.

(i) ✎.....

(ii) ✎.....

✎.....

Q4. (i) Label a water lily plant with an L and (ii) write down one way in which it is adapted to life in a pond.

(ii) ✎.....

Q5. What makes pond water green?

✎.....

Q6. If you take a plant out of the pond it collapses. Why is this?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 12 and 13** of *Adapting and surviving*

Answers

1. **A = heron, B = dragonfly, C = frog.**
2. **B, dragonfly; C, frog; D, fish.**
3. **(i) worms and insects; (ii) Decaying material ➔ worms ➔ fish ➔ heron; or decaying material ➔ insects ➔ fish ➔ heron.**
4. **(i) The water lily plant is below the heron's neck (ii) It has floating leaves.**
5. **Large numbers of algae.**
6. **It does not have a strong stem as it is adapted to the water giving it support.**

Complementary work

(a) Put some pond water and water weed in a screw-top jar and leave in a cool, well-lit place. Let the children look at it periodically. They may find that the weed grows, then dies and grows again. Water fleas, cyclops or seed-like ostracods may be seen swimming in the water at certain times of year.

(b) Arrange for the class to pond dip every two months and see how the 'catch' varies through the year. All organisms must be returned straight to the pond.

Teaching notes

Algae used to be classified with the plant group but now are put in a separate group with single-celled animals called the Protoctista. The children do not need to know this at this level but will meet this group in their early secondary years.

The water flea, cyclops and the ostracod are crustaceans and are freshwater relations of crabs and lobsters.

In addition to its spear-like beak, the heron has feathers which form a 'powder puff' on its breast. This is so the heron can clean the slime off its beak after eating a fish or a frog.

Dragonfly nymphs prey on small fish and tadpoles in the water. When they change into an adult they catch insects in the air. They have two ways of doing this. Some dragonflies rest on a twig then dart into the air to snatch their prey. Other dragonflies fly along a length of pond and back until they catch something to eat.

Some water plants have hollow stems which allow air to pass down to the roots as oxygen is in short supply in the water and in the pond mud.

If the children go pond dipping, expect them to find diving beetles, water beetles, water boatmen, water measurers, water scorpions (a bug with a snorkel for a tail), pond skaters, water mites, leeches, flat worms (may be on the water surface looking like black tea leaves), ramshorn snails, pond snails, and caddis flies. They may see a water vole, water shrew, mink, moorhen, reed bunting, or mallard. You may want them to look up these species and find out about them before they make their pond visit.

5

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

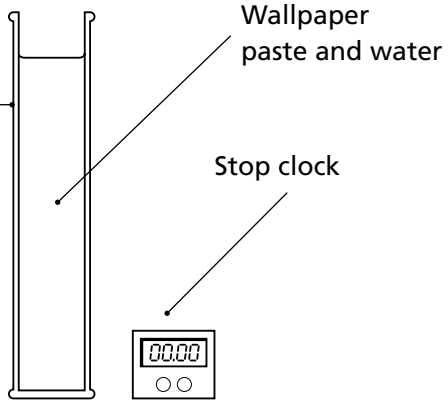
Based on **pages 12 and 13** of *Adapting and surviving*

Testing model algae

Try this…

1. Make four small balls of Plasticine then draw out two spines from one, three spines from another and four spines from the last.

Plasticine models to test



2. You are going to drop each model down a tube of wallpaper paste and time how long it takes to sink.

3. Decide how many times you are going to try the test with each model.

4. Make a table to record your results, like the one below. On the first line, below **Time taken to sink**, write in **Test 1**, **Test 2**, etc – up to the number of tests you decided upon.

No of spines	Time taken to sink
One	
Two	
Three	
Four	

5. Now carry out your test and fill in the table as you go along.

Looking at the results.

6. What do the results show?

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 12 and 13** of *Adapting and surviving*

Introducing the activity

(a) Remind the children about the tiny algae in water that can turn the water green and show them some photographs of algae under the microscope (see note (i)).

(b) Algae are also found in lakes and the sea, and have to stay in sunlight to make food. Water currents help them stay afloat but when they are absent the algae start to sink. If they sink slowly, they have a greater chance of being swept back up into the light.

(c) The spines are such a prominent feature of algae that model algae can be made with spines to see if they affect the way the algae sink.

Using the sheet

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

(e) Let the children try tasks 1 to 5 (see note (iii)).

(f) Let the children try task 6.

Completing the activity

(g) Let the children compare their results.

Conclusion

Algae have spines which slow down their rate of sinking.

Teaching notes

(i) Many algae have spines. The children will find out if this is an adaptation to prevent sinking and help the algae stay in the light.

(ii) If the children have done the activity in Unit 4, let them see if they can adapt the table to their needs. (Empty rows have been included in the table for children to add their own 'Test 1', 'Test 2', etc, and also to add an entry for any models tried with more than four spines.)

(iii) The tube should be a tall plastic and transparent tube (avoid glass). The end could be sealed with a stopper or a large chunk of Plasticine. The tube should be filled with a mixture of (non-allergic) wallpaper paste and water. The models should be made from Plasticine balls that weigh about 0.5 grammes. You may find that children adapt the models and may produce some with lots of spines. This should be allowed as it may further reinforce the idea that spines do help to slow down sinking.

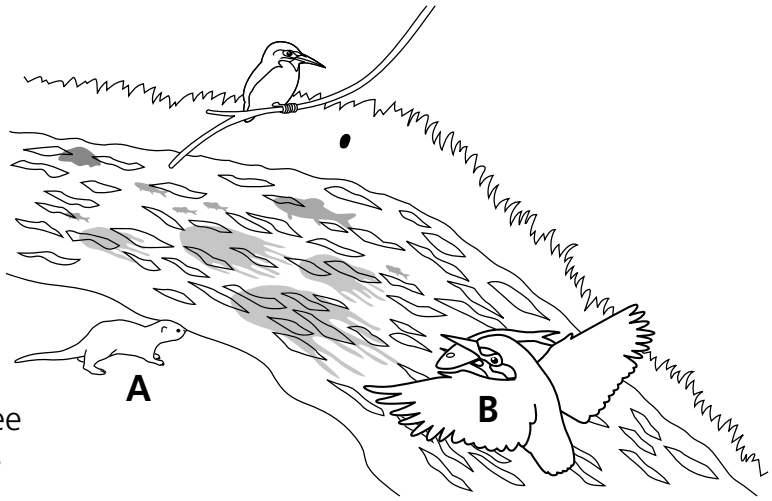
6

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

See **pages 14 and 15** of *Adapting and surviving*

Rivers

Rivers often begin as fast-flowing streams with rocky beds, then get slower and flow over muddy beds as they near the sea. As a result, rivers contain many different types of life.



Q1. (i) What is animal A? (ii) State three ways in which its body is adapted to its way of life.

(i) ✎.....

(ii) ✎.....

✎.....

✎.....

Q2. (i) What is animal B? (ii) How is its beak adapted to catching its food?

