Science units
Grade 3

Contents

Science scheme of work: Grade 3 units

87 hours

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45 teaching hours

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2 hours

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7 hours

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7 hours

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Materials: 12 hours

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2 hours

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14 hours

GRADE 3: Life science 1

Classification of plants and animals

UNIT 3L.1
7 hours

About this unit

This unit is the first of four units on life science for Grade 3.

The unit is designed to guide your planning and teaching of lessons on physical processes. It provides a link between the standards for science and your lesson plans

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For extension or consolidation activities, look at the scheme of work for Grade 5 and Grade 2.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, children should already be able to give examples of how living things are suited to their habitats. They should know that flowering plants grow from seeds and that they take in water through their roots and transport this to all parts of the plant.

Expectations

By the end of the unit, children recognise that individuals of the same species (including humans) show variation. They group animals and plants together on the basis of common characteristics. They identify patterns in their observations.

Children who progress further recognise the importance of identifying organisms correctly and use simple branching keys to do this.

Resources

The main resources needed for this unit are:

- photographs of children and members of their family
- pictures of a range of animals and plants
- videos of plants and animals
- computer classification programmes

Key vocabulary and technical terms

Children should understand, use and spell correctly:

- *feathers*, *fur*, *scales*, *shells*, *wings*
- *branch*, *group*, *key*, *classify*, *sort*
- *bigger than*, *taller than* and other comparative phrases

Standards for the unit

Unit 3L.1

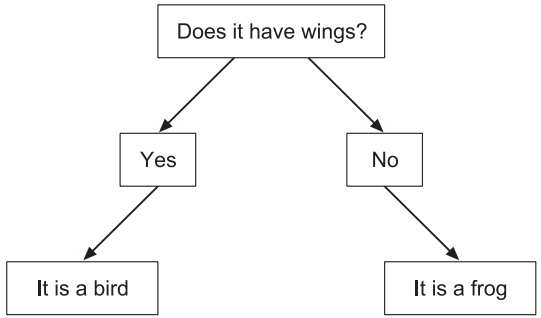
7 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
7 hours **Classification of plants and animals**	1.6.1 Know that living organisms need food, water and air, that they are sensitive, and that they grow and reproduce, and that it is these characteristics that distinguish them from non-living things.	3.4.1 Describe qualitative and quantitative similarities and differences between humans and between individuals of the same type of other organisms.	4.4.1 Recognise the importance of correctly identifying organisms and use simple branching tree keys to make correct identifications.
		3.5.1 Use the observable characteristics of animals and plants to cluster them into meaningful groups.	
	2.1.2 Collect data in a systematic manner.	3.1.3 Make systematic observations and identify patterns.	4.2.4 Classify data and observations and draw conclusions from classification.
	2.1.4 Look for simple patterns in observations made.	3.3.2 Use appropriate equipment to measure length …	4.3.3 Measure length … accurately using appropriate equipment.
	2.2.2 Sort objects into groups, make simple comparisons and identify trends and patterns.		
	2.3.1 Use a tape measure and ruler correctly.		

Activities

Unit 3L.1

Objectives	Possible teaching activities	Notes	School resources
7 hours **Classification of plants and animals** Describe qualitative and quantitative similarities and differences between humans and between individuals of the same type of other organisms. Use the observable characteristics of animals and plants to cluster them into meaningful groups. Make systematic observations and identify patterns. Use appropriate equipment to measure length …	Give children a collection of animals and plants and ask them to classify them into plants and animals. Challenge them to provide a reason for their decisions.	The collection could be pictures or it could be a mixture of live animals and plants alongside pictures, toys and plastic models.	Use this column to note your own school's resources, e.g. textbooks, worksheets.
	Give children pictures of humans and ask them to decide whether they would put them in the animal or plant group. Ask them to explain why humans are like animals – what do they have in common? Key responses would be: • they move; • they breathe; • they eat; • they excrete; • they can have babies. Ask children to name common characteristics of humans – what do all humans have in common? Ask children to think about: • ways in which humans are the similar; • ways in which humans are different. Give children pictures of people from across the world, showing different ethnic groupings. Ask children to think about: • how are the people similar? • how are the people different? • how are you similar and different to the people in the photographs?	Some children will find it easier to note differences than similarities. However, we classify according to similarities, therefore it is important that children become more confident in recognising similarities.	
	Sort the children into pairs, ask them to look at themselves in a mirror and paint a picture of themselves. Then ask them to write six statements to go with their picture; each statement must be a comparison of the similarities and differences between themselves and their partner. For example: • I have brown eyes. They are similar to my friend's eyes. • I am taller than my friend. • My friend likes to watch football the same as me.	Display the photographs and written work around the classroom. Encourage children to use comparative words such as *same*, *different*, *similar*.	
	Ask children to bring in photographs of themselves, from when they were babies to the present day. Ask groups of children to share their photographs and place them into groups. For example, shape of face (oval, heart shaped), fringe, height, age. Place photographs of children as toddlers on the wall or in a class photograph book and encourage children to try to work out who it is in each photograph. • Do their class friends look the same or different from when they were a toddler? • Who can they recognise easily and who has changed a lot?	When children bring photographs to school, make sure that their name is on the back of the picture.	

Objectives	Possible teaching activities	Notes	School resources
	Give children a personal grid on which they can place measurements such as: • height; • shoe size; • hand span; • arm span; • head circumference. Form groups of five or six children and ask them to compare measurements with each other and see who is the tallest, shortest, has biggest hand span, and so on. Support children in their groups to share their information and create a series of bar charts (height of people in our group, hand span of people in our group).	**Mathematics:** Children may need to be given a short focused teaching session on how to use rulers and tape measures. Children do not always transfer mathematical skills into science, so it is useful to spend a short amount of time reminding them about basic measurement skills. Children might need help to create a bar chart.	
	Ask children to draw around one of their feet and cut it out and write their shoe size in the middle of the 'cut out foot'. Challenge children to line up against a wall in order of height: smallest to tallest. Above each child, mark their height (this could be done with a strip of paper with their name on) and then ask children to place their 'cut out foot' where they were standing. This will give a graph on the wall and one of the floor. Discuss with children the idea of there being a pattern in the measurements; ask them to think about the following questions: • Do taller people have bigger feet? • Do smaller people have smaller feet? • What is the pattern in the data? • Was there anyone who did not match the pattern? Why?	This is a good activity for showing relationships in data, and encouraging children to make generalisations. In this activity, the generalisation is that taller people have bigger feet. The reason is for the purpose of balance. Taller people require bigger feet to help the body balance when upright.	
	Provide children with collections of pictures or models of different types of animals (e.g. birds, horses, insects). Ask children to think about what is similar about the collection of birds and what is different. Repeat this with the other animals. A useful way for children to record this activity is by completing a table that you provide, for example: **Comparing** A sparrow / A hawk claws for gripping / claws for gripping and tearing	Table taken from S. Naylor, B. Keogh and A. Goldsworthy (2004) *Active Assessment*, Millgatehouse Publishing.	

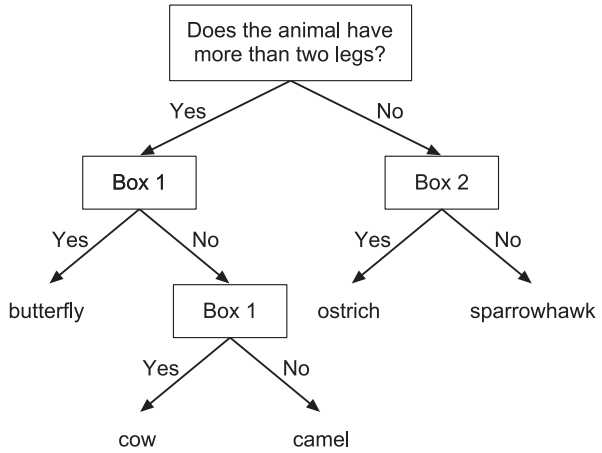
Objectives	Possible teaching activities	Notes	School resources
	Provide children with collections of different types of plants (e.g. cacti, bean plants). Ask them to think about what is similar about the collection of plants and what is different. Repeat this with the other types of plants. A useful way for children to record this activity is by completing a table that you provide, for example: **Comparing** A cactus / A bean plant sharp spikes for leaves / large flat leaves		
	Introduce children to branching keys. Begin with a simple branching key, for example:  Ask children to create their own simple branching key. Give them two different pictures of either plants or animals and ask them to make their simple branching key and use questions to help lead their friend to the right answer.	There are computer programmes that can help children to develop their understanding of and ability to use and create branching keys. This activity provides an introduction to branching keys which will also be developed in more depth in Grade 4.	
	Give children toy animals, models or pictures and ask them to choose the odd one out and explain why. For example: • pictures of a sparrow, hawk, snail; • pictures of a fish, snake and butterfly. In this activity, it is important that children not only say the snail is the odd one out but also explain why. For example, they could explain that the other two animals have feathers and beaks, but the snail does not.		

Objectives	Possible teaching activities	Notes	School resources
	Challenge children to collect, either from home or around the classroom, pictures, models or specimens of a group of animals or plants (e.g. birds, reptiles, mammals, insects, cacti). Their collection could be shown as: • a book; • a poster; • a table top collection. Children should create a set of criteria that helps to define the main characteristics of that group, which helps to distinguish the group of animals/plants from other groups. For example: birds – two legs, wings, feathers, beak; cacti – waxy surface, spikes, shallow roots.		
	Support children in making a database of animals or plants (e.g. a database of different birds or cacti). The database should contain basic information – support children in creating their own fields for the database, for example: *Bird* type of feet type of beak habitat food *Plant* type of leaves colour habitat seeds	**ICT opportunity:** This provides an opportunity for children to construct a simple database, linking ICT into science.	
	Challenge children to research a particular animal or plant as an activity for home. Ask them to find out four interesting facts about their chosen animal and plant. Over a number of days allow each child to tell the rest of the class their interesting facts.		

Assessment

Unit 3L.1

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Look at the collection of picture cards. Sort them into groups of animals and plants.* *Give two reasons why you have put those cards in the animal group.* *Give two reasons why you have put those cards in the plant group.*	Make a set of picture cards by sticking pictures or photographs of animals and plants onto stiff card, or laminate them, so that they can be used again.	
	Look at the pictures of these two animals. *Name three things about the animals that are the same.* *Name three things that about the animals that are different.*	Give children two different animals, for example: • bird and monkey; • horse and camel; • crocodile and falcon.	
	Aisha and Muna sorted the animals using the key below.	Include pictures of animals in any diagrams such as this that you use with children.	



Three questions are missing from their key.

*Circle **1**, **2** or **3** next to each question below to show which box in the key the question goes in.*

Question	***The question goes in box …***
Does it have a long neck?	*1 2 3*
Does it have horns?	*1 2 3*
Does it have antennae?	*1 2 3*

From Testbase, Q 04A04

GRADE 3: Life science

Growing living things

UNIT 3L.2
7 hours

About this unit

This unit is the second of four units on life science for Grade 3.

The unit is designed to guide your planning and teaching of lessons on physical processes. It provides a link between the standards for science and your lesson plans.

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For extension or consolidation activities, look at the scheme of work for Grade 4 and Grade 2.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, children should already know that flowering plants grow from seeds and that they take in water through their roots and transport this to all parts of the plant.

Expectations

By the end of the unit, children know that light, air, water and heat affect the growth of green plants and that the leaves of green plants are important to their growth. They devise fair tests based on predictions and recognise when a conclusion is justified. They identify patterns in their observations. They collect and organise observations and data in tabular forms. They draw valid conclusions from observations and data.

Children who progress further describe the main stages in the reproduction of flowering plants, including seed dispersal. They make observations and collect data systematically, and plan a fair test by deciding how to control variables.

Resources

The main resources needed for this unit are:

- seeds, seedlings, plant pots, plant trays, compost
- rulers, tape measures, dataloggers, syringes
- digital camera
- old tights, cress seeds, grass seeds, celery, carnations, fully grown plants such as geraniums (pelargoniums)

Key vocabulary and technical terms

Children should understand, use and spell correctly:

- *plant*, *seeds*, *seedlings*, *compost*, *cress*, *grass*, *celery*, *carnation*, *geranium*, *leaves*, *roots*, *stem*
- *light*, *heat*, *water*, *air*, *temperature*, *thermometer*, *light meter*
- *affect*, *growth*, *conditions*, *different*, *taller*, *compare*
- *reliable*, *fair*, *results*, *conclusions*

Standards for the unit

Unit 3L.2

7 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
4 hours **Growing living things** **3 hours** **Investigating plant growth**	2.6.1 Know that, given the right conditions, the seeds of flowering plants can sprout and grow into new plants. 2.6.2 Know that flowering plants take in water through their roots and transport this to all parts of the plant. 2.6.3 Recognise that many local plants can live with little water. 2.1.1 Collect data in a systematic manner. 2.1.4 Look for simple patterns in observations made. 2.3.1 Use a tape measure and ruler correctly.	3.7.1 Identify that light, air, water and heat affect the growth of green plants. 3.7.2 Know that the leaves of green plants are important to their growth. 3.1.1 Devise a fair test or comparison and recognise when conclusions are justified. 3.1.3 Make systematic observations and identify patterns. 3.2.2 Display data and observations in tables. 3.3.2 Use appropriate equipment to measure length … and temperature.	4.8.1 Describe the main stages in the reproduction of flowering plants. 4.8.2 Illustrate ways in which seeds are dispersed. 4.1.1 Outline a simple plan, deciding what evidence should be collected and what observations are justified, and collect relevant data and make observations in a systematic manner. 4.3.2 Use a datalogger to collect data automatically.

Activities

Unit 3L.2

Objectives	Possible teaching activities	Notes	School resources
7 hours **Growing living things** Identify that light, air, water and heat affect the growth of green plants. Know that the leaves of green plants are important to their growth.	Ask children to draw or paint a large picture of a sunflower or other flower. Give children pieces of card or paper on which to write captions stating the things that they already know about plants. Display these around the classroom to use as a focal point for a class discussion introducing this topic and for revising key ideas about plants and plant growth. Remind children about key ideas they have met before, such as: • parts of a plant; • conditions for growing plants; • plants taking in water through their roots.		Use this column to note your own school's resources, e.g. textbooks, worksheets.
	Show children different plants with different roots. Ask them to think about what they know about roots (refer them to their ideas from the previous activity) and why plants have roots. Remind them that plants have roots to: • help anchor them into the ground; • take up water. Ask children to think of ways they could show that plants take up water through their roots. Place suitable resources as prompts in front of the children to give them clues as to the sorts of things that they could do. Children might suggest: putting the roots of a plant in water in a clear container and seeing how much water the roots take up. Challenge children to think through problems such as: • How would you know how much water the roots had taken up? • If the container is open, could the water be evaporating? What should we do? Ask children should draw what they see and give an explanation, for example: The water in the container got less. This was because the roots sucked the water up into the plant.	Children should measure how much water the plant takes up over a period of time. Using that information they could also calculate how much water a plant might take up over longer periods of time, such as a week, a month, a year. Contrast this with the amount that children drink in a day, a week, a month and a year. Remind children that all living things – animals and plants – need water to survive. Enquiry skill 3.2.3	
	Show children a plant that is pot bound and a plant that is not. Ask them to think about why plants need to spread their roots out, either horizontally or downwards into the soil. They should be able to explain that roots need to find water in the soil, and that some plants' roots go down a long way to find water, while other plants' roots search for water closer to the surface. Show children a cactus and ask them to think about how cacti, which grow in very dry conditions, find and keep water.	Cacti grow in arid areas and therefore do not need a huge root system to find water – there is so little water to find. Instead they have developed ways to make sure that they do not lose water (e.g. by having spikes as leaves, a waxy surface and a swollen stem that can store water).	
	Ask children to think about how the water gets from the roots to the rest of the plant and then to draw a picture of a plant and write down their ideas. This might elicit some interesting ideas. Then give each child a celery stem, so that they can see the tubes that carry water from the roots up through the stem to the rest of the plant. Allow children to place their celery stems into a container of coloured water. Ask them to write down or draw their prediction about what will happen to the stem.	It is important to help children make the links between how celery and carnations take up water and what happens in other green plants.	

