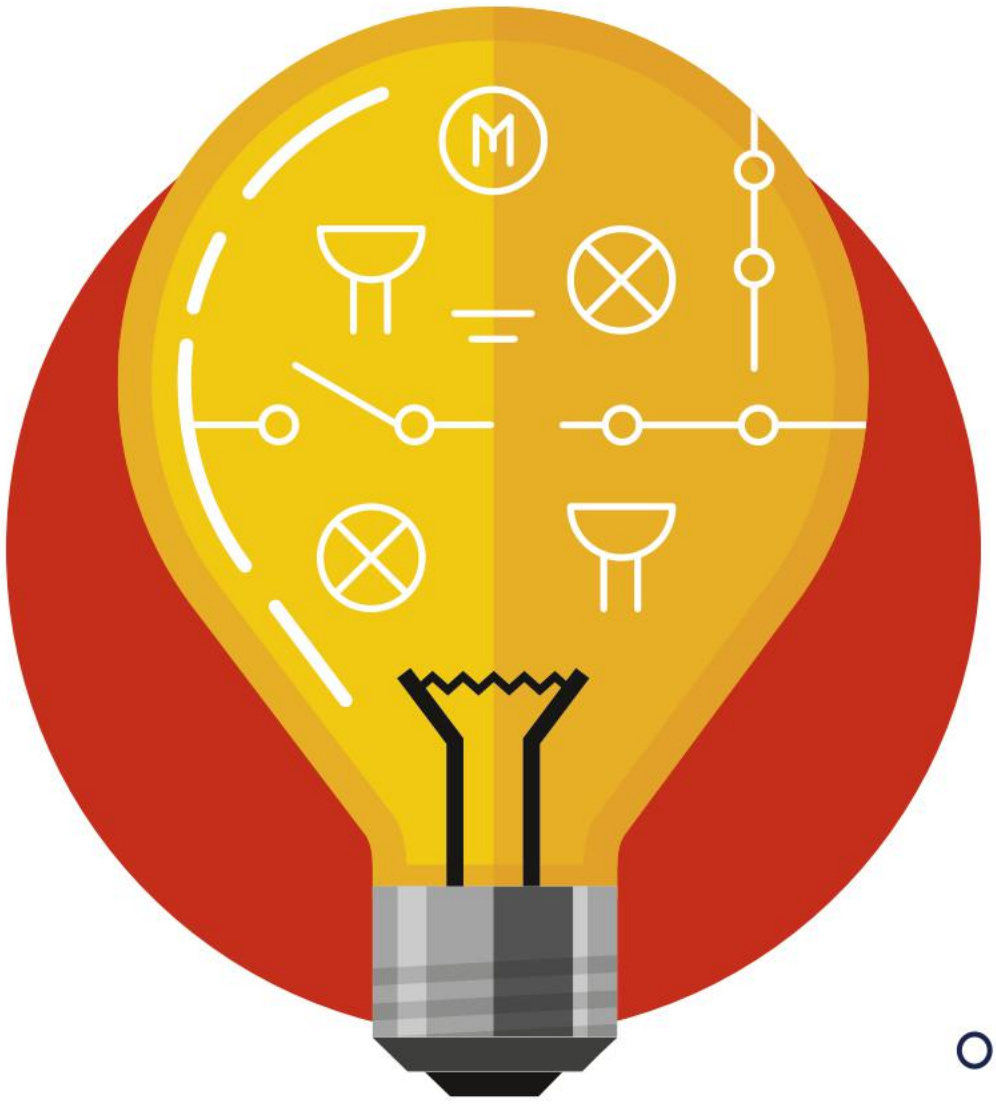
Oxford International Resources

6

Science

Workbook

Second Edition



Primary

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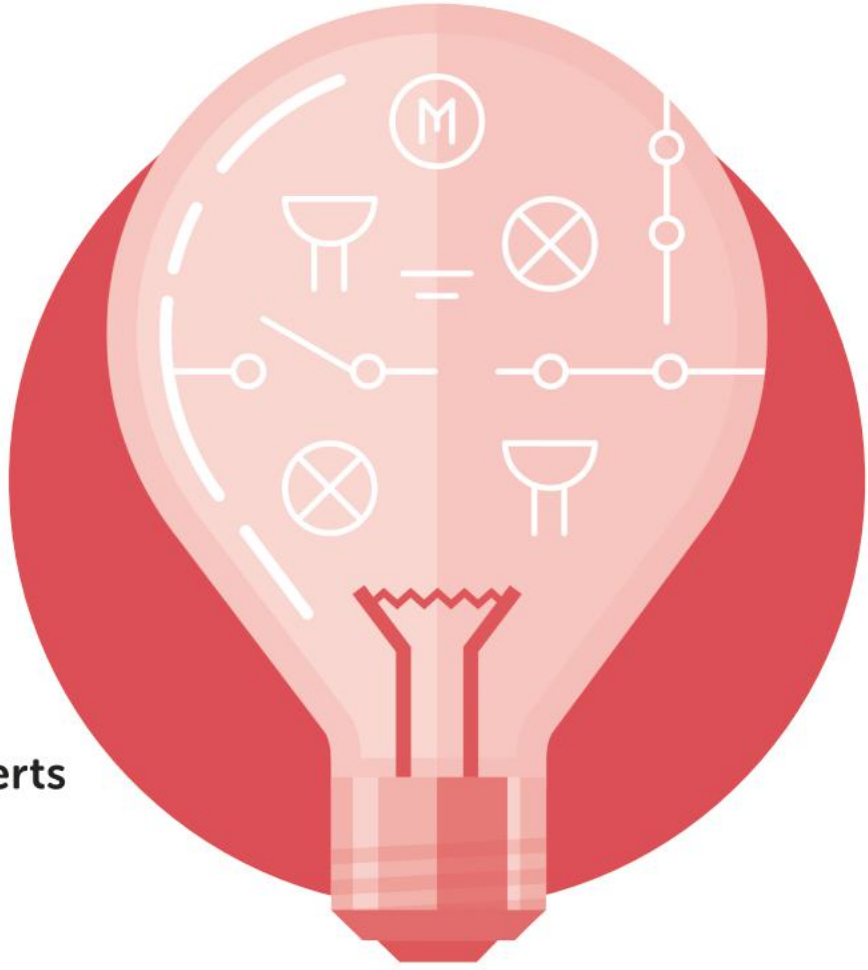

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Moving shadow puppets

This activity supports the investigation on page 93 of your Student Book.
Use the shadow puppets you have made. You are going to explore how to make these shadow puppets appear to move.

1. One person should hold the puppet in front of the source of light.

   They should try to hold the puppet as still as they can.

2. Observe what happens to the shadow puppet.

3. Move the torch to make the shadow puppet move.

4. Repeat the investigation, but this time move the light source 5, 10 and 20 centimetres to the right. Measure how much the shadows move. Do the same again, this time moving the light source to the left. Record your results below.

Direction the light source moves	How much the light source was moved (centimetres)	How much the shadow moves (centimetres)
To the right	5	
	10	
	20	
To the left	5	
	10	
	20	

Contents

How to Use this Book

The Workbook for *Oxford International Primary Science* supports the Student Book that children are using in their science lessons for this year.

The Student Book includes some pair, group and whole-class activities, hands-on tasks and write-in tasks to test students' understanding and help them learn. It is important to extend these tasks. This Workbook enables students to build on what they have learned in the Student Book to develop a secure understanding of scientific concepts.

Encouraging students to think about and apply their growing skills and knowledge helps them consolidate their understanding and work scientifically. This helps with confidence. Students also have opportunities to see that science is relevant all around them – both inside and outside the classroom.

