Government of **Western Australia**
School Curriculum and Standards Authority

Science

Teaching, learning and assessment exemplar

Year 6

Acknowledgement of Country

Kaya. The School Curriculum and Standards Authority (the Authority) acknowledges that our offices are on Whadjuk Noongar boodjar and that we deliver our services on the country of many traditional custodians and language groups throughout Western Australia. The Authority acknowledges the traditional custodians throughout Western Australia and their continuing connection to land, waters and community. We offer our respect to Elders past and present.

Background

This teaching, learning and assessment exemplar (the exemplar) has been developed by the School Curriculum and Standards Authority (the Authority) as part of the *School Education Act Employees (Teachers and Administrators) General Agreement 2017* (Clause 61.1–61.3).

Disclaimer

Any resources, such as texts and websites, that may be referred to in this document are provided as examples of resources that teachers can use to support their learning programs. Their inclusion does not imply that they are mandated or that they are the only resources relevant to the course. Teachers must exercise their professional judgement as to the appropriateness of any resources they may wish to use.

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Contents

The Western Australian Curriculum

The *Western Australian Curriculum and Assessment Outline* (the *Outline* – https://k10outline.scsa.wa.edu.au/) sets out the mandated curriculum, guiding principles for teaching, learning and assessment, and support for teachers in their assessment and reporting of student achievement. The *Outline* recognises that all students in Australian schools, or international schools implementing the Western Australian Curriculum, are entitled to be given access to the eight learning areas described in the *Alice Springs* (*Mparntwe*) *Education Declaration*, December 2019.

The Science curriculum

The mandated curriculum is presented in the year level syllabus documents.

The Science curriculum delivers a sequential and age-appropriate progression of learning with the following key elements:

- a year level description that provides an overview of the context for teaching and learning in the year
- a series of content descriptions, populated through strands and sub-strands, that sets out the knowledge, understanding and skills that teachers are expected to teach and students are expected to learn
- an achievement standard that describes an expected level that the majority of students are achieving by the end of a given year of schooling. An achievement standard describes the quality of learning (e.g. the depth of conceptual understanding and the sophistication of skills) that would indicate the student is well placed to commence the learning required in the next year.

This exemplar

This Science exemplar articulates the content in the *Outline* and approaches to teaching, learning and assessment reflective of the Principles of Teaching, Learning and Assessment. This exemplar presents planning for eight weeks of teaching and learning for each of the four terms, with a time allocation of two hours per week.

Catering for diversity

This exemplar provides a suggested approach for the delivery of the curriculum and reflects the rationale, aims and content structure of the learning area. When planning the learning experiences, consideration has been given to ensuring that they are inclusive and can be used in, or adapted for, individual circumstances. It is the classroom teacher who is best placed to consider and respond to (accommodate) the diversity of their students. Reflecting on the learning experiences offered in this exemplar will enable teachers to make appropriate adjustments (where applicable) to better cater for students' gender, personal interests, achievement levels, socio-economic, cultural and language backgrounds, experiences and local area contexts.

Using this exemplar

This teaching, learning and assessment exemplar provides suggestions to support the delivery of the mandated curriculum content. This exemplar provides:

- a teaching and learning sequence
- the mandated curriculum content to be taught at each point of the teaching and learning sequence, suggested resources, sample assessment tasks and marking keys
- the number of lessons to deliver the teaching and learning experiences
- learning intentions and support notes that may provide focus questions and additional information and/or examples to assist with the interpretation of curriculum content
- support notes to assist teachers to unpack the content and support teaching and learning experiences
- teaching and learning experiences that outline the structure of the lesson. These explicitly state each activity that the lesson will progress through and the key focus area for that activity.

Links to electronic resources

This sequence of lessons may utilise electronic web-based resources, such as videos and image galleries. Teachers should be present while an electronic resource is in use and close links immediately after a resource, such as a video, has played to prevent default ‘auto play’ of additional videos. Where resources are referred for home study, they should be uploaded through Connect, or an equivalent system, that filters advertising content.

Best practice

Teaching and learning

The teaching and learning opportunities offered in this exemplar are not exhaustive. Thus, teachers are encouraged to make professional decisions about which learning experiences, and the sequence in which they are delivered, are best suited to their classroom context, taking into account the availability of resources and student ability.

This sample may prove a useful starting point for amplifying creativity in the classroom, while presenting the embedded expectations of the Western Australian Curriculum: Science.

Teachers may find opportunities to incorporate the General Capabilities and the Cross-curriculum Priorities into the teaching and learning program.

Ways of teaching – teachers can locate additional information on the Ways of teaching from the School Curriculum and Standards Authority (the Authority) website https://k10outline.scsa.wa.edu.au/home/wa-curriculum/learning-areas/humanities-and-social-sciences/overview/humanities-and-social-sciences-ways-of-teaching.

Assessing

Assessment, both formative and summative, is an integral part of teaching and learning. Assessment should arise naturally out of the learning experiences provided to students. In addition, assessment should provide regular opportunities for teachers to reflect on student achievement and progress. As part of the support it provides for teachers, this exemplar includes suggested assessment points. It is the teacher's role to consider the contexts of their classroom and students, the range of assessments required, and the sampling of content descriptions selected to allow their students the opportunity to demonstrate achievement in relation to the year-level achievement standard. Teachers are best placed to make decisions about whether the suggested assessment/s are used as formative or summative assessment and/or for moderation purposes.

Ways of assessing – a range of assessment strategies that can enable teachers to understand where students are in their learning is available on the Authority website https://k10outline.scsa.wa.edu.au/home/wa-curriculum/learning-areas/science/overview/science-ways-of-assessing.

Reflecting

Reflective practice involves a cyclic process during which teachers continually review the effects of their teaching and make appropriate adjustments to their planning. The cycle involves planning, teaching, observing, reflecting and replanning.

This exemplar supports reflective practice and provides flexibility for teachers in their planning. The exemplar shows how content can be combined and revisited throughout the year. Teachers will choose to expand or contract the amount of time spent on developing the required understandings and skills according to their reflective processes and professional judgements about their students' evolving learning needs.

Year level description

In the middle to late childhood phase of schooling, students develop a sense of self, their world expands, and they begin to see themselves as members of larger communities. Learning experiences emphasise and lead to an appreciation of both the commonality and diversity of human experience and concerns.

Science provides opportunities for students to explore their physical, social, cultural and technological surroundings. As students develop the ability to work collaboratively, they work with others to plan and make decisions in constructing knowledge.

In Year 6, students explore the relationship between the growth and survival of living things, changing conditions in their environment and the influence of human activities. They are introduced to ways to classify changes to substances as reversible and irreversible. Students explore the effects of sudden geological changes and extreme weather on the surface of Earth. They identify the role of the components in electrical circuits and learn to describe energy flows in terms of transfer and transformation.

Students pose questions that include the variable to be changed and apply science knowledge to make reasoned predictions of the results. To test their predictions, they plan and conduct fair, repeatable investigations that include controlled variables. Students describe the observed relationships in the collected data between variables to be measured and changed, compare their results to their predictions and pose further questions to investigate. Students report on their investigation and findings using appropriate language features. They use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research.

Achievement standard

By the end of the year:

Students explain how changes in conditions in the environment and the influence of human activities affect the growth and survival of living things. They classify and compare reversible and irreversible changes to substances. Students describe the effect of sudden geological changes and extreme weather on Earth's surface. They identify the role of circuit components, insulators and conductors in the transfer and transformation of electrical energy.

Students pose testable questions that include variables to be changed and measured and apply science knowledge to make reasoned predictions. They plan and conduct safe, fair, repeatable investigations to test predictions and identify the relationship between variables. Students use equipment to generate and record data that they process and represent using tables, graphs and models to describe their findings, including using line graphs to represent continuous data. They evaluate the fairness of an investigation, identifying difficulties and ways to minimise these. They compare their results to their predictions, posing questions for further investigation. With assistance, students draw conclusions based on collected data and communicate these in various ways, including scientific reports. They use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research.

Term 1

Weeks 1–8: Physical sciences

Term 1 Overview

Physical sciences The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Introduction to circuits	Changing circuits	Investigation: wire length	Summative assessment- *student directed investigation* conductors (Appendix B)	Conductors: report writing	Electrical safety	Switch design	Parallel circuits
Identifying circuit components	Investigation: wire length	Investigation: wire length	Investigation: conductors	Conductors: report writing	Conductors and insulators: switch design	Parallel circuits	Renewable energy
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
• wires • 9V batteries • globes • torches	• wires • globes • 9V batteries • motors • buzzers • switches	• foil • batteries • globes • rulers	• globes • batteries • wires • switches • materials to test for conductivity	• science report downloaded	• small electrical appliance, such as a kettle	• materials to build switches • 9V batteries • wires • globes • motors • buzzers • switches	• wires, foil and other conductors • 9V batteries • globes • motors • buzzers

Term 1 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • What is electrical energy? • What are some examples of electrical energy in our daily lives? • What components make up a circuit? • How does electrical energy flow through a circuit? • How can a circuit be visually represented? **Support notes** Energy can be transferred (from one location to another) and transformed (changed from one type to another). The two types of electric circuits referred to in this exemplar are simple, or series circuits, and parallel circuits. A simple scientific drawing represents information clearly and concisely. Scientific drawings and diagrams are commonly used for equipment. A circuit diagram can be used to represent the transfer of energy. Information about electrical circuit symbols can be found online. An example can be found at Circuit symbols – BBC Bitesize https://www.bbc.co.uk/bitesize/articles/znm6nk7#z6mjxg8	**Learning experience 1** 1. In small groups, students brainstorm everything they know about electricity; for example, where it comes from, how it travels, how it is stored etc. 2. Share ideas as a class. 3. Students construct a list of all the things that use electricity in the school, at home and in other places, such as shops, sporting grounds, roads and workplaces. 4. Provide students with equipment to make simple circuits and allow them time to investigate the components. 5. As students use relevant scientific vocabulary, or share ideas on how circuits work, record them on the board. 6. Once students are familiar with the components of a simple circuit, ask them to make a circuit with a battery, two wires and a light globe. 7. Ask students to use their finger to follow the path of the energy from the battery, along the wire, into the light globe and back into the battery. 8. Discuss the energy transformations taking place in the circuit by considering where the energy starts and where it ends. This can be drawn as a simple flowchart of chemical energy > electrical energy > heat and light energy. 9. Model how to draw a simple circuit on the board, with labels for the components. Students copy the diagram.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

	Safety considerations
	When using electricity of any type, care must be taken. In general, 9V batteries or batteries found in torches only have a small amount of energy; however, students should not use damaged batteries or use them in any way other than intended.
	
	Mains power should not be used throughout any of these lessons.
	
	Resources
	• Wires (or aluminium foil cut and folded to make wires)
	• 9V batteries
	• Globes
	• Torches
	
	Suggested assessment points
	Diagnostic assessment
	Observe if students can:
	• identify the key requirements for the transfer of electrical energy
	• model a simple working circuit using symbols.
		Learning experience 2
		1. Revisit the diagram from the previous lesson and introduce electrical symbols.
		2. Students share their ideas of why standard electrical symbols might be used for circuits instead of just drawing what they see.
		3. Redraw the simple circuit using the symbols underneath the original. Ask students, 'Why don't you need to add labels to this diagram?'
		4. Review the electrical components by holding them up. For example, wires, batteries, globes.
		5. Give students time to use the components to make circuits and think of 'rules' for making circuits, such as:
		  • the circuit must have a power source
		  • the circuit must be closed to work
		  • the circuit must be attached via a positive and negative terminal
		  • the circuit must be attached via metal in the wires and components.
		6. Write the rules that students devise on the board.
		7. Give students a torch to take apart and find the circuit that makes it work.
		8. With the torch apart, open and close the switch and ask students to look for the mechanism working on the inside.
		9. Using the electrical symbols from earlier, draw a diagram of the circuit from the torch. Compare the diagram to the previous one and discuss any differences and similarities.