Objectives	Possible teaching activities	Notes	School resources
	After a day the stem should have changed colour; ask children if their predictions were correct and to draw the celery before and after and write a sentence explaining what has happened. Allow children to cut their celery stems in half and describe and explain what they can see. Then show children some white carnations and ask them to predict what will happen if they place these in a container of coloured water (different carnations could be placed in different coloured water). They could take photographs with a digital camera to show before and after. The children should be able to explain what happened, for example: The carnation turned pink, this was because the stem sucked up the coloured water and took it to the flower.	Enquiry skill 3.2.3	
	Discuss the outcomes of the previous activity and ask children to think about whether a plant can have too much or too little water. Ask them to share their ideas; write these on a white board for future reference. Challenge children to think of ways in which they can find out how a plant may be affected by too much or too little water. This provides an opportunity for children to carry out an investigation to find out 'How does the amount of water affect the growth of a plant?' Ask children: • How many seedlings do you think you need to use? • What amounts of water will you use? • What equipment will you use to measure the water? • How often will you water the seedlings? • How will you make your test fair? • How will you record your results? • What are your predictions on the affect of each amount of water on the seedlings? When children have their results, ask them to write down what they have found out from this investigation. Ask them to think about why it is important that they read the instructions when purchasing seeds or plants. This is a good point to discuss with children the issue of how good their evidence is when dealing with living things such as plants. Ask them to think about whether they could use just one plant and pour 5 cm^3 water on it. Would that be the best way to carry out the investigation? What if that plant had something wrong with it? How would that affect the results? Ask them to think about what they should do to make sure that one plant does not give them an unusual result.	For this activity, children should use seedlings. Choose seeds that germinate quickly, for example, cress seeds. Measurement is an important issue in this activity; children should be challenged to think about how to measure accurately (and deliver to the plant without spilling) set amounts of water. The most accurate and easiest way to water a seedling is to use a syringe. Enquiry skills 3.1.1–3.1.3, 3.2.2, 3.3.2 Not all children need to do all of the investigations described in this unit – one group could investigate the effect of different amounts of water, another group could investigate the effect of light and another group could investigate the effect of heat. However, each group should communicate their investigation and findings to the rest of the class, so that all children develop their understanding of how light, air, water and heat affect the growth of green plants.	

Objectives	Possible teaching activities	Notes	School resources
3 hours **Investigating plant growth** Devise a fair test or comparison and recognise when conclusions are justified. Make systematic observations and identify patterns. Display data and observations in tables. Use appropriate equipment to measure length … and temperature.	Ask children to think about what they know about light and plant growth. Refer back to their work from the first activity in this unit. Ask them how they could show that plants need light to grow healthily. (They could grow seedlings in different amounts of light.) This provides an opportunity for children to carry out an investigation to find out 'How does the amount of light affect the growth of a plant?' Ask children: • How many seedlings do you think you need to use? • Could you measure the amount of light? • What will you measure, as a result? • How often will you measure the seedlings? • How will you make your test fair? • How will you record your results? • What are your predictions about the affect of different amounts of light on the seedlings? When children have their results, ask them to write down what they have found out from this investigation. Ask them to think about why it is important that they read the instructions when purchasing seeds or plants in relation to where they are positioned and the amount of light they receive. Encourage children to take a series of photographs of the plants over time.	Some children will work at a level where they will place seedlings in a light place, shady place and dark place (perhaps a cupboard. Other children might be able to measure the amount of light a plant receives by using a computer datalogger light sensor. Children will notice that often the plant in the dark will grow taller, but the colour will be different and the quality of the growth poor. Enquiry skills 3.1.1–3.1.3, 3.2.2, 3.3.2	
	Ask children what effect they think heat has on the growth of plants. This provides an opportunity for children to carry out an investigation to find out 'How does the temperature affect the growth of a plant?' Ask children: • How many seedlings do you think you need to use? • How will you measure temperature? • What will you measure, as a result? • How often will you measure the seedlings? • How will you make your test fair? • How will you record your results? • What are your predictions on the affect of temperature on the seedlings? When children have their results, ask them to write down what they have found out from this investigation. Ask them to think about why it is important that they read the instructions when purchasing seeds or plants in relation to where they are positioned and the temperature of their surroundings.	Some children might suggest placing a plant in very cold or freezing conditions. Challenge the children to think about whether this is fair, since if they were put in a fridge or freezer the plants would also be in the dark. Enquiry skills 3.1.1–3.1.3, 3.2.2, 3.3.2	
	Ask children to think about whether plants need air to live. Encourage them to make links with what other living things need to survive. Challenge children to plan a fair test to answer the question 'Do plants need air to survive?' Remind them about keeping their test fair. Remind them too that they need to think about using more than one plant to make sure that their results are reliable and are not upset because of a plant that might have something wrong with it.	Enquiry skill 3.1.1	

Objectives	Possible teaching activities	Notes	School resources
	Ask children to think about the question 'Do green plants need their leaves to grow?' Encourage them to share ideas and to design a fair test to answer this question. When children have carried out their tests and answered the question, challenge them to find out 'What number of leaves does a plant need to grow?' Children could think about testing: • all leaves; • ¾ of the leaves; • ½ of the leaves; • ¼ of the leaves.	Enquiry skill 3.1.1	
	Make 'seed heads' or 'cress heads' with children. Cut a foot out of an old pair of tights and place a teaspoon of grass seed in the foot, cover it with a layer of compost and then pack the foot with newspaper to make a round head shape and tie up the open end. Water it Stand the 'seed head' upright in a container of water so that the tied end draws up water. Let children create a face on the 'seed head' and then wait until the head grows hair. This can also be done with cress in an empty eggshell. The grass can be cut as it grows and it will re-grow, unlike cress which will not re-grow if cut. Ask children to think about: • How is the plant getting water? • Why does the grass grow back? • What would happen to the grass or cress 'hair' if we put the 'seed head' or 'cress head' in a dark cupboard? • What would happen to the 'hair' if it was denied air?	Cress will grow more quickly than grass, which usually takes around 10–14 days to germinate. Grass has its growing point at the base of the plant so when it is cut it can re-grow. Cress has its growing point near the top of the plant and therefore, if cut, the growing point is cut off, preventing it from re-growing.	
	Remind children why we need plants to grow well; discuss the idea that farmers need to grow plants in the right conditions to make sure that they harvest a good crop. Review what children have learnt from the unit and ask them to produce a leaflet giving advice on how to look after plants kept in the classroom or at home.	Enquiry skill 3.2.5	

Assessment

Unit 3L.2

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Here is a seedling for you to look after. Write or draw a set of instruction on how to look after these seedlings so that they grow tall and healthy.*	Give children a sheet of paper divided into 6–8 sections in which they write or draw pictures.	
	Look at the piece of card (or plastic) that has been placed over the grass. It has been covering the grass for 3 weeks. a. *If we uncover the grass, what do you think it will look like?* b. *Why will it look like that?* c. *What colour should it be?* d. *How could you get the grass back to being a dark green colour?*	Either cover an area of grass in the school grounds with card or black polythene, or grow some grass in the classroom and cover that. Alternatively show children a set of photographs taken using a digital camera.	
	Here is a plant label. Read the instructions on the label then answer the questions below. a. *Where in a room should the plant be placed for the light?* b. *What temperature should the room be?* c. *How often should you water the plant and how much water should you use?*		
	Here is a test that Jamal and Safa did to find out if leaves affect plant growth. *They had two plants exactly the same.* *They took most of the leaves off one plant and left the other plant with all its leaves on.* *Each plant was left in the same place and given the same amount of water.* *Jamal and Safa measured the plants at the beginning and at the end.* *Here are their results:*	Present children with the data. Either ask them to write their responses or ask them to tell you orally.	

	At start	***After 2 weeks***	***Growth***
Plant with all leaves	*15 cm*	*18 cm*	*3 cm*
Plant with leaves off	*15 cm*	*15.5 cm*	*0.5 cm*

a. *What did Jamal and Safa do to make the test fair?*
b. *Which plant had grown the most after two weeks? Why?*
c. *Write down your conclusion from Jamal and Safa's test.*

GRADE 3: Life science 3

Micro-organisms

UNIT 3L.3
4 hours

About this unit

This unit is the third of four units on life science for Grade 3.

The unit is designed to guide your planning and teaching of lessons on life science. It provides a link between the standards for science and your lesson plans.

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For extension activities, look at the scheme of work for Grade 4.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

No previous learning is required.

Expectations

By the end of the unit, children know that some organisms are too small to be seen by the unaided eye.

Children who progress further know that some micro-organisms can cause illness and that good hygiene offers protection against this.

Resources

The main resources needed for this unit are:

- microscopes, computer microscope, slides
- pre-prepared slides, pictures of micro-organisms
- CD-ROMs, leaflets on micro-organisms
- Internet access

Key vocabulary and technical terms

Children should understand, use and spell correctly:

- *organisms*, *micro-organisms*
- *microscope*, *slides*
- *small*, *microscopic*
- *bacteria*, *mould*, *virus*, *germs*, *microbes*

Standards for the unit

Unit 3L.3

4 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
4 hours **Classification of micro-organisms**		3.8.1 Know that individual micro-organisms cannot be seen by the unaided eye. 3.3.1 Handle simple equipment correctly, safely and without damage to carry out simple experiments.	4.10.1 Know that some micro-organisms can cause illness. 4.10.2 Know that good hygiene is important in protection from illness caused by micro-organisms. 4.3.1 Handle more complex equipment correctly, safely and without damage to carry out experiments.

Activities

Unit 3L.3

Objectives	Possible teaching activities	Notes	School resources
4 hours **Classification of micro-organisms** Know that individual micro-organisms cannot be seen by the unaided eye. Handle simple equipment correctly, safely and without damage to carry out simple experiments.	Ask children what they know about micro-organisms. Encourage them to create a concept map of their ideas, using key words that you provide. The key words could also be used as starting points for discussions. Examples of key words are: • micro-organisms • bacteria • viruses • microscope • mould • ill • germs • microbe	Allow two or three children to contribute to one concept map, thereby sharing ideas and encouraging each other to link ideas. During feedback, explain to children that the word *microbe* can also be used instead of *micro-organism*. They are the same thing. Explain that the prefix micro means small or one-millionth. Hence **micro**scope, **micro**-organism. Also explain that *microbe* describes a group of living things that include, *bacteria*, *viruses* and *mould* (*fungi*).	Use this column to note your own school's resources, e.g. textbooks, worksheets.
	Give children pictures of micro-organisms to look at. Challenge children to find out ten things about micro-organisms and write down each new idea on a separate card. Then, when everyone has ten cards, tell them to swap cards with other children in the classroom, always giving the other person a card with something that they do not know. No one can have more than ten cards at any one time. As children collect a new card they must read it and try to remember each new fact. Let this continue for about ten minutes. Then draw the class together and ask children to share a new fact that they have learned – however, no one can repeat a fact. Scribe the new facts for the class to think about. Some important ideas that should emerge are: • the variety of micro-organisms; • some are useful, others are harmful; • they are too small to be seen without help; • they are living things, therefore they have life processes; • they are not plants, they are not animals, but they are a special group of their own; • they are everywhere; • there are more of them on a person's hand than there are people on the entire planet; • they are in the air we breathe, the ground we walk on, the food we eat – they're even inside us; • we couldn't digest food without them – animals couldn't, either; • without them, plants couldn't grow, garbage wouldn't decay and there would be a lot less oxygen to breathe; • *microbe* is a term for tiny creatures that individually are too small to be seen with the unaided eye; • microbes include bacteria, fungi and viruses.	Pictures of micro-organisms can be found in books and on the web. **ICT opportunity:** Use of the Internet.	

Objectives	Possible teaching activities	Notes	School resources
	Give different groups of children different types or aspects of micro-organism to find facts about. For example, a group investigating bacteria might discover that: • bacteria come in all shapes – balls, spirals, cubes and rods; • bacteria can live in temperatures higher than boiling point and in cold that would freeze blood; • bacteria live on or in just about every place on Earth, from soil to water, from your bedroom to the Arctic ice, and in volcanoes; • each square centimetre of your skin contains about 100 000 bacteria; • in a teaspoon of soil there are more than a billion (1 000 000 000) bacteria.		
	Information relating to size and the number of micro-organisms can fascinate children. For example, there are 100 000 bacteria on 1 cm² of skin. Ask children to calculate how many bacteria there are on one of their fingers. Show children a picture of a virus or bacteria, and indicate how many times it has been magnified. Give each child a grain of rice or a small bead. Ask them to draw it 10 times as big, then 100 times. Let groups of children try to create a picture of a bead or a grain or rice that is 1000 times as big.	Scale is a difficult concept for children, even more difficult is to understand how minute micro-organisms are and how many can exist on a small area. This activity illustrates the idea of scale and that the virus or bacteria in the picture will have been magnified so much that it looks very big, but in fact the one bacteria in the picture is so tiny that thousands of them could fit onto the head of a pin.	
	Allow children to use a microscope to view pre-prepared slides of micro-organisms. Ask them to sketch what they see and use descriptive words, to describe what it looks like.	**ICT opportunity:** Use computer microscopes designed for younger children to allow the whole class to view an image through a projector or small groups to view on a computer screen. Enquiry skill 3.3.1	
	Provide children with an opportunity to research micro-organisms using magazines, newspapers, CD-ROMs, the Internet and reference books. Challenge them to find out about micro-organisms that are useful and those that can be harmful. When they have collected their information, ask them to create their own poster or booklet on micro-organisms. They could create a character 'Mahmoud the Mighty Micro-organism' and use the character to share with other people what they have found out.	**ICT opportunity:** Use of the Internet.	
	Show children some examples of mouldy food (e.g. bread, fruit or cheese) and ask them what is on the food. Look at the mould using a standard microscope or a computer microscope. Explain to children that the mould actually consists of many individual fungi, which are microbes so tiny that each one cannot be seen easily without a microscope, and there are millions of them on one piece of mouldy food. Ask children where they have seen other moulds growing. Let children grow moulds on different foods and compare what they look like under a microscope. If using a computer microscope, take and store digital images of the mould for children to examine.	**Safety**: Mouldy foods should be kept in closed plastic bags or other closed containers. Only grow moulds in sealed containers and dispose of them carefully. Some children can be allergic to mould spores. **ICT opportunity:** Use of a computer microscope.	
	Repeat the first activity in this unit. Ask children to add what they know now in a different coloured pen so that new or changed knowledge can be picked out by both child and teacher.		

Assessment

Unit 3L.3

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Tell me three things that you know about micro-organisms.*		
	Which of these are true and which false? A. *Micro-organisms feed and grow.* B. *Micro-organisms reproduce.* C. *All micro-organisms are harmful.*		
	*Why is the word **micro** used in the name **micro-organism**?*		
	Explain one way that micro-organisms can be useful to humans. *Explain one way that micro-organism can be harmful to humans.*		
	Which of these do we need to use to observe micro-organisms? A. *Telescope* B. *Microscope* C. *Periscope*		
	Which of these are true and which false? A. *All micro-organisms are bad and can make us ill.* B. *There are micro-organisms all around us* C. *Micro-organisms are only found in the bathroom*		

GRADE 3: Life science 4

Body parts and functions

UNIT 3L.4
12 hours

About this unit

This unit is the fourth of four units on life science for Grade 3.