Students may find it useful to complete an investigation planning form. This sets out all the stages of the investigation. A proforma is provided in the Teacher's Guide. Find out more at:

www.oxfordprimary.com/international-science

Structure of the book

This Workbook is divided into five units plus a Support for Teachers and Parents section and a Quiz:

Support for Teachers and Parents

Unit 1 Classification and Habitats

Unit 2 Organs and Systems

Unit 3 The Way We See Things

Unit 4 Building Electrical Circuits

Unit 5 Adaptation and Inherited Characteristics

Quiz Yourself

What you will find in each unit

There are four types of lessons:

Key words and introduction lessons encourage students to read, spell and use the scientific vocabulary in the unit.

Activities build on the work in the Student Book. These help with developing language skills, developing scientific enquiry skills, applying mathematical knowledge and securing understanding rather than just recall. The Support for Teachers and Parents notes on pages 6–13 give you advice on how to help students with each activity.

What I have learned encourages students to talk about what they have learned, reflect on what went well and revisit any areas they need to check. This encourages a growth mindset.

Investigate like a scientist enables students to apply what they have learned in practical contexts.

What you will find in the lessons

Icons show the nature of each task:

 **Discuss**: Students are encouraged to discuss and communicate scientific ideas and approaches. They can work in pairs or small groups for discussion tasks.

 **Investigate**: Students are encouraged to plan, ask questions and record results for each investigation. They are asked to observe closely, make predictions and compare their results with others. Sometimes you will use different equipment, which is available in school. You may also ask students to carry out a test in a different way, to make sure they are safe.

 **Language support**: This icon highlights activities that provide language support through writing frames or word banks. Students are encouraged to write, read and record short answers.

 **Hints and tips**: Students are encouraged to think about tips to make investigations safer or more effective.

Stretch zone: Students are encouraged to extend their understanding.

 **Mindful moments**: Students are encouraged to think about and reflect on what they have learned. This supports students' well-being.

 **What went well**:Students are encouraged to talk about what went well in each module to secure their understanding.

Student Book

Throughout the Workbook, you will find links to the Student Book. Students can refer to information in the Student Book to help them complete activities.

Teacher's Guide

The Teacher's Guide that accompanies this book provides lesson notes and answers for each page.

Support for Teachers and Parents

1 Classification and Habitats

What students will learn

This unit helps students to understand more about living things and how they are classified into groups. They use the characteristics of living things to place them into the appropriate group. Students consider a range of habitats and look at the ways in which humans can care for and protect habitats, and how human activity can lead to the destruction of habitats and the animals and plants that live there. Students will:

- group living things using classification systems
- explore the reasons for classifying living things based on their characteristics
- explore how humans have positive (good) and negative (bad) effects on the environment
- learn about a number of ways of caring for the environment.

Key words

characteristic, classification, conservation, deforestation, environment, greenhouse effect, habitat, key, kingdom, microorganism, pollution, species

Scientific enquiry skills

This unit helps students to develop and practise the following scientific enquiry skills.

Scientific enquiry skill	Page
Plan and/or carry out enquiries to answer questions	17, 19–21, 25–26, 28–33, 38–39, 41
Make predictions	26, 32–33, 36, 41
Recognise and control variables	26, 30, 41
Make observations	17, 19–20, 22–23, 26, 28, 30, 33, 38, 41
Take measurements, using equipment accurately	19, 26, 30, 36, 41
Record data and results	17–21, 23, 26, 28, 30, 32–33, 35, 36, 39, 41
Analyse data, notice patterns and group or classify things	16, 19–20, 23, 26–27, 30, 32–33, 35–36, 38–39, 41
Report and present findings	16, 18–20, 23, 25–26, 29–31, 33, 36–39, 41
Draw conclusions and give explanations	19–20, 22–23, 25–30, 35–36, 38, 41
Identify causal relationships	19, 24, 26, 30, 36, 41

Ways to help

- Encourage students to observe the animals and plants in their local area.
- Display pictures of a range of different habitats in the room so students can observe them.
- Ask students to think about why it is important to care for habitats.
- Encourage students to use classification keys and identification books to find out the names of living things and group them.

