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

Science

Teaching, learning and assessment exemplar

Year 3

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 four 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. The 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/science/overview/science-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 3, students observe the characteristics of living things and use these to group them. They apply criteria to identify things as living, non-living or once-living. They recall the observable properties of solids and liquids and understand that a change of state is caused by adding or removing heat. Students identify important Earth resources and how humans and other living things use them in interconnected ways. They learn energy can be transferred and transformed.

Students pose questions and make predictions. They plan and conduct fair investigations and compare their findings with others, and to their predictions. They represent observations and data using simple tables and column graphs or other visual or physical models and communicate ideas and findings using scientific vocabulary. Students use science knowledge to propose explanations for observed phenomena and solutions to problems.

Achievement standard

By the end of the year:

Students group living things based on their characteristics and distinguish them from non-living and once-living things. They recall the observable properties of solids and liquids and understand that a change of state in a substance results from adding or removing heat. Students recognise that soils, rocks and minerals are important Earth resources and are used by both humans and other living things in different and interconnected ways. They understand that energy can be transferred and transformed.

Students explore science ideas by posing guided questions about the effect on one variable of changing another. They make predictions, with assistance, and test them by planning and conducting safe investigations that account for variables to be kept the same. They make and record observations with some familiar scaled instruments, such as thermometers. They organise data using tables, column graphs or models. With support, they communicate findings using familiar scientific vocabulary. Students use science knowledge to propose explanations for observed phenomena and simple solutions to problems.

Term 1

Weeks 1–8: Physical sciences

Overview

Physical sciences Energy can move from one thing to another (transfer), and change form (transform)							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Energy introduction	Practical: Heat energy	Investigation: Heat transfer	Energy transformation: Introduction and stations	Investigation: Rubber band car	Investigation: Rubber band car	Conductors and insulators review	Bringing it all together: Transfer and transform investigation – Slinky®
Energy transfer	Investigation: Heat transfer	Investigation: Heat transfer	Investigation: Rubber band car	Investigation: Rubber band car	Energy transfer: review	Practical: Energy transformation review	Investigation: Slinky – communicating
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
• sticky notes • sports equipment	• cups • kettle • food dye • spoons (metal and wooden) • various heat sources • infrared/radar thermometer	• spoons (metal and wooden) • timers • various heat sources • infrared/radar thermometer	• hair dryer • torch • drum • plants (or pictures of them) • glow-in-the-dark objects • Slinky • rubber band car materials	• rubber band cars • measuring tapes or rulers	• Newton's cradle	• electric cord • coloured paper • timers • infrared/radar thermometer	• Slinky • timers • blocks or other building materials based on the chosen investigation

Term 1 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** Energy can move from one thing to another (transfer), and change form (transform) **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • What is energy? • Where does energy come from? • How can energy be used? • What does 'energy transfer' mean? • How can energy be transferred? • When/where does energy transfer in everyday life? **Support notes** The first learning experience is an introduction to the topic. The focus is on exploring, observing and constructing learning. Students should begin to use appropriate scientific vocabulary to talk about energy transformation and transfer. Energy is the capacity to do work, such as to produce movement, heat or light. Energy cannot be created or destroyed, but it can be transferred (moved) or transformed (changed). Energy cannot disappear; it needs to have moved to a different object or be changed into another type of energy. In both learning experiences, students are required to construct diagrams using scientific vocabulary. In the second learning experience, this idea is built on by adding arrows that show the transfer of energy.	**Learning experience 1** 1. Introduce students to the topic of energy by asking them to brainstorm what they know about energy, types of energy or examples of energy. Students record their ideas on a graphic organiser, sticky notes, a class chart or with digital technologies before discussing. 2. Share ideas as a class and discuss common types of energy, such as: • chemical • electrical • kinetic (movement) • sound • heat • light. Have students act out or call out examples of these types of energy. Draw attention to how they use or observe these types of energy in everyday life. 3. Reinforce the concept that energy can't be made or lost, but it can be changed (transformed) or moved (transferred) from one object to another. As a class, define: • energy • transfer • transform. 4. Revisit the everyday examples from earlier in the lesson and discuss whether it is transfer or transformation of energy that is occurring. For example, when students

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Resources • Images of energy sources to inform brainstorm • Sticky notes • Sports equipment, such as beanbags, cricket bats and balls, or basketballs, depending on availability **Safety considerations** Teachers should make decisions about equipment that is safe and suitable for students to use. Risks can be minimised by the teacher demonstrating investigations. Student safety remains paramount at all times. **Suggested assessment points** **Diagnostic assessment** • Ideas given during the brainstorm session will provide teachers with information about students' prior knowledge and any misconceptions that may exist. **Formative assessment** Observe if students can: • use scientific vocabulary in their verbal discussions and models • communicate their ideas using models, including arrows and labels, to accurately show the transfer of energy.	kick a ball, energy is transferring from their foot to the ball; and when they turn on the heater, energy is transforming from electricity to heat. 5. Students choose two or three examples of energy usage to draw and describe. **Learning experience 2** 1. Review types of energy. Ask students to write or draw on a sticky note an example of energy at work. As a class, sort the examples into the type of energy being used. For example, lights would be electrical energy, throwing a ball would be kinetic energy and singing would be sound energy. 2. A common form of energy transfer is when kinetic (movement) energy is passed from one moving object to a still object. In a suitable area (e.g. outside grassed area), use sports equipment (e.g. soccer balls, beanbags, basketballs, or cricket bats and balls) to demonstrate this transfer of energy. Allow all students to try it and investigate changing the amount of energy used. 3. In class, discuss students' observations and model drawing a diagram of what happened. Use labels and arrows to show the transfer of energy. Students produce their own diagram, with a focus on arrows accurately showing the transfer of energy between objects.

Term 1 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** Energy can move from one thing to another (transfer), and change form (transform) **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • What are the different forms of energy? • Is heat a form of energy? • What does 'energy transfer' mean? • What are some examples of energy transfer? • How can heat transfer from one object to another? • Does heat transfer to some materials more easily than others? **Support notes** In the first learning experience, students consider heat as energy. Heat gives more energy to atoms, allowing them to move faster and further apart from each other. Hot water has more energy than cold water; therefore, when food dye is dropped into the hot water, it moves around and mixes quicker than if it would in cold water. This demonstration will allow students to observe the extra energy at work. Heat always moves from the hotter object to the colder object. In the second learning experience, the teacher shows an example of using a heat source to heat a metal spoon. The heat source used depends on what is readily available. Some examples include placing the spoon on a hot water bottle or in a cup with hot water.	**Learning experience 1** 1. Show students five everyday objects and ask them to share ideas of how each item is related to energy. For example, a hot water bottle (heat energy), a toy car (kinetic energy), a torch (light energy) or an instrument (sound energy). 2. Remind students that energy can move (transfer) from one object to another. Heat is an example of energy that moves in three ways. 3. Ask students to share examples they have experienced of heat moving, e.g. sitting around a camp fire, baking a cake, using a hot water bottle, petting or holding a pet and feeling their warmth. 4. As a class, choose one example to turn into a flow chart showing the transfer of heat. For example, holding a mug of hot chocolate. Electrical energy is transformed (changed) into heat energy to heat up water in a kettle → the hot water is transferred to the mug → the heat from the mug is transferred to someone's hands when they touch the mug. 5. In small groups or as a whole class, set up two clear cups of water, one with hot water and one at room temperature. Discuss safety around hot water. 6. Ask students to predict what will happen when food dye is dropped into each container. Will the food dye act the same or differently in hot and cold water? 7. Discuss how to make it a fair test.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Resources Everyday objects to show during the introduction of the lesson: • Copies of the *Fair test investigation* template (Appendix A) • Clear cups • Kettle/means of heating water • Food dye • Metal spoons (enough for one for each group) • Wooden spoons (enough for one for each group) • Timers • Access to heat sources, e.g. hot water bottles, hot water, heaters • Infrared/radar thermometer. **Suggested assessment point** **Formative assessment** Observe if students can: • use scientific vocabulary (e.g. transfer, kinetic) to explain the transfer of energy • develop, with guidance, questions that include what is being changed and measured • produce, with guidance, a prediction that identifies what they think will happen when a variable is changed.	• What are we changing? (temperature of the water) • What are we measuring or observing? (how the food dye acts) • What are we trying to keep the same? (the amount of food dye, the amount of water, not stirring the contents etc.) 8. Students take a photo of the containers after the food dye is dropped to easily observe the difference. 9. Compare the results to the predictions made before the food dye was added. Was there anything that could be changed to make the test fairer? Do students have any new questions about heat or energy in general? 10. Ask students to explain why the dye mixes in quickly to the hot water and more slowly in the room-temperature water. Discuss the ideas. **Learning experience 2** 1. Pose the question: Does heat energy transfer differently between different materials? Show students a metal spoon and ask them to predict how heat might move into the spoon. Allow students to touch the spoon to gauge the starting temperature and use an infrared thermometer to take an accurate temperature. 2. Put the spoon on/in a heat source for one or two minutes and then compare the temperature of the spoon now to the temperature before. 3. As a class, draw a diagram showing how the heat moved from the heat source to the metal spoon.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		4. Place students in groups and provide each with a metal spoon and a wooden spoon. Ask each group to brainstorm ways to add heat to the spoons, e.g. putting them out in the sunlight or in front of a heater, holding them in their hands or putting them in hot water. Groups will test two of these ideas. 5. Lead students through the process of planning the investigation using the *Fair test investigation* template, including consideration of: • what they will change (the material of the spoons) • what they will measure (the temperature of the spoons) • what they will keep the same (time, method of measurement, size of spoon etc.). 6. Ask students to write the question, 'If we change the material the spoon is made of, what will happen to the temperature of the spoon?' Students should write their prediction in the format *If* _____, *then* _____. 7. Review the steps of the investigation that will be undertaken in the next lesson.