The unit is designed to guide your planning and teaching of lessons on life science. It provides a link between the standards for science and your lesson plans.

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For extension activities, look at the scheme of work for Grade 4.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, children should already be able to match external parts of their bodies to those of other organisms and relate structures to functions. They should know their sense organise and their functions. They should be able to devise fair ways of testing predictions and make a display of data collected.

Expectations

By the end of the unit, children know that humans and other animals have lungs for gas exchange, intestines for absorbing food, kidneys for dealing with waste and a heart for circulating blood around the body. They know that blood carries gases, food and waste. They explain how exercise affects heart rate and know that exercise and diet are important to good health. They give examples of animals that have a skeleton and know that the skeleton functions in protection, support and movement. They devise fair tests and recognise when a conclusion is justified. They organise observations in tabular and pictorial forms and use pictures and explanations to communicate what they have found out.

Children who progress further know that life processes are internally regulated and can be disturbed by injury, illness and inappropriate actions. They know the general effects of tobacco, alcohol and drugs on the body. They plan a fair test by deciding how to control variables, and check and repeat observations to improve accuracy. They recognise when conclusions are justified. They construct and interpret two-way tables, bar charts and diagrams to communicate their results.

Resources

The main resources needed for this unit are:

- models and pictures of skeletons, CD-ROM material on bones, collection of bones
- model of human torso, model of heart, pictures and CD-ROM material on the organs of the body, fish for dissection
- computer datalogger, pulse meter
- collection of food in containers with labels or food labels

Key vocabulary and technical terms

Children should understand, use and spell correctly:

- *skeleton*, *bones*, *muscle*, *spine*, *ribcage*, *support*, *protection*, *movement*
- *organs*, *heart*, *lungs*, *kidneys*, *intestines*, *torso*, *circulation*, *digestive*, *waste*, *system*, *respiration*, *gases*, *oxygen*, *carbon dioxide*, *blood*, *cells*
- *exercise*, *fitness*, *health*, *healthy*, *food*, *pulse*, *heart rate*, *heart beat*
- *protein*, *carbohydrates*, *vitamins*, *fats*

Standards for the unit

Unit 3L.4

12 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
3 hours **The skeleton** **5 hours** **Body organs** **4 hours** **Keeping healthy**	2.5.1 Recognise the visible body parts of animals that are similar to those of humans and relate structure to function. 2.5.2 Identify that skin is sensitive to touch, the nose detects smells, eyes detect light and colour, ears detect sounds and the tongue detects taste.	3.6.1 Know that inside living things are structures with specialised functions. 3.6.2 Know that humans and other animals have lungs for gas exchange, intestines for absorbing food, kidneys for dealing with waste and a heart for circulating blood. 3.6.3 Know that the heart pumps blood around the body in blood vessels to carry gases, food and waste. 3.6.4 Know how exercise affects heart rate and that regular exercise and a proper diet is important to health. 3.6.5 Compare the structure of humans and animals and recognise that some have an internal skeleton that provides protection and support and allows for movement.	4.6.1 Know that life processes are controlled. 4.6.2 Know that injury, illness and inappropriate actions disturb life processes.
	2.1.5 Devise fair ways of testing predictions.	3.1.1 Devise a fair test or comparison and recognise when conclusions are justified.	4.1.1 Outline a simple plan, deciding what evidence should be collected and what conclusions are justified, and collect relevant data and make observations in a systematic manner.
	2.2.4 Make a display of data collected.	3.2.2 Display data and observations in tables. 3.2.5 Use a variety of methods to record and communicate observations and data collected.	4.2.1 Construct and interpret two-way tables.

Activities

Unit 3L.4

Objectives	Possible teaching activities	Notes	School resources
3 hours **The skeleton** Compare the structure of humans and animals and recognise that some have an internal skeleton that provides protection and support and allows for movement. Display observations and data in tables. Use a variety of methods to record and communicate observations and data collected.	Ask children to draw an outline of a body and to draw inside what they think the skeleton looks like and where the bones are. Tell them that they can feel the bones in their own body to help them. When the children have finished, encourage them to share their pictures with their friends and to talk about the similarities and differences in their pictures. Then ask children to name as many bones as they can and list them on a whiteboard. Once the children have listed what they know, go through them and ask children to suggest where each bone is on the body. Continue discussing bones and ask children to think about what they would like to know about bones and the skeleton, and to write their questions down. This could be done individually or children could work in pairs or small groups. For example, they might ask: • What do bones look like? • How many bones do humans have? • Do bones stay the same size? How do we know? • How do bones grow? • Which is the largest and smallest bone in the body? Their questions will be used in a later activity as the basis for researching information about the skeleton and bones.	This concept picture is important for the teacher because it helps to elicit children's understanding of the skeleton, and provides a starting point for working with their ideas. Having a large-scale skeleton in the classroom will support children in developing their ideas. Science suppliers offer a range of equipment relating to the skeleton for all ages. Enquiry skill 3.2.3	Use this column to note your own school's resources, e.g. textbooks, worksheets.
	Give children time during lessons to research the human skeleton and create a booklet. Explain that their booklet could be in the shape of a skeleton or a bone, and that it should have only six pages. Tell them that on those pages they need to answer the questions that they asked in the previous activity.		
	Show children a human skeleton – this can be a plastic or card model, or images from the Internet or CD-ROMs. With the help of the children, label major bones in the body – there are some bones children might not know (e.g. collar bone). If there is a large model skeleton in the classroom, leave it out with labels so that children can practise placing the labels on the skeleton. Discuss with children the purpose of different bones (e.g. skull, ribcage, pelvic girdle). Ask children to think about why some bones are so large (e.g. the thigh bone).	Children of this age enjoy learning scientific words, so introduce the names of bones by placing the scientific name alongside the everyday name (e.g. elbow – humerus). However, for assessment children need to know only the word most commonly used.	

Objectives	Possible teaching activities	Notes	School resources
	Show children pictures or models of different kinds of animal skeletons (fish, snakes, sheep, camel, elephant, bird). Ask children to think about the similarities and differences between the different animal skeletons and also between the animal skeletons and the human skeleton. Ask questions such as: • What do all the skeletons have in common? • Which skeleton is the most different? • Which skeleton is most similar to the human skeleton? • Do they all have backbones? (This is a good point to introduce the terms *vertebrates* and *invertebrates*) Give children a set of animal skeletons and pictures of those animals and ask them to match the skeleton to the animal. Challenge children to explain what clues they could see on the skeleton that allowed them to match it with the correct animal picture.		
	Create a display of bones for children to look at. Allow them to handle the bones and to explore what they feel like. Alongside the collection leave a set of challenge cards, which could include activities and questions such as: • What do the bones feel like? • Which bone do you think would be the easiest to break (the most brittle)? • Which bones do you think are the same? • Which bones might be rib bones? • Which bones might be from a fish? • Which bones can you label (e.g. skull, rib)? • Look at the teeth in the skulls. Which skull belongs to an animal that eats grass? Why do you think that? • Look at the teeth in the skulls, which skull belongs to an animal that eats meat? Why do you think that? Put the bones into sets. Make a whole skeleton using some of the bones.		
	In this activity, give children a range of found materials and challenge them to use their knowledge of skeletons to make a human skeleton. When they have completed their model, get them to create caption labels for the main bones. Display all the skeletons created by children for the rest of the class to view. They could also be displayed for the rest of the school.		
	In a previous activity the difference between vertebrates and invertebrates was introduced. Show children pictures of a range of invertebrates (e.g. snails, worms, butterflies, ants) and compare the body of the invertebrate with the human body.	If possible, allow children to observe live invertebrates and note their features (e.g. how they move).	

Objectives	Possible teaching activities	Notes	School resources
	Using the collection of bones, ask children to think about how strong bones are, and when and how they break. Encourage children to think about either themselves or people they know who have broken a bone. Ask: 'What happened and how did the hospital help to mend the bone?' Get children to carry out a survey to find the answers to questions such as: • At what age bones are broken most frequently? • Which is the most common bone that is broken? • Which is the most common way of breaking a bone? Their survey grid could be something like this: **Age** | **Have you broken a bone?** | **Which bone?** | **How?** When children have collected their data, tell them to create a series of bar charts to communicate their findings. Challenge them to draw a set of conclusions, for example: • The age *X* is the most common age for breaking a bone. • Falling over is the most common way of breaking bones. • The collar bone is the bone that is broken the most.	Enquiry skills 3.2.2, 3.2.5	
	Show children a video or CD-ROM sequence to illustrate how bones move and the part played by muscles in enabling the body to move about. Make a card model of a muscle and allow children to use it to show how the muscle works to move the bone (e.g. in the arm). Demonstrate that a muscle attached to a bone has to contract to make their arm move. Explain that muscles work in pairs and that as one muscle relaxes another contracts, and this makes the bone move. When demonstrating this, point out that a muscle shortens when it contracts. When the muscle relaxes it returns to its original length. It is when the muscle contracts that the bone moves.	Many books show children how to make an arm out of card with elastic bands acting as the muscle. While this is a useful idea, many children find it difficult to make such a model. So it may be better for you to make this model and use it to demonstrate to children how muscles work. Then allow children to use the model.	
	Repeat the first activity in this unit by asking children again to draw an outline of a body and to draw inside what they think the skeleton looks like and where the bones are. When they have finished, ask them to compare their original drawing with the new one. Ask them to write sentences or phrases around the new drawing, indicating the things that they know now about the skeleton that they did not know at the beginning of the topic. Give children a vocabulary list as a prompt to help them remember new learning. Include words such as *skeleton*, *bones*, *strength*, *ribs*, *muscle*.	Enquiry skill 3.2.3	

Objectives	Possible teaching activities	Notes	School resources
5 hours **Body organs** Know that inside living things are structures with specialised functions. Know that humans and other animals have lungs for gas exchange, intestines for absorbing food, kidneys for dealing with waste and a heart for circulating blood. Know that the heart pumps blood around the body in blood vessels to carry gases, food and waste. Display data and observations in tables. Use a variety of methods to record and communicate observations and data collected.	Form children into groups of three or four and get them to draw around one of the group on a very large piece of paper. Tell them to think about where the main organs of the body are located and to write the names of the organs in the correct places on the drawing. Then ask them to write beside each label what they know about that organ. The main organs they include should be: • heart; • lungs; • kidneys; • liver; • intestines. Explain to children that this activity helps them find out what they already think they know about the human body. At the end of the topic the same groups will repeat the activity, which will allow children to realise how their learning has moved forward and provide an assessment point for you.	Enquiry skill 3.2.3	
	Show children a model of the torso and locate the various organs of the body (e.g. heart, lungs, kidneys, intestines, liver). Children should also develop knowledge of the location of organs for reproduction. Ask children what they already know about each organ and introduce them to some key ideas about the organs. This should be at the basic level of: • where the organs are located; • their function and importance to the body systems; • a simple description of how they work; • how the body works as a system (e.g. heart and lungs).	Key ideas in relation to the organs are: • The human heart is responsible for supplying the body with oxygenated blood. It is vital to the circulatory system. • The small intestine is where most digestion of food occurs. The large intestine is for absorption of water and excretion of solid waste material. They are part of the digestive system. • The kidneys filter waste, the waste forms urine. • Lungs are part of the respiratory system. The air that you breathe in contains several gases that the body needs to function, including oxygen.	
	Give pairs of children different words related to the organs of the human body. Tell them that they are in charge of creating a glossary definition of the word, and that if they need to they can include a picture or a diagram. Allow them to word process their one page on the word for a class glossary of terms about the organs of the body. The glossary should contain words such as: *arteries*, *capillaries*, *carbon dioxide*, *cell*, *circulation*, *energy*, *heart*, *heartbeat*, *intestines*, *kidney*, *oxygen*, *pulse*, *valve*, *vessels*, *waste*.	**ICT opportunity:** Use of word processing software.	

Objectives	Possible teaching activities	Notes	School resources
	Ask children to write down questions about the heart, lungs, intestines and kidneys. This could be organised in different ways, for example: • individual children could ask three questions about each organ and research the answers to those questions; • small groups of children could write eight questions about one body organ (e.g. the heart) and research the answers to the questions.		
	Encourage children to take notes to answer their questions (discourage them from copying verbatim) and then get them to present their answers in any of a range of ways, for example: • make up a true/false quiz for other children to try; • create a set of fact cards about the organ they have researched for other children to use; • create a pop-up booklet with information about the organ; • create a game in which other children have to get the right answer or match pairs of cards.		
	Allow children, under supervision, to dissect a fish and find and identify its organs. It is important to help children realise that the internal organs of animals are similar.		
	Give children a large cut-out of the human body with separate cut-out organs that can be stuck on with reusable glue or fasteners Challenge children to beat the clock to solve the following problem: 'Sahar (or Khalid) will be late for school if you don't help put the body parts in the right place. How quickly can you do it?'		
	Ask children to bring to school a large plain T-shirt on which they can draw and label the lungs, intestines, kidneys and heart. Children could use the information from their research to create 'Did you know …' facts alongside the organs on their T-shirt. Challenge children to make sure that the position of the organs on the T-shirt directly relates to where they would be found in their own bodies.		
	This is a repeat of the first activity in this section on body organs. Form children into groups of three or four and get them to draw around one of the group on a very large piece of paper. Tell them to think about where the main organs of the body are located and to write the names of the organs in the correct places on the drawing. Then ask them to write beside each label what they know about that organ. The main organs they include should be: • heart; • lungs; • kidneys; • liver; • intestines. Explain to children that this activity helps them to find out how their learning has moved forward since beginning work on the topic. It also provides an assessment point for you.		