Term 1 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • How do each of the circuit components contribute to the whole circuit working? • Why would you use a switch? • What changes could you make to a circuit? • What are the change and measurable variables in the investigation? • How can you use those variables to construct a question? **Support notes** In Year 6, students begin to make choices and design their own investigations. These investigations should be based on fair investigation variables: change (independent), measurable (dependent) and things to keep the same (control). At times, these design choices may be unsuccessful or inconclusive; however, this is part of the process and can be explored in the evaluating section on the investigation template. **Resources** • Wires • Globes • 9V batteries • Motors • Buzzers • Switches • *Fair test investigation* template (Appendix A)	**Learning experience 1** 1. Show students the various electrical symbols they learnt about in the last week and ask them to name what each symbol means. 2. Introduce new components such as switches, motors and noise makers, as well as their associated symbols. 3. Discuss, in depth, the role of the switch in opening and closing the circuit. 4. Allow students time to familiarise themselves with the new components by making simple circuits, following the rules devised in the previous lesson. 5. Explain to students that they are going to test changes to the circuit, and the effect it has on the flow of electricity. This could include adding in extra wires, extra globes, having a globe and a motor on the one battery, taking out components etc. 6. Complete a *Think-pair-share* activity on how to keep the tests fair (only one thing should be changed at time). 7. With their partner, students choose three different changes and devise a way to record the results, such as a T-chart, to identify the change and their observations. 8. Students complete the tests and record their results. 9. In their pairs, students verbally discuss possible explanations for their results. **Learning experience 2** 1. Students share one of the changes they made to their simple circuits in the previous lesson and identify the

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment point **Formative assessment** Observe if students can: • identify the role of individual components within a circuit • identify variables and use them to design a fair test • create questions and predictions based on the variables.	result. Discuss any interesting results and explanations the students might have. 2. Show students aluminium foil and how it can be used in place of wires (if not using for previous circuits already). Students attempt to explain how the foil can work as a wire. 3. Explain that students are going to complete an investigation on how the length of the foil can affect a simple circuit with a power source and a light. 4. In small groups, students discuss and record the variables on their *Fair test investigation* template: • What will I change? (the length of the foil) • What will I measure? (the brightness of the globe) • What will I keep the same? (the width of the foil, the other components) 5. Students use the information to create a question and a prediction. Teachers may need to model how to write a question using the change and measurable variable. 6. As a class, discuss the steps needed to complete the investigation and the list of materials. If completing this section of the template, ask students to fill out the method and materials. 7. Students draw a diagram of the set-up for the investigation using the electrical symbols they have already learnt. 8. Use a cooperative learning strategy to identify two safe classroom behaviours and practices, material safety risks and risk minimisation strategies for the simple circuit investigation using foil. Students fill these ideas out on their investigation template.

Term 1 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • What are electrons? • How does energy travel through a circuit? • How can you share your results? • Was this a fair investigation? • How do Scientists share their ideas with the world? **Support notes** Quantitative data is collected using measured quantities or amounts. This data uses numbers or a scale as part of the measurement process. Qualitative data relies on descriptive and clear language to record observations and results. There may be a degree of subjectivity with this data. In this investigation, collecting data is qualitative and may be subjective as students need to decide whether the brightness of the bulb has changed using their eyes. A good discussion point is how 'self-reported' data can be unreliable as it could appear differently to each student. If available, a lux meter app could be used to measure the 'lumens' put out by the globe with each length of foil; however, the app may still pick up light from other sources.	**Learning experiences 1 and 2** 1. Review the variables for the investigation planned in the previous lesson and discuss how students are going to keep it a fair investigation. 2. Students are going to be measuring/observing the brightness of the bulb. Discuss with students the difficulty in making an accurate measurement and how they might achieve this (see support notes). 3. Once a method of measurement has been chosen, allow students time to conduct their investigation within their groups. 4. Discuss the results. Depending on the lengths of wire chosen, they may have noticed a drop in brightness as the wires got longer or no change at all. 5. Students discuss and display their data. 6. View an online video or image about the flow of electrons through a circuit and ask students to pretend to be electrons moving through a circuit. Ask, 'How would you act if there was an open switch in the circuit? How would you act if you had to travel further to reach the light globe?' 7. Students use these understandings to explain what happened in their investigation in the 'analysing' section of the investigation template. Encourage students to use scientific vocabulary where appropriate.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Collaborating and applying Use science knowledge to develop considered responses to problems at a local and global level, through investigation and research	**Resources** • *Fair test investigation* template (Appendix A) • Foil • Batteries • Globes • Rulers **Suggested assessment point** **Formative assessment** Observe if students can: • explain the energy transfer in a simple circuit • evaluate the reliability of their data • compare their results to their prediction • identify improvements in the method they followed • identify the role the science community plays in adding and assessing current scientific knowledge.	8. In their groups, students consider the reliability of the data they collected and how that could be improved if they were to complete the investigation again. 9. Students compare their results to their predictions, evaluate whether the investigation was fair and suggest possible improvements to methods in the evaluating section of the investigation template. 10. Discuss how scientists share their findings with other scientists and the public. Ask: • 'What is a science report?' • 'Why is it important that the science report is accurate?' • 'Why does the method need to be clear?'

Term 1 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation	**Focus questions** • What is a conductor? • How can you test what materials are conductive? • What are the variables in this investigation? • How can you record your results? **Support notes** Students work towards independently designing fair investigations, using change and measurable investigations. This is an opportunity for them to use a familiar methodology and apply it to a new concept. This investigation can be used as a summative or formative assessment (Appendix B). **Resources** • *Fair test investigation* template (Appendix A) • Globes • 9V batteries • Wires • Materials to test for conductivity, such as paperclips, dry spaghetti, wool, pipe-cleaners and coins. **Suggested assessment point** **Formative/summative assessment** Observe if students can: • complete the planning and conducting of their investigation using the template and checklist (Appendix B).	**Learning experiences 1 and 2** 1. Show students the foil from the previous lesson and ask whether the electrons/electrical current were able to pass through it easily. Ask students: 'What do you call materials that allow electricity to pass through easily (conductors)?' 2. Connect this idea with heat conductors (Year 3 curriculum). Both heat and electrical conductors let energy pass through easily. 3. Pose the question, 'What other objects can work as conductors?' 4. Students consider how to test this question. Encourage students to think about the method they followed for the previous investigation and how they can adapt that to this new investigation. 5. Provide students with the same components for a simple circuit, and a variety of materials to take the place of a wire to test its conductivity. 6. Students need to identify the variables to be changed (type of material), measured (whether it lights the globe) and kept the same (all the other components) and then design an investigation around those variables. 7. Decide as a class what needs to be included in the investigation, such as variables, a question, prediction, method, diagrams, safety considerations, recording of data.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Communicating Communicate ideas in a variety of ways, including scientific reports with appropriate language features		8. Show students the checklist for the investigation in Appendix B. Clarify any unknown terms. 9. Students plan and conduct their investigation. Provide any support necessary. 10. Look at the results as a class and sort the objects that did conduct electricity and those that didn't. Look for patterns in their data. (Metal conducted electricity; everything else didn't.) 11. Students should ensure their results are recorded appropriately and complete the 'analysing' section of the investigation template. 12. Students compare their prediction to their results and evaluate the fairness of the investigation. Finally, students should identify improvements to their investigation.

Term 1 Week 5

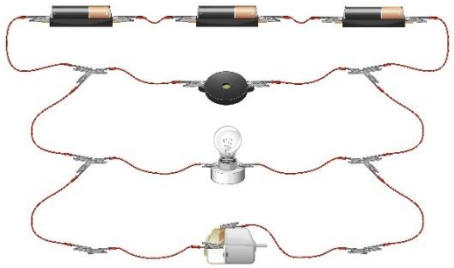
Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • How do scientists communicate their findings with the public? • How could you communicate your investigation? • What is the important information to include? **Support notes** Choose, download and photocopy a science report from *Science Journal for Kids and Teens* at https://www.sciencejournalforkids.org/ that matches students' interest and reading level. **Resources** • Chosen science report (downloaded and photocopied) **Suggested assessment points** **Summative assessment** Observe if students can: • produce a report that includes the necessary sections • communicate their investigation accurately • use appropriate scientific vocabulary.	**Learning experiences 1 and 2** 1. Distribute an appropriate scientific report to act as a mentor text to analyse. Read and discuss any interesting information. 2. Discuss the layout of the scientific report and consider the purpose of each section. Analyse the language features such as headings, bullet points, sentence starters, verbs and adverbs that provide detail, images and/or diagrams to add information. 3. Explain that students are going to construct their own science report based on the investigation from the previous week. 4. Identify the sections that students will be expected to include. For example: • introduction • method • results • interpretation. 5. Students write, edit and design their report. 6. Complete a gallery walk to view each other's reports. Teachers may want to compile the reports in a science journal or display them in some other way.

Term 1 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • How can you stay safe around electricity? • What is a conductor and insulator? • Is air a conductor or insulator? • How do switches work? • How could you use your knowledge of conductors and insulators to design a switch? **Support notes** In the second learning experience, students may want to look at a physical switch component to help generate their ideas. The designing and making of a switch can be completed individually or in small groups. **Resources** • small electrical appliance such as a kettle **Suggested assessment points** **Formative assessment** Observe if students can: • identify possible risks with electricity and ways to minimise them. **Summative assessment** Observe if students can: • understand how insulators and conductors work. • design and plan how to build a switch.	**Learning experience 1** 1. Refer to the beginning of the term, when students assembled a list of all the ways they used electricity throughout the day. 2. Discuss electrical safety for these items and identify other ways that electrical use could be dangerous. 3. Place students in small groups and ask them to list and explain as many unsafe electrical practices as they can think of. 4. Display all the ideas and have each group choose one scenario to roleplay for the class. 5. Groups decide on their scenario and rehearse. 6. After each group has presented their roleplay, discuss the unsafe situations and any actions taken by the characters. 7. As a class, come up with a set of 'rules' for how to stay safe around electricity. Write these on a poster to remain displayed in the classroom. **Learning experience 2** 1. Refer to the conductivity investigation and ask students to share the materials that didn't let electricity flow through them. Make a master list. 2. Explain to students that these materials are called electrical insulators and they act in the opposite way to electrical conductors. 3. Using a *Think-pair-share* strategy, students consider what insulators are used for and why they may be

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		useful (insulators such as plastic and rubber are used to coat wires to stop people getting a shock). 4. Show students an electrical appliance, such as a kettle, demonstrating how the wire and the plug are covered in plastic. 5. Pose the question, 'Is air a conductor or insulator of electricity?' Students consider what prior scientific knowledge they could use to infer the answer (knowledge of closed circuits and switches). 6. Explain to students that they are going to use that knowledge to design a switch in a simple circuit using conductors and insulators. 7. Students design their switch. They should include a method, a labelled diagram and a list of necessary materials.

Term 1 Week 7

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • How can you make a working switch? • What went well with your design and what would you improve? • How is electrical energy transformed to other types of energy? • What is a parallel circuit and how does it work? **Support notes** A parallel circuit is a circuit where the flow of the electricity is branched between two or more components. The image below shows a possible parallel circuit. They can be complex or simple.  Image: brgfx, n.d. **Resources** • Materials to build switches, such as foil, paperclips, cardboard, straws, masking tape. • 9V batteries • Wires	**Learning experience 1** 1. As a class, devise guidelines for the switch, e.g. needs to use an insulator (such as air) when switched off and a conductor when switched on. 2. Give students time to review their design and make any changes necessary to meet the guidelines. 3. Provide materials to enable students to make and test their designs. Encourage students to make changes to their design based on the results from their test. Any changes made should be recorded on their diagrams. 4. When each student/group has finished constructing and testing their switch, ask them to 'prove their concept' by showing their switch in a simple circuit and turning on a light bulb. 5. Allow students time to reflect on their design and write a sentence on what went well and what they would like to improve next time. **Learning experience 2** 1. Review student knowledge and understanding of: • insulators and conductors • switches • transfer of energy in a simple circuit. 2. Discuss how electrical energy is transformed: light and heat energy (globe), sound energy (bell) and kinetic energy (fan).

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

	• Globes
	• Motors
	• Buzzers
	
	Suggested assessment points
	Formative assessment
	Observe if students can:
	• identify insulators and conductors
	• explain transfer of energy in a simple circuit
	• understand the use of correct electrical circuit symbols.
		3. Demonstrate a parallel circuit using one or more of the following:
		  • animated examples online
		  • a parallel circuit diagram using the appropriate electrical circuit symbols
		  • a practical working example.
		4. Devise a definition of parallel circuits (see support notes) to display for all students to see.
		5. Give students the necessary components and allow them time to practise and develop a working parallel circuit.
		6. Students draw their parallel circuit using electrical symbols.