Helping with activities

The following guidance gives you advice on how to help students with each activity.

Identifying the correct kingdom
Encourage students to have their Student Book open to help them to consider the characteristics of the various major groups.

Plant classification survey
Tell students that some of the plants will be very small. Remind them to use a hand lens to look for single-celled algae and mosses.

Classifying animals
Encourage students to think of two or three characteristics for each animal, and how the adaptation helps the animal to survive.

Different shaped beaks
Ask students to compare the type and number of seeds picked up by each tool. Let them think about how efficient each tool was.

Classifying local plants
Try to include some small pond plants – even microscopic – in the survey. Collect small amounts of water in small bottles.

Researching microorganisms
Arrange access to the internet to help with the research task. If this is not possible, download the information sheets yourself or have biology books available.

Making your own classification key
Remind students to design questions that have only a 'yes' or 'no' answer to help them to use the key.

Designing a classification key
Remind students that it is best to choose characteristics that are permanent and easy to identify. Colour and size are particularly problematic.

Protecting our environment
Explain that all of the words needed to fill the blank spaces will be found in the word box.

Conservation project
Collect information leaflets, posters and website information from local conservation groups. Consider inviting a speaker in to talk to students.

Investigate the greenhouse effect
Allow students to take the temperature inside the greenhouse at different times of the day.

The greenhouse effect
If students have problems with the labels, let them look back to page 27 of their Student Book for extra support.

Stone survey
Explain that even a stone that has been shaped or smoothed, or even cut into small pieces, should be included.

Deforestation debate
Explain to students that looking for flaws in the opposite side of an argument or idea is a useful way to understand an issue.

How cloudy is the water?
Point out to students that particles in the water will scatter and block light, so the dirtier the water the less clearly they will see the squares through it.

Waste disposal in the local area
Discuss that a waste material for one person may be useful for another, so many objects could be reused as well as being recycled.

Saving energy at home
Explain that there are different ways to measure the energy used by an appliance. Students can multiply the kilowatts used by the appliance by the length of time it is used for to get a useful measure of energy use.

School energy survey
Arrange a tour around the school that includes a wide range of appliances. Include larger appliances in a kitchen or workshop, for example.

Make a useful object from waste materials
Encourage students to be imaginative. Remind them not to copy any of the examples in their Student Book.

Interpreting recycling data
Remind students to look carefully at the axes of any charts and graphs they are interpreting so they know the categories, scale and numbers involved.

Litter survey
Explain that objects found that are a mixture of materials should be classified based on which material makes up most of the object.

Design an anti-litter poster
Consider having examples of posters available for display to enthuse students and give them new ideas.

Air pollution
Explain that the size of the holes in the filter materials will dictate the type of solid pollution that is trapped.

Saving energy questionnaire
Show students how to make a tally chart as they ask the questions, so they do not have to wait until the end to write a number in.

2 Organs and Systems

What students will learn

This unit helps students to understand more about organs and organ systems. They identify the major organs and locate where they are found in the body. Students learn about the circulatory system and how nutrients and water are moved around the body and kept in balance. They explore the importance of diet, exercise and other factors on health. Students will:

- learn where the major organs are to be found in the human body
- find out about the main functions of the major organs
- explore the human circulatory system and describe the functions of the heart, blood vessels and blood
- describe how nutrients and water are transported in humans and animals
- recognise how diet, exercise, drugs and lifestyle affect our bodies.

Key words

circulatory system, defence mechanism, digestive system, drug, function, infectious disease, lifestyle, medicine, nervous system, organ, urinary system, vaccine

Scientific enquiry skills

This unit helps students to develop and practise the following scientific enquiry skills.