Term 1 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** Energy can move from one thing to another (transfer), and change form (transform) **Science inquiry** **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation	**Focus questions** • How do we make our investigation fair? • How will we measure our results? • What patterns did you notice in the results? **Support notes** In this investigation, students are placing metal and wooden spoons in or near heat sources to determine which material transfers heat easily. Revise safety protocols. Materials that let heat pass through easily are called conductors. Materials that don't let heat pass through easily are called insulators. As students are conducting the investigation, encourage them to keep the test as fair as possible. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Metal spoons (enough for one for each group) • Wooden spoons (enough for one for each group) • Timers • Access to heat sources, e.g. hot water bottles, hot water, heaters • Infrared/radar thermometer	**Learning experience 1** 1. Demonstrate how to use a timer accurately and allow students time to practise using the timer. Play a game to see how quickly students can start and stop the timer. The person with the smallest number of seconds (or milliseconds) on their timer wins. 2. Review the planning conducted in the last lesson and ways to keep the investigation fair. 3. Remind students of safety guidelines. 4. Allow students to conduct their investigation and record their results, either by observing which spoon felt hotter or by using an infrared/radar thermometer to record the temperature. 5. As a class, discuss the results. Was there a pattern that can be identified? What does that pattern tell us? 6. Fill in the 'Explain your results' section of the *Fair test investigation* template. Students may need to be assisted to articulate reasonable conclusions, e.g. 'The metal spoon was the hottest every time, so metal is a material that gets hot easily.' **Learning experience 2** 1. Ask students to consider the following items, and explain to the people around what material they should be made from and why: • frying pan • mug • blanket • wire.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment point **Formative assessment** Observe if students can: • conduct their investigation in a reasonable and safe manner • record their data in a table as accurately as possible • evaluate the fairness of their investigation • use their investigation to develop related questions.	2. Revisit the results from last lesson and review any patterns. For example, metal got hot easily, so metal is a good conductor of heat. This information can be added to the conclusions started in the last lesson, e.g. metal is a good conductor of heat, and wood is a poor conductor of heat. 3. Discuss the investigation and complete a PMI (Plus, Minus, Interesting) activity with students to help evaluate it. Fill out the 'Evaluating' section of the *Fair test investigation* template. Ask students: Was it a fair test? Focus on the accuracy of timing, placement near heat sources etc. If an infrared/radar thermometer wasn't used in this activity, this is a good opportunity to discuss the reliability of self-reported data. Ask students to discuss why a thermometer is a more accurate way to collect data. 4. On a sticky note, students should write any questions that they still have relating to the investigation. For example: • What do we call things that don't let heat pass through easily? • What other materials are good conductors? • Where do we use conductors in everyday life?

Term 1 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** Energy can move from one thing to another (transfer), and change form (transform) **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks	**Focus questions** • How can we observe an energy transformation? • What are some factors that affect potential energy being transformed into kinetic (movement) energy? • How can we make an investigation fair? • How do we record the results of an investigation? • How does energy change form? • What is an energy transformation? **Support notes** Energy transformation is when energy changes from one type of energy to another. Potential energy is stored energy that an object has due to its position and state, e.g. a stretched rubber band has the potential energy to move. The stations listed are to provide ideas for energy transformation. Changes should be made to suit resourcing or school context. To complete the investigation in Learning experience 2, children will use simple rubber band cars. There are many guides to make these cars online, such as Questacon's activity sheet: https://www.questacon.edu.au/sites/default/files/assets/discover/questacon-at-	**Learning experience 1** 1. Review what has been learned about energy. You may want to use a collaborative strategy, sticky notes, mind maps or digital resources, such as digital pin boards or collaborative apps, to gather ideas. 2. Ask students to share what they ate for dinner the night before. Explain that we eat food to give us energy to do all the things our body needs to do. We turn the food (chemical energy) into movement (mechanical energy). Exemplify this by going outside to a grassed area and playing a running game, e.g. Octopus, Fruit salad. 3. Commence a class chart of energy transformations and record the example from outside, that food (chemical energy) lets us run (mechanical energy). 4. Set up stations around the room to demonstrate other types of energy transformation based on equipment you have available. Some examples could be: • using a hairdryer on low/cold (electrical energy to heat energy) • using a torch (chemical energy to light energy) • banging on a drum (kinetic energy to sound energy) • looking at plants/taking pictures of plants (heat and light energy to chemical energy) • looking at glow-in-the-dark items, e.g. toys, glowsticks, stickers (chemical energy to light energy) • dropping a stretched Slinky® (potential energy to kinetic energy).

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	home/%5BQLAB%5D%20Energy%20Week%20-%20Rubber%20Band%20Racer%203-6.pdf. **Resources** Learning experience 1 • Hair dryer • Torch • Drum or other instrument • Live plants or pictures of plants • Glow-in-the-dark objects or glowsticks • Slinky Learning experience 2 • Copies of the *Fair test investigation* template (Appendix A) • One premade car • Popsticks • Rubber bands • Bottle caps • Straws • Wooden skewers • Hot glue gun **Connected learning** The rubber band car investigation integrates with the Engineering principles and systems, and the Materials and technologies specialisations contexts of Design and Technologies. **Suggested assessment points** **Formative assessment**	5. After students have spent time at each station, record the energy transformations on the class chart as well as any other examples they thought of during their investigations. 6. Introduce students to the terminology 'potential energy' by discussing the movement of the Slinky. The students observe potential energy when the Slinky is sitting still, and then it transforms into kinetic energy as it moves. Potential energy is when an object can move, but it is currently not. The energy is stored. As a class, come up with other examples of potential energy, e.g. a stretched rubber band, things high on a shelf or a ball waiting to be bounced. **Learning experience 2** 1. Call out the following examples of energy transfer and transformation: • using a torch (transformation) • kicking a soccer ball (transfer) • hitting a drum (transformation) • activating a glowstick (transformation) • frying an egg (transfer). Ask students to indicate whether they think each one is energy transfer or transformation. Have each student write their answers on a small whiteboard or give a thumbs up/thumbs down. 2. Explain to students that they will be investigating the movement of a rubber band car to observe whether the number of times it is wound affects how far it rolls. The car will transform potential energy into kinetic (movement) energy.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Observe if students can: • use appropriate scientific vocabulary when describing energy transformations, e.g. transform, kinetic, electrical, chemical • provide some examples of energy transformation • follow instructions to construct a rubber band car. **Summative assessment** Observe if students can: • produce a question and prediction that relates to the investigation and includes what is being changed and measured.	3. Provide the materials and instructions to make the cars, if working in groups; otherwise, proceed with a single car. 4. Lead students through the process of planning the investigation using the *Fair test investigation* template, including consideration of: • what they will change (the number of times they wind the rubber band) • what they will measure (the distance the car rolls) • what they will keep the same (surface, weight, car features, starting position etc.). 5. Ask students to write the question, 'If we change the number of times we wind the rubber band, what will happen to the distance the car rolls?' Students then write their prediction in the format *If* _____, *then* _____. 6. Ideally, the cars should be made and the investigation template set up prior to the next learning experience.