(i) ✎.....

(ii) ✎.....

Q3. Why are there few plants in the upper part of a river?

✎.....

✎.....

Q4. (i) An insect larva feeds on a leaf and then is eaten by a small bream. Write a food chain from this information. (ii) Add another animal to the food chain.

(i) ✎.....

(ii) ✎.....

Q5. How is the tidal part of a river different from the middle reaches?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 14 and 15** of *Adapting and surviving*

Answers

1. **(i) Otter; (ii) webbed feet, waterproof coat, sharp claws and teeth to catch fish, closes its ears to keep water out.**

2. **(i) Kingfisher; (ii) Beak is strong and pointed for stabbing fish.**

3. **Because the water is fast flowing and there is a rocky bed which does not allow roots to grow.**

4. **(i) leaf ➔ insect larva ➔ bream**
   (ii) leaf ➔ insect larva ➔ bream ➔ otter (or kingfisher or heron).

5. **It has mud flats and sand banks which contain large numbers of animals. Large numbers of plants grow there. The water is salty.**

Complementary work

(a) When the children have studied the work on the tidal part of the river they may try to model with chopsticks the way a curlew's bill works, by probing with them in sand, where shells are buried, to simulate the adaptation to feeding on buried food.

(b) The adaptation of long-toed feet to soft mud and sand can be demonstrated by making birds' feet out of four pipe cleaners. They should be twisted round to make one foot with toes 5cm long and one foot with toes 2cm long. The feet should then be gently pushed into the sand by the children so they can feel the force each one can withstand before sinking. Alternately, slotted masses may be added to each foot to quantify the weight needed to cause sinking.

Teaching notes

The three parts of the river form three different river habitats. In the upper part, the water is very cold. This allows it to take up more oxygen as it splashes over the rocks. The animals that live here are very sensitive to a high oxygen concentration and would perish if swept lower down where the oxygen level is lower. The animals here are adapted to clinging to rocks and feeding on items that fall into the river. Some caddis flies spin nets to catch small food particles as they are carried along with the current. The dipper is capable of walking underwater to feed.

In the middle part, the water is warmer and holds less oxygen. Plants that grow here are adapted to withstanding the currents. They have strong roots which grip the bank. Those plants immersed in the water have flexible stems that move with the water currents, and leaves which overlap, and point in the direction away from the current source, so they are not pulled off the stem.

In the tidal part of the river the water is somewhat salty and brackish. Plants and animals that live here must be adapted to the brackish conditions. Animals swept here from higher up the river would die.

6

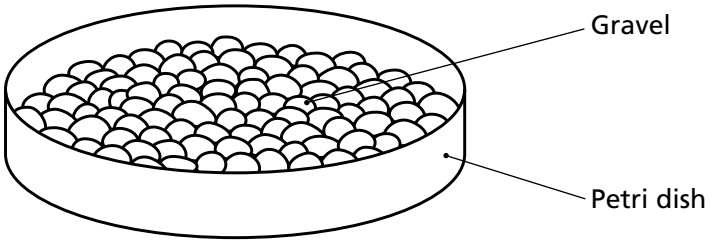
Name: ..... **Form:** .....

Based on **pages 14 and 15** of *Adapting and surviving*

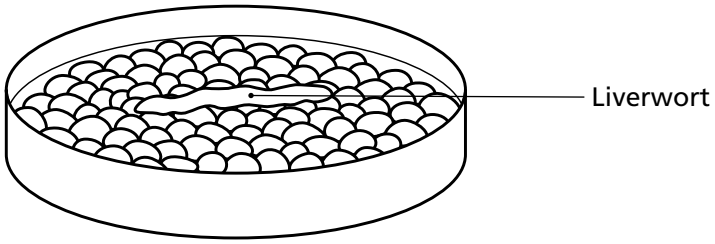
How do liverworts grow

Try this…

1. Put some aquarium gravel in a Petri dish.



2. Add some water but do not let it cover the stones.



3. Put a piece of liverwort in the centre of the dish on the gravel.

4. Put the lid on the dish. Look down on the liverwort and draw its outline on the lid.

5. Put the dish in a warm, light place and every week check its growth and draw its new outline on the lid in a different colour.

6. Describe here how the liverwort changes over time.

✎.....

✎.....

✎.....

7. Plan an investigation to find out how much water a liverwort needs to stay healthy.

✎.....

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 14 and 15** of *Adapting and surviving*

Introducing the activity

(a) Present the children with some liverworts and tell them that they grow on rocks by the river (see note (i)). Liverworts are not flowering plants and have a flat, green body instead of a stem. Challenge the children to find out how they grow and steer them towards the procedure on the sheet.

Using the sheet

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

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

(d) Let the children try tasks 5 and 6 in the following weeks.

(e) Let the children try task 7 (see note (iii)).

Completing the activity

(f) The children can compare their results and find that in dry conditions the liverwort shrivels up and grows less well than in waterlogged conditions.

Conclusion

The liverwort thrives in the moist conditions on stones on a river bank.

Teaching notes

(i) Liverworts grow in many damp places. They can be found growing between paving flags and on damp walls. They form a mat of green straps or 'tongues'. The correct name for each one is a thallus. Separate them into straps about 2 to 3cm long by 1cm wide for the investigation.

(ii) The children may draw on the lid in a water soluble felt tip or crayon. The line should not be thick, as the growth of the liverwort will be gradual. The liverwort may produce bright green swellings on its side which develop into new straps.

(iii) The plan should feature liverworts of a similar size, set up in dishes with the same amount of gravel but with differing volumes of water. The dishes should all be left in the same conditions of warmth and light.

7

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

See **pages 16 and 17** of *Adapting and surviving*

Meadows

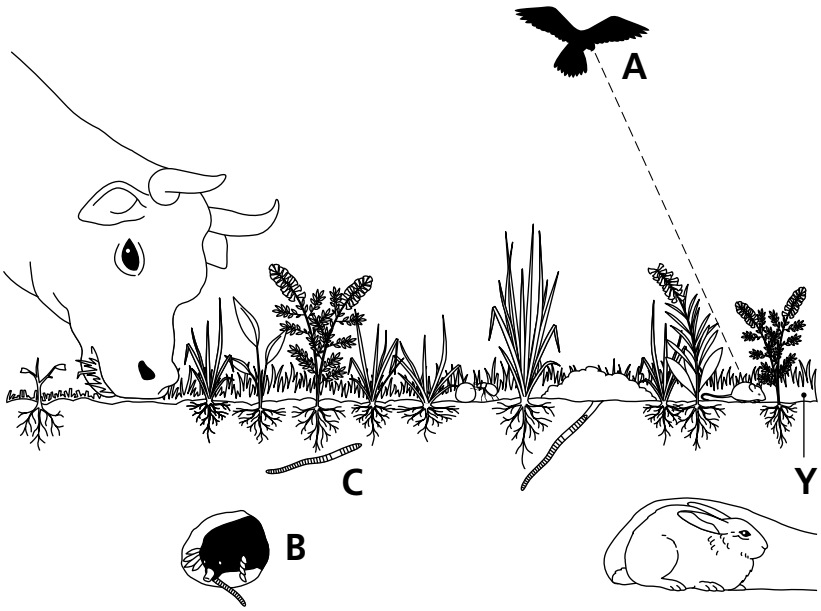
A meadow is a place where grasses and flowering plants grow and where there are no trees. They mainly exist because of the way people farm the land.