Scientific enquiry skill	Page
Plan and/or carry out enquiries to answer questions	43, 49, 53, 55, 57, 59, 61–62, 64, 67
Make predictions	43
Recognise and control variables	43, 49, 53
Make observations	43, 45–46, 48–50, 53, 55–56, 59, 62, 67
Take measurements, using equipment accurately	43, 47, 49, 55, 57, 59
Record data and results	43–44, 47, 49, 53, 55, 57, 59, 61–64
Analyse data, notice patterns and group or classify things	43, 49, 55, 59, 62–64
Report and present findings	43–45, 47, 49, 53, 55–57, 59, 61, 63–64, 67
Draw conclusions and give explanations	43, 48–49, 51, 55–57, 59, 62–64
Identify causal relationships	43, 49, 51, 53, 55, 59

Ways to help

- Encourage students to keep a diary of the foods they eat.
- Display pictures and posters of the organ systems in the room so students can observe them.
- Ask students to review earlier work on heart rate and exercise.
- Encourage students to learn the names of the major organs and systems by displaying key words and terms.

Helping with activities

The following guidance gives you advice on how to help students with each activity.

Where are our organs?

Allow students to look back at their Student Book if they need clues about where to place the organs.

Tracing the organs

Demonstrate how to take a tracing if students are not familiar with the technique.

Our heart, lungs and brain

Point to the parts of the body where the relevant bones are located: the head (skull), the chest (ribs) and the chest bone (sternum).

Summary table

Explain that all of the words needed are in the word box. Suggest that students tick them off as they are used.

How we breathe

Talk through the breathing process as you make exaggerated breathing in and out actions.

Breathing rates

Make sure students are fully rested before starting the investigation, otherwise you will find elevated rates at the start.

Label the parts of the circulatory system

Help students to remember which vessels move blood to and from the heart by using the spelling of vein. It ends with 'in' and it takes blood 'in' to the heart.

Exercise, pulse rates and fitness

Remind students that pulse rates naturally vary between people, but exercise will always increase pulse rate.

Parts of the digestive system

Students can work through this activity as a class or in small groups if they need support labelling the diagram.

Breaking down food

Provide small mirrors so students can find the different types of teeth in their own mouth.

How nutrients enter the blood

You can illustrate the need to have nutrients broken down by asking students to think about how a large tent could be passed through a small window.

Investigating surface area and absorption

Demonstrate how to carry out the calculation and stress how folding allows a larger surface area to be fitted into a small space.

Model the function of the kidney

Use as big a space as possible. Make the holes in the cardboard just big enough for two types of ball (water and urea) to pass through, but not the balls representing protein, sugar and blood cells.

How the urinary system works

Stress that students should only use words from the word box to label the diagram and fill in the gaps.

The brain and nerves

Allow students to use their Student Book as a research resource to work out the answers to the questions.

How sensitive is your skin?

Demonstrate how to make the pointer and stress that the distance between the two points is vital and must be measured accurately.

Learning about microorganisms

Encourage students to write out the names of the main types of pathogens (viruses, bacteria, parasites and fungi) a few times to become familiar with them.

Researching diseases and pathogens

Provide access to the internet to help students find out about the pathogens or print out information for them.

Food labels survey
Provide as many types of food labels as possible as it will be useful for students to see the different ways in which food information is presented.

Make your own healthy eating plate
Point out that students may see different versions of the healthy eating plate. Every healthy eating plate will emphasise eating fruit and vegetables and not eating too much sugar and fat.

Exercise survey
Point out to students that numbers that are being counted or measured in an investigation are usually written up the Y-axis of a graph or chart.

Personal hygiene
Encourage students to reflect on their own personal hygiene practice, but keep this confidential by not engaging in class or group debate.

3 The Way We See Things

What students will learn

This unit helps students to understand more about light and how we see objects. They see that light travels in straight lines and review how objects are seen due to light reflecting from them and entering the eyes. Students look in detail at reflection and mirrors and investigate how the blocking of light by objects results in shadows. They investigate how shadows change over time. Students will:

- recognise that light appears to travel in straight lines
- remember that we see light sources because light from the source enters our eyes
- explore how light can be reflected from surfaces
- find out about how mirrors work and why they are very useful to us
- build on ideas about how light forms shadows to understand their shape and size
- investigate how shadows from the Sun change over time
- discover how light is measured.