Term 1 Week 5

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** Energy can move from one thing to another (transfer), and change form (transform) **Science inquiry** **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns	**Focus questions** • How can we observe an energy transformation? • What are some factors that affect potential energy being transformed into kinetic (movement) energy? • How can we take accurate length measurements? • How can we make an investigation fair? • How do we record the results of an investigation? **Support notes** In the second learning experience, students create a column graph. Teachers are best placed to look at the needs of their students and determine the amount of scaffolding and guidance they may need to complete a column graph successfully. **Resources** • Completed rubber band cars • Measuring instruments, e.g. measuring tapes or rulers • Tablets (if making digital observations) • Column graph (premade by teacher) to show sample results **Connected learning** This investigation provides an opportunity for real-life applications of measurement from the Two-dimensional space and structures sub-strand of Measurement and geometry in Mathematics.	**Learning experience 1** 1. Show students what they will be using to measure distance in the investigation, e.g. tape measure or ruler. Demonstrate how to use it by measuring the length of a pace/step, focusing on lining the measuring tool up with the starting point and finishing point. Record this in a class table. 2. Students practise measuring their own paces in groups/pairs, helping each other to make accurate measurements. Have students record the measurement of their steps in the class table. 3. In groups, students find a smooth, flat surface to test their cars on as planned. Students may record their investigation using a digital device. They should record their results in a table like the one below or similar: **Number of turns** | **Distance travelled** | 4. As a class, discuss the investigation and how it went. Have students share preliminary results. Collect ideas on how they could make the investigation more accurate/reliable if they were to run it again. **Learning experience 2** 1. Show students a column graph of sample data from their investigation from the previous lessons using

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment point **Summative assessment** Observe if students can: • follow instructions to conduct the investigation safely • produce accurate data displays of their results, with guidance.	the same template that they will use. Draw attention to features of the graph, such as: • the X-axis (number of winds of the rubber band) and Y-axis (distance rolled) • title • axis labels. 2. Model the construction of a graph and guide students through the steps using the sample data. 3. Students create their own graph with the data they collected on the distance their rubber band car rolled in the previous lessons. The column graph can also be completed digitally, if appropriate for the school context. 4. In groups, students observe each other's graphs and provide feedback using *Two stars and a wish*, or other appropriate scaffolding. Talk to students about how to give and receive appropriate and helpful feedback before commencing.

Term 1 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** Energy can move from one thing to another (transfer), and change form (transform) **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • What patterns do you notice from the graph? • How do our predictions compare to the data? • Why might these differ? • What other investigations could we conduct? **Support notes** Students may require scaffolding to evaluate the investigation. The teacher is best placed to decide the degree of independence that is appropriate, and a gradual release of responsibility model is encouraged. The second learning experience revises energy transfer to ensure concepts are consolidated. Reinforce the idea that energy transfer is when the same type of energy is transferred from one object to another. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Student graphs • Newton's cradle **Suggested assessment points** **Formative assessment** Observe if students can: • draw diagrams to show the transfer of energy using labels and arrows.	**Learning experience 1** 1. Ask students to look at their graphs developed in the previous learning experience and to compare their predictions to the actual measurements. Students look at the column graph and table, and discuss their observations or conclusions. For example, 'The higher the number of times the rubber band was wound, the further the car would travel'. Students share their ideas verbally, then write a statement comparing their predictions and the results in the 'Explain your results' section of the *Fair test investigation* template. 2. Revise that a fair test is when only one thing (variable) is changed. In groups, students discuss whether they think it was a fair test or not, and why. Revisit the things that the class wanted to keep the same, to evaluate how well that was done. 3. Fill in the 'Evaluating' section of the *Fair test investigation* template as a class, in groups or individually. **Learning experience 2** 1. Show students a real Newton's cradle, or on a video if a real one is not available. Discuss what is happening in the cradle – Is it energy transfer or transformation? 2. Make a human 'Newton's cradle', where students line up and tap the person to their left or right to model the transfer of energy. The person at the end moves

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Summative assessment Observe if students can: • describe some information using evidence from their graph and table • compare their results to their prediction • provide some explanation on whether the investigation was fair.	further out and then comes back to tap the next person to send the energy back the other way. Demonstrate how the energy can only transfer through two people next to each other; it cannot skip ahead. This shows how objects transfer energy to the other objects they are touching. 3. Model how to draw a diagram that uses arrows to show the transfer of energy from one side of the cradle to the other. Remind students of other types of energy transfer discussed throughout the term and choose one to draw a diagram of. Focus on using arrows and accurate labels to show the transfer of energy. 4. In groups, students act out the example that they drew in their book, and the other students must guess what it is.

Term 1 Week 7

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<tr><th>Western Australian Curriculum content</th><th>Teaching and learning intentions</th><th>Learning experiences</th></tr>
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Science understanding

Physical sciences
Energy can move from one thing to another (transfer), and change form (transform)

Science inquiry

Questioning and predicting
Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed

Planning and conducting
Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks

Make and record observations, including formal measurements using familiar scaled instruments

Evaluating
Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation

Communicating
Communicate ideas using scientific vocabulary
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Focus questions
• What is a conductor?
• What is an insulator?
• What are some examples of conductors and insulators?
• How do we use conductors/insulators in our lives?
• What is energy transformation?
• Does colour affect how hot an object can get?
• What conclusions can you make about types of clothing to wear in different weathers, based on the investigation results?

Support notes
The second learning experience is a practical investigation on the transformation of light energy from the Sun into heat energy. Black absorbs all light wavelengths, making black objects get hotter, while white reflects all light wavelengths, making white objects stay cooler.

Resources
• Electrical cord
• Coloured paper
• Timers
• Infrared/radar thermometer
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Learning experience 1
1. Revise the new vocabulary that has been learned this term with a brainstorm. Briefly discuss the meaning of each word as they come up. If not mentioned, discuss the words ‘conduction’ and ‘conductor’.
2. Conductors are objects that let heat pass through them easily. Ask students what they think the opposite of a heat conductor may be. (Insulators: something that doesn’t let heat pass through easily.)
3. Construct a T-chart either as a class or individually to record examples of insulators and conductors.
4. As a class or individually, look around the classroom and school and put any insulators and conductors into charts. Add any other objects students can think of.