Term 1 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** The transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What are the components of a parallel circuit? • When are parallel circuits used in everyday life? • What are the advantages of a parallel circuit and a simple circuit? **Support notes** Peer assessment inclusions to consider: • clarity of diagram and written instructions • correct use of symbols • inclusion of all components • workability of the circuit. In the second learning experience, teachers may want to explore the use and negative impacts of fossil fuels in more detail before looking at renewable energy sources. **Resources** • Wires, foil and other conductors • 9V batteries • Globes • Motors • Buzzers **Connected learning** Teachers can explore the Cross-curriculum Priority of Sustainability through renewable and non-renewable energy sources.	**Learning experience 1** 1. Review parallel circuits and define. 2. Explain to students that they are going to design and draw a parallel circuit using appropriate electrical circuit symbols, including: • a switch • globes or other means of exemplifying the energy conductivity • two or more paths for the current to flow through • appropriate conductors • an appropriate power source • written instructions and notes as required. 3. Students will then give their design to another student to physically build and check its viability. 4. Students design and draw their parallel circuit and, as a class, develop a short checklist for peer review based on the requirements. 5. Discuss how to give good feedback in a respectful and clear manner. 6. Students swap designs with a peer (the teacher may need to facilitate the partners), build their design, take a digital image of the result and complete the feedback checklist. 7. Students come back together and share feedback, individually reflecting on their design and what they might change based on the feedback.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Summative assessment** Observe if students can: • design and draw a parallel circuit • use appropriate electrical circuit symbols • reflect on their design choices based on feedback • identify alternative energy sources and their benefits for the environment.	**Learning experience 2** 1. Refer to the ways students use electricity (from Week 1). They consider how that electricity is generated. 2. Find and watch an online video that explains the movement of electricity from generation to households, such as this Western Power video at https://www.youtube.com/watch?v=c9M_cvDHJuk. 3. Brainstorm energy sources such as fossil fuels, solar, wind, hydropower, geothermal and biomass. Sort these ideas into renewable and non-renewable sources. 4. Ask students to choose one type of renewable energy and research the following: • where the electricity comes from • what resources are required, e.g. solar panels, batteries or wind turbines • what countries/areas the energy source can be used • the benefits and drawbacks of the energy source. 5. Students complete their research and report back to the class or in a small group.

Term 2

Weeks 1–8: Biological sciences

Term 2 Overview

Biological sciences The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Review of biology	Investigation: salinity	Salinity investigation continued Investigation: mould	Salinity investigation continued Mould investigation continued Investigation: yeast	Investigation: salinity conclusion Mould investigation continued	Investigation: mould conclusion	Report writing	Peppered moths
Salinity introduction	Mould introduction	Investigation: yeast	Investigation: yeast	Investigation: salinity conclusion	Report writing	Peppered moths	Human activity impact
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
	• seeds • containers • growing medium • water • spray bottles • salt	• bread • sealable bags • tape • cup • sugar • water • yeast	• yeast • sugar • empty bottles • balloons • measuring tapes • funnels		• report downloaded from *Science Journal for Kids and Teens*	• digital device	• digital device

Term 2 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationship between measured and changed variables **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What adaptations do indigenous animals have to their environment? • How do these adaptations help the animal survive? • What is salinity? • How can salinity impact living things? • What are the benefits of decomposers in an ecosystem? **Support notes** In order to survive, plants require air, water, sunshine, nutrients and the right temperature. Factors that could impact the survival of plants include the wrong amounts of the above factors, insect activity, grazing by animals, extreme weather events and salinity. Salinity is the concentration of salt, in this case the concentration of salt in the soil. **Suggested assessment points** **Diagnostic assessment** Observe if students can: • identify adaptations of a familiar animal that help it to survive • define salinity and identify some of its impacts • identify some ways to minimise the impact of salinity.	**Learning experience 1** 1. Revise with students the characteristics of living things (use the mnemonic MRS GREN for movement, respiration, sensitivity, growth, reproduction, excretion and nutrition). 2. Brainstorm a list of things students can see as they walk around the school, then sort the list into living and non-living things. 3. Ask students what makes something a plant (producer) versus an animal (consumer). 4. Use a *Think-pair-share* strategy to discuss the role of decomposers in an ecosystem. 5. Display an image of a local indigenous animal, such as a lizard, snake, quoll, quenda etc. 6. With student input, annotate the image with structural and behavioural adaptations. Discuss the use/benefit of these adaptations. 7. With a partner, students can choose their own indigenous animal and annotate it with structural and behavioural adaptations. 8. Ask students to identify the habitat/ecosystem their chosen animal lives in. 9. Remind students that an ecosystem is made up of living factors, such as plants and animals, as well as non-living factors, such as weather, rainfall, wind, soil and rocks.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		10. Give each pair two sticky notes and ask them to write one living factor that might affect their animal and one non-living factor that might affect their animal. 11. Students stick their notes to two poster sheets. Review and discuss the factors as a class. **Learning experience 2** 1. Review the living and non-living factors posters from the previous lesson. Reinforce the relationship between these factors and individual organisms. 2. Using a memo board application or paper, give students five minutes to identify the needs of plants and any factors that might impact a plant. 3. Discuss students' ideas and allow them time to add any that may have been missed (see support notes). 4. Write the word 'salinity' on the board and ask students to infer what it might mean when it comes to plants. 5. Watch an online video on salinity, such *as The Silent Flood* by the ABC at https://www.abc.net.au/news/rural/programs/landline/2023-04-16/the-silent-flood:-draining-the-silent-flood-of/102229172. 6. While viewing, ask students to take notes in a T-chart of the possible detrimental impacts of salinity and ways to minimise it. 7. Students share ideas from their charts and come up with a class definition of salinity.

Term 2 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • What variables will you be investigating? • How can you make this investigation fair and safe? • What is mould? • What factors impact mould growth? **Support notes** Choose seeds that will be fast growing, such as wheatgrass or any type of sprout. In their groups, students will need three separate containers. Plant 1 – watered with plain water Plant 2 – watered with saline solution; one tablespoon of salt dissolved per cup of water Plant 3 – watered with saline solution; two tablespoons of salt dissolved per cup of water Plant observations and measurements will be made weekly but will need to be watered daily. **Resources** • Wheatgrass or sprout seeds • Containers for growing, e.g. cups • Growing medium • Water • Spray bottles • Salt • *Fair test investigation* template (Appendix A)	**Learning experience 1** 1. Go over the class definition of salinity and ask students to discuss the general impact of salinity on plants. 2. Explain that the class will be investigating salinity by exposing seeds to different levels of salt. 3. Discuss the variables for the investigation: • What will be changed? (the amount of salt) • What will be measured? (the growth of the plants) • What will be kept the same? (the type of plant, soil, location and container). 4. With guidance, in small groups, students use the template to write a question, prediction, procedure and plan for data collection. 5. Discuss with students the concentrations of salt they will use and how they will deliver it. 6. Discuss why it is important to have an example of one plant receiving fresh water. Use the term ‘control’ and discuss why this is important for comparisons. 7. Students work in their groups to set up the investigation and label their containers clearly. **Learning experience 2** 1. Make a list of decomposers and discuss their role. Focus on fungi and tell students that mould is a type of fungus.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Safety considerations Potting soil should be used in a well-ventilated area. Students should wear gloves and wash their hands well with soap after handling it. **Suggested assessment points** **Formative assessment** Observe if students can: • identify variables to be changed, measured and kept the same • construct a question and predictions using these variables • identify safety risks and ways to minimise them.	2. Ask students to think of a time that they have experienced a piece of food going mouldy and share what happened. 3. Watch an online timelapse video of bread or another familiar food item going mouldy. 4. With students, develop a Know, Want to know and Learned (KWL) chart for mould. Provide students with suitable websites and books to find information to give them an opportunity to answer their questions. 5. Ask students to list the needs of mould (i.e. food source, moisture, temperature, spores) and make an anchor chart to refer to later. 6. Find and look at images of different colours and textures of mould, or microscopic images of mould.

Term 2 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables	**Focus questions** • What factors might impact fungi (yeast/mould)? • How could you use these factors to design an investigation? • What are you going to change, measure and keep the same? • How can you minimise any safety risks? **Support notes** For mould to grow it requires moisture, a food source and suitable temperature (above 4 °Celsius). Students might like to investigate different: • amounts of moisture • amounts of light • types of bread • temperatures. It should be emphasised to students that they are testing only one variable and so must keep other variables constant. Yeast, a micro-organism in the fungus kingdom, requires food to activate it. Like any other organism, it is affected by the environment around it. Students will investigate the impact of different water temperatures on the yeast by collecting the gas it releases. Teachers may choose not to complete an investigation template for this activity or to complete it as a class.	**Learning experience 1** 1. Students collect the plants from their salinity investigation and make measurements and observations. 2. Explain that they will be investigating the growth of mould using their knowledge from the previous lesson. 3. Discuss the variables for the investigation: • What will be changed? (chosen by group) • What will be measured? (the amount of mould growth) • What will be kept the same? (the variables not chosen by groups) 4. With guidance, in small groups, students use the planning format to write a question, a prediction, a procedure and a plan for data collection. 5. Discuss with students the dangers and risks of mould ingestion and inhalation. 6. In their groups, instruct students to identify two potential safety risks in the investigation and ways to minimise it. Share the ideas as a class and add them to their investigation template. 7. Students set up their investigation and conduct initial observations.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Resources • Bread • Resealable bags • Tape • Cup • Sugar • Water • Yeast • *Fair test investigation* template (Appendix A) **Safety considerations** To ensure safety, students must place their bread slices in resealable bags and tape them shut. The bag should not be reopened at any point. **Suggested assessment points** **Formative assessment** Observe if students can: • identify variables to be changed, measured, and kept the same • write questions and predictions using these variables • identify safety risks and how to minimise them • identify factors that may impact on fungi.	**Learning experience 2** 1. Review the needs of mould, i.e. temperature, moisture, and food. Explain that yeast is another form of fungus, like mould. 2. Show images of leavened and unleavened bread and ask students to infer what yeast is used for in the baking of bread. 3. Demonstrate how yeast is activated using room temperature water and sugar. Allow students to smell the activated yeast and observe the increase in volume and gas. 4. Explain that students will investigate the impact of temperature on the activation of yeast. They will alter the temperature of the water and use a balloon to trap the gas released by the yeast, then measure the circumference of the balloon. 5. Discuss the variables for the investigation: • What will be changed? (temperature of the water) • What will be measured? (the circumference of the balloon) • What will be kept the same? (amount of yeast, amount of sugar, volume of water, time left) 6. In small groups, students use the planning format to write a question, a prediction, a procedure and a plan for data collection. 7. Complete the planning aspect, ready to complete the investigation in the next lesson.

Term 2 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • What impact does temperature have on yeast? • Was the investigation fair? • How could you improve your investigation? • How does your prediction compare to your results? **Support notes** Each group will need the following: Bottle 1: Water from the fridge Bottle 2: Room temperature water (a control) Bottle 3: Lukewarm water (mix boiling water with tap water, 50–50 ratio) Bottle 4: Teacher demonstration of boiling water **Resources** • Yeast • Sugar • Empty bottles • Water (different temperatures – cold, room temperature, lukewarm and boiling) • Balloons • Measuring tapes • Funnels **Safety considerations** Make sure the water from the kettle (bottle 4) is a teacher demonstration, for safety.	**Learning experiences 1 and 2** 1. Students make observations and take measurements on both the plants from their salinity investigation and the bread from their mould investigation. 2. Review the method that the class will be following to complete the yeast investigation, as planned in the last lesson. 3. Remind students of any safety risks that need to be minimised. 4. Set up the investigation with three bottles per group and one bottle for the teacher to use for boiling water. 5. Use a digital thermometer to measure the temperature of each water sample. 6. Support students to use a funnel to add the yeast and sugar to the bottles. 7. Students conduct the investigation by recording their data on the circumference of the balloons in tables and watching the teacher complete the investigation with the boiled water. 8. Once all the data has been collected, lead students through turning their data into a column graph. 9. Model how to use the column graph to identify any patterns, and how to draw a conclusion from these patterns. For example, 'The yeast released the most gas at _____ temperature and so _____ water would be the ideal temperature to activate yeast'.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Formative assessment** Observe if students can: • conduct their investigation independently and minimise safety risks • construct an accurate column graph • recognise and describe patterns in their data • evaluate the fairness of their investigation and ways to improve.	10. Students look for their own patterns and conclusions and fill in the analysing section of their investigation template. 11. In their groups, students evaluate the fairness of their investigation and how it might have been improved. 12. Compare their results to their prediction and fill in the evaluating section of the investigation template.