Objectives	Possible teaching activities	Notes	School resources
4 hours **Keeping healthy** Know how exercise affects heart rate and that regular exercise and a proper diet is important to health. Devise a fair test or comparison and recognise when conclusions are justified. Display data and observations in tables. Use a variety of methods to record and communicate observations and data collected.	Ask children to draw a series of pictures showing what they can do to be healthy. Tell them to write a short explanation under each picture. Ask children to draw a series of pictures showing things that they should not do if they want to stay healthy. Tell them to write a short explanation under each picture.		
	Ask children to think about why exercise is important. Let them use leaflets on keeping healthy and resources such as CD-ROMs and books to find out what effect exercise has on the body and on the general well-being of the individual. When they have completed their research, ask them to draw or paint a picture, or use a photograph, of themselves and write around their picture six reasons why they need to exercise.	Help children to develop the idea that exercise is important for a healthy body, that it relieves stress, helps mental well-being, engages people in an enjoyable pastime and can be a social activity, allowing people to make friends and develop social skills.	
	In this activity, children will measure their pulse rate and find out their resting pulse rate. Let children work in pairs so that one child can find the other's pulse rate. Ask them to take three readings and then either choose the middle reading or calculate the average. They can then swap roles. Tell them to record their results in a table like the one below. **Name** | **Pulse reading 1** | **Pulse reading 2** | **Pulse reading 3** | **Middle reading (average)** | | | | | | | | | | | | When they have done this, ask the pairs to add their pulse rates to a class database. This data can then be used to answer questions such as: • Who has the lowest pulse rate? • Who has the highest pulse rate? • What is the average pulse rate for the class? • What was the range of pulse rates in the class? • What was the difference between the highest and the lowest pulse rate?	Discuss with children why they need to take three readings instead of only one. This will help develop their understanding that three readings allow for the possibility of an 'odd' (anomalous) reading. **ICT opportunity:** If the school has a computer datalogger with heart rate monitor, it could be used in activities in which children measure pulse rate. Enquiry skill 3.2.2, 3.2.5	
	In this activity, children will plan and carry out an investigation to answer the question 'How does exercise affect pulse rate?' Ask children to consider some of the following questions when planning their test: • What sort of exercise do you need to do? • For how long? • How will you keep it fair? • What will you measure? • How will you record your results? • How will you use your resting pulse rate in this activity? When children have completed this activity, ask them to consider their results and answer the original question 'How does exercise affect pulse rate?'	**Safety:** Make sure that children do not overexert themselves when they exercise. Enquiry skill 3.1.1	Lesson plan 3.1 Exercise and pulse rate

Objectives	Possible teaching activities	Notes	School resources
	Ask children to keep an exercise diary for one week. Challenge them to reflect on their own level of exercise and to consider whether they could do anything to improve the amount of exercise they take. Encourage children to remember that exercise might include sport, walking, skipping and dancing. Encourage children to create their own 20 minute exercise routine that they could do with their friends or with members of their family. Challenge them to think about what kinds of exercises they could do in their home, taking into account the need to be safe and the space available. Allow children to set their routine to music and to show other children. They could even show the rest of the school how easy it is to keep fit.	Be aware that home circumstances will dictate how much exercise children take. However, it is important that children also develop an understanding that they must begin to take some responsibility of their own health and well-being.	
	Give children a set of cards related to diet and healthy eating. Ask them to sort the cards into those they think are true and those they think are false. For example, statements on the cards could include: • Chocolate bars are the best food for keeping healthy. • We don't need to eat and fruit or vegetables to keep healthy. • Water gives us energy and is good for us. • Water is good for the brain and helps us to think. • Fish is a good food to eat; we should eat it at least twice a week.	Prepare cards for children in advance. It is important not to suggest that some food (e.g. chips, crisps, cakes, chocolate, biscuits and other such food) are bad for us and should not be eaten. The key issue is that humans require a balanced diet.	
	Introduce children to the main food groups and their importance in the human diet. For example: • Carbohydrates (e.g. from cereals, bread, pasta) provide energy. • Proteins (e.g. from beans, meat, eggs, chicken, fish, nuts, diary products) are needed for growth and to help repair the body. • Fats (e.g. from dairy products, meat, vegetables, fish oils) are important as a store of energy. Too much fatty food can make people overweight and unhealthy. • Fibre and vitamins (e.g. from cereals, fruit, vegetables) are needed for good digestion, healthy heart, bones and teeth.		
	Ask children to keep a food diary for a week, in which they write what they have to eat each day and label these according to the food group. An example of a diary might be: **Breakfast** / **Lunch** / **Evening meal** / **Snacks** Friday Saturday When children have completed their diary, challenge them to think about how healthy their diet is and what changes they could make. For example, could they swap a chocolate bar for a piece of fruit?	Enquiry skill 3.2.2	

Objectives	Possible teaching activities	Notes	School resources
	Give children a large piece of paper, which is to be their lunch tray. Give them: • a circle for their drink; • a large paper plate for their main meal; • a small plate for desert/pudding; Ask them to create a special 'healthy meal' and draw on: • what they will drink; • their main meal, which must include something from each of the food groups; • something for desert/ pudding Their aim is to create a healthy meal. Extend this by asking children to do the same for each meal of the day and then look across the meals to make sure that what they eat during the day is balanced.		
	Give children tins and packets of food. Ask them to look at the food labels and find out which of the food on their table has: • most/least salt; • most/least sugar; • most/least carbohydrates; • most/least calories; • different vitamins. Discuss with children the importance of looking at the food labels because they can tell us about what is inside the food. So, if we were trying to reduce calorie intake, we would compare the same food by different manufacturers to find out which was best for us. Similarly, if someone wanted to reduce their intake of salt they would look at the labels.		
	Celebrate healthy living by allowing children to create a class fitness video and having a whole class exercise session, after which they have a healthy snack. The class could plan this and have it as their last lesson in this topic.	**Safety:** Check with parents that children are not allergic to any foods that will be offered.	

Assessment

Unit 3L.4

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Put the labels against the right bone in the body.*	Give children a picture of a skeleton or a model skeleton and labels.	
	Match the body organ with what it does. *Heart* — *Digest food* *Lungs* — *Filter waste* *Kidneys* — *Take in oxygen* *Intestines* — *Pump blood*		
	Here are two lunch boxes. ***A***: *Pitta bread and hummus*; *Chicken salad*; *Apple*; *Bottle of water*; *Packet of crisps* ***B***: *Pizza*; *Salad*; *Chocolate bar*; *Piece of cake*; *Fizzy drink* a. *Which lunch box contains the healthier meal?* b. *Give three reasons why.*		
	Look at the tally chart showing how often a group of children eat fruit. ***How often?*** — ***How many children?*** *more than once a day* — ✓✓✓✓✓ ✓ *once a day* — ✓✓✓✓✓ ✓✓✓✓ *once a week* — ✓✓✓✓✓ ✓✓✓✓✓ ✓ *less than once a week* — ✓✓✓ *never* — ✓ a. *How many children never ate fruit?* b. *How many children ate fruit once a week?* c. *Which children were the healthiest? Why?*		

GRADE 3: Materials 1

Comparing materials

UNIT 3M.1
10 hours

About this unit

This unit is the first of two units on materials for Grade 3.

The unit is designed to guide your planning and teaching of lessons on materials. It provides a link between the standards for science and your lesson plans.

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For extension or consolidation activities, look at the scheme of work for Grade 4 and Grade 2.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, children should already be able to use their senses to help describe some properties of materials, and classify materials according to whether they occur naturally or are synthetic.

Expectations

By the end of the unit, children classify simple materials on the basis of their physical properties. They show how we use different materials for different purposes, such as food, clothing and shelter, and recognise that some materials have many different uses. They compare materials according to common properties.

Children who progress further know that there are three states of matter and that each has particular characteristics. They know that metals are an important class of materials and list some uses of common ones. They name the properties of metals that make them useful.

Resources

The main resources needed for this unit are:

- collection of objects made from one or two common materials (e.g. a metal spoon or pan with a wooden handle, toy cars made from metal and plastic)
- collection of drinks/foodstuffs (e.g. flour, sugar, tea leaves, coffee (ground and beans), butter, rice, lentils, tomato ketchup, orange juice, cooking oil, vinegar, treacle)
- collection of personal hygiene products (e.g. toothpaste, soap, shampoo, shower gel, shaving foam, bubble bath, soap 'bombs' that fizz when added to water)
- collection of items to sort by physical properties (e.g. swimming goggles, skipping ropes, hair brush)
- small collection of objects for simple crush/stretch tests (e.g. paper cups, paper tissues, drinks cans, pair of tights, plastic bottle, wooden spoon, polystyrene packaging)
- collection of objects (and pictures of objects) made from one material, such as wood or plastic.
- food colouring, dyes, icing, white modelling clay, white paint

Key vocabulary and technical terms

Students should understand, use and spell correctly:

- names of common materials: *wood*, *plastic*, *metal*, *glass*, *rubber*
- words relating to physical properties: *absorbent*, *strong*, *liquid*, *solid*, *powder*
- expressions of comparison: *heavier than, more flexible than*
- nouns and related verbs: *comparison/compare, description/describe*
- words related to use of materials: *use*, *purpose*

Standards for the unit

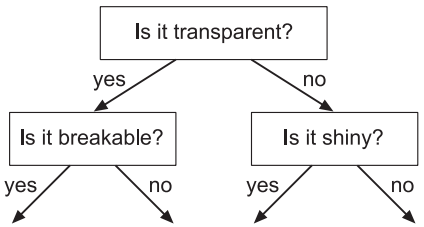
Unit 3M.1

10 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
3 hours **Identifying common materials** **4 hours** **Classifying materials** **3 hours** **Uses of materials**	2.7.1 Describe the properties of materials in terms of how they look, feel and smell. 1.7.1 Name a number of common materials and show some of the ways we use them. 1.7.4 Show that one material can often be used to make a variety of different objects. 2.7.4 Know that both natural and synthetic materials are often changed further before they are used. 2.7.3 Classify materials according to whether they occur naturally or are synthetic. 2.2.2 Sort objects into groups, make simple comparisons and identify trends and patterns.	3.9.1 Classify simple materials in various ways on the basis of their physical properties. 3.9.2 Identify and recall a range of common materials such as different cloths, plastics, paper, ceramics and construction materials. 3.9.3 Realise that some materials are used for many different purposes. 3.9.4 Compare materials according to common properties, such as hardness, strength, flexibility, transparency. 3.2.1 Classify data according to shared characteristics and identify trends and patterns.	4.12.3 Explain the properties of metals that make them useful. 4.12.1 Know that metals are an important class of materials and list some of their common uses. 4.11.1 Know that there are three states of matter – solid, liquid and gas – and that each state of matter has particular characteristics. 4.2.4 Classify data and observations and draw conclusions from the classification.

Activities

Unit 3M.1

Objectives	Possible teaching activities	Notes	School resources
3 hours **Identifying common materials** Identify and recall a range of common materials such as different cloths, plastics, paper, ceramics and construction materials.	To begin this unit, get children to carry out short activities to recall materials that they have learned about in previous grades. Ask children to draw a concept map. First provide a few key words and then hold a class brainstorming session to elicit a range of other words. Example key words are *plastic*, *wood*, *wool*, *natural*, *synthetic*, *flexible*, *transparent* (*see-through*), etc. These key words cover materials' names, origins and properties, and should help children to think of many additions to begin their concept map. Children then make the connections to show what they know about these materials.	This is a useful elicitation activity. Find out from previous teachers which materials provided the focus for the materials units in Grades 1 and 2.	Use this column to note your own school's resources, e.g. textbooks, worksheets.
	Focus on the materials whose names and properties children had most difficulty recalling. Create a display of objects made from these materials and ask children to sort them according to the materials from which they are made. To challenge children, include objects made from more than one material (e.g. a metal spoon or pan with a wooden handle, toy cars made from metal and plastic). If you ask children to sort the objects into PE hoops, they may be able to work out that these items can be added to overlapping hoops, and are thus introduced to Venn diagrams. Ask children to record their findings on paper, in overlapping circles, and to label the circles to show the materials by which they have sorted the objects.	Enquiry skill 3.1.3, 3.2.1	
	Ask children to carry out a survey of the school, focusing on materials used for construction. Give them a table to complete, which has columns headed 'wood', 'metal', 'plastic', 'ceramic' and 'other'. It is hoped that children list items such as roof tiles, bricks, window frames, windows, mortar, which holds the bricks together, paving stones, tarmac in the car park. Many of these will fall into the 'other' category for discussion on returning to the classroom. Ask children to draw or photograph examples of the materials during their survey. Ask groups of children to produce a booklet on each of these materials, researching additional information using the Internet and books, and by contacting local companies that produce or use these materials.	**ICT opportunity:** Use of digital photography and the Internet.	
	Ask children, in groups, to look at clothes labels and make a list of materials used to make a wide range of clothing. To do this they can look at the labels in clothing they are wearing, with the aid of others in their group. Tell them to record their findings in a table, with headings such as 'cotton', 'wool', 'polyester', 'viscose'. Encourage them to discuss whether the materials are synthetic or from natural sources (revision of Grade 2 work on materials). Ask them to identify the most and least common materials and to discuss the reasons for this.	There is a wide range of synthetic fibres used in clothing today, so it may be preferable to list some items of clothing under a title 'other' to limit the number of headings in the table. Alternatively, use a carefully selected range of clothes for the activity.	
	Introduce children to new materials, such as those used in cooking and the food industry. This will introduce liquids and solids, including powders. Give children a range of foodstuffs to observe and identify (e.g. flour, sugar, tea leaves, coffee (ground and beans), butter, rice, lentils, tomato ketchup, orange juice, cooking oil, vinegar, treacle). Challenge children to identify all the foodstuffs and sort them in different ways (e.g. wet or dry, things you can eat/drink without changing and things you can't, runny and not runny). Carry out a similar activity using 'things that help us keep clean' (e.g. toothpaste, soap, shampoo, shower gel, shaving foam, bubble bath, soap 'bombs' that fizz when added to water).	Enquiry skill 3.1.3	

Objectives	Possible teaching activities	Notes	School resources
4 hours **Classifying materials** Classify simple materials in various ways on the basis of their physical properties. Compare materials according to common properties, such as hardness, strength, flexibility, transparency. Classify data according to shared characteristics and identify trends and patterns.	The concept map described earlier will provide information on what children recall of the physical properties covered in previous grades. Remind children of all the properties of materials that they have already learned about (e.g. flexible/stiff, heavy/light, float/sink, waterproof/not waterproof, shiny/dull, opaque/transparent/translucent). Provide children with a range of objects that cover as many of the physical properties they have learned about as possible, some PE hoops and property cards (each card has one physical property written on it and perhaps a small picture). Include objects that have more than one property (e.g. swimming goggles, skipping ropes, hair brush), to challenge children to sort into Venn diagrams, as in the activity above. Ask children to use the cards to label the hoops and then sort the objects into the hoops. (For example, they may choose to sort the objects according to whether they are flexible or not. They would label the overlapping hoops with the 'flexible' and 'rigid' property cards, before sorting the objects into one of the hoops, or into the overlapping area (intersection).) After recording the sorted objects, in photographs, drawings or writing, let children choose another criteria to sort by, and so on.	Enquiry skills 3.1.3, 3.2.1	
	Get the class to produce an illustrated dictionary of properties. Share out the properties between groups of children and ask each group: • provide a definition that is easy to understand; • draw a picture or include photographs of materials/objects displaying that property; • list as many things as possible with that property; • describe simple tests they have carried out in relation to the property.		
	Introduce children to new physical properties (including any described in the scheme of work for previous grades that were not covered), such as strength of materials. Strength refers to either how easy it is to crush a material/object or how easy it is to stretch an object. Give children objects to handle and let them try to stretch and crush them (e.g. paper cups, paper tissues, drinks cans, pair of tights, plastic bottle, wooden spoon, polystyrene packaging). Tell children to sort the objects accordingly.	Enquiry skills 3.1.3, 3.2.1	
	Ask more able children to complete identification keys like the one below by adding the names shown in italic to the key. *window* *sandwich bag* *metal pan* *wooden spoon*  Make similar keys for children to complete. Encourage children to produce 'Property key mobiles', by writing the questions and materials on both sides of pieces of card, and then joining cards together with coloured wool (green = yes, red = no) with 'yes' and 'no' labels attached to the wool. Suspend the mobiles from the ceiling.	**ICT opportunity:** Use computer programmes that allow children to construct identification keys.	