Some examples include:
<table>
<tr><th>Conductor</th><th>Insulator</th></tr>
<tr><td>frying pan
metal spoon
paper clip
seat belt buckle
metal bench</td><td>insulated drink bottle
Esky®
jumper
blanket
carpet
plastic
wood</td></tr>
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5. Students work collaboratively to share examples to add to the class or their own T-chart. The examples above are heat (thermal) conductors and insulators. However, materials can
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Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Safety considerations Western Power has more information and activities on electrical safety and conductors through their program *Electrical safety with Sparky*: https://www.westernpower.com.au/resources-education/school-education/electrical-safetyprograms/electrical-safety-with-sparky/. **Suggested assessment point** **Formative assessment** Observe if students can: • identify and explain some common conductors and insulators • describe the energy transformation that took place in the investigation • make some conclusions based on the results of the investigation, e.g. All of the darker colours were the hottest.	also be electrical conductors and insulators. 6. Show students a plug from any electrical item and discuss the materials that the wire and plug are made from (metal covered by plastic). This shows that metal is a good conductor of electricity, as the part of the plug that goes into the socket is metal. The rest of the plug and the wire is coated in plastic, which is a poor conductor of electricity. **Learning experience 2** 1. Review the class chart made earlier in the term about the types of energy transformation. Add any new ideas to the chart. 2. Remind students that energy transformation is when the type of energy changes from one type to another. For example, the Sun provides light energy, which can transform to heat energy. The light energy excites atoms, which transforms into heat. Ask students to share times that they have experienced heat energy from the Sun, and what they were wearing and doing. 3. Show students several coloured sheets of paper, including a white and a black sheet. 4. Pose the question: If we put these coloured sheets of paper in the heat of the Sun, what will happen to their temperature? 5. Ask students to predict which colour they think will be the hottest/coolest after being outside for 20 minutes. Collect their predictions in a tally chart or other data display. 6. Put the paper outside for 20 minutes. 7. While the paper is sitting outside, discuss how you are trying

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		to keep the test fair, including consideration of: • what they have changed (the colour of the paper) • what they are measuring (the temperature of the paper) • what they are keeping the same (the size of the paper, keeping them in full sunshine, the time outside etc.). 8. After 20 minutes, take the temperature of the paper. Without a thermometer, students will need to use their hands to judge and sort the colours. 9. Back inside, sort the colours from coolest to hottest. This should also follow the pattern of lightest to darkest colour. Discuss the reasons behind this (see Support notes). 10. Compare the results to the data display of predictions and discuss if it was a fair test. Was there anything that needed to change to make it a fairer test? 11. In pairs, ask students to share what they would wear in a hot desert and why.

Term 1 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Physical sciences** Energy can move from one thing to another (transfer), and change form (transform) **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • Are we seeing the transfer or transformation of energy when using a Slinky®? • What changes can you make to test your Slinky? • What important science vocabulary do we need to use? • How could you communicate information about energy transfer and transformation to someone else? • What do you still want to know about energy? **Support notes** The learning experiences this week focus on bringing the knowledge of energy transfer and transformation together. When using a Slinky, energy is both transferred and transformed. When giving the Slinky a push, kinetic energy is being transferred from a person's hand to the Slinky, but it uses gravitational pull if dropped. Teachers should decide about filling out all or some of the *Fair test investigation* template. Students can make decisions to plan and design their own investigation and in doing so, demonstrate their ability to conduct a fair investigation. Please note: Even if students cannot present these findings to younger students, the focus is on clearly	**Learning experiences** 1. Review the ways energy is used in everyday life through a memory game. For example, the first student says, 'Today I woke up and I turned on the light.' The next student says, 'Today I woke up, turned on the light and then ate some toast for breakfast', and so on. Use this game to clarify any misconceptions and link prior knowledge. 2. Discuss how the Slinky toys that were used earlier in the unit show transformation of energy. Give students some time to play with the Slinky in small groups, to investigate the different types of energy they may be seeing. 3. Discuss the term 'potential energy', which refers to the stored energy in an object that it could potentially use. Explain to students that they saw potential energy when using the rubber band cars, as they wound up and tightened the rubber band. 4. A Slinky toy has potential energy before they begin moving and they have kinetic energy once they start moving. They may also produce sound energy as they are moving. Students will complete an investigation on the Slinky and then produce a visual aid for younger students. 5. As a class, devise an investigation using the Slinky. • What is something that could be changed? (the width of the steps the Slinky is pushed down, the

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	communicating their scientific findings for a particular audience. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Slinky • Timers • Blocks and other building materials based on the chosen investigation **Suggested assessment point** **Summative assessment** Observe if students can: • identify the transfer and transformation of energy with the Slinky • make choices to conduct a fair investigation • produce a clear model or diagram that uses labels, scientific vocabulary and arrows to show the transfer and transformation of energy.	starting height of the Slinky, the number of stairs the Slinky descends) • What would be measured? (the amount of time the Slinky takes to get down to the floor, how many steps the Slinky goes down before stopping) • What will be kept the same? (the size of the Slinky, the starting height, the number of stairs, the surface etc.) 6. Complete the *Fair test investigation* template as a class or individually. Students can film or take photographs of the results. 7. Discuss how students can use this investigation to produce a visual aid for younger students to understand the transfer and transformation of energy that occurred with the Slinky. They should consider: • clear use of vocabulary – any unfamiliar science vocabulary should be explained • detailed pictures/diagrams to help understanding • arrows to clearly show the transfer and transformation of energy. 8. Students can produce the visual aid in groups or individually, using digital technologies or on paper. When they are completed, allow students to show the younger students or each other.

Term 2

Weeks 1–8: Biological sciences

Overview

Biological sciences Living things can be distinguished from non-living and once-living things, and grouped by their characteristics							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Living, non-living and once-living things	Fieldwork: identifying living, non-living and once-living things around the school	Investigation: plant sensitivity	Classifying living things: dichotomous keys	Investigation: yeast	Investigation: plant sensitivity	Aboriginal and Torres Strait Islander histories and cultures – deep listening	Design an original insect
Classification introduction	Classifying animals: vertebrates	Fieldwork: insect sensitivity	Classifying living things: fungus kingdom	Investigation: yeast	Fieldwork: invertebrates	Summative assessment: *Living, once-living and non-living* (Appendix B)	Construct an original insect
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
• objects for sorting • living things flashcards	• digital tool or paper for pictures • an excerpt from a nature documentary	• pots for plants (containers or cups) • planting medium (potting mix or cottonwool) • seeds	• leaves • mushrooms • magnifying glasses	• dried yeast • sugar • sand • cups • warm water	• magnifying glasses • containers • gloves	Summative assessment	• playdough • popsticks • pipe cleaners • various building materials

Term 2 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Focus questions** • What are the features of living things? • What is meant by non-living things? • What is meant by once-living things? • How can we tell the difference between living, once-living and non-living things? • What do all living things do? • How can we group living things by their observable features? **Support notes** The common acronym for remembering the criteria for living things is MRS GREN. Movement: all living things move in some way, including plants. Reproduce: all living things have a way to reproduce, including live birth, eggs and seeds. Sensing: all living things are sensitive to their environment. Grow: all living things have a life cycle and grow. Respire: often characterised as breathing, it is the chemical process that releases energy in living things. Excrete: all living things get rid of their waste products.	**Learning experience 1** 1. Without telling students the reason, sort the class into groups based on one observable feature, like hair colour. Ask them to guess what the groups may be based on. Repeat a few more times, each time based on another observable feature. 2. Explain that we can sort living things into groups based on their features. This is called 'classifying' or 'classification'. 3. Show students a selection of items or flashcards of a variety of items, including animals, plants, rocks, furniture and fruit. Include some items that would be considered once-living. In small groups, students sort the objects based on any feature they can think of. Ask them to share with the class what criteria they used. 4. Students re-sort the objects under the headings 'Living' and 'Non-living'. Any objects that they can't decide on should be put to the side to discuss later. 5. Students share their completed sorts and any objects they put to the side with a call out. 6. Explain that the term 'once-living' refers to things that were once alive but aren't any longer. Students rearrange their pictures to include 'Once-living' as a separate group. 7. Ask students to brainstorm characteristics that they think all living things have/do and write them on the board. Write MRS GREN on the board, and the