Q1. Name the animals labelled A, B and C.

A ✎.....

B ✎.....

C ✎.....



Q2. Make a food chain which uses animals B and C.

✎.....

✎.....

Q3. (i) Name two ways in which animal B is adapted to its way of life. (ii) Why does it not live in a wood?

(i) ✎.....

✎.....

(ii) ✎.....

Q4. Why do many different types of plants grow in meadows?

✎.....

✎.....

Q5. (i) Put an X where a vole may be found. (ii) Why would it be found in this place?

(ii) ✎.....

Q6. Why can plant Y survive in a meadow in which animals are grazing?

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 16 and 17** of *Adapting and surviving*

Answers

1. **A = kestrel, B = mole, C = earthworm.**
2. **Dead leaves ➔ earthworm ➔ mole.**
3. **(i) It has a body which is shaped for moving through the soil, strong short arms, spade-like paws, sharp claws; (ii) tree roots would get in its way.**
4. **There are no trees to shade them and stop them making food.**
5. **(i) The tunnel used by the rabbit, (ii) hiding from hunting birds.**
6. **It can sprout a new shoot from the base of its stem.**

Complementary work

(a) The children can investigate the success of different camouflage patterns by looking at different grassy areas, making patterns they think will be difficult to see, then testing them on other members of the class.

(b) Pit fall traps could be set up in a grassy area and the catch compared with the animals found by taking a piece of turf to bits. The efficiency of the trap for providing reliable data about all the animals in the grassy area can be assessed.

(c) Show the children pictures of manure being spread on a meadow to improve plant growth, and show them packets of fertiliser used as 'plant food' for houseplants and garden plants. Let the children use secondary sources to find out how fertiliser helps healthy growth.

Teaching notes

Grass has many adaptations to its habitat. The growing point of its shoot is below the reach of the grazer's mouth, so it is not damaged when leaves and grass stalks are removed. The plant is not totally dependent on producing seeds for reproduction, so if its flower stalks or seeds are eaten it can still produce vegetatively by sending out side shoots called tillers. These grow out along the surface of the meadow, or just below it, and have side buds which develop into new grass plants. The network of plants produced in this way provides a sort of skeleton to the turf and helps hold the soil in place, thus preserving the habitat. The hard-wearing nature of the plant leaves prevents them being shredded when grazing animals pass by and this, in turn, keeps the soil from being exposed and eroding.

You may add to your work on the meadow by letting the children sow meadow plants (obtainable from garden centres) and observing the variety of forms that are produced. If there is room on the school site, set up a meadow area in which the plants can grow. Many meadow species, including birds such as the skylark, are in rapid decline due to changes in meadow and field management. You may like your class to research this topic to investigate its causes and the steps that have been taken to conserve meadow species.

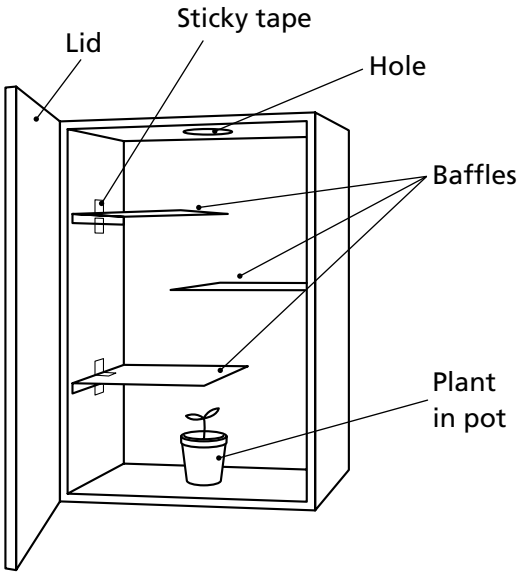
7

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

Based on **pages 16 and 17** of *Adapting and surviving*

Growing towards the light

Try this…



1. Take a box and paint it black inside.

2. Cut out pieces of cardboard to make baffles, paint them black and fit them in the box as the diagram shows.

3. Put a seedling in the bottom of the box.

4. Make a drawing of the inside of your box with the seedling.

5. Close the lid. The next day, look inside the box and draw the new position of the seedling. Put the date by the new position.

6. Repeat task 5 every day for a few days.

7. How successful is the seedling at finding light?

✎.....

Teacher's sheet: activity

Based on **pages 16 and 17** of *Adapting and surviving*

Introducing the activity

(a) Ask the children to think what it would be like for a seed germinating in a meadow when the grass has grown. They should think of the leaves overlapping above and keeping out the light.

(b) Show them how the conditions can be simulated by putting a seedling in a box which has baffles (the overlapping leaves), with a light hole in the top. Tell the children they are going to make such a light box and test a seedling to see if it can reach the light.

Using the sheet

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

(d) Let the children try tasks 1 to 4 (see note (ii)).

(e) Let the children have time each day to check their box and make their drawings.

(f) Let the children assess the success of the seedling. It will be deemed successful if it has found its way round the baffles and up through the hole.

Completing the activity

(g) Let the children compare their results by looking at the ways the seedlings grew.

(h) Let the children investigate other kinds of plants to see if they can make the journey into the light.

Conclusion

When a plant is growing in dim light, it is sensitive to the direction of the light and will grow towards the place where the light is brightest.

Teaching notes

(i) Shoe boxes are ideal for this investigation. Cut a hole in one end before the children start as some children find this a difficult task.

(ii) The shoe box could have two to four baffles equally spaced inside the box. Each one is stuck inside the box with sticky paper. Each baffle should only come a little over half way across the box so that the stem can weave its way through them. Make sure that the children draw a large diagram so their drawing of the growth of the seedling can be as large as possible. They may draw a label, from the tip of the shoot for that day, out to a date at the side of the drawing of the box. The children should also test the compost to see if it is dry and add water if necessary.