Objectives	Possible teaching activities	Notes	School resources
	Provide children with either real objects or pictures for this activity. The use of pictures will be more challenging and therefore suitable for more able children. Give them a table similar to the one below to complete: **Object/material** | **Flexible or stiff** | **Heavy or light** | **Strong** | **Breakable** | **Waterproof or absorbent** Plastic bag | *flexible* | *light* | *no* | *no* | *waterproof* Metal pan | | | | | Glass mirror | | | | | Woollen jumper | | | | | The table should cover all the physical properties that children have learned about. This could be carried out individually, in pairs, in groups or as a whole class. It should prompt a great deal of discussion, and perhaps disagreement. For example, some properties are not distinct opposites, but are on a scale, such as heavy or light, strength. This could lead to discussion of comparative statements, such as 'the plastic bag is lighter than the pan'.	This could be an assessment activity. Make sure the items chosen to add to the table are made from one material only, as the focus is on the material and not on the object. **ICT opportunity:** Create a simple database of materials' properties. Enquiry skills 3.2.1, 3.2.2	
	An alternative to the activity above is to give children a set of completed properties, with the object/material missing from column 1. Include the names of the materials at the bottom of the sheet and tell children either to cut and paste or to write the correct names in column 1. This could also form a game of '20 questions', in which children ask questions related to the properties of an object. The object could be from the completed table, but for a more challenging version allow one child to think of a new object and answer the other children's questions about it. If the class or group guesses the correct object before they have asked 20 questions, they win, but if more than 20 questions are asked, the child wins. (*Note:* the number of questions may need reducing, depending on the number of properties covered.)		

<table>
<tr><th>Objectives</th><th>Possible teaching activities</th><th>Notes</th><th>School resources</th></tr>
<tr><td>3 hours

Uses of materials

Realise that some materials are used for many different purposes.</td><td>Begin a collection of wooden objects on an interactive display. Above the display add pictures of wooden objects. Ask children to bring one object and one picture from home to add to the display. Examples include:

<table><tr><th>Objects</th><th>Pictures</th></tr><tr><td>wooden spoons rulers
chopping boards wood shavings
clothes pegs jewellery
jewellery boxes toys clocks
stools</td><td>bridges boats fences tables
chairs cupboards bed frames
mallet window frames doors
wooden beams fuel clogs</td></tr></table>
Seeing this collection should reinforce the idea that a material can be used for many different purposes. Ask the following questions, either of the whole class, or as part of the interactive display:
• Why has wood been chosen for this object?
• What are the main properties of the object?
• Does wood always have this property? Give me an example of a wooden object that does/doesn’t.
• Could it be made from anything else? Why/Why not?
• Can you think of anything else made from wood not in the display? What are its main properties?</td><td>Similar interactive displays could be made using plastic objects (metals are covered in detail in Grade 4).</td><td></td></tr>
<tr><td></td><td>Ask children to research the use of glass, as a collection of glass objects should not be made in the classroom. This research could include the use of books, the Internet and CD-ROMs, and talking to people who work with glass (such as the school window cleaner, local people employed as glass-blowers or in glass-recycling). Children could talk to their parents, aunties, uncles and grandparents about the replacement of many glass items with plastic, and the advantages of this. For example, all bottles used to be made from glass, now many are made from plastic.

The information they collect could be made into a class booklet, or a series of posters to display around the school with specific messages (e.g. about recycling or safety).

Encourage children to discuss and research more unusual materials, such as the pigments and dyes used to colour many other materials, including paints, plastics, fabrics, wool and food colourings. Let children dye some fabrics (e.g. by tie-dyeing) and add food colouring to white icing, white modelling clay or white paint to observe the effects.</td><td>ICT opportunity: Use of the Internet and CD-ROMs.

Extension activity: Ask more able children to go on to research alternative materials, such as rubber or ceramics.</td><td></td></tr>
</table>

Assessment

Unit 3M.1

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Add lines and sentences to connect pairs of words on this concept map. Add extra words if you want to, and make as many connections as you can.*	The concept map activity that started this unit is repeated at the end. Key words can again be given.	
	Look at the set of picture cards. Make a list of the main object in each picture and the material it is made from. Now sort the pictures into the materials they are made from. Write sentences about the things you have sorted: *This is a _____ and it is made from _____.*	Give children a set of picture cards showing: • objects observed during the unit; • objects not observed during the unit.	
	Design and draw an outfit for one of the following activities: • *skate-boarding;* • *walking on the Moon;* • *skiing;* • *underwater diving.* *Label your drawing, showing the materials you have chosen and why you have chosen them.*		
	Select three properties from the box below that are needed by each of the following objects: *mirror pan carrier bag wooden spoon watch strap swimming costume jam jar dish cloth tyre* *flexible breakable hard heavy waterproof* *stiff opaque strong shiny soft* *transparent absorbent light dull not breakable*	The list of objects should contain some that have been observed during the unit, and others that have not.	
	Complete the following sentences: • *A pan is _____ than a key.* • *A wire is _____ than a pipe.* • *A paper towel is _____ than a carrier bag.*	These are examples. If children struggle to complete the sentences, provide them with a set of phrase cards, such as: 'is lighter than' 'is more absorbent than (soaks up more than)' 'is more flexible than'.	
	List at least four items made from each material shown in the table below. Add more if you can. ***Metal*** | ***Plastic*** | ***Wood*** | ***Glass*** | | | |	The headings can be changed to cover a different range of materials.	
	Other assessment opportunities have been highlighted in the notes on the possible teaching activities above.		

GRADE 3: Materials 2

Investigating materials

UNIT 3M.2
10 hours

About this unit

This unit is the second of two units on materials for Grade 3.

The unit is designed to guide your planning and teaching of lessons on materials. It provides a link between the standards for science and your lesson plans.

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For extension or consolidation activities, look at the scheme of work for Grade 4 and Grade 2.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, children should already be able to use their senses to help describe some properties of materials and devise simple tests for these properties. They should be able to draw conclusions from observations and evidence, make predictions about what might happen in an investigation and then test them. They should recognise when conclusions are justified. They should be able to label pictures and make tables to record observations.

Expectations

By the end of the unit, children compare materials according to common properties and test the properties of materials to find out how appropriate they are for the use made of them. They devise fair tests based on predictions and recognise when a conclusion is justified. They identify patterns in their observations. They collect and organise observations and data in tabular and pictorial forms.

Children who progress further know that there are three states of matter and that each has particular characteristics. They make observations and collect data systematically, plan a fair test by deciding how to control variables, and check and repeat observations to improve accuracy. They construct and interpret two-way tables, bar charts and diagrams to communicate their results.

Resources

The main resources needed for this unit are:

- plastic and paper cups, aluminium cans
- variety of tights of different thicknesses and styles
- 50, 100, 150 g masses
- packaging materials(e.g. tissue paper, newspaper, foam wrap, bubble wrap)
- 'fragile' items (e.g. popadoms, whole potato crisps, meringues)
- access to a freezer, ice-cube trays, plastic bowls or plates
- samples of common plastics, such as expanded polystyrene (e.g. some food packaging trays), PVC (e.g. some shampoo bottles), polythene (e.g. milk containers), polystyrene (e.g. drinking cup from vending machine)
- materials to test for absorbency (e.g. plastic from a carrier bag, dusters or other cotton fabrics, paper towels/tissues, paper, nylon fabrics)
- materials to test for thermal insulation (e.g. cotton, wool, nylon)
- small drinks bottles (250–330 ml)
- samples of naturally and synthetically dyed fabric, white cotton, corks
- range of filters (e.g. colanders, sieves, tights, tissue paper, paper towels, fishing nets, cotton wool)
- sand, small stones, grit
- washing-up liquid, glycerine, 'bubble-blowers',
- materials to make ropes (e.g. polythene bags, cling film, long grass or straw)

Key vocabulary and technical terms

Children should understand, use and spell correctly:

- expressions of comparison: *cool, cooler, coolest*
- nouns and related verbs: *comparison/compare, description/describe*
- words related to the use of materials: *use, purpose*
- expressions making predictions: *I think that it will / might / could …, because …*
- expressions of reason using *because*
- words related to the investigation of properties: *investigate*, *test*, *describe*, *explain*, *conclude*, *evidence*

Standards for the unit

Unit 3M.2

10 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
5 hours **Comparing materials' properties**	2.7.2 Devise simple tests for some properties of materials.	3.9.4 Compare materials according to common properties, such as hardness, strength, flexibility, transparency. 3.9.5 Know that the use we make of materials depends on their properties and devise tests to find out how appropriate they are for the use made of them.	4.11.1 Know that there are three states of matter – solid, liquid and gas – and that each state of matter has particular characteristics.
5 hours **Relationship between materials' uses and properties**	2.7.4 Know that both natural and synthetic materials are often changed further before they are used.	3.9.6 Show and understand how the way in which the material is used can affect its properties.	4.12.3 Explain the properties of metals that make them useful.
	2.1.1 Collect data in a systematic manner.	3.1.1 Devise a fair test or comparison and recognise when conclusions are justified.	4.1.1 Outline a simple plan, deciding what evidence should be collected and what conclusions are justified, and collect relevant data and make observations in a systematic manner.
	2.1.2 Draw conclusions from observations and data.	3.1.2 Make and test predictions and draw conclusions from observations and data.	4.1.2 Design a fair test by identifying key factors to vary.
	2.1.3 Make predictions about the outcome of an investigation.	3.1.3 Make systematic observations and identify patterns.	4.2.1 Construct and interpret two-way tables.
	2.2.3 Use correct names of objects and processes when describing an investigation.	3.2.2 Display data and observations in tables.	4.2.2 Express results in the form of bar charts.
	2.2.4 Make a display of data collected.	3.2.3 Use labelled pictures to communicate observations.	4.2.3 Record observations in diagrammatic form and interpret simple diagrams.
	2.2.6 Make pictograms with simple scales to assist in data display.	3.2.5 Use a variety of methods to record and communicate observations and data collected.	4.2.4 Classify data and observations and draw conclusions from the classification.

Activities

Unit 3M.2

Objectives	Possible teaching activities	Notes	School resources
5 hours **Comparing materials' properties** Compare materials according to common properties, such as hardness, strength, flexibility, transparency. Devise a fair test or comparison and recognise when conclusions are justified. Make and test predictions and draw conclusions from observations and data. Make systematic observations and identify patterns. Display data and observations in tables. Use labelled pictures to communicate observations. Use a variety of methods to record and communicate observations and data collected.	**Material strength** Remind children (from Unit 3M.1) that the strength of materials refers to (a) how easy it is to crush a material and (b) how easy it is to stretch a material. Either of these properties can be tested. For the crush test, use different types of cups/containers made from paper, plastic, aluminium. Discuss the factors required for a fair test, and ask children: • Is the size of each container important? Why? • How should we crush the containers in a fair way? (e.g. discuss squashing/squeezing by hand, placing masses on the container, vertical or horizontal position of containers.) Let children carry out the test, and record their observations in tables, as pictograms or as labelled pictures of the cans at different stages in the investigation. Tell them to compare their results to decide which are the strongest and weakest materials. For the stretch test, carry out an investigation of tights. To set a context, produce a fictitious letter from a ballet school that wants to recommend the best tights for students to wear for their weekly practice. Show children a range of tights of different sizes, thicknesses, patterns and colours to stimulate discussion about differences between pairs of tights, and to help them decide which factor they want to focus on for their investigation. Once they have decided which factor they want to investigate (e.g. does the thickness affect the stretchiness or do patterns affect the stretchiness), tell them to plan their fair test. Labelled pictures can form part of this planning process. Encourage children to make predictions about the outcome, giving reasons. For each pair of tights tested, ask children to measure how far the tights stretch with a specific mass, say 100 g, added. Ask more able children to measure the stretch after adding 50, 100, 150 g, and so on, to each pair of tights. Suggest to children that they record their results using the real tights – by pinning them to paper at the length to which they stretched. Also encourage them to measure the length of each pair of tights and produce a bar chart. If everyone has carried out the same investigation, do this as a class exercise, in which children take it in turns to stick a gummed square to a graph with prepared axes and the tights named on (and samples stuck to) the horizontal axis. Encourage more able children to record the data in line graphs, with different colours of lines representing different pairs of tights. During discussion of the data, refer back to children's predictions. Ask questions such as: • Were the results what you expected? • How were they different? • Why were they different?' Ask children to complete the activity by writing a letter of recommendation to the ballet school, backing up their claims with evidence (e.g. bar charts). Make a display of the investigative process with headings such as 'Planning' and 'Doing', and including the original letter, planning pictures, tables of results, bar charts and final letters to the ballet school.	Enquiry skills 3.1.1–3.1.3, 3.2.2, 3.2.3, 3.3.1, 3.3.2 Children should be moving away from the idea that colour is an important variable, but some may still need to investigate this in order to appreciate its irrelevance.	Use this column to note your own school's resources, e.g. textbooks, worksheets.

Objectives	Possible teaching activities	Notes	School resources
	Shock absorption Ask children to carry out tests on a range of packaging materials to find the most suitable to protect fragile objects. Give them a range of materials (e.g. tissue paper, newspaper, foam wrap, bubble wrap) and ask them to select, with justification, three materials, ranging from poor to excellent for the purpose. Use easily breakable foods (e.g. popadoms, whole crisps, meringues) as the fragile objects. Follow the process described in the 'material strength' investigation above to investigate these materials. Suggest a context for the investigation (e.g. the needs of packaging companies, makers of fragile objects, people wishing to move house and protect their possessions). Possible tests involve dropping the object wrapped in the material from a height of 1–2 m, or dropping a mass of 100–200 g onto the object. Encourage more able children to increase the height or mass gradually for each packaging material, thus offering the opportunity of recording in line graphs instead of bar charts.	Enquiry skills 3.1.1–3.1.3, 3.2.2, 3.2.3, 3.3.1, 3.3.2	
	Melting ice In this investigation, children explore the affect of placing ice in different parts of the classroom on the time taken for the ice to melt. Help children to devise a fair test, making sure they consider such things as the size of the ice pieces and the types of containers used. Encourage discussion of the differences between different locations in the classroom (e.g. how cold or warm, light or dark it is). Then get children to build on this discussion to make predictions, accompanied by reasons. Help the class to decide how often they should observe the ice to see whether it has melted. The investigation is best carried out as a whole class split into groups (e.g. each group takes responsibility for one pot of ice). Create a class table, which the children complete every 5 or 10 minutes, by placing a ✓ or a × in the appropriate place to indicate whether their ice has melted. The time can be measured using a stopclock, alarm clock or sand timer. When all the ice has melted, ask children to look at the table of results and discuss the effects of location on the ice. Ask them to consider ways of preventing the ice from melting, and to suggest what would happen to other materials (e.g. chocolate, butter, wax) if left in similar places. Give each child is given a part-prepared bar chart and asked them to complete it using the information in the class table. Also ask them to write down what the results tell them. The more able the children, the less information you should provide for creating the chart.	Enquiry skills 3.1.1, 3.1.2, 3.1.3, 3.2.2	
	Exploring plastics Let children investigate different plastics to observe what happens to them when trying to crease them. Use samples of expanded polystyrene (e.g. some food packaging trays), PVC (e.g. some shampoo bottles), polythene (e.g. milk containers), polystyrene (e.g. drinking cup from vending machine). Children will find that some plastics will snap, some will crease and leave a white line, and others will crease leaving no white line. The white line is referred to as *stress whitening*. Provide the following information to children so that this test can be used as a way of identifying unknown samples of plastics. snaps — expanded polystyrene creases — polythene creases with stress whitening — polystyrene, thin PVC and some polythene	Further details on this and other activities on plastics' properties can be downloaded from www.psep.org.	