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Nutrition: all living things require nutrition, through consumption of food or photosynthesis. **Resources** • Objects for sorting • Flashcards of living things. Ready-made pictures can be found on the *Feathers, fur or leaves* webpage by Primary Connections: https://primaryconnections.org.au/v84-sequences/feathers-fur-or-leaves?tabIndex=2. • Venn diagrams **Suggested assessment points** **Diagnostic assessment** • Students' grouping of objects will give information on their current understanding of living, once-living and non-living things. **Formative assessment** Observe if students can: • complete a Venn diagram with examples of similarities and differences between the organisms, including observable features.	corresponding words. Compare these to the words the class brainstormed. 8. Compare some of the objects the students couldn't decide on to the MRS GREN criteria. **Learning experience 2** 1. Write MRS GREN on the board and challenge students to name as many words as they can remember. Fill in any gaps. Remind students of the relevant science vocabulary, including 'living', 'non-living', 'once-living' and 'classify'. 2. Ask students to stand in a circle around the living things flashcards. Discuss ways they could sort the living things, such as plants and animals, body coverings, number of legs or the way they move. 3. Choose two living things that are not similar. As a class, discuss the similarities and differences. Model how to compare and contrast the living things with a Venn diagram (Appendix A). 4. Place students in pairs and give each pair two cards that represent observably different living things. Give them five minutes to discuss the similarities and differences between their living things before completing their own Venn diagram individually. 5. Using their Venn diagrams, each pair should share with the class one thing that is similar and one thing that is different about their living things.

Term 2 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • Where can you find different types of living things? • How do you know the difference between living, once-living and non-living things? • Which things are difficult to classify as living or non-living? • Are there any things that you are not sure are living or non-living? • What characteristics do the groups of vertebrates have in common? • How can you tell what kind of vertebrate an animal is? **Support notes** When justifying whether something is living, it needs to meet all the criteria. Teachers are best placed to determine the best way of accessing information for their class. This could include using the internet to search for information, books from the school library or information printed off by the teacher. **Resources** • Copies of the *Vertebrates* template (Appendix A) • Digital tool to take pictures, such a tablet, or paper for drawing • Digital tools for research • Books from the library	**Learning experience 1** 1. Show students a brief clip from a nature documentary. Ask them to list all the living things they saw in the clip. Emphasise the breadth and variety of living things. Discuss and address any misconceptions. 2. Talk about living, once-living and non-living things in the school. Tell students they are going to record at least one example of each category that they can see in the school, either by drawing them or taking a photograph of each one. 3. Take students outside to an area of the school that they are likely to find one of each thing. This will create some interesting discussions about things that seem hard to categorise. For example, a tree that has lost its leaves, leaves that are still green but no longer attached to a tree, or wood chips. 4. Once back inside, students should assemble their pictures using a digital tool to create a photo collage – or, if using paper, cut and glue them onto a poster. 5. Students exemplify their understanding by writing a sentence on their collage to explain why they chose each picture. For example, 'A magpie is living because it moves and eats.'

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• An excerpt from a nature documentary **Suggested assessment point** **Formative assessment** Observe if students can: • choose appropriate objects for a living, once-living and non-living collage • choose information that demonstrates their depth of understanding of observable features used for classification.	**Learning experience 2** 1. Write MRS GREN on the board and give students a couple of minutes to recall what each letter attributes to. They write their thoughts on a small whiteboard, a sticky note or scrap paper. 2. Tell students what vertebrates and invertebrates are and ask them to vote on which category humans are. Once it is established that humans are vertebrates, tell students there are five types of vertebrates and that humans are mammals. Ask them to guess the other four. 3. Once all five have been identified (mammals, reptiles, amphibians, fish and birds), explain to students that each group has a set of characteristics that they all share. For example, all mammals have hair or fur at some point in their life cycles, including mammals that live in the ocean. 4. Place students into groups of up to five and randomly assign each student one type of vertebrate. Explain that they are going to become the 'expert' on one vertebrate to share information with their group. 5. Students research the characteristics of their vertebrate and some examples to add to their *Vertebrates* placemat (Appendix A). 6. Students share their information with their group. By the end, their templates should be filled for each vertebrate.

Term 2 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns	**Focus questions** • Can plants sense light? • How can we investigate the effect of light on plant growth? • How do we ensure a fair test? • How do we record the results of an investigation? **Support notes** Choosing any type of sprout for the seeds will ensure fast growth; however, other seeds or seedlings may be substituted for sprout seeds. The plants in the light should have access to sunlight through a window or door and must not be disturbed. They should develop normally. The seeds will grow in a variety of mediums, such as potting mix, soil from a garden bed, wet cottonwool or wet paper towel. When using cottonwool or paper towel, ensure it always stays damp. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Pots, containers or cups • A planting medium, such as potting mix or wet cottonwool • Seeds	**Learning experience 1** 1. Give students examples of living, non-living and once-living objects, such as a rock, water, driftwood, a potted plant, a ladybird and a carrot. Using the *Think-pair-share* strategy, students discuss whether each object is living, non-living or once-living, and provide reasons for their thoughts. 2. Discuss a plant example in depth, e.g. a potted plant. Plants often don't seem to be doing things like moving, respiring, excreting or being sensitive to their environment. 3. Explain to students that they are going to test whether plants can be sensitive to their environment by planting seeds and keeping some in the dark and some in sunlight. Gather students' initial predictions of what might happen. 4. As a class, decide the following. • What are we changing? (the amount of light the plants receive) • What are we measuring? (this can be decided as a class – the length of the plants and/or general appearance) • What are we keeping the same? (the type of plant seeds, amount of time growing, amount of water, plant set-up etc.) 5. Use this information to fill out the 'Questioning and predicting' section of the *Fair test investigation* template. As a class, devise a question, such as, 'If we change the amount of light the seeds receive, what will happen to their growth?' Students write their prediction in the format *If* _____, *then* _____.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• Sticky notes **Safety considerations** If using potting mix for the plants, ensure it is done outside or in a well-ventilated area. Students should thoroughly wash their hands with soap, including under their nails, every time they touch the soil. **Suggested assessment point** **Formative assessment** Observe if students can: • produce questions and predictions that make sense for the investigation • conduct the investigation in a reasonable and safe manner • identify ways that insects are sensitive and react to their environment.	6. In small groups or as a class, place the seeds in a medium, such as wet cottonwool or soil, and add the same number of seeds and amount of water to each pot. Label the pots 'light' and 'dark' respectively. Place the 'dark' pots somewhere they will receive little light, such as in a cupboard. Place the 'light' pots near a window where they will receive sunlight. 7. Fill out the 'Planning and conducting' section of the *Fair test investigation* template. Students can take a photo using a digital tool instead of drawing a diagram. **Learning experience 2** 1. Play 'Guess my animal', where the teacher thinks of an animal and students must ask questions to find out information to guess the animal. The teacher can only answer 'yes' or 'no'. Students could ask questions such as 'Is the animal a vertebrate?' or 'Does it lay eggs?' 2. Remind students of the MRS GREN acronym with the S being 'sensitive to the environment'. Show students a picture of an insect and discuss whether an insect is a living thing. Ask students to suggest how insects react to their environment. 3. Explain to students that they will be going on a hunt around the school to see what insects and other creatures they can find. This may include lifting logs/rocks and/or digging into the soil. 4. It is important to discuss the ethical responsibilities scientists have. Students are going out on their hunt as scientists, merely to observe and not to touch.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		5. As students walk around the school, look for places that slaters or earthworms may live. Ask students to observe how these living things act when the log/rock is lifted, or the soil around them is dug up. Do they react in any way? 6. Look for places that ants and bees may be found. Are they reacting to anything? Bees and ants often follow each other by sensing pheromones left by others. This makes ants follow a certain trail, or bees come to a certain area. Students may also observe flies, dragonflies or other insects, depending on the time of year. 7. When back in the classroom, ask students to call out the living things they saw and then write each one on a sticky note or slip of paper. Classify the living things by putting them into groups, such as insects, crustaceans, annelids and arachnids. Slaters are crustaceans, earthworms are annelids, snails are molluscs and spiders are arachnids.