8

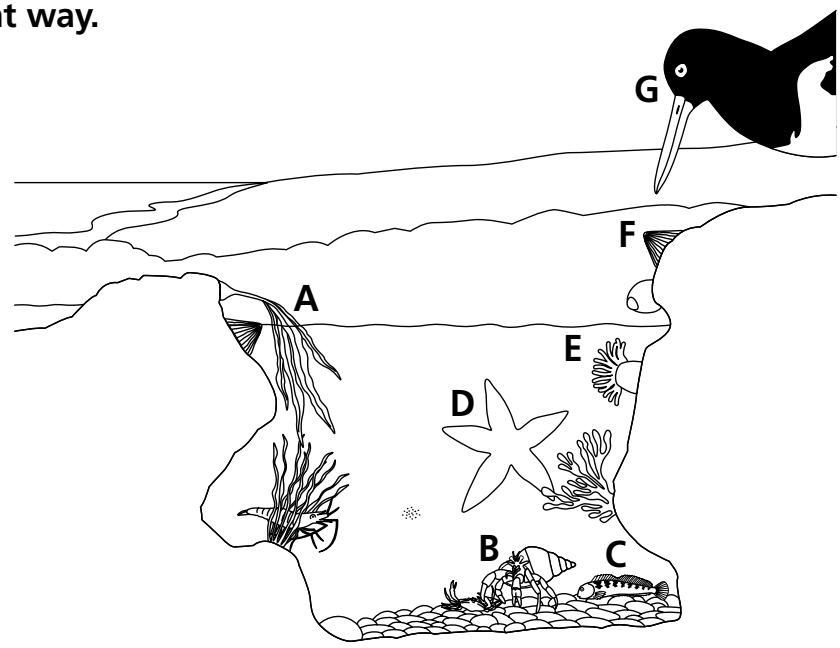
Name: ..... **Form:** .....

See **pages 18 and 19** of *Adapting and surviving*

Rock pools

Some animals can live in rock pools, even though they are battered by waves, if they are adapted in the right way.

Q1. Name the living things labelled **A** to **G**.



A ✎.....

B ✎.....

C ✎.....

D ✎.....

E ✎.....

F ✎.....

G ✎.....

Q2. What does **A** give to the water that helps the other living things survive?

✎.....

Q3. What do the other living things give to the water that helps **A** survive?

✎.....

Q4. How often is the rock pool covered with sea water?

✎.....

Q5. State two ways in which **F** is adapted for life on a rocky shore.

1 ✎.....

✎.....

2 ✎.....

✎.....

Q6. Which living thing is living in the remains of a dead animal? ✎.....

Teacher's sheet: comprehension

See **pages 18 and 19** of *Adapting and surviving*

Answers

1. **A = seaweed, B = hermit crab, C = blenny, D = starfish, E = sea anemone, F = limpet, G = oyster catcher.**
2. **Oxygen.**
3. **Their wastes.**
4. **Twice a day.**
5. **1 = Streamlined shell to stop breaking waves pulling it off. 2 = Thick shell which does not crack when hit by pebbles in waves.**
6. **B, the hermit crab.**

Complementary work

(a) The children can use secondary sources to find out how the water rises up and down the shore twice a day.

(b) Children who buy microscope kits often find that they include brine shrimp eggs to observe. The eggs can be hatched by putting them in a salt solution which is made from 1 litre of rainwater and between 30 to 40 grammes of salt. When the eggs hatch, the tiny shrimps swim by using their antennae. They can be fed on a suspension of yeast. They are difficult to rear but can reach over a centimetre in length. The brine shrimps' habitat is saltwater lakes and pools, not the open sea.

Teaching notes

Seaweeds are not flowering plants. They are large algae. They do not have roots, but a rootlike structure, called a holdfast, which secures the plant to the rock. They do not have leaves. The flat green structures are called fronds. The bladderwrack is a seaweed which is adapted to keeping its fronds in the upper, well-lit water by using air bladders which make the fronds float. Children sometimes pop these bladders when they find the seaweed on the shore.

Not only are marine organisms adapted to life on the shore, they are also adapted to life at particular levels on the shore. Some are found only on the lower shore because they cannot survive long periods out of water. A few can be found on the upper shore because they can stand the high temperatures and dry conditions longer than organisms that live lower down the shore.

There are two kinds of tides. Neap tides, in which the water does not come very high up the shore nor go down very low, and spring tides, which are the highest and lowest tides. Visits to the shore at low spring tides are the most rewarding as rock pools which are only exposed a few times a month can be observed.

Algae are organisms that developed in the sea but they have moved to freshwater and to damp places on land. They may be found turning damp walls and tree trunks bright green.

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

Based on **pages 18 and 19** of *Adapting and surviving*

Rock pools and salt water

Try this…

Rock pools

1. Set up a selection of dishes, bowls and tanks in a sunny and warm position. These are your rock pools.

2. Fill each pool nearly to the brim. Record how much water you add to each 'rock pool'.

3. Take the temperature of each rock pool and record it every half hour. On the back of this worksheet, or on a separate piece of paper, make a table for your results.

4. Write down your prediction for how the temperature of the 'pools' will change during the day.

✎.....

5. After several hours compare your results with your prediction.

Growing plants in salt water

6. Could cress live where the water is salty? Plan an investigation to show that it can or cannot live in salty conditions.

7. Write down what you will need.

✎.....

✎.....

8. Write down what you will do.

✎.....

✎.....

✎.....

9. Make a table on a separate sheet of paper.

10. Carry out the investigation and prepare a full report of your findings.

Teacher's sheet: activity

Based on **pages 18 and 19** of *Adapting and surviving*

Introducing the activity

(a) Tell the children that most sea creatures are adapted to a low, steady temperature. Ask the children what will happen to the creatures if they are caught in different rock pools when the tide goes out.

(b) Challenge the children to test the idea without going to rockpools on a beach. Steer them round to the first activity on the sheet.

Using the sheet

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

(d) Let the children try tasks 1 to 5.

(e) In the time between taking temperatures, go through tasks 6 to 9 with the children.

(f) Let the children carry out tasks 6 to 9 in between taking their temperature readings.

(g) Let the children record the temperature changes of each rockpool on a graph.

(h) Let the children assess the survival chances of sea creatures in each rock pool.

(i) In a separate session, let the children try out their investigation (see note (ii)).

Completing the activity

(j) The children can present their reports on growing plants in salty water to the class.

(k) The children can discuss how there are barriers which prevent sea creatures moving into other habitats and plants moving into the sea. From this, they could research the life cycle of the salmon and the eel.

Conclusion

Smaller rockpools heat up more than larger rockpools. Land plants cannot grow well in salt water. Only a few organisms can change habitats.

Teaching notes

(i) Make sure that the children use a measuring cup or cylinder to find the volume of water in the pools and that they construct a table. The column headings for this should be: 'Rockpool', 'Volume cm^3', 'Temperature at 10am', 'Temperature at 10.30am', etc (see example below).

(ii) Check the children's plans and look for the same number of cress plants in each sample, plants of the same age, the same volume of water given to each sample, different concentrations of salt (sea water has a salinity of about 35g per litre). You can make this up by dissolving 35g of salt in a litre of water, or let the children dissolve 3.5g in $100cm^3$ of water. You do not need salinities greater than this but they could use three different salinities (each one less than this), and one sample grown with non-salty water, but the same conditions of light and warmth.