Objectives	Possible teaching activities	Notes	School resources
5 hours **Relationship between materials' uses and properties** Know that the use we make of materials depends on their properties and devise tests to find out how appropriate they are for the use made of them. Show and understand how the way in which the material is used can affect its properties. Devise a fair test or comparison and recognise when conclusions are justified. Make and test predictions and draw conclusions from observations and data. Make systematic observations and identify patterns. Display data and observations in tables. Use labelled pictures to communicate observations. Use a variety of methods to record and communicate observations and data collected.	**Absorbency** The context for this investigation is finding the best materials for a nappy (i.e. the material on the inside needs to be very absorbent, but the outer layer should not be). Produce fictitious letters from a nappy company or unhappy parents to provide a starting point. Materials to test could include plastic from a carrier bag, dusters or other cotton fabrics, paper towels/tissues, paper, nylon fabrics. Let children discuss, either as a class or in groups, the best way to test these materials for their absorbency, including fair test conditions. Encourage them to discuss what they think will happen (predictions) and their reasons. Examples of tests include: • Placing a sample of each material on a paper towel, and pouring/dripping small amounts of water onto the material until the water shows on the paper towel (up to a fixed amount). Recording and measurement can be by drawing round the wet area on the paper towel, or by counting the number of drops of water required before the paper towel becomes wet. • Peg strips of each material to a line and hold them in a tub of water so about 1–2 cm of the material is in the water. After a fixed amount of time, say 30 seconds, remove the material and cut and stick the part that absorbed water onto a record sheet, or measure the length of material that has absorbed water. Provide guidance to help children determine the quantities and measurements involved and the means of recording their observations. Samples of each material can be stuck onto tables on record sheets, the size of the sample representing the length of fabric that absorbed water. Encourage more able children to display their data in simple bar charts, with names of materials on the horizontal axis, and the measurement of length/area of wet material on the vertical axis. During the final discussion of the test, refer back to the children's predictions, and how valid they were – including the reasons they gave. Discuss what advice they would give to the nappy company regarding the best materials to make the nappy. At this stage, they may wish to consider other factors, such as comfort of the nappy.	Enquiry skills 3.1.1, 3.1.2, 3.2.2, 3.3.1	
	Insulation In this investigation, children test fabrics for their ability to keep people cool in hot weather. The 'people' can be represented by drinks cans or bottles. Ask children to wrap different fabrics round the cans or bottles and shine light from desk lamps onto them. Provide thermometers for children to put in each can or bottle and ask them to take and record the temperature inside every 5 minutes for, say, 30 minutes. Ask children to make predictions, carry out their investigations and record results as suggested elsewhere in this unit. Let children observe fabrics closely through a hand lens to aid discussion of the differences between fabrics.	**ICT opportunity:** Use temperature probes inside the three containers, and appropriate software to print tables, and plot and print graphs. Enquiry skills 3.1.1, 3.1.2, 3.1.3, 3.2.2, 3.3.1, 3.3.2, 3.3.3	

Objectives	Possible teaching activities	Notes	School resources
	Rub test In Unit 2M.4, children may dye fabrics using natural and synthetic dyes. If possible, ask their teacher to save some pieces of the fabric for your class to use for this test. Alternatively, collect samples of fabric which have been dyed using natural and synthetic dyes. If children did carry out the colour-fastness tests in Grade 2, discuss the results. If they did not, lead a general discussion on what can happen to coloured fabrics when washed (e.g. what can happen to white socks if accidentally washed with very dark clothes) and when they are in sunlight for a long time (e.g. what happens to curtains after a few months). Introduce children to the idea of *quality testing* in industry. Companies have to ensure their products retain a high quality before selling them, and they carry out lots of scientific tests to achieve this. One such test is the *rub test*, which children can mimic by attaching a piece of plain white cotton to a cork with a rubber band and rubbing it against the dyed fabric a specified number of times, with a constant pressure and a constant speed. If the resulting piece of white cotton does not have any dye visible on it, the dyed fabric has passed the quality control test. Before setting up the test, let children discuss how they will achieve a constant pressure and speed (e.g. a weighted long-handled spoon on top of the cork, which is pushed and pulled to the tick of a metronome). Ask them to make predictions on what they think the outcome will be, with justifications for their predictions. Children who have carried out the Grade 2 dye activities should have a great deal of prior knowledge to use at this point. Encourage children to discuss how to record their data; suggestions may include sticking samples of each fabric next to the piece of white cotton on which they were rubbed to a record sheet. These will form a very visual set of data for use when discussing the outcomes.	Enquiry skills 3.1.1, 3.1.2, 3.2.2, 3.2.3, 3.3.1 For visual examples of the test equipment and recording methods used by scientists in industry, visit www.colour-ed.org, and select the Teachers' notes in the activity 'Quality testing of dyes'.	
	Filtration Place a sample of seawater in a 1 litre bottle, and make sure it contains sand and small stones. Show children the seawater. Tell them that this is to be turned into drinking water and ask them to think about what the first step in achieving this might be. Collect their ideas on the board or OHP; if no one has suggested using any kind of sieves or filters, add this as your idea. Discuss each idea in turn, and decide which will form the basis for investigation. A range of ideas could be chosen by different groups, or the whole class could carry out the filtration activity. Make up individual samples of seawater for children in small (say 330 ml) drinks bottles, ensuring that there are similar amounts of sand and stones in each sample. Show children a range of filters (e.g. colanders, sieves, tights, tissue paper, paper towels, fishing nets, cotton wool). Allow each group to select three filters to test, ranging from one they predict to be poor to one they predict will be excellent. Ask them to provide justification for their choices.	If children's ideas highlight misconceptions, they may need to test the ideas before they appreciate this. **Safety:** Check local regulations to find out whether seawater can be used in the classroom. If not, make up samples using tap water, salt, sand and stones. Enquiry skills 3.1.1, 3.1.2, 3.1.3, 3.2.2, 3.2.3, 3.2.5, 3.3.1, 3.3.3	

Objectives	Possible teaching activities	Notes	School resources
	In devising their test, encourage children to think about the measurements they will make, including time taken to filter the sample (an important consideration in industry), as well as how they might measure the success of the different filters. The effectiveness of filters can measured by: • recording the amount of material filtered out; • allowing each filtrate to settle and recording the amount of sediment; • holding samples up to the light for a visual comparison. Encourage children to make drawings of both the filtered-out materials and the resulting sediment in the filtered samples.		
	During the discussion of the results, children should mention the sizes of the holes in the different filters. They may not realise that some materials have holes; discuss this and let children hold materials to the light and observe them through a hand lens so that they can see the holes. Let them look at filtration materials under a microscope to see the hole (or 'pore') size. Discuss filtration systems (often used in industry) in which large-holed filters remove large lumps and then progressively finer filters are used until the smallest lumps are removed. This prevents the fine filters from getting clogged with all the large lumps.	**ICT opportunity:** Use light sensors to measure light shining through each resulting water sample. The more light that passes through, the more successful the filtration.	
	Blowing bubbles The cost of materials is an important consideration in industry. Let children investigate this alongside the properties of materials, by challenging them to mix a bubble-blowing mixture that is fun to use and cost-effective.		
	Tell them that a bubbles company is thinking of adding a new ingredient to its mixture: glycerine. The company has heard that glycerine improves the bubble mixture in some way. However, it wants to introduce glycerine only if it is sure it is effective, as it is expensive. The company currently uses 50% water and 50% washing-up liquid.	Glycerine alters the strength of the bubble mixture, thus allowing bubbles to last longer, and they may bounce rather than pop when they hit a surface.	
	Ask children to plan their investigations to try different ratios of water/washing-up liquid to glycerine. Tell them they need to decide what a good bubble mixture produces (e.g. large bubbles, lots of bubbles, bubbles that last a long time before popping, or perhaps a combination of all of these). Remind them to think about how to make the test fair. For example, they need to consider: • the type of bubble blower used (e.g. should a person blow the bubbles or should they use a hair dryer or wave the blower in the air?); • how they will measure the size of the bubbles (will they chase them with a ruler, blow them near a grid on the wall and take photographs, pop the bubbles onto paper and measure the diameter of the circle or cut the circles out and stick them onto a record sheet?). Ask more able children to record several of the 'best bubble' criteria. Once all the results have been collated, discuss with the class the best ratios to recommend to the company.	Enquiry skills 3.1.1, 3.1.1, 3.2.2, 3.2.5, 3.3.1, 3.3.2	

Objectives	Possible teaching activities	Notes	School resources
	Recycled paper Let children make recycled paper out of newspaper, paper bags or computer paper (see the Internet for recipes and instructions). Get children to compare the properties of the paper (e.g. appearance, strength, absorbency, ease of writing or drawing on it) with non-recycled paper and commercially available recycled paper..	**ICT opportunity:** Produce a database of properties of the different kinds of paper.	
	Making ropes Untwist pieces of conventional rope, yarn or string and discuss how the material has changed, and how good the strands would now be as a rope, and why. Let children try making ropes out of a range of materials, including strips of polythene bag, strips of cling film, strips of paper, long grass or straw. Tell children to test the strength of (a) the material strands before twisting or plaiting into a rope, and (b) the resulting ropes. This can be done by fixing/holding one end of the material or 'rope' and then adding a firm bulldog clip and force meter to the other end to measure the force needed to stretch/break the material. Discuss the results, and why each material's strength has changed when twisted together.	Enquiry skills 3.1.3, 3.2.2, 3.3.1	

	Examples of assessment tasks and questions	Notes	School resources

Assessment

Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.

Some children carried out a fair test on three different fabrics, A, B and C. They hung a 100 g mass on the bottom of each fabric. The table shows the results of their test:

	Fabric A	***Fabric B***	***Fabric C***
How far the fabric stretched, in cm	*0*	*6*	*15*

The teacher wants a fabric that does not stretch. Which one should the teacher choose?

Nader used ice cubes to find the warmest classroom in school. He put one ice cube on each of four plates and put them in different classrooms. He measured the time it took for each ice cube to melt completely.

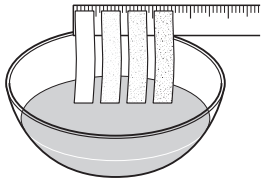
	Classroom 1	***Classroom 2***	***Classroom 3***	***Classroom 4***
Time taken for the ice cube to melt, in minutes	*37*	*48*	*34*	*42*

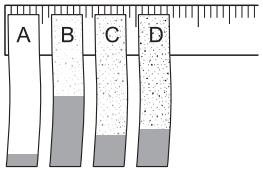
a. *Which classroom was the warmest?*

b. *Which classroom was the coldest?*

c. *Describe how the temperature of a room affects the time taken for an ice cube to melt.*

*Absorbent materials **soak up** water well. Yamama and Badeer have four equal strips of different types of paper. They want to find out which is most absorbent.*



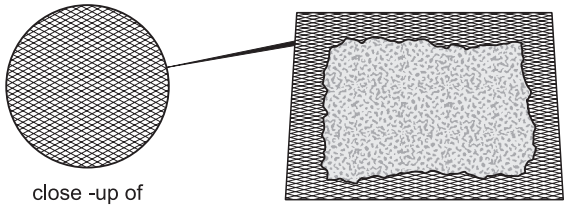


They dip the strips into coloured water, then take them out again. This picture shows the pieces of paper after they are taken out of the water.

a. *How can you tell from the picture that material B has soaked up the most water?*

b. *Circle **two** materials that soak up water well:*

kitchen roll cotton fabric plastic sheet aluminium foil

	Examples of assessment tasks and questions	Notes	School resources
	Some children want to recycle the scrap paper from their classroom. After they have soaked the torn up paper in water overnight, they mash it all up. Now it is called pulp. The children spread the pulp onto some wire mesh to dry. When the pulp is dry, it forms a sheet of recycled paper.  close -up of wire mesh pulp on wire mesh *The mesh has holes in it.* a. *How do the holes in the mesh help the pulp to dry?* b. *What could the children do to make the pulp dry faster?* c. *The children want to compare their recycled paper with other paper in their classroom. What test could they do?*		
	Husain and Ranim want to find out which material will be best to wear in hot weather. The teacher fills three bottles with hot water. Husain wraps a piece of cotton round one bottle, wool round the next, and nylon round the last. Ranim measures the temperature in each bottle. It is the same in each bottle. *They leave all the bottles in the same place to cool.* *What else must the children keep the same for their test to be fair? Tick **two** boxes.* *The size of each cup.* ☐ *The material wrapped round each cup.* ☐ *The final temperature of the water.* ☐ *The amount of hot water in each cup.* ☐		

GRADE 3: Physical processes 1

Forces, magnets and springs

UNIT 3P.1
11 hours

About this unit

This unit is the first of three units on physical processes for Grade 3.

The unit is designed to guide your planning and teaching of lessons on physical processes. It provides a link between the standards for science and your lesson plans

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For extension or consolidation activities, look at the scheme of work for Grade 5 and Grade 2.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, children should already be able to identify the effects of forces, such as squashing, twisting and stretching, and know how pushes and pulls are used to make familiar objects speed up and slow down.

Expectations

By the end of the unit, children recognise that a force acts in a particular direction. They know that there are forces of attraction and repulsion between magnets, recognise that only certain kinds of materials are magnetic and state some of the ways magnets are used in everyday life. They recognise that a stretched or compressed spring can exert a force.

Children who progress further know that friction is a force that opposes movement and that air and water resistance slow objects down. They calculate how fast something is moving and perform tests to show what shapes move best through water and air. They know that only certain metals can be made into magnets, that magnets have two poles and that unlike poles attract each other and like poles repel. They know that magnets attract iron but not other metals.

Resources

The main resources needed for this unit are:

- collection of magnets and materials that are magnetic and non-magnetic
- collection of springs and everyday objects containing springs (e.g. toys)
- digital camera

Key vocabulary and technical terms

Children should understand, use and spell correctly:

- *force, direction*, *size, pushing, pulling*
- *spring*, *compress, compressed*, *compression*, *stretch*, *stretched*, *exert*
- *magnet*, *magnetic*, *attract*, *attraction*, *repulse*, *repulsion*, *materials*
- *strong*, *strength*, *weak*, *aluminium*, *metal*, *metallic*, *iron*, *steel*, *plastic*

Standards for the unit

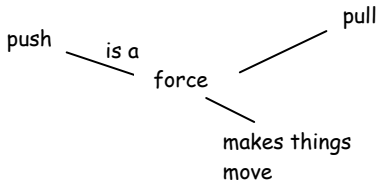
Unit 3P.1

11 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
3 hours **Size and direction of forces** **5 hours** **Magnets** **3 hours** **Springs**	2.8.1 Know that forces are pushes and pulls. 2.8.2 Identify different effects on objects of forces such as squashing, twisting and stretching. 2.8.3 Show how forces can make familiar objects speed up and slow down.	3.10.1 Know that the effects of a force depend on its direction as well as its size.	5.12.1 Know that forces are pushes and pulls, and that the unit of force is the newton. 5.12.2 Measure short time intervals and distance, and use these to calculate the speed of an object. 5.12.3 Know that friction is a force that opposes movement and that the nature of the surfaces in contact influences the size of the frictional force … 5.12.4 Know that water and air resistance slow an object down when it moves through water or air and that the shape of an object affects the size of this resistance.
	2.8.1 Know that forces are pushes and pulls.	3.10.2 Demonstrate that there are forces of attraction and repulsion between magnets. 3.10.3 Know that some metal objects are attracted to a magnet but others, such as aluminium cans, are not. 3.10.4 Know that magnetic forces can act through non-metallic materials. 3.10.5 Give examples of some of the ways that magnets are used in everyday life.	5.13.3 Know that certain metals, such as iron and nickel, can be made into magnets. 5.13.4 Know that magnets have two poles and that unlike poles attract and like poles repel each other. 5.13.5 Know that magnets attract objects that contain iron, but not those that contain other metals such as aluminium or copper. 5.13.6 Distinguish between a metal that is magnetic and a metal that is magnetised.
	2.8.1 Know that forces are pushes and pulls. 2.8.2 Identify different effects on objects of forces such as squashing, twisting and stretching.	3.10.6 Show that a stretched or a compressed spring can exert a force.	