Term 2 Week 5

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Planning and conducting** Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation	**Focus questions** • What is the best way to display your data? • What impact does salinity have on plants? • Was your investigation fair? • Why are repeatable investigations important in Science? **Support notes** When disposing of plants and materials, ensure the soil that received salt water is thrown out rather than placed in a garden bed. **Suggested assessment points** **Formative assessment** Observe if students can: • construct an accurate line graph • interpret information from their data displays • evaluate the fairness of their investigation and suggest improvements • compare their results to their prediction.	**Learning experiences 1 and 2** 1. Give students time to make observations and take measurements on both the plants from their salinity investigation and the bread from their mould investigation. 2. This will be the last week of measurement and observations of the plants. Ask students to review any images they took throughout the process. 3. Students share their results verbally, including height and any other visual observations such as colour and the general health of the plant. 4. In their groups, students discuss whether their data should be displayed using a column graph or a line graph and why. 5. Reach a consensus as a class, guiding the discussion if necessary (a line graph should be chosen due to the continuous data collected; however, multiple lines will be needed). 6. Lead students in turning their data into a line graph. 7. Students use their graph to make conclusions about the possible effect of salinity on plants, as modelled to them in the previous week's investigation. 8. Students put ideas into their investigation template. 9. Ask students to evaluate the fairness of their investigation, and ways to improve it as well as compare their prediction to their results. Fill in the evaluating section of the template.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		10. Have a discussion on the term ‘repeatable investigation’. Students consider if their salinity investigation was repeatable. Ask students, ‘How does repeating an investigation make it more reliable?’ 11. What does reliable data look like?

Term 2 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Planning and conducting** Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • What environmental factors impact mould growth? • What features does an effective science report have? **Support notes** As students have spent most of the term working on concurrently running investigations, they will choose one of them to write a report on. The amount of scaffolding necessary for students to complete their report is to be determined by the teacher. **Resources** • Examples of science reports downloaded from *Science Journal for Kids and Teens* at https://www.sciencejournalforkids.org/ **Suggested assessment points** **Summative assessment** Observe if students can: • represent their observations in accurate ways • draw conclusions from their results • evaluate the fairness of their investigation with an explanation • identify features of a scientific report.	**Learning experience 1** 1. Students complete the final observation of their mouldy bread pieces. Review any images and diagrams collected by students throughout the investigation. 2. Students may want to view each other's bread pieces to observe any interesting results. 3. Using only the pieces of bread from their group, students make a statement about environmental impacts on mould growth to put into their investigation template. For example, the more moisture present on a piece of bread, the more mould will grow; or mould grows more on pieces of bread in the dark than pieces in sunlight. 4. Within their groups, students evaluate the fairness of their investigation and compare the results to their prediction. They fill in the information in the evaluating section of their investigation template. 5. As a class, construct a list of factors that promote mould growth and factors that inhibit mould growth. **Learning experience 2** 1. Recap the three investigations that students have been working on during the last five weeks: salinity, mould and yeast. 2. Explain that students are going to choose one of their investigations to complete a scientific report on, as they did last term.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		3. Show students several scientific reports downloaded from *Science Journal for Kids and Teens* at https://www.sciencejournalforkids.org/. In small groups, allow them time to analyse the structure and language features of the reports. 4. As a class, decide on the important language features and make a list of what students will be expected to include in their own report. 5. Students start writing their chosen investigation as a report. This report writing will be continued in the next week.

Term 2 Week 7

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What features does an effective science report have? • Why did peppered moths change their colouring? **Support notes** Peppered moths were observed to have changed colours in a short amount of time coinciding with the industrial revolution. As areas became more polluted, tree bark darkened with smog, and so the moths adapted to a darker colour to camouflage. In areas with less pollution, where tree bark remained light, moths remained light in colour. Bernard Kettlewell conducted a lot of this research in the 1950s. The Museum of Natural History has a *Peppered Moth Game* that shows the mechanics of how many of each moth gets eaten in each environment and the effect on their population: https://learningzone.oumnh.ox.ac.uk/peppered-moth-game. **Resources** • Examples of science reports downloaded from *Science Journal for Kids and Teens* at https://www.sciencejournalforkids.org/ • Internet-enabled device required to complete the game and research	**Learning experience 1** 1. Students continue working on their report, ensuring they have met all the agreed-upon language features from the previous lesson. 2. Students edit their report and add any design features, such as sub-headings, images, diagrams, tables and graphs. 3. Once all the reports are complete, compile them into a class science journal for display in the classroom or the school library. 4. Discuss why it is important for scientists to communicate their findings. Ask, 'How might the report you wrote be helpful to others? What could others learn from it?' **Learning experience 2** 1. Display images of light and dark peppered moths and give students time to brainstorm the visible adaptations the moths have. 2. Ask students to consider why the same species of moth may have such different colours, and how those colours might help the moth survive. 3. In partners, students research the reasons behind the differing colours of the peppered moths. 4. When making notes they should consider: the speed of which the coloured adaptations took place, what the ultimate cause of the differing colours was and the method that Bernard Kettlewell took to

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Summative assessment** Observe if students can: • identify features of a scientific report • reproduce a scientific report to communicate their findings • identify the role of humans in the growth and survival of other living things.	discover and investigate the adaptations of the moths. 5. Discuss all these points as a class, as well as how human activity is changing the climate and the impact that may have on living things. 6. Show students the Museum of Natural History's Peppered Moth Game, giving them time to play and explore the mechanics of the game. The game will be used more in the next lesson.

Term 2 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** The growth and survival of living things are affected by the changing conditions of their environment and the influence of human activities **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What patterns do you see in your graphs? • What is the relationship between the two sets of data? • What impact can humans have on living things? **Support notes** Choose a topic for students to investigate that is relevant to the local area or student context and interests. Some potential areas for research might include: • human impacts on the Great Barrier Reef • the impact of land clearing on soil salinity in the wheatbelt of Western Australia • the impact of plastic pollution on seabirds and other animals • the impact of introduced species on indigenous animals. Providing students with a limited range of topics chosen based on available information will support their research. Students research the current solutions to these problems and understand that although these issues are significant, they can be overcome. **Resources** • Internet-enabled device to complete the game and research	**Learning experience 1** 1. Review the adaptations of peppered moths from the previous lesson, and how human activity caused rapid changes. Remind students of the *Peppered Moth Game* from the Museum of Natural History. 2. In partners, assign one student to play three rounds in the unpolluted woodland and the other to play three rounds in the polluted woodland. 3. Once the three rounds are complete, students note down the population of the dark- and light-coloured moths for each round. 4. Instruct each student to create a column graph to match these results. Teachers provide scaffolding as appropriate. 5. Allow partners time to compare their graphs and identify any patterns. 6. Ask students to discuss: • What patterns are you seeing between the light- and dark-coloured moths? (One goes down, while the other goes up.) • What are you noticing between the two graphs? (They are the inverse of each other.) • Why did one type of moth (dark or light) go down so rapidly? (It was much easier to see and so got eaten more often.) 7. Together, students need to construct a paragraph to convey those findings discussed above.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Summative assessment** Observe if students can: • produce an accurate column graph • make reasonable conclusions from their data • explain a way that human activity impacts on the growth and survival of living things.	8. When complete, each pair can share their paragraph with another pair and see if their results were similar. **Learning experience 2** 1. Present the students with a topic about human impact on a natural environment (see support notes). View an online video as a hook for the chosen topic, such as a relevant *Behind the News* (Australian Broadcasting Corporation) episode. 2. Discuss the extent of the chosen problem/s, aspects of human impact and the difference people can make to the issue. 3. In small groups or individually, students research: • the cause of the problem • the impact it is having on living things in the area • ways to solve or lessen the impact of the problem. 4. Students report back to the class an outline of the problem, an effect on the environment and a possible solution.

Term 3

Weeks 1–8: Earth and space sciences

Term 3 Overview

Earth and space sciences The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods.							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Earth's structure	Investigation: earthquakes	Investigation: earthquakes	Earthquake-proof buildings	Tsunamis: mapping	Investigation: volcanoes	Extreme weather events	Investigation: floods
Tectonic plates	Investigation: earthquakes	Earthquake-proof buildings	Tsunamis	Volcanoes	Investigation: volcanoes	Investigation: floods	Investigation: floods
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
• Hard-boiled egg • playdough of different colours • sharp knife	• firm card • dirt • large grids or graph paper • weights • small toy animals, people, buildings and trees • *Fair test investigation* template (Appendix A)	• popsticks • straws (plastic or paper) • toothpicks • pipe cleaners • spaghetti (uncooked) • cardboard strips • plastic bricks	• popsticks • straws (plastic or paper) • toothpicks • pipe cleaners • spaghetti (uncooked) • cardboard strips • plastic bricks • masking tape • materials outlined in the WASP demonstration	• Geoscience Australia – *Student Activities* (2004 Indian Ocean Tsunami resource)	• *Fair test investigation* template (Appendix A) • beakers or clear jars • clingwrap • straws • four liquids of various viscosity, e.g. margarine, honey, tomato sauce, water	• *Fair test investigation* template (Appendix A) • watering cans	• watering cans

Term 3 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What are some of the ways the surface of Earth has changed? • What causes movement of the Earth's surface? • What happens beneath the surface of Earth? • What is meant by plate tectonics and continental drift? • What evidence is there of plate tectonics? **Support notes** Evidence for plate tectonics and continental drift that students may find and reference include the way the continents appear to be able to fit together like a puzzle, the similarity in fossil records across continents, live animals that had a common ancestor spread across different continents and glacial evidence. **Resources** • Hard-boiled egg • Modelling clay in different colours • A sharp knife retained by the teacher **Suggested assessment points** **Diagnostic assessment** Observe if students can: • name the layers of Earth • identify how changes on Earth's surface may occur • use evidence to support their ideas.	**Learning experience 1** 1. Give students five minutes to record what they know about what features of Earth have been shaped by movement. How does the movement of the Earth's surface shape our planet and cause natural events like earthquakes, volcanoes and tsunamis? 2. Show students a hard-boiled egg and ask students what is below the shell. The shell represents the crust of Earth that all living things reside on. 3. Cut the egg lengthways and ask the students to observe the interior. The white represents the mantle, and the yolk represents the outer and inner core. 4. Using the egg as inspiration, ask students to draw a labelled diagram. 5. Explain to students that they will be making a model of Earth's layers using modelling clay. Show students a suitable image of Earth showing four layers: inner-core, outer-core, mantle and crust. 6. Students create their own models by making a ball to represent the core, which they wrap in modelling clay to represent the other layers. Slice the model in half and label with toothpicks and paper. **Learning experience 2** 1. Explain that the crust floats on the mantle and is divided into sections called tectonic plates.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		2. Display a simple map showing the edges of the plates. Ask students to infer what kind of things might be happening where those plates meet (earthquakes, mountains, volcanoes). 3. Display another image of the 'ring of fire' showing the position of volcanoes. Compare the two images, and how the volcano placement relates to the edge of tectonic plates. 4. Instruct students how to use their hands to model the movement of the tectonic plate and what may result from these movements, e.g. plates crashing together could result in mountains, volcanoes or earthquakes. 5. Explain that when scientist Alfred Wegner first proposed 'continental drift', he was ridiculed and no one believed him. Over time, evidence was found that showed that Alfred Wegner was most probably right. 6. Working in small groups, students research and write a short paragraph (or use dot points) to provide evidence for the theory of plate tectonics and continental drift. 7. Students share their evidence with the wider class.