Rock pool	Volume cm^3	Temp at 10am	Temp at 10.30am	Temp at 11am	Temp at 11.30am	Temp at Midday	Temp at 1.30pm	Temp at 2pm

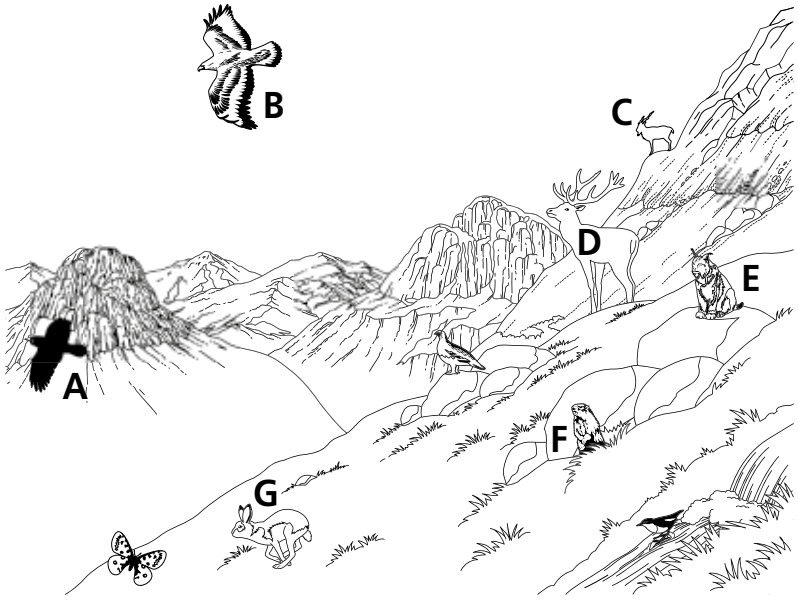
9

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

See **pages 20 and 21** of *Adapting and surviving*

Mountains

Mountains are places with cool summers and harsh, snowy winters. They are places where only the specially adapted can survive.



Q1. Shade in the areas where you may find trees on the mountains.

Q2. Name two plants which grow above the tree line.

1 ✎.....

2 ✎.....

Q3. Name the animals labelled A-G.

A ✎.....

B ✎..... C ✎.....

D ✎..... E ✎.....

F ✎..... G ✎.....

Q4. The ptarmigan is a mountain bird which changes colour during the year.
(i) Why does it do this? (ii) How does its colour change from winter to summer?
(iii) Name another animal in the picture which changes colour like the ptarmigan.

(i) ✎.....

(ii) ✎.....

(iii) ✎.....

Q5. When winter comes, what does animal C do?

✎.....

Q6. When winter comes, what does animal F do?

✎.....

Teacher's sheet: comprehension

See **pages 20 and 21** of *Adapting and surviving*

Answers

1. **In the valley.**
2. **Heather, edelweiss, sedges, mosses, hardy grasses, lichens.**
3. **A = raven, B = golden eagle, C = mountain goat, D = red deer, E = lynx, F = marmot, G = mountain hare.**
4. **(i) It changes colour to camouflage itself so it is not eaten by predators. (ii) It changes from white to brown. (iii) G, Mountain hare.**
5. **It migrates to a lower part of the mountain.**
6. **It hibernates.**

Complementary work

(a) The children can use secondary sources to locate the mountain ranges of the world, then search for and describe a variety of plants and animals that live on each one.

(b) Alternatively, the children can use secondary sources to find out about Douglas fir, grizzly bear, big horn sheep and cougar (Rocky mountains); cloudforest, torrent ducks, spectacled bear, vicuna (Andes); giant lobelia, hyrax, duiker (African equatorial highlands); edelweiss, Apollo butterfly, alpine chough (Alps); rhododendron, snow leopard, yak, bar headed goose (Himalayas).

Teaching notes

Lichens are a feature of mountain plant life which are also found in many non-mountainous places. These plants are really a symbiotic relationship between a fungus and a type of algae. The fungus part grips the rocky surface and supports the algae, which make food both for themselves and the fungus. You may wish to show the children some local rocks encrusted with lichen to support the picture on page 20 of the pupil's book.

You may also like to show the children some alpine plants (obtainable from a garden centre) and let the children plant them in a rockery in the school grounds.

When the children are looking for animals that live in the mountains, it may help if they focus on birds of prey, vultures, members of the crow family, rodents, the cat family, the sheep family, and the deer family. The plants are more diverse and some types of plants have giant species that grow in mountainous regions.

9

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

Based on **pages 20 and 21** of *Adapting and surviving*

Comparing soils

Try this…

1. Look at soil A and soil B which your teacher has given you. Describe how they are similar and how they are different.

✎.....

✎.....

✎.....

2. In which soil do you think most animals could live? Explain your answer.

✎.....

✎.....

✎.....

3. Which soil do you think would hold on to the most water when a shower of rain fell on it? Explain your answer.

✎.....

✎.....

✎.....

4. Plan an investigation to test your answer.

✎.....

✎.....

✎.....

5. Carry out your investigation and prepare a report, including a table of your results.

✎.....

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 20 and 21** of *Adapting and surviving*

Introducing the activity

(a) Tell the children that you have made up a mountain soil and wish them to compare it with a local soil (see note (i)).

Using the sheet

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

(c) Let the children try tasks 1, 2 and 3.

(d) Let the children try task 4 and check their work (see note (iii)).

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

Completing the activity

The children compare their results. If none have repeated the test as part of their investigation let them do this now (see note (v)).

Conclusion

Mountain soil drains more quickly then local soil due to its large fragments and the wider gaps between them.

Teaching notes

(i) You can make up the soil from a mixture of small gravel, coarse and fine sand and a small amount of compost. It must look like a brown, gravelly, gritty substance with just a bit of humus. In contrast, the local soil should be a loam which is rich in humus (similar to potting compost).

(ii) The children can use drawings in their descriptions.

(iii) Look for the same amounts of soil being used, the same volume of water being poured onto each soil and each soil being allowed to drain for the same amount of time.

(iv) The children should produce a table with two columns headed 'Soil' and 'Amount drained' (see example below). They should describe what they did and offer an explanation for the results based on their knowledge of soils, such as 'the mountain soil had larger pieces than the local soil and had larger gaps which allowed more water to drain through'. Look for children repeating the experiment to check their results. If this is not done by anyone, challenge them to defend why they have made a conclusion on just one set of measurements.

(v) The children may be slow to realise that results need checking by repeat experiments. They need to get into the practice of this for work in later school life.