11 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
	2.1.1 Collect data in a systematic manner. 2.1.5 Devise fair ways of testing predictions. 2.2.2 Sort objects into groups, make simple comparisons and identify trends and patterns. 2.2.4 Make a display of data collected.	3.1.1 Devise a fair test or comparison and recognise when conclusions are justified. 3.1.2 Make and test predictions and draw conclusions from observations and data. 3.1.3 Make systematic observations and identify patterns. 3.2.2 Display data and observations in tables. 3.3.1 Handle simple equipment correctly, safely and without damage to carry out simple experiments.	4.1.1 Outline a simple plan, deciding what evidence should be collected and what conclusions are justified, and collect relevant data and make observations in a systematic manner. 4.1.2 Design a fair test by identifying key factors to vary.

Activities

Unit 3P.1

Objectives	Possible teaching activities	Notes	School resources
3 hours **Size and direction of forces** Know that the effects of a force depend on its direction as well as its size.	Ask children to place the word 'forces' in the middle of a piece of paper and then write phrases or words to link to the word 'forces', making a concept map. Challenge children to write the link between the new words and the word 'forces'. This activity could be carried out either by individuals or by a whole class. Save the concept map and at the end of the topic ask children to create another one and compare the before and after concept maps.	Concept maps are a useful way of eliciting children's understanding about a topic. They help the teacher to know what children know and understand, and can also provide a useful starting point for a new topic. 	Use this column to note your own school's resources, e.g. textbooks, worksheets.
	In a PE lesson, get children to form pairs and give them different kinds of small apparatus (e.g. footballs, bats and balls, bean bags, small sponge balls). Tell one child in each pair to instruct the other to throw, kick or bat a ball. The instructions must relate to the size and direction of the force to be used; for example, the child might say 'big push force to the left' or 'small push force backwards'. Tell children to kick a ball round series of obstacles to get to the end of a course. Ask them to think about the forces involved – make sure they are aware that they are changing the size and direction of the forces that they use.	During the lesson ask children to demonstrate to the rest of the class and explain which forces were being used, or ask the rest of the class which forces they saw being used.	
	Ask children to make a simple game involving forces (e.g. a football board game in which the player has to get a table tennis ball into the net from different positions, using different size forces and changing the direction of forces, or a game in which players have to blow a table tennis ball around an obstacle course, using different size forces and changing the direction of the forces to make the ball change direction).	It is important that children can explain the forces in action in their games. This is a good opportunity for children to develop communication skills and explain to other children how their games work.	

Objectives	Possible teaching activities	Notes	School resources
5 hours **Magnets** Demonstrate that there are forces of attraction and repulsion between magnets. Know that some metal objects are attracted to a magnet but others, such as aluminium cans, are not. Know that magnetic forces can act through non-metallic materials. Give examples of some of the ways that magnets are used in everyday life. Devise a fair test or comparison and recognise when conclusions are justified.	Give children a variety of magnets of different shapes and sizes (e.g. bar, horseshoe and circular). Allow them to explore using the magnets to find out what they do and what happens when they put them close to different objects made from magnetic and non-magnetic materials. Tell children that you would like them to think about what they are learning about magnets as they explore them. Explain that you will ask them to share what they have learned about magnets with the rest of the class at the end of the session. Ask questions such as: • What have you found out about magnets? • What do you know now that you did not know at the beginning of the activity? • How many different things have you found out? • What is the most interesting thing you have found out about magnets? Explain that if a material is 'pulled' towards the magnet, we say that the material is *attracted* to the magnet. Materials that are attracted to magnets are called *magnetic*. Ask children to place two magnets together so that they can feel the magnets pushing against each other (*repulsion*) and pulling towards each other (*attraction*).	**Safety**: Make sure that metal objects do not have sharp edges and are safe to use. Magnets can lose their magnetism if banged, dropped and knocked about. Make sure children know that they should handle magnets with care. Make sure that the magnets include some that are much stronger than the others. Create a class *Big Book on Magnets* in which children can write about what they have found out, draw pictures of magnets, and place digital photographs of magnets and their activities. It is important to focus on key words and teach children scientific terms such as *magnetic*. Children often misunderstand the word *magnetised* – which is a material that acts as a magnet.	
	Give children small paper circles, a magnet and something to use to stick the paper to objects. Ask them to go around the room and test materials with their magnet. Tell them to stick a paper circle on each material that they test and to draw a face on the circle – a smiley face for magnetic and a frown face for non-magnetic. When children have completed this activity, use their results from around the classroom to talk about magnetic and non-magnetic materials and make generalisations about different materials.	Many children think that all metals are attracted to magnets. Make sure that a range of metals are available to use to challenge this idea. It is mainly iron and some iron alloys that are attracted to a magnet. Aluminium cans are not magnetic. 'Tins' that are not made from aluminium but are largely made of iron are magnetic.	
	Give children a collection of materials found around the classroom. Ask them to suggest which materials are magnetic and how they can find out whether they are right. Ask children to create their own table to record their results or give them a simple table like the one below to complete. **Object** | **Guess** (magnetic or non-magnetic) | **Result** (magnetic or non-magnetic) | | | When they have completed their table, ask children to look at their results and make a generalisation about what kinds of material the magnet attracts and what kinds of material the magnet does not attract. Ask children to sort the list into magnetic and non-magnetic materials. Ask children to make their own collection of materials from around the classroom or from home and to test and classify them, recording their results in a table. Ask children to find out whether it makes any difference which end of the magnet is used to attract materials	Enquiry skills 3.1.2, 3.1.3, 3.2.2 Some children think that only one end or one part of a magnet works. This activity helps to challenge such ideas.	

Objectives	Possible teaching activities	Notes	School resources
	This activity provides an opportunity for children to carry out a fair test. Give children several magnets of different shapes and sizes and ask them to find out which one is the strongest. Ask them to think about what they could do to answer the question. Ask them to share their ideas with each other. They might suggest some of the following: • use paper clips and see how many paper clips each magnet picks up; • use metal masses (weights) and find out how many each magnet can pull along a table top; • see how close a magnet has to be before it attracts a metal object to it. Challenge children to explain: • what equipment they will need; • how they will make their test fair; • what they will measure; • what their results tell them; • their conclusions, using their results (e.g. the round magnet picked up 15 paper clips so it was strongest; the bar magnet picked up only 2 paperclips so it was the weakest).	In this activity concentrate on those aspects of scientific enquiry that are highlighted in the learning outcomes. Children often think that big magnets are stronger, this is not necessarily so. However, children will often stay with long-held beliefs, so you need to challenge them to use their results to back up their ideas. Enquiry skills 3.1.1, 3.1.2, 3.2.2	
	Give children a magnet and a variety of materials (e.g. card, fabric, aluminium foil, thin wood, water). Challenge them to find out whether their magnet works through each of the materials. Ask them to explain what they will do and how they will record their results and share them with other people in the class. Then challenge children to find out what is the thickest material that their magnet will work through. Does their magnet work through the same thickness in all of the materials? For example, 1 cm of fabric and 1 cm of wood?	Some children think that magnets will not work through different materials. This activity is designed to challenge this idea. **ICT opportunity:** Children could use the digital camera to take photographs of their activity. Add these to the class *Big Book on Magnets*. Enquiry skills 3.1.1, 3.1.2, 3.2.2	
	Ask children to think about where magnets are used in everyday life. Ask them to find out where magnets are used at home and to draw any objects that contain magnets and bring their drawings back to school to share with the class.	Explain to children that they must take care when using something brought in by another child.	
	Ask children to bring objects with magnets from home to make a class collection. They could bring: • fridge magnets; • purses or handbags with magnetic clips; • magnetic games; • magnetic toys; • screwdrivers that are magnetic. Place the collection on a table for children to look at and explore.		
	Look at different magnetic games with children. Ask them to explain how each of the magnetic games works, and to think about which part of the game is a magnet and where magnetic materials are used in the game. Challenge children, in pairs, to design and make their own magnet game.	You could use any magnetic games that children have brought in from home for the collection of objects containing magnets.	
	Ask children to bring in fridge magnets and look at how they are made. Challenge children to make their own fridge magnets, using card, thin wood, plastic or modelling clay. Tell them to design their fridge magnet on paper first and then make it. Display children's fridge magnets on a magnetic board or a magnetic tray.	Some science equipment suppliers sell packs of small magnets that can be glued onto card, wood and plastic.	

Objectives	Possible teaching activities	Notes	School resources
3 hours **Springs** Show that a stretched or a compressed spring can exert a force. Devise a fair test or comparison and recognise when conclusions are justified. Make systematic observations and identify patterns. Display data and observations in tables. Handle simple equipment correctly, safely and without damage to carry out simple experiments.	Show children a collection of springs and elastic bands. Allow them to experience handling springs and elastic bands, stretching and compressing them. Ask them to think about what kinds of forces they are using when they stretch a spring or elastic band (pull force) and compress a spring (push force). Ask them to think about and describe what they can feel when they stretch or compress a spring and when they stretch an elastic band. Teach children the words *stretch* and *compress*. Discuss the following ideas about the forces in action when a spring is compressed and stretched or an elastic band is stretched: • when a spring is stretched, it exerts a force in the opposite direction (a pull-back force) on whatever is stretching it; • when an elastic band is stretched it exerts a pull-back force on whatever is stretching it • when a spring is compressed, it exerts a push-back force on whatever is compressing it. Ask children to think about where they have seen springs in use in everyday life. Make a list of examples of where springs are used at school or at home. Children might suggest, for example, toys, mattress, chair, pens and stapler. Create a table-top collection of objects that contain springs. Make a collection of elastic items, including elastic bands and dressmaking elastic.	**Safety:** Warn children that they need to be careful when using springs and stretching elastic bands. Encourage children to use appropriate scientific language when they are describing stretching and compressing. For example, 'When I stretch a spring I can feel a pull force on my hand and when I compress a spring I can feel a push force against my hand.' Make sure children understand that materials that are termed *elastic* are able to be stretched and then return back to their original shape.	
	Give children a collection of different springs and tell them they have to answer the question 'Which spring is the stretchiest?' Ask children the following questions to make them think about how they would test the springs: • What will you do? • What equipment will you need? • How will you keep your test fair? • How will you make sure your test is safe? • What will you measure? • How will you record your results? • What will your table look like? • Which spring do you predict will be the stretchiest? Why do you think this? This activity can be planned as a whole class session – take ideas from children and put them on the board or OHP.	This activity provides a good opportunity for children to carry out a fair test investigation. Some children will require support in thinking through the process, measuring and recording results. **Safety**: Make sure that children have discussed how to carry out their investigation safely. Encourage children to make comparative statements when explaining their results; for example, 'When we put the mass (weight) on the spring it stretched *x* cm'; 'The stronger spring stretched the least, the weaker spring stretched the most'.	
	Once the fair test investigation has been planned, ask children to work in groups to carry it out. Children might decide to hang the springs vertically and attach a mass (same size) on the end of each spring and measure how far the spring stretches. When children have completed their activity and collected their results (data), ask the following questions: • What is the pattern in your results? • Was your prediction correct? How do you know? • Which spring was the stretchiest? • What effect does attaching a mass (weight) have on the spring? • What forces are in action? Describe them.	The idea that stronger springs will be harder to stretch because they have a bigger pull-back force can be difficult for children to understand. Enquiry skills 3.1.1–3.1.3, 3.2.2, 3.3.1	

Objectives	Possible teaching activities	Notes	School resources
	Give children an elastic band each and ask them to stretch it using different forces: a small pull force, a medium pull force and a big pull force. Challenge to them to use scientific vocabulary to describe what happens to the elastic band. Discuss the idea of catapults and how a catapult works. Show children a 'car catapult machine'. Challenge them to use their understanding of forces to explain how they think it works. Challenge children to think about 'How would the amount of stretch of the catapult affect how far the car travels?' Ask them how they would test their idea and what they would do. Use similar questions to those in the previous activity to reinforce how they plan a simple fair test. • What will you do? • What equipment will you need? • How will you keep your test fair? • What will you measure? • How will you record your results? What will your table look like? • Which spring do you predict will be the stretchiest? Why do you think this?	**Safety:** Warn children about the dangers of letting elastic bands go and tell them that they should not flick or 'fire' elastic bands in the classroom since they could injure their friends. A 'car catapult machine' is very easily made. It is a flat board with an elastic band stretched between two nails at one end. This activity gives children the opportunity to carry out a whole investigation. It may be helpful to concentrate on the aspects of investigation highlighted in the learning objectives. Enquiry skills 3.1.1–3.1.3, 3.2.2, 3.3.1	
	This activity can be planned in a whole class session – take ideas from children and put them on the board or OHP. Once the fair test investigation has been planned, ask children to work in groups to carry it out. Children might decide to measure how far the elastic is stretched and how far the car travels. They should record their results in a table like the one below. **Distance elastic band is stretched** | **Distance the car travels** When children have completed their activity and collected their results (data), ask them to make comparisons, for example 'When I used a big force the car went further.' Ask children to identify patterns in their data, for example 'The more you stretch the elastic band, the further the car will go.' Challenge children to explain the forces in action in this activity, for example 'The more I stretched the elastic band the bigger the pull force I had to use. When I pulled the elastic band *x* cm, the car went further because the elastic band was pushing it more.'	Data handling is an important aspect of science, and time should be allowed for children to explain their results. Do not ask children to produce a graph from their table of results in this activity because a line graph would be required, which is not appropriate at this level.	

Assessment

Unit 3P.1

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Fold your paper in half. In one half, draw a picture showing forces in action. Show a force being used to change the direction of something. Write a sentence explaining the force underneath your picture.* *In the other half of the paper, draw a picture where a big force or a small force is being used. Write a sentence explaining the force underneath your picture.*	Give children a blank piece of paper to draw on. If any children have language difficulties and are unable to write a sentence, ask them to say the sentence and scribe what they say.	
	There are some objects in a box. *Which objects will the magnet attract? Write your answers in the table.* ***Object*** / ***Is attracted*** / ***Is not attracted***	Give children a box containing several objects, some of which will be attracted by the magnet and some of which will not. For example: • wooden pencil; • steel key; • copper wire; • cardboard box; • iron nail. If any children are unable to complete the table, ask them to sort the objects into two different sets.	
	Children tested the strength of three magnets by finding out how many steel paper clips each magnet held. They recorded their results. ***Magnet*** / ***Number of paper clips*** *Horseshoe* / *6* *Bar* / *14* *Round* / *18* *Look at the results in the table.* *Which is the strongest magnet? How do you know?* *Which is the weakest magnet? How do you know?*	If any children have reading difficulties, read the questions and information to them and allow them to answer orally.	

GRADE 3: Physical processes 2

Shadows, mirrors and magnifiers

UNIT 3P.2
14 hours

About this unit

This unit is the second of two units on physical processes for Grade 3.

The unit is designed to guide your planning and teaching of lessons on physical processes. It provides a link between the standards for science and your lesson plans.

The teaching and learning activities should help you to plan the content and pace of lessons. Adapt the ideas to meet the needs of your class. For consolidation activities, look at the scheme of work for Grade 1.

You can also supplement the activities with appropriate tasks and exercises from your school's textbooks and other resources.

Introduce the unit to children by summarising what they will learn and how this builds on earlier work. Review the unit at the end, drawing out the main learning points, links to other work and 'real life' applications.

Previous learning

To meet the expectations of this unit, children should already know that we use our senses to detect light and that light is needed to see things. They should be able to name light sources.