Term 3 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science Inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables	**Focus questions** • What causes earthquakes? • What might be happening on the crust when an earthquake is occurring? • How can you test the damage that occurs in relation to the epicentre? **Support notes** To complete the investigation students will use large grids to represent a town. In the middle of the grid there should be an 'X' to represent an epicentre, the simulated origin of the earthquake. Toys of people, buildings, animals, trees etc. can be placed on different points of the grid. When a small weight is dropped on the epicentre, damage is recorded as the toys that have moved off their spot or fallen over. The magnitude of the earthquake can be increased by dropping a heavier weight each time or increasing the height of the drop. This investigation works best on a spongy surface such as carpet. Please note this investigation doesn't represent the exact mechanics of how an earthquake takes place, but rather reinforces the idea that earthquakes vary in magnitude and are strongest around the epicentre. **Safety considerations** Students should drop the weights, not throw them. Smaller weights of up to 200 g should be used.	**Learning experience 1 and 2** 1. Remind students of tectonic plates and ask them to demonstrate with their hands what kind of tectonic plate movement might cause an Earthquake. (Almost any type of plate movement can result in an Earthquake.) 2. Simulate tectonic plate movement with pieces of firm card piled with dirt. 3. Pose questions about the measurement of movement of tectonic plates and introduce the seismograph (ground monitoring equipment used in earthquake measurement) and Richter scale (invented to quantify the magnitude of the earthquake, as measured by seismograph). View online images of seismographs to see how they work. 4. Introduce the vocabulary 'epicentre' and explain that students will be completing an investigation by using a model town to investigate epicentres of earthquakes. 5. Model to students how the investigation will be carried out by dropping the weight on the epicentre. 6. In groups, the students discuss what they could change to increase the magnitude of the earthquake. As a class, decide how to increase the magnitude of the earthquake.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Resources • Firm card • Dirt • Large grids or graph paper • Weights • Small toy animals, people, buildings and trees • *Fair test investigation* template (Appendix A) **Suggested assessment points** **Formative assessment** Observe if students can: • identify variables and utilise them to create a question and prediction. • conduct their investigation safely. • devise ways to accurately record their results.	7. Discuss: • What will be changed? (class choice – height of weight drop or the mass of the weight) • What will be measured? (the amount of damage) • What will be kept the same? (the grid, the placement of the items, the surface, any other variable that hasn't been changed) 8. Students record these variables in their investigation template and use them to create a question and prediction. 9. Students produce a set of instructions that are clear and can be followed by others. 10. Allow students time to discuss how they might record the damage that occurs on each part of the grid with each drop, such as drawing the grid and writing an 'X' to represent each item that moves or falls over. 11. Conduct the investigation and discuss the preliminary results.

Term 3 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • How can you display your data in an appropriate way? • What conclusions can you make from your data? • Was your investigation fair? How could you improve it? • How are structures made to be earthquake resistant? **Support notes** In the second learning experience, students are learning about, and designing, a building to withstand earthquakes. They may need to research some design features that will aid with this, such as shapes used in the construction, and the flexibility of the building. When displaying video footage of earthquakes, teachers should view it first to ensure no distressing content is present. **Resources** • Popsticks • Straws (plastic or paper) • Toothpicks • Pipe cleaners • Spaghetti (uncooked) • Cardboard strips • Plastic bricks • Masking tape	**Learning experience 1** 1. Review the results of the investigation from the previous week. 2. Discuss how to display the data in an appropriate graph, focusing on the function of line and column graphs. Students should deduce that a column graph is the most appropriate choice as no continuous data was recorded. 3. Students create a column graph to show their results. Teachers provide scaffolding as appropriate. 4. Model how to draw conclusions based on the data. For example, as the weight was dropped from a higher point, the amount of damage was higher. 5. Students fill in the analysing section of their investigation template. 6. In their groups, students compare their results to their predictions and evaluate the fairness of their investigation. Students should discuss ways to improve their methodology, to make it fairer and repeatable. 7. Students fill out the evaluating section of the *Fair test investigation* template. **Learning experience 2** 1. Show students some online videos of buildings being affected by earthquakes. 2. Discuss what makes some buildings safer in earthquakes than others.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Formative assessment** Observe if students can: • compare the function of different data displays • construct an appropriate graph to display data • compare their predictions to the results • evaluate the fairness of their investigation and suggest improvements.	3. Explain that, in countries that are earthquake prone, buildings are designed to withstand earthquakes. Tell students that they will be building a model and testing it to see if it can withstand an earthquake (table shaking). 4. In small groups, students design and construct buildings to withstand earthquakes. Provide students with the following criteria for their structures: • at least 30 cm tall • fit into a 15 cm by 15 cm square • remains upright and whole for at least 10 seconds of table shaking. 5. Demonstrate to students how hard and long the table will be shaken, to aid their planning 6. Begin the planning, with the design and construction process to be continued in the next lesson.

Term 3 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science Inquiry** **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • How could you improve your design? • What causes tsunamis? • What kind of damage can tsunamis create? • How should people respond to a tsunami warning? **Support notes** Earthquakes can create movement of the seafloor, which can cause a tsunami. Tsunamis can travel long distances and impact countries far away from the initial tremor. The second learning experience is based on lessons from AusEarthEd in their Woodside Australian Science Project (WASP). The information on how to set up the tsunami demonstration can be found at https://www.wasp.edu.au/mod/resource/view.php?id=431. **Resources** • Popsticks • Straws (plastic or paper) • Toothpicks • Pipe cleaners • Spaghetti (uncooked) • Cardboard strips • Plastic bricks • Masking tape • Materials outlined in the WASP demonstration	**Learning experience 1** 1. Students continue with their design and testing process for their buildings, ensuring they meet the criteria outlined in the previous lesson. 2. Once complete, students write a paragraph to explain the design factors of their building that should make it earthquake resistant. 3. Test towers by shaking a table. All towers should be tested simultaneously to ensure they are under the same conditions. 4. Discuss the results and why each tower remained upright. Focus on materials and engineering. 5. In their groups, students discuss how they would change the construction if they had to build again. **Learning experience 2** 1. Brainstorm the impacts that an earthquake can have on Earth's surface and living things, e.g. can create fissures/cracks, bring down buildings and trees or create tsunamis. 2. Ask students to infer how earthquakes cause tsunamis. 3. Show students the tsunami demonstration set-up (see support notes) and discuss formations of the beach and ocean. 4. Students share a verbal prediction of what they think will happen in the tray when a tsunami is simulated. 5. Complete the demonstration as outlined in the notes.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Formative assessment** Observe if students can: • explain their design choices and their intended function • explain the cause of tsunamis • identify the impact tsunamis can have on living and non-living things in the environment.	Make verbal observations of what changed in the landscape and how the living things were impacted. 6. Students draw a diagram using arrows to show the movement of the waves and answer the following questions: • What caused the tsunami? • How did the tsunami impact the sand on the beach? • What happened to the living things? • What should people do if there is a tsunami warning? (The student may need to be guided or complete research to answer.) 7. Students share their first answer with a small group and add any extra information to their notes. Rotate students into a new group for each successive answer.

Term 3 Week 5

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science inquiry** **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • How can you read this map to get information about how the tsunami travelled? • How are tsunamis predicted? • How are volcanoes formed? • How do volcanoes impact the surface of the Earth and the things living on it? **Support notes** The first lesson is developed from resources provided from the Australian Government Geoscience Australia. The resource can be accessed at https://d28rz98at9flks.cloudfront.net/71987/Rec2011_027_student_activities.pdf, with the resource sheet referenced in this lesson on p. 5. Ensure any video footage shown in class is previewed to avoid any distressing images. **Resources** • Geoscience Australia – *Student Activities* (2004 Indian Ocean Tsunami resource) https://d28rz98at9flks.cloudfront.net/71987/Rec2011_027_student_activities.pdf	**Learning experience 1** 1. View online videos of tsunamis and their impacts. 2. Review the mechanism of tsunamis from the demonstration in the previous lesson. 3. Pose the question, 'How do authorities know to give a tsunami warning?' Give students time to discuss before sharing ideas as a class. Reference previously introduced vocabulary, such as seismometer, magnitude, Richter scale. 4. Explain that seismologists and other Earth scientists use equipment to measure any tremors in the Earth and monitor wave strength using buoys. The magnitude of earthquakes and other Earth events enables scientists to work out when and where tsunami waves might hit. 5. Display the map shown on the Geoscience Australia resource, page 5 (see support notes on how to access). 6. Look at the various symbols and markings on the map and discuss what they mean and represent. 7. Model how to complete the first line of the table, using the map to decipher the time it took for the tsunami to travel. 8. Allow students to complete the rest of the table independently before going through answers as a class and clearing up any misconceptions. **Learning experience 2** 1. On a sticky note, students write a sentence about how they think volcanoes are formed.

Connected learning

The mapping activity connects to the Geography sub-strand in the Humanities and Social Sciences curriculum for Year 6. Teachers may want to explore the cultures of the countries represented in further detail.

Suggested assessment points

Summative assessment

Observe if students can:

- use the map to ascertain information correctly.

Formative assessment

Observe if students can:

- identify the cause of volcanoes and the impact they have on Earth's surface and living things.

2. Explain that volcanoes are formed from relative movements at the plate boundaries.
3. Display images of various volcanoes from around the world and discuss their different shapes and colours. Flatter volcanoes are referred to as shield volcanoes, and those that are steeper and more conical are referred to as stratovolcanoes.
4. In partners, students create a T-chart and use books, internet searches and prior knowledge to input the impact of volcanoes on Earth's crust and living things. Remind students that impact doesn't have to mean a negative effect; volcanoes can be very beneficial to the Earth and the things living on it.

Living things	Earth's surface
• Hot lava can kill living things (plants and animals) • Ash provides rich nutrients for plants • Some of the gas discharged from volcanoes causes the Earth to cool for up to three years • Displaces living things	• Stratovolcanoes change the landscape • Aids production of extrusive igneous rocks • Creates geysers and hot springs • Can cause mudflows • Changes the seafloor

5. Share ideas as a class so students can add information to their T-charts.
6. Find and watch video footage or eruptions, and slow flowing lava to observe the possible impacts.

Term 3 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables	**Focus questions** • How does the viscosity of lava impact the shape of a volcano and the nature of its eruptions? • How do you write a clear method? • Why is a clear method important in Science? **Support notes** This investigation is taken from AusEarthEd WASP resources at https://www.wasp.edu.au/mod/resource/view.php?id=4111 In this investigation, most of the template is completed verbally or collaboratively to provide more time to focus on methodology. Depending on the needs of the students, teachers may choose to focus on other science inquiry skills. Providing a clear methodology that others can understand allows peers to validate results and therefore make the results more reliable. **Resources** • *Fair test investigation* template (Appendix A) • Beakers or clear jars • Clingwrap • Straws • Four liquids of various viscosity, e.g. margarine, honey, tomato sauce, water	**Learning experiences 1 and 2** 1. Review the shapes of a variety of volcanoes and ask students to discuss why they differ so much. Ask, 'If the outer structure of volcanoes is made from cooled lava, what do the different shapes tell us about the lava?' 2. Explain to students that they are going to do an investigation, using liquids to represent lava. They put different liquids into a jar or beaker and cover it with clingwrap. They then use a straw to blow into the liquid and observe the amount of movement and splatter. Show the students a variety of liquids of various viscosities. Discuss the differences between them. 3. As a class, complete the investigation template, discussing what is being changed (type of liquid), measured (how the liquids move) and kept the same (amount of liquid, straw, beaker and clingwrap set-up). Predictions can be verbal or shared using a collaborative learning strategy. 4. In small groups, distribute the materials and ask students to identify two potential safety risks and how to minimise them, e.g. not swallowing the substances. 5. Allow students time to complete their investigation and note down observations. 6. Guide students to make connections between what they observed and real volcanoes. Volcanoes with

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Formative assessment** Observe if students can: • identify and minimise safety risks • create a clear and repeatable method • provide constructive feedback to peers that demonstrates an understanding of investigation method • explain the connection between clear methodology and reliability of results.	thicker lava are likely to be more conical in shape and be more explosive. Volcanoes with thinner/runnier lava are likely to be flatter in shape and have eruptions that flow far. 7. Review the steps that students took to complete the investigation. Discuss what makes a method easy to follow. 8. Give students time to write a clear method using appropriate scientific vocabulary. 9. Talk to students about how to provide kind, respectful and constructive criticism. Swap methods with a peer and ask them to give appropriate feedback. 10. Students edit their methods to align with the feedback. 11. Discuss as a class why clear methodologies for science investigations are important and lead to more reliable data.