Key words

beam, light intensity, light source, mirror, opaque, ray, reflect, shadow, silhouette, translucent, transparent

Scientific enquiry skills

This unit helps students to develop and practise the following scientific enquiry skills.

Scientific enquiry skill	Page
Plan and/or carry out enquiries to answer questions	70–71, 73–74, 76, 79, 81–83, 85, 87–89, 90–93, 95–96, 98–99
Make predictions	74, 79, 87–88, 91, 99
Recognise and control variables	74, 83, 85, 92, 95, 98–99
Make observations	70–76, 78–79, 81–85, 87–89, 92–93, 95–99
Take measurements, using equipment accurately	70–71, 83, 92–93, 96–99
Record data and results	70, 74, 76, 79, 82–83, 85, 87–89, 91–93, 95–99
Analyse data, notice patterns and group or classify things	70, 74, 76, 81–83, 85, 87–89, 92–93, 95–100
Report and present findings	70–71, 73–74, 76, 78–80, 83, 85, 88–89, 91–93, 95–100
Draw conclusions and give explanations	70–74, 76, 79, 83–85, 87–89, 92–93, 95, 97–100
Identify causal relationships	70, 74, 83, 85, 88–89, 92–93, 98–100

Ways to help

- Encourage students to review their prior work by asking them to explain what they already know about shadows.
- Ask students to regularly observe shadows and point out any changes during the day.
- Display photographs of shadows in the same place but at different times of the day.
- Arrange for a very dark part of the room or school to be available to demonstrate the lack of light.
- Encourage students to explore mirrors to see how light reflects.
- Obtain or make simple ray boxes to show narrow beams or rays of light.

Helping with activities

The following guidance gives you advice on how to help students with each activity.

Is there a link between sight and taste?
Explain that by seeing food your brain is already preparing to deal with messages from the taste buds.

How important is sight?
Point out that tapping and echoes from a room can give us a clue about our surroundings, even if we cannot see them.

Tricking your eyes
Give students access to the internet to find examples of optical illusions, or you could print off a number of examples and arrange these around the room.

Making a science animated film
Encourage students to research their science idea and then recommend they split it up into 20 or more stages to make the animation move smoothly.

Shining back
Spread varied objects around the room and ensure that some are dark and dull (such as black cloth) and others are bright and shiny (such as chrome ornaments).

Artificial light
Explain that the word 'artificial' means it has been made by a person or people – or by a machine made by people. It comes from the Latin word for handicraft (*artificis*).

The mirrored image
Point out that, although the image in a plane (flat) mirror is reversed (left becomes right and right becomes left), it is not inverted. Top does not become bottom.

Mirror writing
Allow students to make up their own messages to send to each other. This models one of the earliest codes.

Making a periscope
Make sure students have the mirrors set at exactly 45° otherwise the light from the object will not reach their eye and they will not see it.

Guiding light
Students could try to work out the problem using trial and error. However, ask them to think back to their work with the periscope to give them a clue how to progress.

Mirrors and design
Ask students to discuss where they have seen mirrors and what they were used for. List any they mention in three columns: mainly decorative; used to cast light; used to make a room appear larger.

Make a pinhole camera
Explain that the image seen on the screen of the pinhole camera is inverted (upside down). This is because light from the bottom of the object, for example, travels in a straight line. Therefore, after the light passes through the hole it continues and must hit the top of the screen.

Having fun with mirrors
Help students to remember the difference between convex and concave mirrors. Tell them that caves go inwards and so do concave mirrors.

Does light travel in straight lines?
Explain that if light could bend around corners, it would pass through the holes even if the cards were not lined up. This doesn't happen, so light must travel in straight lines.

Investigating refraction
Explain that refraction can make objects underwater appear much closer. Show students photographs of different examples of refraction in water.