Soil	Amount drained

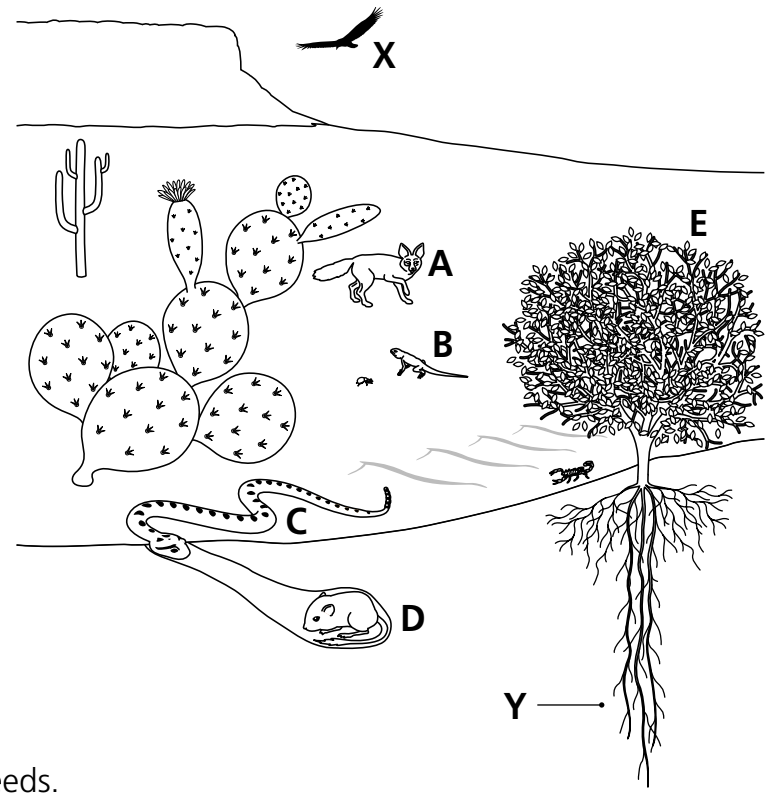
10

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

See **pages 22 and 23** of *Adapting and surviving*

Deserts

Deserts are mainly hot places with very little rainfall. Very few plants and animals can survive such difficult conditions.



Q1. Name the animals labelled A to D.

A ✎.....

B ✎.....

C ✎.....

D ✎.....

Q2. One of the animals feeds on seeds.
Make two food chains using seeds, this animal and other animals in the diagram.

✎.....

✎.....

Q3. Why is the bird X flying so high?

✎.....

Q4. (i) What is the name of plant E? (ii) What is the part labelled Y?

(i) ✎..... (ii) ✎.....

Q5. Where do cacti store water?

✎.....

Q6. How is a camel adapted to living in the desert?

✎.....

✎.....

✎.....

Teacher's sheet: comprehension

See **pages 22 and 23** of *Adapting and surviving*

Answers

1. **A = desert fox, B = lizard, C = sidewinder snake, D = kangaroo rat.**
2. **Seeds ➔ kangaroo rat ➔ sidewinder snake. Seeds ➔ kangaroo rat ➔ desert fox.**
3. **To spot its prey or dead animals.**
4. **(i) Creosote bush, (ii) tap root.**
5. **In their stems.**
6. **It can store water in its body and survive when it has lost up to a third of the stored water. It can store fat, which allows it to go without food for weeks. It has thick fur to protect it from the heat. It has pad-like hooves for travelling across soft ground.**

Complementary work

(a) The children can use secondary sources to find the major deserts of the world, then describe some of the plants and animals that are found in each one.

(b) Alternatively, the children can find out about the yucca, prickly pear, rattlesnake, kangaroo rat, cottontail rabbit and kit fox (North American desert); palm trees, lanner falcon, addax, fennec, sandgrouse (Sahara); saxoul shrubs, bactrian camel, jerboa, stone curlew (cold Asian deserts); desert oak, spinifex grass, moloch, red kangaroo, stump-tailed skink (Australia).

Teaching notes

You may wish to use this unit to revise some general work on plants. For example, you could ask the children about germination and its requirements; the life cycle of a plant; or the basic structure of a plant, and then talk about how they have become changed to adapt a plant for desert life. You may also revise ideas about insulation, in reference to the camel's coat, but also the children could think about clothes they would need for a cold night in the desert.

The bactrian, or two humped camel, is found in Asia and the dromedary, or one humped camel, is found in Africa and has been introduced into Australia.

When the children investigate other desert animals they will find evidence of fat storage in the stump-tailed skink.

Although the scorpion may look as if it is related to the lobster, it is not. It is in the same animal group as the spider, mite and harvestman. This group is called the arachnidae.

10

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

Based on **pages 22 and 23** of *Adapting and surviving*

Desert feet

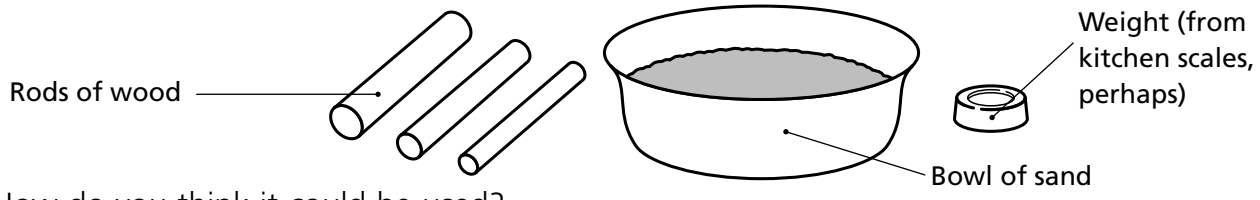
Try this…

1. Think about this question.

Does the size of the foot really affect the way the body sinks into the sand?

You must plan an investigation to answer it.

2. Here is some equipment that could be used to test the idea.



How do you think it could be used?

✎.....

✎.....

✎.....

✎.....

3. Plan your own investigation. You can use the equipment in the diagram, some of the equipment shown and some other equipment, or a different set of equipment.

✎.....

✎.....

✎.....

✎.....

4. Construct a table for your results on a separate piece of paper and try your plan.

Looking at the results.

5. What do the results show?

✎.....

✎.....

Teacher's sheet: activity

Based on **pages 22 and 23** of *Adapting and surviving*

Introducing the activity

(a) Remind the children about the camel having pad-like hooves which make it possible to travel across soft sand. Tell them that the pads cover a large area and this suggests that if a large area is in contact with the sand it will keep the camel from sinking into the sand. From this develop the idea that large feet could be an adaptation to crossing the sand without sinking.

Using the sheet

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

(c) Let the children try task 3 but check it before they begin their investigation (see note (ii)).

(d) Let the children try tasks 4 and 5 (see note (iii)).

Completing the activity

(e) Let the children compare their investigation plans and results (see note (iv)).

Conclusion

A body with a large area in contact with the sand will sink less than a body of similar weight that has a smaller area in contact with the sand.

Teaching notes

(i) The equipment is presented to help the children focus on the problem, but they could also use it for their own investigation.

(ii) If the children use the items in the diagram they might decide that each piece of wood plus the weight is a 'body'. They would stand the wood vertically with one end touching the sand, then put the weight on top and let it press down on the wood. They would measure how far the wood went into the sand. If they used the wooden rods in order, starting with the thinnest, they would find that the 'body' with the smallest area in contact with the sand sunk the most and the 'body' with the largest area in contact with the sand sunk the least. If children have made the pipecleaner models of birds' feet in Unit 6 they may want to use them in some way with slotted weights. Whatever the plan, look for a logical arrangement of the table.