Term 3 Week 7

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations	**Focus questions** • What is meant by extreme weather? • What are some examples of extreme weather? • How does human activity contribute to extreme weather? **Support notes** The Intergovernmental Panel on Climate Change defines extreme weather as 'an event that is rare at a particular place and time of year.' (Intergovernmental Panel on Climate Change, 2023) According to NASA it includes: • heat extremes • wildfires • droughts • cyclones • heavy rain or snow • rising floods. (NASA, n.d.) Use sticky notes to record the variables that students contribute to the discussion. These may be manipulated physically to help students understand how the parts of a testable question can be developed. Ensure the sticky notes are accessible and visible to students to support the planning of investigations.	**Learning experience 1** 1. Discuss what is meant by extreme weather and brainstorm types of extreme weather (see support notes). 2. View images or videos online of extreme weather events and relate to any extreme weather events that may have been experienced in the local area. 3. Give students a fishbone diagram, or direct them how to draw their own, with each 'bone' being a separate extreme weather event. 4. Discuss with students what things to consider for 'good research', e.g. using reliable sources, putting things into their own words or looking up meaning of unknown words. 5. Students use internet searches to discover what each extreme weather event is and what causes them. Students add these to the fishbone diagrams. 6. On the bottom of the sheet, students devise a short definition of what is meant by extreme weather events. 7. Discuss with students the connection between human activity, climate change and extreme weather events, e.g. burning fossil fuels leads to more carbon dioxide in the atmosphere, leading to increased water temperatures and more intense storms.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Resources • *Fair test investigation* template (Appendix A) • Watering cans **Suggested assessment point** **Summative assessment** Observe if students can: • identify and define extreme weather events • plan a scientific investigation • make a prediction reasonable to the investigation.	**Learning experience 2** 1. Ask students to call out extreme weather events from the previous lesson and record on the board. Focus on floods or flash floods, discussing their cause and what kind of impact they may have on the environment and the living things within it. 2. Demonstrate to students the impact of pouring water on soil that has no vegetation. Pour water from different heights, in different amounts, and on different surfaces (sandpit, potting mix, grassed area and a well-planted area). 3. Identify and discuss both the variables that were changed and those that were kept the same, and the notion of fair testing (variables may include volume of water, speed of pour, distance from the soil surface and slope of the surface). 4. Identify and discuss what could be measured. This is a difficult task and depends on student observation. Encourage students to use technology, where possible, and rulers to ensure observations are objective. Digital technology may assist in capturing footage that can be replayed slowly to show the displacement and movement of soil. 5. Students plan an investigation, using a variable discussed, to demonstrate the erosion of soil caused by water. 6. They complete relevant sections in the investigation template: questioning and predicting, planning and conducting.

Term 3 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** The effect of sudden geological events on Earth's surface, such as tsunamis, earthquakes and volcanic eruptions, and extreme weather, such as cyclones, extreme heat and floods. **Science inquiry** **Planning and conducting** Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What have you found out about the impact of flooding on soil and vegetation? • What issues did you find during your investigation? • How could you improve these issues? **Resources** • Watering cans **Suggested assessment point** **Summative assessment** Observe if students can: • demonstrate understanding of the investigation process • present results and data in a suitable format • suggest improvements to the investigation.	**Learning experiences 1 and 2** 1. Discuss the student-directed investigation methods discussed the previous week in small groups to check for understanding. 2. Address the complexities of measuring variables in most of the investigations and explore strategies to ensure quality observations to record results. 3. Students conduct the investigation as planned and record observations and results (using digital technologies as appropriate). 4. Students use their observations to make general conclusions of their findings, such as 'When water flows through dirt with no vegetation, the dirt moves a lot more'. Students add these conclusions to the analysing section on their investigation template. 5. Students compare their predictions to their results in the evaluating section. 6. In small groups, students identify the challenges they encountered and observed during the investigation and how they could remedy these in future investigations. They add this information to their template. 7. Conclude the activity as a class and consider how knowledge, understanding and ideas could be shared to inform decision making.

Term 4

Weeks 1–8: Chemical sciences

Term 4 Overview

Chemical sciences Materials can undergo reversible changes and irreversible changes							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Changes to states of matter	Solubility introduction	Summative assessment: *Changes to materials can be reversible or irreversible* Investigation: solubility (Appendix C)	Investigation: solubility – representing relationships	Investigation: rust	Separating mixtures	Water filtration	Investigation: rust
Matter	Investigation: solubility	Investigation: solubility	Reversible and irreversible changes	Investigation: rust	Water filtration	Irreversible changes: baking	Investigation: rust
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
• ice • heat source • pan • substances to freeze (see support notes) • freezer • sugar • small containers • spoons	• sugar • water • small containers • measuring spoons • mixing spoons • salt	• water of various temperatures • cups • measuring spoons • mixing spoons • salt	• bread • corn kernels • egg • chocolate buttons • heat source to cook ingredients	• steel wool • resealable bags • salt • water • vinegar	• marbles • sand • black pepper • salt • plastic spoons • sieves • bowls • water filter materials (see support notes)	• materials for filtration systems (see support notes) • ingredients for recipes (see support notes)	

Term 4 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

Science understanding
 	
Chemical sciences
Materials can undergo reversible changes and irreversible changes
 	
Science inquiry
 	
Questioning and predicting
Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions
 	
Processing, modelling and analysing
Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables
 	
Communicating
Communicate ideas in a variety of ways including scientific reports with appropriate language features
	Focus questions
	• What is matter?
	• What is the effect of heating and cooling different substances (ingredients)?
	• Is water the only substance that can be in all three states of matter?
	• What is solubility?
	
	Support notes
	A simple scientific drawing represents information clearly and concisely. A diagram may also exemplify a change process that is or has taken place. See marking key (Appendix C).
	
	Students require a basic understanding of science variable terminology. The information in brackets is provided for the teacher:
	• What will I change? (independent variable)
	• What will I measure? (dependant variable)
	• What will I keep the same? (controlled variable)
	
	Resources
	• Ice
	• Heat source to heat pan
	• Pan
	• Substances to freeze: coconut oil, olive oil, tomato sauce, honey, mayonnaise
	• Sugar
	• Small containers
	• Spoons
		Learning experience 1
		1. Complete a KWL chart to establish student knowledge and understanding of matter and the three states in which it exists: solid, liquid and gas.
		2. Demonstrate the three states in which water exists (melt ice in a pot and bring water to the boil, then capture steam in a glass container/bowl).
		3. Use labelled diagrams to explain and discuss the change of state and the correct terminology.
		4. Demonstrate how to label diagrams correctly. Students complete their own diagram.
		5. Introduce and define the words reversible and irreversible. Students give a show of hands to indicate whether turning ice into water and then gas is reversible or irreversible.
		6. Discuss how simple and familiar kitchen ingredients (substances) act and may react to heating and freezing (change of state). Substances may include coconut oil, olive oil, tomato sauce, honey or mayonnaise.
		7. Make predictions and discuss reasons why the changes may occur.
		8. Describe the observable properties of the substance in liquid state:
		  • how it moves and acts
		  • viscosity
		  • transparency.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment point **Formative assessment** Observe if students can: • explain and provide examples of the three states of matter • demonstrate observations and understanding in a scientific diagram • make a prediction reasonable to the investigation.	9. Conduct the activity placing all substances in small, individual, see-through containers (plastic cups, sandwich bags or ice cube trays) and freezing them. **Learning experience 2** 1. View the items put into the freezer previously and model how to complete a detailed diagram, showing the changes to the substances. 2. Students draw a detailed diagram of one of the substances. 3. Ask students to vote whether the changes are reversible or irreversible for each substance. Students should deduce that a change of state is always reversible, as the type of matter stays the same. 4. Use a collaborative learning strategy to predict and discuss the number of teaspoons of sugar that would 'fit' into a small transparent container. 5. Students test their predictions and record the results and observations. 6. Compare and discuss findings with others. Discuss fairness of testing and ways to improve the accuracy of results. (Results will be used in the following lesson.) 7. Introduce the concept of solubility using sugar and warm water. View sample online materials to exemplify the process under extreme magnification.

Term 4 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

Science understanding
 	
Chemical sciences
Materials can undergo reversible changes and irreversible changes
 	
Science inquiry
 	
Questioning and predicting
Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions
 	
Planning and conducting
Plan and conduct fair, safe and repeatable investigations
 	
Use equipment to observe, measure and record data
	Focus questions
	• What is solubility?
	• What is saturation?
	• What factors impact solubility?
	
	Support notes
	
	The second learning experience uses the same principles, but changes the substance being dissolved. The investigation will lead into the assessment outlined in Appendix C. Students will test four temperatures of water: cold, room temperature, warm (50% room temperature, 50% boiling) and hot boiled water.
	
	Solubility – the ability of a substance to dissolve into another substance.
	
	Saturation – the maximum amount of a substance has been dissolved into another substance so that no more can be dissolved.
	
	Resources
	• *Fair test investigation* template (Appendix A)
	• Sugar
	• Water
	• Measuring spoons
	• Cups
	• Salt
		Learning experience 1
		1. Compare the predictions and results of the previous lesson's activity. How many spoons of sugar fit into a container?
		2. Discuss sugar as a state of matter in its granular state.
		3. Review the concept of solubility using sugar and warm water.
		4. Pose the question, 'How many spoons of sugar will fit into a container of water?'
		5. Model the planning of the investigation.
		  • What will I change? (water/no water)
		  • What will I measure? (the number of spoons of sugar)
		  • What will I keep the same? (volume and temperature of water, water agitation)
		6. Develop the question to be investigated by the class.
		7. Students share predictions verbally in their group, using comparative language where appropriate, e.g. 'I think fewer spoons of sugar will fit into the cup with water than the cup without water'.
		8. Conduct the investigation in the same way as the practical activity in the last lesson and record results.
		9. Discuss findings and compare to the predictions.
		
		Learning experience 2
		1. Devise a class definition of solubility (see support notes and Glossary).

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment point **Formative assessment** Observe if students can: • plan a scientific investigation • identify variables to be changed, measured and kept the same • make a prediction reasonable to the investigation • identify potential safety risks and ways to minimise.	2. Discuss the term 'saturation' and how students would know that the saturation point has been reached. (No more can be dissolved into the water.) 3. Show students table salt and compare its structure to the sugar they used in previous activities. 4. Pose the question: Does temperature impact the amount of salt that can be dissolved? 5. Lead students through planning the investigation, using collaborative strategies to identify: • What is being changed? (the temperature of the water) • What is being measured? (the amount of salt being dissolved) • What is being kept the same? (the volume of water, the size of the spoon, the substance being dissolved and the amount of stirring) 6. Students use these variables to devise a question and prediction that is reasonable for the investigation and add them to their template. 7. If needed, students complete the method and materials section in their template. 8. Students identify two potential safety risks and ways to minimise these risks, e.g. the teacher using the boiling water or not consuming any of the solution. 9. Students draw a detailed diagram of the set-up of the investigation, including labels and annotations.

Term 4 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** Materials can undergo reversible changes and irreversible changes **Science inquiry** **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation	**Focus questions** • Does temperature impact the solubility of a substance? • How can you minimise risk? • How will you keep your investigation fair? **Support notes** Students complete their investigation and should find that the warmer the water is, the more salt can be dissolved before reaching saturation. Show students the marking key (Appendix C). **Resources** • Assessment marking key (Appendix C) • Water of various temperatures • Cups • Spoons • Salt **Suggested assessment point** These learning experiences and student understanding form part of the assessment task (Appendix C). **Formative assessment** Observe if students can: • conduct an investigation safely and fairly • identify patterns and explain them in their results • explain whether their investigation was fair and suggest improvements to their methodology • compare their results to their prediction.	**Learning experiences 1 and 2** 1. Review the method that students will follow to complete their investigation involving the temperature of water and solubility. 2. Share the student ideas of safety risks identified in the previous lesson. Establish a set of safe classroom behaviours and practices, material safety risks and risk minimisation strategies. 3. In small groups, students devise a table to record their results, and the steps they will take to keep the investigation as fair as possible. 4. Distribute the materials to groups and allow students time to complete the investigation. 5. Ask various groups to summarise their findings to the class and discuss patterns and relationships in data. 6. Fill out the analysing section of the investigation template. 7. Discuss fair testing and challenges that students may have encountered. 8. Compare the results with the predictions made and discuss possible reasons behind them. 9. Students use this information to fill out the evaluating section of their investigation template. 10. Discuss the materials selected and consider alternatives that could be changed and measured. Students share any other testable questions regarding the solubility of substances. 11. Save one of the saturated solutions to observe later.