Term 2 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • Why are visual displays of information helpful? • What is a dichotomous key? • How do scientists use dichotomous keys? • How are dichotomous keys helpful when classifying living things? • What features of leaves do you notice that could help us classify them? • What similarities do fungi have with the plant and animal kingdoms? • What evidence do you have to say that fungi are living things? **Support notes** A dichotomous key is a visual tool used by biologists to classify living things by providing two options for classification in branches until arriving at a final answer. Teachers should search for and save images of dichotomous keys that suit the context of the class, to show at the beginning of the lesson, before moving on to creating their own based on the living things found in the last lesson. An example of what this dichotomous key might look like can be found in Appendix A. Questions and branches should be changed based on what invertebrates were found during the lesson.	**Learning experience 1** 1. Use the plants from the previous learning experience to complete observations. This could be measuring any stems or completing diagrams/observations on the plants. Plants may or may not have germinated yet. Highlight the importance of observations reflecting exactly what they see. 2. Introduce students to the term ‘dichotomous key’ (see Support notes). 3. Show examples of dichotomous keys and explain them to the students. Highlight how dichotomous keys usually focus on one group of living things (e.g. invertebrates, mammals, breeds of dog) and use observable features to create the branches. 4. Come up with a simple dichotomous key as a class based on the insects and other creatures the students encountered on the creature hunt in the previous lesson. Possible branches include the number of legs, colour and habitat. 5. Explain to students that they are going to be botanists by collecting leaves and creating another dichotomous key. 6. Walk around the school to look for and collect a variety of leaves. 7. Bring the leaves back to the classroom and construct a dichotomous key. Take suggestions from students on how to classify the leaves. For example, ‘Does the leaf have a serrated edge?’ or ‘Does the leaf have a fuzzy

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	The five accepted kingdoms are Plantae (plants), Animalia (animals), Fungi, Protista (single-celled organisms) and Monera (cells with no nuclei). Students don't require all the above information at this stage of learning but can know of kingdoms as one of the ways we classify living things. If possible, get mushrooms in an array of shapes and sizes for students to examine, such as button, oyster, shiitake, enoki or portobello. **Resources** • Examples of dichotomous keys • Example of an invertebrate dichotomous key (Appendix A) • Plants from previous week • Leaves • A variety of mushrooms • Magnifying glasses **Safety considerations** Teachers should obtain the mushrooms from a reputable source and not gather wild mushrooms that may be harmful. Warn students not to pick and eat any wild mushrooms, as safe varieties can be very difficult to identify. **Suggested assessment point** **Summative assessment** Observe if students can:	coating?' Continue until all the leaves have been classified in some way. The leaves can be stuck directly onto the dichotomous key. 8. Students can record the key on paper or take a photo. **Learning experience 2** 1. Play 'Guess my animal' as described in Week 3. 2. Explain to students that there are many ways of classifying living things and that the second highest rank, when it comes to this classification, is called kingdoms. 3. Ask students if they have ever heard the words 'fungus' or 'fungi' before. Highlight how mushrooms don't fit into 'animal' or 'plant' classifications, so fungi have their own kingdom. 4. Students will be mycologists (scientists that study fungi) and examine some fungi. Show students the mushrooms. Discuss the main parts of the mushroom: the pileus (cap), the stipe (stalk) and the lamellae (gills). 5. In pairs or individually, give students the mushrooms and some magnifying glasses, and encourage them to touch, smell and look at the various parts of the mushrooms. They should take apart the mushrooms so they can see and feel everything. Record any vocabulary students use to describe the mushrooms. Students who have eaten mushrooms at home may want to share what they taste like. 6. Discuss with the class: • Are fungi living things?

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• identify some observable features of the leaves to add to the dichotomous keys • identify some features that puts fungi in their own kingdom.	• How do fungi reproduce? Call students' attention to the lamellae (gills) under the mushroom pilei (caps) to see where the spores are stored. 7. Choose a large mushroom with large gills and cut its stipe (stalk) off, so the cap can lie flat. On a white piece of paper, put the mushroom gill-side down and put a container over the top so it doesn't get disturbed. In 24 hours, there will be a spore print, where some of the spores from the gills were transferred to the paper. 8. Look at videos of Australian fungi online.

Term 2 Week 5

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation	**Focus questions** • What is a fungus? • What can we tell about yeast by observing it? • What signs will tell you if the yeast is living or non-living? • How does yeast compare to sand? • How do the results compare to what you predicted? • Is yeast living or non-living? What evidence do you have from your investigation for this answer? **Support notes** Yeast is a type of fungus that is living but dormant when bought from the supermarket. In its dried state, it looks like sand; thus, sand is a good medium to compare to the yeast. When the yeast is activated, students observe some of the MRS GREN criteria: yeast takes nutrition from the sugar and uses respiration to process the sugar for energy. It excretes carbon dioxide, which creates bubbles and apparent growth. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Dried yeast • Sugar • Sand • Cups	**Learning experiences** 1. Revisit the spore print from the last investigation and note any interesting features. To keep the print, spray it lightly with hairspray or a fixing agent. 2. Look at the plants growing in the light and dark, and complete observations for the week. 3. Show students a container of dry yeast and a container of sand. Allow students to touch and smell both. 4. Pose the question: Is yeast a living thing? Students can discuss what they think, using their prior learning on living things. 5. In groups or as a whole class, students fill two cups with warm water and add a teaspoon of sugar to each. In one cup, add a teaspoon of sand, and in the other, a teaspoon of yeast. Cover both cups with plastic wrap, leave in a warm place and wait 10 minutes to see the results. 6. As a class, decide the following. • What are we changing? (the substance in the cup) • What are we measuring? (how the substances react) • What are we keeping the same? (the amount of water, the amount of sugar, the amount of substance, the time etc.) 7. Fill out the 'Questioning and predicting', and 'Planning and conducting' sections of the *Fair test investigation* template.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Communicating Communicate ideas using scientific vocabulary	• Warm water **Suggested assessment point** **Formative assessment** Observe if students can: • produce questions and predictions that make sense for the investigation • conduct the investigation in a reasonable and safe manner • use scientific vocabulary to describe characteristics of the yeast.	8. Complete the investigation using measuring spoons and timers to ensure all measurement is accurate. 9. Students complete a MRS GREN checklist for the results, ticking off the characteristics as they see them for both cups. Students also draw a diagram noting the changes they observed. 10. Students should conclude that yeast is living. Use the information in the Support notes to fill in the 'Explain your results' section of the *Fair test investigation* template. Students work within their groups to decide what information to include. 11. Ask students to share within their group whether their prediction was correct, and if it was a fair investigation. They should consider whether their timing and measuring out of materials was accurate, and whether the temperature of the water stayed consistent across both cups. Fill in the 'Evaluating' section of the *Fair test investigation* template.