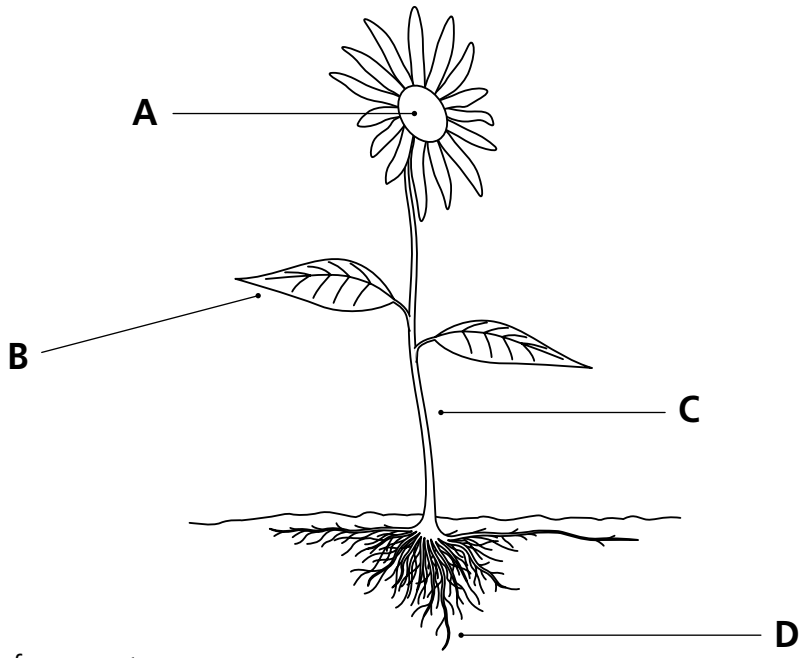
(iii) They should discover the relationship and express it in terms of the larger the area of a body in contact with the sand, the less the body sinks into the sand.

(iv) This shows that the same conclusion can be obtained using different investigations, and that one form of investigation confirms the results of another.

QUESTIONS

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

Q1. Four parts of a plant are labelled A-D.



(i) Name the four parts.

A ✎..... B ✎.....

C ✎..... D ✎.....

(ii) Which part makes food?

✎.....

(iii) Which part takes in food and nutrients?

✎.....

Q2. State two ways in which plants stop animals from eating them.

1 ✎.....

2 ✎.....

Q3. A caterpillar eats an oak leaf.

A thrush eats the caterpillar.

Make a food chain from this information.

✎.....

QUESTIONS

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

Q4. How do these four animals survive in the winter?

Match the animal to its way of surviving by drawing lines between the boxes.

Hedgehog	Migrates
Swallow	Remains in egg
An insect	Keeps active
Squirrel	Hibernates

Q5. From where do plants get the energy they use to make food?

✎.....

Q6. (i) Why do some plants on the woodland floor come into leaf before the trees?

✎.....

✎.....

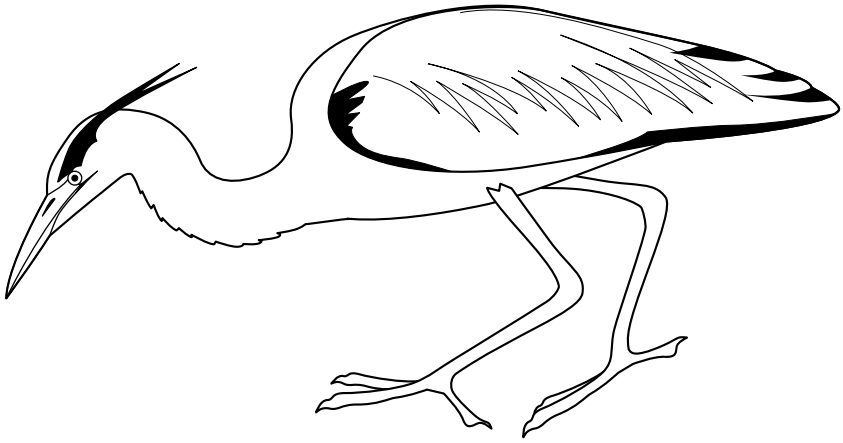
(ii) Name a woodland plant that comes into flower early in the year.

✎.....

QUESTIONS

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

Q7. This bird is a heron.



(i) In which habitat may you find a heron?

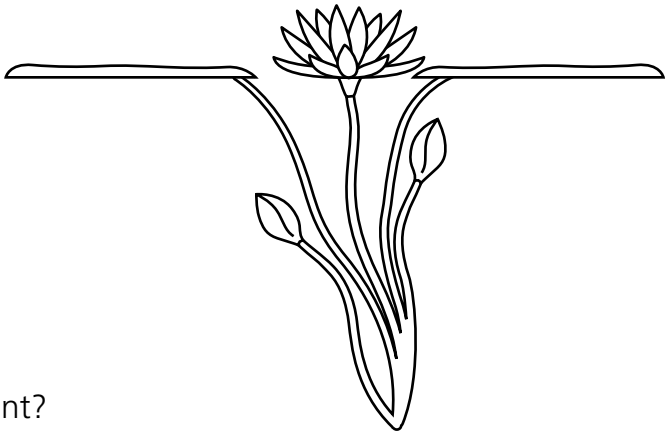
✎.....

(ii) State two ways in which it is adapted to its habitat.

1 ✎.....

2 ✎.....

Q8.



(i) What is this plant?

✎.....

(ii) Label the food-making parts with an F.

(iii) This plant was brought onto land and it collapsed. Why is this?

✎.....

✎.....

QUESTIONS

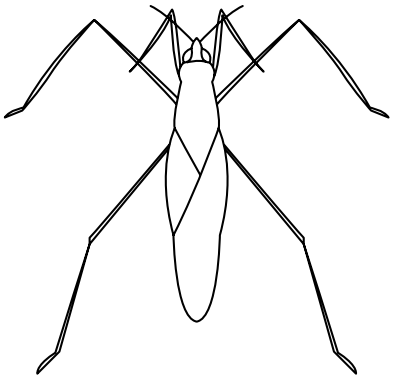
Name: ..... **Form:** .....