Term 4 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** Materials can undergo reversible changes and irreversible changes **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features	**Focus questions** • What relationship did you observe in the investigation? • How can you represent this relationship? • What evidence can you see for reversible and irreversible changes? **Support notes** If the water has not completely evaporated in the saved sample from the investigation, it may need to be reviewed later once it has evaporated; however, some salt crystals should still be visible. Teachers should choose examples of reversible and irreversible changes that are able to be completed in a safe manner. Other examples include ripping paper, lighting a candle and making sandcastles. **Resources** • Bread • Corn kernels • Egg • Chocolate buttons • Heat sources to heat/cook the ingredients **Suggested assessment point** **Summative assessment** Observe if students can: • articulate the relationship between the change and measurable variables	**Learning experience 1** 1. Remind students of the question originally asked: Does temperature impact the amount of salt that can be dissolved? 2. Students devise a short answer to the question based on the evidence they collected during the investigation. 3. Explain to students that the relationship between the variables (the temperature of the water and the amount of salt that could dissolve) is what was being investigated. 4. In their investigation groups, students plan a way to represent that relationship, identify the two variables and show the evidence collected, e.g. a column graph or a pictograph. 5. Allow students time to execute their plan either individually or in a group. 6. Students swap their work with another group/student and provide clear and respectful feedback on the effectiveness of their display. 7. Students indicate if they think that dissolving salt in water is a reversible or irreversible change. Show students the saturated solution saved from the investigation and look for changes. If the water has completely evaporated, the salt will be left behind. It is a reversible change.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• display data in an accurate way • classify changes as reversible or irreversible • identify some evidence to support these classifications.	**Learning experience 2** 1. On the board, construct a T-chart with reversible and irreversible changes. Students share some ideas to add to the chart. 2. Discuss and observe kitchen ingredients that are changed (heated or cooled) and are either reversible or irreversible such as: • bread (toast) • corn kernels (popped) • egg (fried) • chocolate buttons (melted). 3. Students discuss whether these changes are reversible or irreversible and why they think that. For example, the corn kernels have turned into a different chemical substance and cannot be changed back. 4. Make an ongoing list of evidence that students noticed that could indicate irreversible changes, e.g. smell or a change in colour, temperature or consistency. 5. Add the changes to the T-chart as they are completed. Students copy the chart and add their own ideas of reversible and irreversible changes.

Term 4 Week 5

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** Materials can undergo reversible changes and irreversible changes **Science inquiry** **Questioning and predicting** Pose testable questions that include variables to be measured and changed, and apply science knowledge to make predictions **Planning and conducting** Plan and conduct fair, safe and repeatable investigations Use equipment to observe, measure and record data **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What causes rust? • What materials rust? • What environmental factors can increase rust production? • How can you plan a fair investigation using your scientific knowledge? **Support notes** Students will investigate the impact of environmental factors on the production of rust; for example, water, salt and acid. This investigation starts with a hypothetical scenario: 'A lot of objects in the school are made from iron or steel. The principal would like us to investigate how we can protect these items from rusting and weathering'. **Resources** • *Fair test investigation* template (Appendix A) • Steel wool • Resealable bags • Salt • Water • Vinegar Measuring of rust during this investigation is based on observation and judgement. Digital images taken at scheduled intervals may be useful.	**Learning experiences 1 and 2** 1. Share images and online footage of Western Australia's Pilbara region. View images from space to exemplify the starkness and colour variations in the landscape. 2. In small groups, use a KWL strategy to establish student knowledge and understanding of the Pilbara. 3. Discuss the composition of the rock and the high amount of iron that is present (and the chemical weathering known as oxidisation or rust with iron and steel). 4. Students share a time they have experienced rust, such as on a bike left outside. 5. Explain to students that rust can damage some materials. Identify any objects in the school that may be made of iron or steel and therefore be susceptible to rust. 6. Tell students the principal wants to ensure that those items don't rust and are able to be used safely into the future. Students need to research and investigate factors that impact rust. 7. Students research what can contribute to rust and share their findings in small groups or to the class. Remind students they need to be able to put their research into their own words to demonstrate their understanding. 8. Once students have shared their information, put them into small groups and explain they will be investigating their research findings. Each group will have three pieces of steel wool kept in resealable bags. One bag

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment point **Formative assessment** Observe if students can: • identify and explain impacts on rust • identify change and measurable variables • use those variables to make a testable question and reasonable prediction • use clearly labelled diagrams and annotations to represent and communicate understanding.	will have nothing added apart from the steel wool, and they need to decide what they will add to the other bags based on their research, e.g. plain and salt water, water and vinegar, lemon juice and dry salt etc. 9. Guide students to identify the variables: • change (the substances in the bag with the steel wool) • measure (the amount of rust forming) • keep the same (the amount of steel wool, the temperature they are kept in). 10. Students use the variables to construct a question and prediction and fill in their template. 11. Students set up their investigation, taking a digital image and adding detailed diagrams to their template.

Term 4 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

Science understanding
 	
Chemical sciences
Materials can undergo reversible changes and irreversible changes
 	
Science inquiry
 	
Communicating
Communicate ideas in a variety of ways, including scientific reports with appropriate language features
 	
Collaborating and applying
Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research
	Focus questions
	• Are these mixtures reversible or irreversible?
	• How could you reverse the mixtures?
	• What is an irreversible change that could happen?
	• Where does water come from?
	• How can individuals conserve water?
	• How can water be cleaned?
	
	Support notes
	Locate teacher support information and resources to exemplify water recycling examples and filtration systems online. For example, search terms such as, 'natural water filter', 'DIY water filter' etc.
	
	When constructing a filter, teachers and students need to consider using a variety of materials that will filter larger sediment down to small pieces of sediment. For example, use pebbles, gravel, sand and a coffee filter.
	
	Resources
	• Marbles
	• Sand
	• Black pepper
	• Salt
	• Plastic spoon
	• Sieve
	• Bowls
	• Materials for the chosen water filter
		Learning experience 1
		1. Students check their rust investigation set-up, taking digital photos and making observations.
		2. Demonstrate mixing the following:
		  • sand and marbles
		  • salt and black pepper (finely ground).
		3. Pose the question: Can these processes be reversed, and how?
		4. Ask students to brainstorm how they would separate the mixtures.
		5. Demonstrate separating the marble and sand mixture using a sieve. Make more of the mixture and distribute to small groups with sieves to separate.
		6. Demonstrate using static electricity on a plastic spoon to lift the pepper.
		7. Students test separating pepper from the salt using static electricity.
		8. Students record the mixture and processes to separate them using diagrams.
		9. Students come up with an irreversible change that can happen to marbles, sand, salt or pepper. For example, turning the sand into glass.
		
		Learning experience 2
		1. Use a cooperative learning strategy to discuss:
		  • water uses in the home
		  • where the water goes from the drain
		  • water recycling.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Connected learning Teachers can continue the investigation into water and resource use, to bring in the Cross-curriculum Priority Sustainability. **Suggested assessment point** **Formative assessment** Observe if students can: • identify a change as reversible or irreversible • explain how to reverse a change • draw a clearly labelled diagram to exemplify the design.	2. Identify and discuss the fact that water is a finite resource and the implications of this. Discuss with students how water can be filtered and cleaned for reuse, e.g. with wastewater or salt water. 3. Pose the question: Can a tablespoon of sand be removed from 500 mL of water? 4. View online examples of how sand may be removed from water. 5. Discuss the pros and cons of these methods. 6. Choose a simple water filter system for practical demonstration, e.g. coffee filters and gravel. Discuss the stages or grades of filtration that occur. 7. Students draw a labelled diagram of the water filter system observed. 8. In small groups, students design and draw an improved water filter to test in the following lesson. Specify the materials required.

Term 4 Week 7

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** Materials can undergo reversible changes and irreversible changes **Science inquiry** **Planning and conducting** Use equipment to observe, measure and record data **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • How successful was your filtration system? • How could you improve your filtration system? • What indicators can you look for to signal an irreversible change? • What has changed during the baking process to show you whether there has been a reversible or irreversible change? **Support notes** In the first learning experience, the students are building their filtration system as planned in the lesson before. The focus should be on evaluating the successfulness of the design and ways to improve their idea, rather than a completely successful project. In the second learning experience, teachers are required to choose a simple recipe that suits the equipment available and the needs of the students. The recipe needs to be cooked or baked as part of the process, to produce an irreversible change. Some examples are butter cookies, vanilla cake, pancakes, muffins, cupcakes etc. **Safety considerations** When choosing a recipe, teachers should consider any medical needs of students and staff, including allergies. In general, things should never be consumed in science unless with permission from the teacher.	**Learning experience 1** 1. Students check their rust investigation, taking digital photos and making observations. 2. Review the water filtration process from the previous lesson. 3. Discuss and review student planning and address concerns and questions. 4. Students construct and test their design. 5. Compare water colour/clarity with other students. Use digital technology to record information. 6. Students evaluate the plan and suggest improvements to the design to further improve the filtration of the water. **Learning experience 2** 1. Review the T-charts from earlier in the unit and instruct students to add any other reversible or irreversible changes they have learnt. 2. Focusing on irreversible changes, give students five minutes to write down as many indicators as they can think of that may indicate an irreversible change, e.g. change in smell, temperature, giving off light, change in colour or texture. 3. Discuss ideas as a class and reinforce that one of the biggest indicators of an irreversible change is that a completely new substance has been generated. 4. Begin baking the chosen recipe as a class, identifying each ingredient and process as you go.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Resources • materials for students to build their own filtration systems based on their plans, e.g. gravel, sand, rocks, filter paper, leaves, twigs, or containers • ingredients for chosen recipe **Suggested assessment points** **Summative assessment** Observe if students can: • evaluate the success of their filtration system with explanations • identify indicators of an irreversible change • use evidence from their observations to make a conjecture.	5. Once the mixture is complete and ready to go into the oven, discuss the steps that could be reversed or not. For example, an egg can't be uncracked; water can be evaporated out. 6. Before cooking the recipe, students make observations of the temperature, texture, colour, smell etc. 7. Cook/bake the recipe and ask students to make the same observations on temperature, texture, colour and smell. 8. Students compare their observations of before and after baking and identify the changes that occurred. Ask the students if any of the cooking/baking steps can be reversed and provide evidence for their answer, e.g. the cake cannot go back to being a raw batter because a whole new substance has been made. The colour, texture and smell have changed. 9. Allow students to eat the recipe and note any interesting observations of taste, texture.

Term 4 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** Materials can undergo reversible changes and irreversible changes **Science inquiry** **Planning and conducting** Use equipment to observe, measure and record data **Processing, modelling and analysing** Organise and represent data using tables, graphs and models to identify the relationships between measured and changed variables **Evaluating** Compare findings with those of others, and to predictions; evaluate the fairness of an investigation and suggest improvements; and pose questions for further investigation **Communicating** Communicate ideas in a variety of ways, including scientific reports with appropriate language features **Collaborating and applying** Use science knowledge to develop considered responses to problems, at a local and global level, through investigation and research	**Focus questions** • What factors impact rust production? • How can rust production be prevented? • Was your investigation fair? How could you improve it? • How can you represent this information? • What evidence can you use to support your ideas? **Support notes** If possible, invite the principal in at the end of the lesson to see the students' ideas. **Suggested assessment points** **Summative assessment** Observe if students can: • use their results to make conclusions • evaluate the fairness of their investigation and ways to improve • compare their results to their predictions • identify and use evidence.	**Learning experience 1 and 2** 1. Students look at and photograph their rust investigation and make any relevant observations. 2. In their investigation template, students fill in a short summary of their results in the analysing section. 3. With their group peers, students evaluate the fairness of their investigation and any improvements that could have been made to their method. Add this information to the evaluating section of their template. 4. Students compare their results to their prediction. 5. Discuss the importance of every group having a piece of steel wool that nothing was added to. This piece would be referred to as the 'control' so that all the other results can be compared to how steel wool would react with nothing changed. 6. Remind students that the original goal of the investigation was to give information to the principal about how to protect the objects made of steel and iron. 7. Students decide how to represent this information and what they would like to say, e.g. 'the steel items should be kept away from salt and coated in a protective layer'. This may include writing a letter or putting together an infographic or a picture collage using the digital images taken throughout the investigation. 8. Independent research may be required to determine prevention strategies. 9. Reinforce that students should be using evidence from their investigation to support their arguments. 10. Their ideas should be sent to the principal or presented in person.

Appendix A

Resources

Fair test investigation template Name: _____

Questioning and predicting

Group members: _____

Task title: _____

State the variables for this investigation.

What I will change (independent variable)	**What I will measure** (dependent variable)	**What I will keep the same** (controlled variables)

Write the question to be investigated.

_____

_____

_____

_____

_____

Write a prediction for the investigation and explain why you think this will happen.

_____

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Marking key

Description	✓
Questioning and predicting	✓
Correctly identifies the variable to be changed (independent variable)	
Correctly identifies the variable to be measured (dependent variable)	
Correctly identifies at least two controlled variables	
Writes a question that can be investigated and is reasonable	
Writes a question that identifies how variables will be: • changed • measured	
Writes a question that is reasonable	
Writes a prediction that describes a relationship between the dependent variable and the independent variable **OR** Writes a prediction that describes a relationship between the dependent variable and the independent variable, and matches the question posed	
Provides a reasonable explanation for making the prediction	

Fair test investigation template Name: _____

Planning and conducting

Group members: _____

Task title: _____

List the equipment required for the investigation.

_____

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Describe the possible safety risks in this investigation and suggest how they can be managed or controlled.