Term 2 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation	**Focus questions** • What do you notice about your two plants? • Why do you think the plants look different? • What do plants need to survive? • Was the result the same or different from your prediction? • Was this a fair investigation? • Is there a way to make it fairer? • What would be the best way to represent the data and why? **Support notes** The teacher should collect the leaf litter sample in Learning experience 2, to ensure safety and that a good sample is taken. It is possible that no invertebrates are found in the leaf litter sample. No evidence of invertebrates is still a valuable result, as it gives information about the biodiversity of that spot in the school. If no evidence is found, consider taking a sample from another area of the school or visiting an area of vegetation known to have invertebrates to gather information for the graphing exercise. Creating graphs other than column graphs is not part of the Year 3 curriculum; however, it gives students an opportunity to use models to show their results. The data display could be completed as a whole class, small groups or individually, depending on the class context.	**Learning experience 1** 1. Students take out their two plants from the ongoing investigation, and record measurements and observations for the last time. 2. Give students an opportunity to walk around and look at other groups' plants and notice any similarities or differences. 3. In their groups, students discuss why they think the plants growing in the dark were taller, skinnier and white as opposed to the plants growing in the light. 4. Students summarise these ideas in the 'Explain your results' section of the *Fair test investigation* template. They can complete this section as a group or individually. 5. Students evaluate whether the investigation was fair and whether their prediction was correct. 6. Ask students to write down any further questions they have about plants on sticky notes. **Learning experience 2** 1. Ask students to call out as many of the five types of vertebrates as they can remember from earlier in the term (mammals, reptiles, fish, amphibians and birds). 2. On small whiteboards or sticky notes, ask students to write one sentence to explain what makes a living thing a vertebrate or an invertebrate.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Resources • Copies of the *Fair test investigation* template (Appendix A) • Magnifying glasses • Container for holding leaf litter sample • Gloves for handling the leaf litter sample **Suggested assessment points** **Formative assessment** Observe if students can: • verbally compare their results to their predictions • identify whether the investigation is fair or not with evidence. **Summative assessment** Observe if students can: • identify some observable features when classifying invertebrates • produce an accurate data display.	3. Remind students of looking around the school earlier in the term and hunting for invertebrates. What types did they see? 4. Tell students that scientists who study insects are called entomologists and they often collect a sampling to get an idea of what invertebrates exist in the area. The sampling might not all be insects and may include other small invertebrates. Explain to the class that they are going to take a sampling from an area of the school and catalogue what is found. 5. Walk around the school and find an appropriate area with leaf litter. The teacher should take a sample of the leaf litter, making sure to also scoop some of the soil beneath the leaf litter, and put it all into a larger container. 6. Carefully pick through the leaf litter and separate out any living things. Students should use magnifying glasses to carefully examine any living things found in the leaf matter. 7. After examining the invertebrates as a class, attempt to classify them based on their observable features. For example, anything with six legs is an insect, no legs is an annelid, one foot (such as a snail) is a mollusc and eight legs is an arachnid. Count the number of each invertebrate and record them in a chart. Take photographs and safely return the invertebrates to the place they were taken from. 8. Discuss with students the best way to represent the data. This could be a column graph, a pictograph or a

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		pie graph. Discuss the benefits and drawbacks of each idea before choosing a method. 9. Lead students through creating the chosen graph as a class or individually. Focus on labelling and the accuracy of data representation. 10. Give students some examples of animals, such as a giraffe, octopus, starfish, snake or dragonfly, and ask them to show you with a hand gesture whether the animal is a vertebrate or invertebrate.

Term 2 Week 7

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Focus questions** • What senses can we use to make observations in science? • What do you think we might hear in our deep listening session? Why? • What did you feel when you were deep listening? • Where else might using your sense of hearing help? **Support notes** Learning experience 1 is based on a lesson from the *Observing features of living things* unit from Australians Together at https://australianstogether.org.au/assets/Curriculum-Resources/F-Science_English_Observing-features-of-living-things_Unit-Guide.pdf. The cultural information included should be read and followed closely. The aim of the first learning experience is to recognise and acknowledge the work of Aboriginal and Torres Strait Islander peoples and their deep, ongoing connection and understanding of Country/Place. Teachers are encouraged to be culturally responsive to the Aboriginal and Torres Strait Islander people in the class and school when discussing the topic of colonisation. **Resources** • Summative assessment	**Learning experience 1** This learning experience is inspired by a lesson from the *Observing features of living things* unit from Australians Together at https://australianstogether.org.au/assets/Curriculum-Resources/F-Science_English_Observing-features-of-living-things_Unit-Guide.pdf. The unit contains important cultural information around the appropriate use of deep listening practices that should be read by teachers and other adults helping conduct the lesson beforehand. 1. Review all the living things the students have encountered in the school throughout the term, such as plants, fungi, birds or insects. 2. Talk to students about the area the school is situated, and the name of the Country. Aboriginal and Torres Strait Islander peoples have practised a deep connection with the place the school is on for many thousands of years. 3. One way Aboriginal and Torres Strait Islander people explore this connection is through deep listening, which means to sit quietly and listen carefully to the things around them. Some Aboriginal and Torres Strait Islander people have a special name for this cultural practice, which was interrupted during and after colonisation. Although this cultural practice is not what students will be doing today, they can still

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Connected learning Learning experience 1 includes the Cross-curriculum Priority Aboriginal and Torres Strait Islander histories and culture. **Suggested assessment points** **Formative assessment** Observe if students can: • use their senses to identify and classify things in the school. **Summative assessment** • Appendix B: Assessment task 1	do a form of deep listening to learn about the area they are in. 4. Ask students to predict what they might hear when they are deep listening. This can include living and non-living things. 5. Take students to a large outdoor space where they will have enough room to sit away from each other. Ask students to sit quietly in their place and listen carefully to what they can hear. The amount of time the students sit is to be determined by the teacher. 6. After their deep listening session, students get together in pairs or small groups to share the things they heard. Remind students that they don't need to have seen the things they heard; for this deep listening observation, they are using their sense of hearing. 7. In the classroom, make a list on the board of the things students heard. 8. Ask students: • Were there any sounds you heard that surprised you? • Were there any sounds you expected to hear but didn't? • Were there any sounds that you don't remember noticing before? 9. Once the list is complete, ask students to classify the sounds from the list into groups, such as 'living things' and 'non-living things'.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		10. Compile the list into the chosen classifications in a class chart or individually. **Learning experience 2** 1. Explain the task in Appendix B and allow students to complete the assessment independently.

Term 2 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Biological sciences** Living things can be distinguished from non-living and once-living things, and grouped by their characteristics **Science inquiry** **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Focus questions** • What characteristics do all insects share? • What materials would be the most suitable to create your own insect? • How could you change or improve on your design? • Can you identify all the features of your insect? • How can you explain your insect to others? **Support notes** This activity allows students to be creative and use their biological understanding to design their own insect. The insect must have all the correct features to be identified as an insect and must be labelled accurately. When displaying their insect design to others, encourage students to use scientific vocabulary suitable to the audience. **Resources** • Playdough • Popsticks • Pipe cleaners • Any other available building materials **Suggested assessment points** **Formative assessment** Observe if students can: • make decisions about material suitability • make purposeful changes to their design.	**Learning experience 1** 1. Review the lessons on insects from this term and some of the insects found around the school. 2. Discuss the characteristics that all insects have and write them on the board: • exoskeleton • three body parts: head, thorax, abdomen • six legs • antennae • compound eyes. 3. Students are going to design their own insect. It can be based on one that already exists or be completely novel, but it must have all the characteristics shown above. Encourage students to think about how the insect will move and what the insect may eat, as this will influence their design. 4. Students draw a bird's-eye view of their insect and label all the features. 5. Students name their insect and identify what it eats and how it moves. When complete, students complete a gallery walk to look at other designs. **Learning experience 2** 1. Revisit the insect designs from the previous learning experience and provide time for students to make changes to their design to ensure it has all the correct characteristics for an insect.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Summative assessment Observe if students can: • include, and accurately label, the features of an insect.	2. Give students access to the building materials to start building their design. Changes to the design should be noted on the planning sheet. 3. Students make, assess and adjust their design until it looks how they want it to. 4. Students label the parts of their insect by either using paper or taking a picture and using a digital writing tool to add in the labels. Provide students with the opportunity to show and communicate their ideas about their insect.