Colour investigation
Provide a range of filters, or even transparent sweet wrappers, so students can explore a wide range of different colours.

Does it let light through or block light?
Explain to students that they will need to use the words more than once to fill in the gaps.

Translucent, transparent and opaque objects
Have large word cards in your room so that students become familiar with these key terms.

Does it make a good shadow?
Remind students that in order to make a clear shadow the light has to be blocked. This should give them a huge clue about opaque materials.

Investigating translucent and opaque materials
Allow students to use their imaginations to design different ways to test how much light passes through the materials. They could use a light meter, or they could judge the darkness of shadows against a spectrum of very light grey to black squares.

Making shadows
Encourage students to not only make the shapes suggested, but also to vary the size of the shapes by moving their hands towards or away from the light source.

Making silhouettes
Ask students to investigate the distance between the light source and the person, and the person and the screen to get a sharp and not a blurred image.

Investigate the size of shadows
Remind students to carry out measurements more than once and calculate an average to reduce error.

Moving shadow puppets
Help students to see the relationship between the light source movement and the shadow movement by explaining they will always be in the opposite direction.

Shadow hide and seek
Select a suitable place for the game so that there are objects such as trees to hide behind, but the area is not so dense with objects that the Sun cannot create shadows.

Does the darkness of shadows change during the day?
Explain to students that many things can change how dark a shadow looks. These include reflected light from objects, artificial light from windows and how opaque the object casting the shadow is.

Make a sundial
Stress that students should not move the sundial between measurements or that will invalidate their results.

Telling the time with shadows
Explain that it is an important part of any design process to test a prototype, evaluate it and then work on improvements.

Measuring light intensity
Point out that a tiny piece of tissue will block some light from hitting the solar strip, but that, if the light is bright, it will still allow the calculator to work. They can experiment with different layers of tissue until the calculator stops working.

Which light source will be brightest?
Point out that in order to make this a fair test each piece of the tissue paper should be the same thickness.

Light intensity timeline
Explain that a timeline sets out activities, events or inventions along a line that shows when they happened and in what order.

Distance and light intensity
Remind students that scientists will place the variable they are deciding on (the independent variable) along the X-axis. In this case, that is the distance from the source. The dependent variable goes along the Y-axis. In this case, that is the light intensity.

4 Building Electrical Circuits

What students will learn

This unit helps students to understand more about electricity and how to build and test electrical circuits. They explore conductors and insulators and assemble circuits from different components. Students investigate the effects of changing the number and voltage of cells (batteries). They predict and test what happens when components in a circuit are changed and represent circuits by using circuit diagrams. Students will:

- find out how some materials are better conductors and insulators of electricity than others
- find out how some metals are good conductors of electricity and most other materials are not
- understand why metals are used for cables and wires and why plastics are used to cover wires and as covers for plugs and switches
- learn how changing the number and voltage of cells affects the components in a circuit
- predict and test the effects of making changes to circuits
- draw diagrams of series circuits using standard symbols.

Key words

ammeter, battery, bulb, buzzer, circuit diagram, component, conductor, insulator, parallel circuit, series circuit, switch, voltage, voltmeter

Scientific enquiry skills

This unit helps students to develop and practise the following scientific enquiry skills.

Scientific enquiry skill	Page
Plan and/or carry out enquiries to answer questions	105, 107, 109, 112–113, 115, 117, 118–120, 123, 125
Make predictions	107, 112–113, 119, 123, 125
Recognise and control variables	107, 112–113, 125
Make observations	105, 107, 109, 113, 115–116, 118–121, 123, 125
Take measurements, using equipment accurately	107, 109, 113, 120
Record data and results	105, 107, 109, 112–113, 115, 118–120, 123
Analyse data, notice patterns and group or classify things	105, 107, 109, 113, 115–116, 118–120
Report and present findings	105–107, 109, 112–113, 115, 118–120, 125
Draw conclusions and give explanations	105, 107, 109, 112–113, 115–116, 118–120, 123, 125
Identify causal relationships	107, 109, 112–113, 118–120

Ways to help

- Encourage students to learn the symbols of the components by displaying them around the room.
- Arrange incomplete circuits so students can fault find and repair the circuits.
- Ask students to think about why it is important to have both conducting and insulating materials.
- Encourage students to use circuit diagrams whenever they represent/draw a circuit.