Safety risks	How they can be managed or controlled

Write the method for this investigation.

Include how the variables will be changed, measured and controlled.

Draw a labelled diagram or provide a digital representation of the equipment set-up.

Describe your observations and record your results in an appropriate table.

Table title: _____

Marking key

Description	✓
Planning and conducting	✓
Selects the appropriate equipment required to conduct the investigation	
Explains the choice of equipment required to conduct the investigation	
Identifies safety risks associated with the investigation	
Uses equipment safely	
Provides a method for the investigation	
Includes a logical sequence of steps for the method	
Uses appropriate language with reference to science terms **OR** Uses appropriate language with reference to science terms. Provides details regarding measurement and data collection, specific and relevant to the investigation	
Provides a method which contains sufficient detail to allow for repeat trials, or so the investigation may be replicated Includes the details: • how the independent variable is changed • how the dependent variable is measured • how other variables are controlled • the method is easy to follow	
Draws a clear diagram that includes: • equipment shown correctly set up • correct labels	
Draws a table that includes: • descriptive title containing dependent and independent variables • information relevant to the investigation • appropriate column headings with units of measurement (if applicable)	
Data collection is accurate	
Data is interpreted **OR** Data is interpreted and understood in relation to the investigation	

Fair test investigation template Name: _____

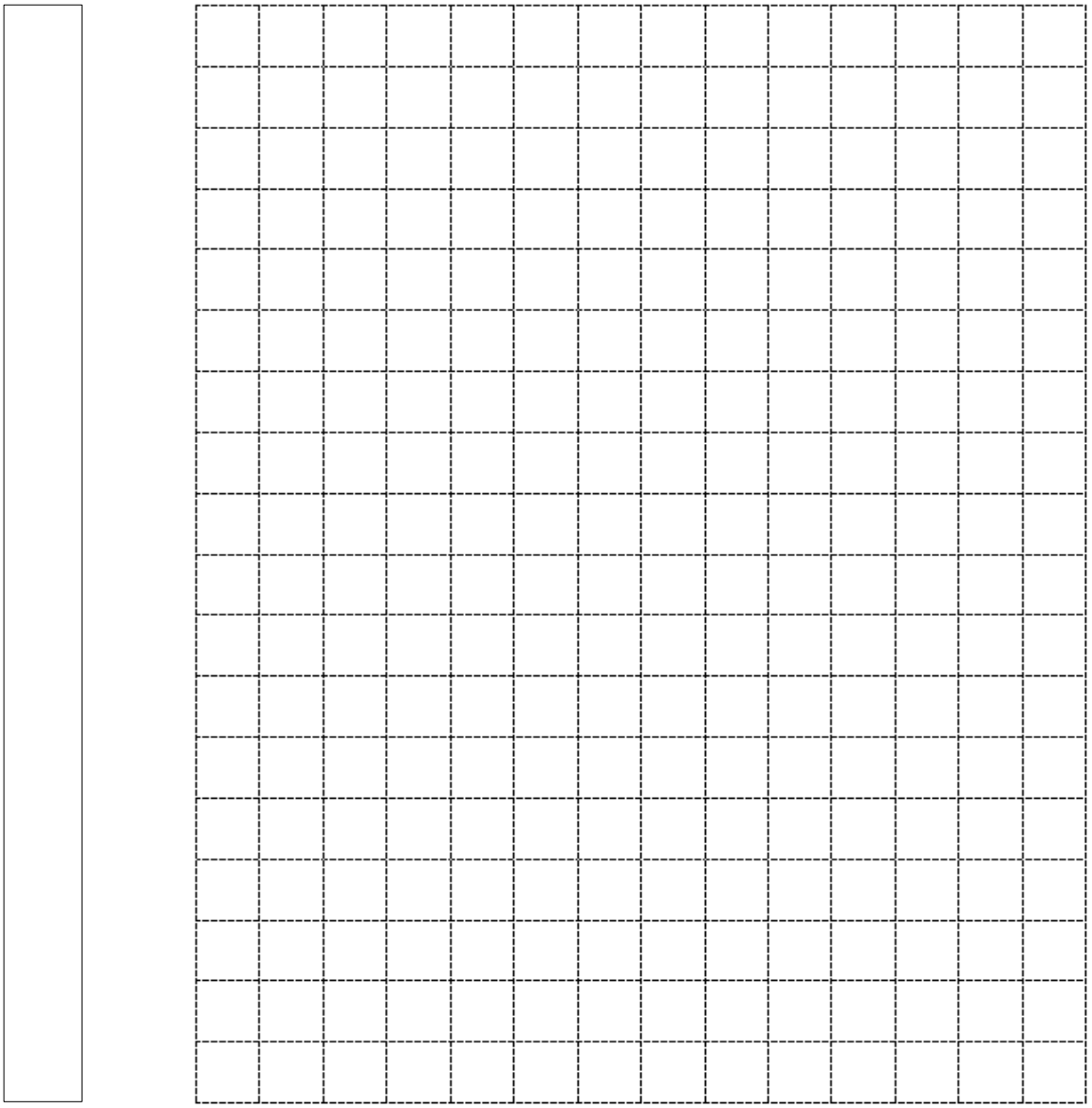
Processing, modelling and analysing

Group members: _____

Task title: _____

Graph the results of the investigation. Label each of the axes and include appropriate units of measurement.

Graph title: _____



Marking key

Description	✓
Processing, modelling and analysing	✓
Graphs results collected from the investigation (if applicable): • provides appropriate graph title • labels axes correctly • includes appropriate units of measurement • plots results correctly • draws the appropriate type of graph	

Fair test investigation template Name: _____

Processing, modelling and analysing; and Evaluating

Group members: _____

Task title: _____

Analysing data
Describe the relationships or patterns in the results.

Evaluating
Was your prediction correct? Why or why not?

Was this a fair investigation? Why or why not? How can the investigation be improved?

Marking key

Description	✓
Processing, modelling and analysing	✓
Describes the relationships or patterns in the results	
Refers to specific results when describing the relationship	
Applies science ideas and understanding to the explanation	
Uses appropriate science terminology and language	
Evaluating	✓
Compares the results to their prediction	
Identifies difficulties experienced when conducting the investigation May include reference to, but is not limited to: quality of the data, correct use of equipment and choice of equipment	
Makes suggestions to overcome the difficulties described	

Appendix B

Assessment task 1

Student-directed investigation

Task details

Title	Student-directed investigation
Description	Students develop an investigable question and conduct a student-directed investigation. They then independently complete the Planning and conducting section of the investigation template for submission as a summative assessment piece.
Type of assessment	Summative
Purpose of assessment	To demonstrate Science inquiry skills of Planning and conducting of investigations
Evidence to be collected	Investigation template
Suggested time	One 60-minute lesson in class
Differentiation	Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged. Where appropriate, teachers may either scaffold or extend the scope of the assessment tasks.

Content descriptions

Science inquiry

- Plan and conduct fair, safe and repeatable investigations
- Use equipment to observe, measure and record data

Task preparation

Prior learning

The teacher-directed investigation commenced in Week 4 is used to model the Physical sciences content and investigation process. Students are familiar with the investigation templates used as part of the learning experiences.

Resources

- *Fair task investigation* template (Appendix A): Planning and conducting
- Various materials to test for conductivity
- Wires
- 9V batteries
- Globes

Instructions for teacher

Ensure students are familiar with all sections of the *Fair task investigation* template (Appendix A) referenced throughout the exemplar, and used for teaching, learning and assessment.

The teaching and learning sequence has been timetabled to start in Week 4 (Physical sciences) and requires approximately two hours to teach and assess the content. Teachers may choose to do this as a learning activity or a formative or a summative assessment based on their professional judgement and student learning.

Explain the following to the students, paraphrasing where necessary:

Investigate what materials allow electricity to pass through and light a globe. Complete the planning and conducting section of the investigation template with as much information as possible.

Instructions to students

Investigate what materials allow electricity to pass through and light a globe. Complete the planning and conducting section of the investigation planner with as much information as possible.

Marking key

Description	✓
Planning and conducting	✓
Selects the appropriate equipment required to conduct the investigation	
Explains the choice of equipment required to conduct the investigation	
Identifies safety risks associated with the investigation	
Uses equipment safely	
Provides a method for the investigation	
Includes a logical sequence of steps for the method	
Uses of appropriate language with reference to science terms **OR** Uses appropriate language with reference to science terms. Provides details regarding measurement and data collection, specific and relevant to the investigation	
Provides a method which contains sufficient detail to allow for repeat trials, or so the investigation may be replicated Detail includes: • how the independent variable is changed • how the dependent variable is measured • how other variables are controlled • method is easily followed	
Draws a clear diagram that includes: • equipment shown correctly set up • correct labels	
Draws a table that includes: • descriptive title containing dependent and independent variables • information relevant to the investigation • appropriate column headings with units of measurement (if applicable)	
Data collection is accurate	
Data is interpreted **OR** Data is interpreted and understood in relation to the investigation	

Appendix C

Assessment task 2

Changes to materials can be reversible or irreversible

Task details

Title	Changes to materials can be reversible or irreversible
Description	Students communicate Chemical sciences knowledge and understanding using a clearly labelled diagram and annotations
Type of assessment	Formative or summative
Purpose of assessment	To demonstrate Science understanding and the application of a scientific idea to the investigation conducted
Evidence to be collected	Diagrams and written annotations (and incidental verbal explanations)
Suggested time	One 60-minute lesson in class
Differentiation	Teachers should differentiate their teaching and assessment to meet the specific learning needs of their students, based on their level of readiness to learn and their need to be challenged. Where appropriate, teachers may either scaffold or extend the scope of the assessment tasks.

Content descriptions

Science understanding

- Materials can undergo reversible changes and irreversible changes

Science inquiry

- Communicate ideas in a variety of ways, including scientific reports with appropriate language features

Task preparation

Prior learning

The student-directed investigation commenced in Week 3, Chemical sciences, is used as the source of data and information for this assessment.

Resources

Fair test investigation template (Appendix A): Analysing and evaluating

- Table salt
- Water of varying temperatures
- Cups
- Measuring spoons
- Mixing spoons

Instructions for teacher

The student-directed investigation commenced in Week 2, learning experience 1 provides the context for observation and assessment. Students investigate the number of teaspoons of salt that can be dissolved in varying temperatures of water. The investigation process facilitates opportunities for students to engage in a practical approach to changing variables and exploring scientific ideas. As the salt-water solution evaporates, the salt crystals remain. Students draw a scientific diagram with labels and annotations to explain the reversible process observed.

Instructions to students

Draw a scientific diagram of the salt-water solution investigation.

Demonstrate your science knowledge and understanding of the change that has taken place, identifying whether the change is reversible or irreversible.

Include the following information:

- a neat diagram that represents the investigation (consider the scale of the diagram)
- correct labels
- ruled lines
- an informative title
- annotations that demonstrate knowledge and understanding of the change process that has taken place
- a statement indicating whether the change is reversible or irreversible and how that conclusion was reached.

Marking key

Description	✓
Science understanding: **Chemical sciences** Materials can undergo reversible changes and irreversible changes	✓
Identifies that salt is a solid	
Explains that salt can be dissolved in water	
Explains that the salt crystals become smaller and there is a change in state when they are dissolved	
Refers to saturation of water (when the water can dissolve no more salt)	
Identifies that the change to the salt is reversible	
Identifies that the water evaporates and the salt remains	
Science inquiry: Communicating Communicate ideas in a variety of ways, including scientific reports with appropriate language features Diagram includes:	✓
Relevant and descriptive title	
Neat and clear illustration	
Use of appropriate labels	
Use of annotations to explain scientific concepts	
Ruled lines	

Acknowledgements

Term 1, Week 7

Support notes

brgfx. (n.d.). *Science Experiment of Circuits* [Diagram]. Retrieved December, 2025, from https://www.freepik.com/free-vector/science-experiment-circuits_19703408.htm#fromView=search&page=1&position=20&uuid=c222d183-b2e6-4117-b5f0-e90a6d43f9b1&query=parallel+circuits

Term 3, Week 7

Support notes

Quote from: Intergovernmental Panel on Climate Change (IPCC). (2023). *Climate Change 2021 – The Physical Science Basis: Working Group I Contribution to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. Retrieved December, 2025, from https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-11/

Term 3, Week 7

Support notes

Information from: NASA. (n.d.). *Extreme Weather and Climate Change*. Retrieved December, 2025, from https://science.nasa.gov/climate-change/extreme-weather/