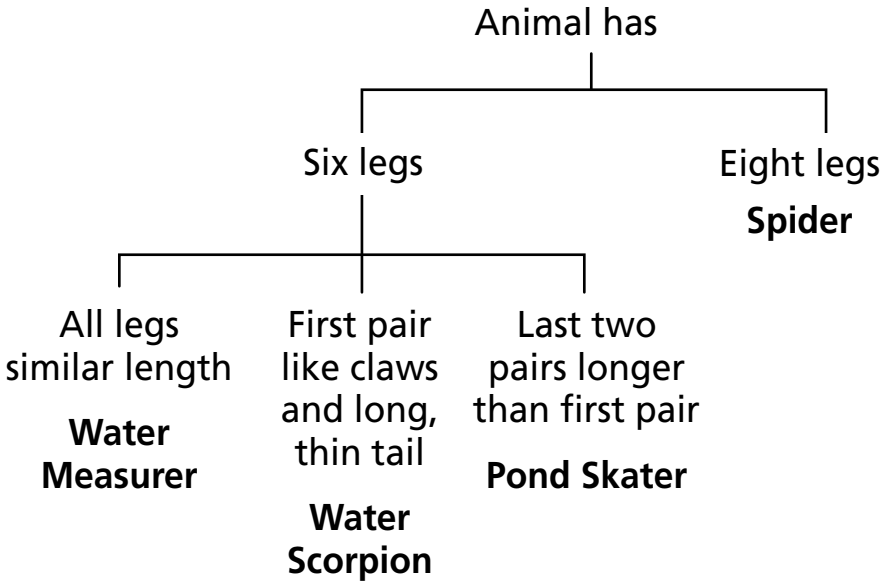
Q9. In a lake, the algae was eaten by water fleas and fish ate the water fleas.

Make a food chain from this information.

✎.....

Q10. Use the key to identify this water animal.





The animal is ✎.....

Q11. (i) Which habitat has the largest number of different plants – the woodland floor or a meadow?

✎.....

(ii) Explain your answer.

✎.....

✎.....

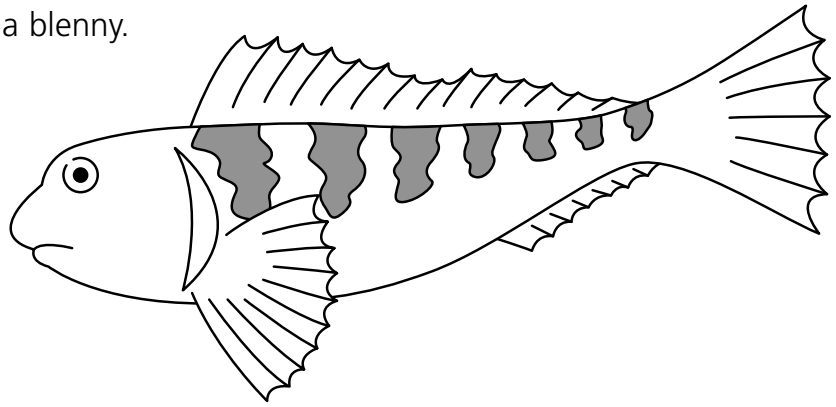
QUESTIONS

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

Q12. A beetle eats an oak leaf, a shrew eats a beetle and an owl eats a shrew. Make a food chain from this information.

✎.....

Q13. This fish is a blenny.



(i) In which habitat would you find a blenny?

✎.....

(ii) State two ways it is adapted to avoid predators.

1 ✎.....

2 ✎.....

Q14. A plant grows low to the ground and has dark green leaves and makes its own antifreeze.

(i) To which habitat is it adapted?

✎.....

(ii) Why are the leaves dark green instead of light green?

✎.....

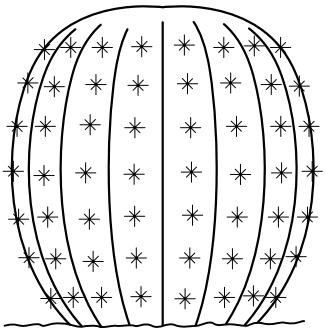
(iii) State another adaptation the plant may have for surviving in its habitat.

✎.....

QUESTIONS

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

Q15.



(i) What is this plant?

✎.....

(ii) Which part of the plant makes food?

✎.....

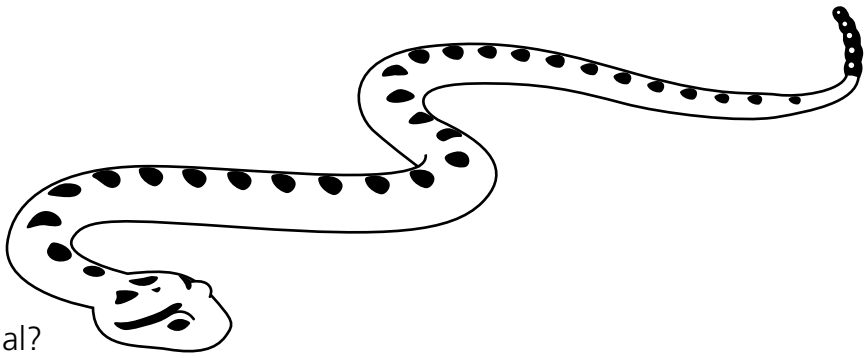
(iii) At certain times of year the plant swells up. Why is this?

✎.....

(iv) Why is it not attacked by animals?

✎.....

Q16.



(i) What is this animal?

✎.....

(ii) In which habitat would you find it?

✎.....

(iii) Only a small part of the animal's body touches the ground as it moves. Why is this?

✎.....

✎.....

ANSWERS

1. (i) A = flower, B = leaf, C = stem, D = root. *4 marks*
(ii) B or leaf. *1 mark*
(iii) D or root. *1 mark*

2. Have poisons, thorns, tough and hard to digest, have insects like ants to defend them, have insect repellents. *2 marks*

3. Oak ➔ caterpillar ➔ thrush. (1 mark for order, 1 mark for arrow direction.) *2 marks*

4. Hedgehog hibernates, swallow migrates, insect remains in egg, squirrel keeps active. *4 marks*

5. The Sun. *1 mark*

6. (i) So they can use sunlight to make food before the trees come into leaf and make it shady. *1 mark*
(ii) Snowdrop, primrose, bluebell. *1 mark*

7. (i) Pond (or freshwater habitat). *1 mark*
(ii) Pointed beak for spearing fish, long legs for wading, large toes to keep from sinking in mud. *2 marks*

8. (i) Water lily. *1 mark*
(ii) Label the two floating leaves. *1 mark*
(iii) Because it is adapted to the water holding it up and does not have strong supporting structures of its own. *1 mark*

9. Algae ➔ water flea ➔ fish. *2 marks*

10. Pond skater. *1 mark*

11. (i) Meadow. *1 mark*
(ii) More light because trees are absent and do not create shade. *1 mark*

12. Oak ➔ beetle ➔ shrew ➔ owl. *2 marks*

13. (i) Rock pool. *1 mark*
(ii) Camouflage, eyes on top of head to see predators approaching. *2 marks*

14. (i) Mountains. *1 mark*
(ii) To absorb more heat. *1 mark*
(iii) Long tap root, furry leaves. *1 mark*

15. (i) Cactus. *1 mark*
(ii) Stem. *1 mark*
(iii) Takes in water. *1 mark*
(iv) Because its spines protect it. *1 mark*

16. (i) Sidewinder snake. *1 mark*
(ii) Desert. *1 mark*
(iii) It helps the snake avoid hot sand, and prevents it from sinking into soft sand. *2 marks*

Total marks: 44