Expectations

By the end of the unit, children know that shadows occur when a light source is blocked by an object and correctly apply the words *transparent* and *opaque* to objects. They know that the shape of a shadow is similar to the shape of the object that makes it. They use a mirror to reflect light and a magnifying glass to focus it.

Children who progress further explain how shadows are made and how to change the size of a shadow.

Resources

The main resources needed for this unit are:

- light sources (e.g. torches, overhead projector)
- collection of opaque, transparent and translucent objects and materials
- mirrors, combs, cardboard tubes, doilies, coloured cellophane, art straws, wooden dowelling, sticky tape, glue, card holders
- magnifying lenses, microscope
- collection of periscopes and kaleidoscopes

Key vocabulary and technical terms

Children should understand, use and spell correctly:

- *light*, *source*, *travels*, *direction*
- *shadow*, *Sun*, *object*, *blocked*, *transparent*, *opaque*, *translucent*
- *mirror*, *reflect*, *kaleidoscope*, *periscope*
- *magnifying*, *focus*, *magnifier*, *lenses*

Standards for the unit

Unit 3P.2

14 hours	SUPPORTING STANDARDS	CORE STANDARDS Grade 3 standards	EXTENSION STANDARDS
8 hours **Shadows** **6 hours** **Mirrors and magnifiers**	1.9.4 Know that shiny objects do not make their own light; they need light sources to make them visible. 1.9.5 Name some common sources of light …	3.11.1 Explain that shadows occur when a light source is blocked by an object. 3.11.2 Recognise that the shape of a shadow is similar to the shape of the object that makes it. 3.11.3 Show that light can pass through a transparent object but not through an opaque one. 3.11.4 Know that many objects are transparent only to light of a particular colour. 3.11.5 Know that light can be reflected by mirrors. 3.11.6 Use a magnifying glass to focus light. 3.11.7 Know that heat and light have many similar properties.	6.16.1 Know that light moves in straight lines and, in consequence, objects placed in front of a light source create shadows.

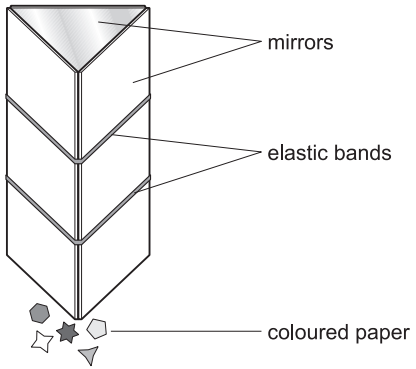
Activities

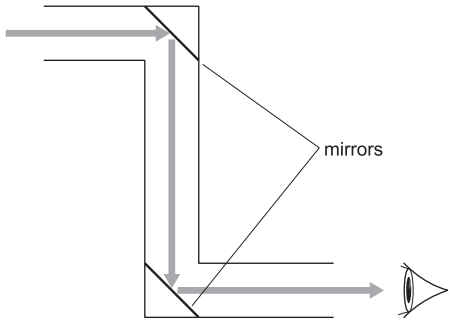
Unit 3P.2

Objectives	Possible teaching activities	Notes	School resources
8 hours **Shadows** Explain that shadows occur when a light source is blocked by an object. Recognise that the shape of a shadow is similar to the shape of the object that makes it. Show that light can pass through a transparent object but not through an opaque one. Know that many objects are transparent only to light of a particular colour.	Ask children to think about what they know about light and shadows. Get them to draw pictures to show what they know or to share their ideas orally with the rest of the class while you write these ideas on a white board or large sheet of paper, which is then displayed on the classroom wall. Discuss their ideas, reminding them about ideas from previous work on light such as: • we use our eyes to detect light; • there are different sources of light; • we need light to see; • darkness is the absence of light. Ask children to think about where they have seen shadows formed and under what conditions. Ask them how they think shadows are formed and what they would need to make a shadow.		Use this column to note your own school's resources, e.g. textbooks, worksheets.
	Give children a torch and a set of objects and allow them to explore making shadows. Ask them to show their shadow to the rest of the class and to try to describe what they are doing to make the shadow. Introduce children to the idea that light travels from a source, this can be demonstrated by shining a powerful torch beam through a comb or a cardboard tube. Shine the torch so that the beam goes through a cardboard tube. Place an object such as a small teddy bear at the other end of the tube. Show that the teddy bear blocks the light completely if it covers the end of the tube, and that if it is moved slightly away from the end it stops the beam from going through it to the other side of the bear. Discuss the idea that if something stops light a shadow will be formed on the other side of the object (that is the other side of the object will be in darkness).	Give children a large piece of white card or a sheet of white paper against a wall onto which they can project their shadows. Make sure that torches have a very bright beam otherwise the results may be disappointing. Overhead projectors create very clear shadows and can be used by children to create shadows on classroom walls.	
	Take a number of cards with a small hole through their centre and stand them in a row with the holes lined up. Push a stick of spaghetti through the series of holes to model how light travels in straight lines. Then take the spaghetti out of the holes and shine a beam of light from a torch through the holes to demonstrate that light travels in straight lines. While the beam of light is shining through the holes, move one of the cards a little to one side so that its hole is no longer in line with the others. This will demonstrate that light cannot travel through a material that blocks the light (called an *opaque* material). Give children a set of cards with holes in them and challenge them to set up the cards so that the torch beam goes through as many holes as possible and hits a target at the other end.	Make a set of cards with a small hole through each in the same position. Stand them up in card holders or plastic modelling clay. The understanding that light travels in straight lines is important in understanding how shadows are formed. Begin to use terms such as *transparent* and *opaque*, linking the term *transparent* with 'see through', and *opaque* with 'not see through'.	

Objectives	Possible teaching activities	Notes	School resources
	At an appropriate time of the day take children into the school grounds to look for shadows. Challenge them to make shadows using their bodies. Allow them to explore making their own shadows; encourage them to stand in different positions to see how their shadow changes. Tell them to work with a partner to make strange shadows. Get them to record their shadows by drawing round them with chalk or using a digital camera to take photographs. Ask children to show each other their shadows and encourage them to explain how their shadows are made. Challenge them to use key words such as *light*, *travels*, *blocks*, *opaque* and *shadow*.	**Safety:** Warn children never to look directly at the Sun.	
	Ask children to find six things around the classroom that block light (are opaque) and so will make a shadow. Allow them to use the objects to make shadows. Challenge them to find answers to the following questions: • What happens when you make the light dimmer and brighter? • What happens when you move the light forward and backward? • What happens when you move the light up and down? • How can you make the shadow smaller? • How can you make the shadow bigger? Ask children to explain how they change the size of the shadow. Challenge them to complete comparative statements such as: • The nearer the object is to the light source, the _____ the shadow is. • The further away the object is from the light source the _____ the shadow is.		
	Give children a sheet showing a number of shadows of everyday objects and ask them, 'What made the shadow?' Children could play the 'What made the shadow game?' by matching actual objects to pictures of their shadows.	Create shadow games by photocopying everyday objects such as scissors or leaves onto card and then laminate the card to produce a re-useable resource.	
	Give children a collection of different materials that are transparent, translucent and opaque. Ask children to define the words *transparent* and *opaque* and talk about what the word *translucent* means. Ask children to sort (classify) the materials into groups: transparent, translucent and opaque. Give the children an outline of a house with a door and window. Challenge them to put the right material into each window or door. Ask them which windows in the house would need transparent, translucent and opaque materials. Give children coloured cellophane (sweet wrappers would work) and ask them to create a stained glass window. Ask whether it is opaque, transparent or translucent?	The houses could be photocopiable sheets or houses made from card with the windows cut out so that children can glue the material to the back of the card.	

Objectives	Possible teaching activities	Notes	School resources
	Give children a range of plastic colour paddles, or coloured acetate or cellophane. Ask them to predict what will happen when they shine light through each material and then let them test their predictions. Remind them about their experience of making a stained glass window and what colour the light shining through was. Explain that some objects are transparent only to light of a particular colour. Ask them to make new predictions for a different set of materials and then try their ideas out to see if they were right. Ask children to make a picture using different coloured cellophane to create special effects.	Enquiry skill 3.1.2	
	Give children a range of objects, some of which are transparent, translucent and opaque. Ask them to predict which will form shadows and explain their results. Challenge them to explain unexpected results – for example, a transparent plastic bottle that made a faint shadow. Give children sheets of transparent polythene (this could be cut from plastic bags). Ask them to shine the torch through one layer and see what happens. Then tell them to add another layer, then another and to repeat this until they have used all the pieces of polythene. Ask them to describe what happens. At the end of this session, challenge children to think about what they know about light, materials and shadows that they did not know at the beginning of the topic. Scribe their responses, or allow those children who are able to create sentences about what they know.	Children should be able to predict that the opaque materials will form shadows	
	Provide children with a range of opaque, transparent and translucent materials and ask them to work individually or in pairs to make a shadow puppet. Challenge them to create colour effects in their shadow puppets. Ask them: • What will your shadow puppet look like? • What will you use? • How will you make it move? • How will you make colour effects on your shadow puppet? • How will you make the shadow smaller or larger? Ask children who complete their shadow puppets to create a mini-play for the puppets.	Put out materials such as, card, paper, paper doilies, coloured cellophane, art straws, wooden dowelling, sticky tape, glue, transparent, opaque and translucent materials. This activity makes a good finale to the shadows topic; children could create their own plays using different shadow puppets and even show other children in the school.	

Objectives	Possible teaching activities	Notes	School resources
6 hours **Mirrors and magnifiers** Know that light can be reflected by mirrors. Use a magnifying glass to focus light. Know that heat and light have many similar properties.	Allow children to explore a collection of mirrors, some of which they might have brought from home themselves. Include shiny objects that also reflect images, such as spoons. Ask children to explain why mirrors are useful and what other materials they have seen that can reflect an image. Children might suggest glass windows, marble floors, water and other shiny surfaces. Discuss the idea that smooth shiny surfaces can reflect while bumpy, non-shiny surfaces do not. Explain that mirrors are very shiny and smooth and reflect images very well. Ask children to find out what happens if they block light so that it cannot reach the mirror. Encourage children to reflect light onto different surfaces. Can they control where the mirror reflects the light onto?	Create a collection of mirrors, include shaving mirrors, handbag mirrors as well as mirrors from science equipment suppliers. **Safety:** If using glass mirrors from science suppliers, make sure that the backs of the mirrors are covered with sticky-back plastic so that if they are dropped the mirror pieces do not scatter. Tell children to inform a teacher if a mirror breaks.	
	Challenge children to use their mirrors to reflect light onto: • dark areas of the classroom; • bull's eye targets; • specific objects. Ask children to explain how they make the mirrors reflect light where they want it to go.	It is important to encourage children to use scientific terms in their explanations, such as *light*, *straight lines*, *reflect*, *mirror*.	
	Give children the opportunity to make a mirror maze, in which mirrors are placed at angles in such a way as to allow a beam of light to hit a target or go through a hole at the end of the maze. Tell them they need to explore the angle at which each mirror should be positioned so that the game works.	Mirrors could be placed in card holders or plastic modelling clay.	
	Show children a collection of kaleidoscopes and allow them to use them. Ask children to explain what they can see and the effects the kaleidoscope creates. Show children the inside of a kaleidoscope so that they see how mirrors are used and how the kaleidoscope works.	Kaleidoscopes can be purchased from toy shops and science equipment suppliers.	
	Give children one mirror each and some shiny pieces of coloured paper. Tell them to put the paper in front of the mirror and ask them what they can see in the mirror. Give children two mirrors each and some shiny pieces of coloured paper. Tell them to place the mirrors at 90 degrees and to put the paper in front of the mirrors. Ask them to describe what they can see in the mirrors now, and in what ways it is different from and the same as looking in one mirror. Give children three mirrors each and some shiny pieces of coloured paper. Tell them to place the mirrors so that they make a triangle and to put the paper in middle of the triangle. Ask them to describe what they can see in the mirrors now, and in what ways it is different from and the same as looking in one mirror. Show children how to make a simple kaleidoscope. Then ask them to make one and use it to look at pieces of fabric, paper and shiny things. When they have finished, ask them to display their kaleidoscope with a set of picture instructions for making one and explaining how it works.	 *Making a kaleidoscope* Place three mirrors together, use elastic bands to hold them securely, look through it at the objects on a piece of card. Rotate the card.	

Objectives	Possible teaching activities	Notes	School resources
	Show children a periscope and allow them to explore using it. They will find out that it allows them to see over objects and around corners, even though light travels in straight lines and does not bend to travel round things. If possible, show children the inside of a periscope so that they can see how mirrors are positioned. Challenge children to try to explain how the mirrors work. Prompt children by giving them clues. Ask them to think about using the following vocabulary: • straight lines; • light; • reflection; • mirrors; • eye; • bounces; • down; • top; • bottom. Leave the periscope out for children to continue to explore. Also leave out sets of mirrors for them to position on a ruler to see if they can make a simple periscope.	 *A simple periscope* Light travels in straight lines. The light travels through the open top of the periscope hits the top mirror, is reflected off it down the tube to the bottom mirror, is reflected off it into the eye and the image is seen.	
	Challenge children to work in pairs to design and make a periscope. They will need time to explore and try things out, checking and changing their design and ideas as they go along.	This is an important activity since it will offer opportunities for problem solving. While it may seem expedient to tell children what to do and how to solve their problem, it is important to allow them to discuss what their problems are, and to suggest and try out solutions.	
	Give children access to a collection of objects that are magnifiers (e.g. magnifying glasses, lenses, spectacles, small containers with thick glass bottoms). Allow children to explore using the magnifiers. After a while, demonstrate how to use the magnifier by moving it closer to and further away from the object, until the object is in focus and can be seen clearly. Ask children to explain how the magnifier changes things that they are looking at, and to think about why magnifiers are useful. If possible also allow children access to a microscope.		
	Demonstrate how a magnifying glass can be used to focus light on an object. Show how this can lead to, for example, a piece of paper catching alight, to help children to understand that heat is focused as well as light. Do not allow children to repeat this activity unless under strict supervision.	**Safety:** Fire hazard – this activity must be carried out under strict supervision. Place the piece of paper in a tray of sand so that if it catches alight the sand can be used to put the flames out. Do not allow children to focus light on anyone's skin or clothes.	

Assessment

Unit 3P.2

	Examples of assessment tasks and questions	Notes	School resources
Assessment Set up activities that allow children to demonstrate what they have learned in this unit. The activities can be provided informally or formally during and at the end of the unit, or to do at home. They can be selected from the teaching activities or can be new experiences. Choose tasks and questions from the examples to incorporate in the activities.	*Which statement is true and which are false?* A. *A shadow is formed when the light is turned off.* B. *A shadow is formed when the path of light is blocked by an object.* C. *A shadow is formed when an object falls to the floor.*		
	When an object blocks the path of light, what shape of shadow is formed? A. *A shadow similar in shape to the object.* B. *A dark blob.* C. *No shadow is formed.*		
	Explain or show what happens to the shadow of an object if it is moved closer to a light source. Does its shadow: A. *get bigger?* B. *get smaller?* C. *stay the same size?*	If children are unable to explain this because of language difficulties, then allow them to demonstrate.	
	Sort these materials into three sets: • *transparent;* • *translucent;* • *opaque.* *Tell your friend why something is transparent, opaque or translucent.*	Give children a set of materials to sort and trays or boxes labelled *transparent*, *translucent* and *opaque*.	
	Describe how a periscope works. Use these words in your description. • *light* • *straight lines* • *reflects* • *image* • *mirrors*		
	Draw a picture to show how you would use a magnifying glass to burn a piece of paper.	**Safety:** Make sure that children know that they must never try this activity themselves without teacher supervision.	