Helping with activities

The following guidance gives you advice on how to help students with each activity.

Explain conductors and insulators
Display some devices and appliances that have parts that conduct (e.g. wires and parts of the plugs) and parts that insulate (e.g. the plastic coating on wires).

Is it an insulator?
Demonstrate how to set up the test circuit and show how the two unconnected wires can have crocodile clips on to allow other materials to be placed across the gap.

Research project: Ampère
Arrange for students to have access to the internet if possible. If not, you could download and print information about Ampère.

Investigate the conductivity of metals
Provide a range of metals such as pieces of copper wire or pipe, steel and aluminium strips cut from cans and zinc rings.

Wiring a plug
Explain that across the world there can be different designs for plugs and even different colours for the wires. Show some examples.

What have you learned so far?
Encourage students to attempt the questions to review their learning and then allow them to look back to research what they could not answer.

Changing the components in a circuit
Explain to students that they can change the number of batteries or bulbs in a circuit or add or remove other components, but only one at a time. Their circuit will always need to include at least one bulb.

Investigating the thickness of a wire
Point out that the thickness of a wire can be imagined like a door. A wide door will let more people pass through at the same time than a narrow door. A thick wire will let more electricity pass through at the same time than a narrow wire.

How does a filament bulb work?
Hand round or display some examples of filament bulbs. You can show large room light versions and small torch versions. Many bulbs are being replaced with LEDs, but you should be able to find some filament ones.

Does the width of a wire affect how hot it gets?
Explain that a fuse is an example of a circuit breaker. It is the weakest part of a circuit and so will fail (or burn out) before more expensive parts. Fuse wire is placed in a fireproof container so it is safe.

Using circuit diagrams
Display the symbols for the components in your room so students become familiar with them. Encourage them to use circuit diagrams to represent the circuit they construct.

Drawing circuits
Remind students that they always need to link components with connecting wires. These wires are always drawn as straight lines with 90° corners in a circuit.

Build circuits from diagrams and test them
Encourage a logical, step-by-step approach to fault finding. Students should start at the battery and check if it is connected and is the correct way round. They then follow the circuit clockwise – testing each connection then each component.

Investigating series and parallel circuits
Set up a series and a parallel circuit to show students the difference. Explain that the parallel circuit gives the flow/current of electricity two possible paths.

Using a voltmeter
Demonstrate how the voltmeter is not connected in series (in a line) as an ammeter is. Instead, it is set up in parallel. This means the meter is measuring the difference before and after a component.

Making a battery
Explain that the metal coins react with the lemon juice to create negatively charged particles called electrons. These are pushed around the circuit as an electrical current.

Model circuits
For greatest effect, and to make the task and content more memorable, provide the largest possible paper plates or card so the circuit models are huge. Display them around the room so they look spectacular.

Circuit wordsearch
Suggest that students look in the puzzle for the first letter of the first word in the list and then search around that for the second letter, and so on.

5 Adaptation and Inherited Characteristics

What students will learn

This unit helps students to understand more about how living things are adapted to their habitats and how characteristics are passed from parents to their offspring. Students study examples of how living things have changed over time and link this to the ways that animals and plants have to be adapted to their habitat to survive. They review that living things do not live forever and so must have offspring to ensure the survival of the species. Students study how offspring vary from their parents and that this can eventually lead to new species. Students will:

- recognise that living things have changed over time
- learn that fossils give us information about living things that lived on Earth millions of years ago
- review that living things produce offspring
- recognise that offspring vary and are not identical to their parents