Term 3

Weeks 1–8: Earth and space sciences

Overview

Earth and space sciences Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
Resources introduction	Investigation: soil samples	Investigation: soil samples	Rock classification: types of rock	Investigation: mineral structure	Investigation: mineral structure	Fieldwork: surveying and mitigation strategies for mining	Summative assessment*: My mine* investigation – conducting (Appendix C)
Fieldwork: soil around the school	Uses for soil	Fieldwork: rock classification	Minerals introduction	Mineral extraction	Fieldwork: mining	Summative assessment: *My mine* investigation – planning (Appendix C)	Careers in Earth science
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
• counters • small trowel • resealable bags • containers • pipettes • magnifying glasses • sieves	• soil samples • jars with lids • chalk	• magnifying glasses • a video about geologists	• rock samples • a video about everyday mineral use	• magnifying glasses • table salt • Epsom salt • jars/cups • string • popsticks • saturated salt solutions • cookies • mining tools	• blocks or toys to bury in the sandpit	• trays • sand • marbles • toy animals • leaves • rocks • a video of large mining equipment at work	• environment trays – constructed in Week 7 • spoons • popsticks • tweezers • spades/rakes • small ball • large poster paper

Term 3 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways **Science inquiry** **Planning and conducting** Make and record observations, including formal measurements using familiar scaled instruments **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • What is meant by the term 'resource'? • What resources do we use every day? • Which of these resources are natural or processed? • What is soil? • How do we use soil? • How do types of soil compare? • What do you notice about the soil? **Support notes** Students will need to bring in a sample of soil from home for the next investigation. Communicate with parents about when to bring the soil in and the size of the sample. If most of the school and homes contain the same soil type, teachers should source soil samples from gardening supply businesses to compare soil characteristics. **Resources** • Counters • Small trowel • Resealable bags or jars • Large containers • Pipettes • Magnifying glasses • Sieves	**Learning experience 1** 1. Ask students to write a list of things we get from the Earth that help us live and what they are used for. 2. Explain that a resource is something that humans can use. Show students images of water, air (or the effect of air, such as wind or a balloon), rocks, minerals, soil, fossil fuels (oil, gas and coal), sunlight, wind and forests, and discuss what they are used for. 3. Show students a selection of images of natural resources, such as water, timber and rocks, and human-made resources, such as rubber, paper, plastic, concrete and fabric. As a class, sort these based on if they are found in nature or not. Ask students what the difference is between the two sets. What materials are the second set made from? 4. Ask students to stand in a circle around labels for commonly used resources, such as water, cloth, air, food, metal, electricity etc. Give each student five counters. Ask students to share their mornings and stop each time they mention a resource. For example, 'I woke up when my alarm (electricity) went off and changed into my uniform (cloth). I ate my breakfast (food) and brushed my teeth (water).' Each time a resource is mentioned, students should place one of their counters on the label. Point out how quickly students ran out of counters and lead them to recognise that humans are continually using resources.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment points **Diagnostic assessment** • Students explain what a resource is and provide examples of resources they use during their day. **Formative assessment** Observe if students can: • make some general conclusions about the soil using evidence from their observations.	5. Students make a list of all the resources they used during the previous day. They highlight the natural resources in one colour and the human-made resources in another colour. 6. Students write one thing they have learned about natural resources on a piece of paper. Return to the circle, where all students screw up their paper and throw it into the centre of the circle. Students pick up a piece of paper (not their own) and read out what it says. **Learning experience 2** 1. Show students images of resources. Ask them to name the resource and indicate if it is a natural resource. Include soil. Ask students what soil is used for, and where it comes from. 2. Watch ABC Education's *Kids in the Garden* – Episode 1: Soil (2005) at https://www.abc.net.au/education/kids-in-the-garden-ep-1-soil-healthy-dirt-makes-healthy-plants/13633060. 3. Take students around the school and observe the different types of soil. Take small samples of soil, place in resealable bags and show students how to label their samples. 4. In the classroom, place the samples into larger containers so students can see and touch them. Students look at and touch every sample and examine the properties of the soil, focusing on the colour, texture, water repellence and the presence of organic material. The water repellence can be tested by

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		dropping water onto the soil and watching how quickly it absorbs. 5. Assign small groups of students to one sample and ask them to note down its features, such as colour, size of grains, how it feels etc. 6. Students should take some of their assigned sample and sift it, using a sieve, onto a piece of paper. Check the sieve to find any larger particles (rocks or larger organic matter). Then use a magnifying glass to look for the presence of living things, such as worms. Students should add these findings to their observations, noting the different-sized particles and any other interesting finds. 7. Lastly, students mix their sample with a little water and attempt to squeeze it into a ball. They should note how it feels while kneading it: gritty (sandy), silky (silty) or sticky (clay). If they cannot make a ball, the soil is very sandy. 8. Ask students to add their observations to their earlier work. Each group can present a field report on their soil sample. 9. Give students a resealable bag and ask them to collect a small sample from home or a nearby park area for the next lesson.

Term 3 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

Science understanding
 	
Earth and space sciences
Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways
 	
Science inquiry
 	
Questioning and predicting
Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed
 	
Planning and conducting
Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks
	Focus questions
	• What type of soil do you think is in your sample?
	• How can you test this prediction?
	• What can you do to keep the investigation fair?
	• Why does life on Earth need soil to survive?
	• How do humans use soil?
	• How do other living things use soil?
	• How do our food sources depend on soil?
	
	Support notes
	The aim of the investigation is to get an idea of the type of soil that is prevalent in the local area. In the second learning experience, students are focusing on the use of soil in plant and animal life.
	
	Resources
	• Copies of the *Fair test investigation* template (Appendix A)
	• Soil samples from home or the local environment
	• Jars with lids
	• Chalk
	
	Connected learning
	Curriculum connections can be made between Learning experience 2 about soil's use for food production in Design and Technologies.
		Learning experience 1
		1. Sitting in a circle, students show their soil samples. Make observations on the differences in colour, texture, size of particles and pieces of organic matter.
		2. Ask students to make a prediction by raising their hand if they think their soil sample is sand, silt or clay.
		3. Pose the question: What is the most common type of soil in our local area?
		4. Explain that students are going to put their soil sample in a jar with water so they can see its composition and compare it to the other samples.
		5. As a class, decide the following.
		  • What are we changing? (the location the soil sample originated from)
		  • What are we measuring? (the layers of the soil)
		  • What are we keeping the same? (the amount of soil/water, the amount of time, the climate in the classroom etc.)
		6. Use this information to fill out the 'Questioning and predicting' section of the *Fair test investigation* template. As a class, develop a question, such as, 'What is the most common type of soil in our area?' Students write their prediction.
		7. Students place one cup of their soil sample into a jar and fill the rest of the jar with water. Once the lid is screwed on, shake the jars to mix everything together.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	Suggested assessment point **Formative assessment** Observe if students can: • produce a question and prediction relevant to the investigation • follow instructions to conduct the investigation in a safe and reasonable manner • identify some ways that living things use soil • describe at least one connection between a food source and soil.	8. Fill out the 'Planning and conducting' section of the *Fair test investigation* template, taking care to create a detailed diagram of what the soil samples look like before they settle. 9. Students place the jars somewhere they won't be disturbed over the next week to let them settle into layers. 10. Allow students to look at all the samples and note any differences they can see. **Learning experience 2** 1. Students look at the soil samples and note any changes since the last lesson. Remind them to be careful not to disturb them, as they are still settling. 2. Ask students to name all the ways soil is useful, not just to humans but for a range of living things. Some examples include: • growing food for humans • habitats for animals, plants and fungi • food for other animals • building materials • mineral extraction • water storage • raw materials, such as clay for making pots. 3. Take students outside to a large, paved area to stand in a circle. Use chalk to write the word 'soil' in the middle. Using chalk, each student writes a food on the outside of the circle. Work together to draw arrows to the connection to soil. For example, eggs come from a hen → hens need energy from plants

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		and insects to lay an egg → soil helps grow the plants and provide a habitat for the insects. Some of the connections may cross over with other connections. 4. By the end, there should be a web of foods and how they are produced, all leading back to soil. Humans require soil to produce all our food sources, even if there are production steps in between. 5. Back in the classroom, students should choose two or three examples of food and draw in the connections that lead back to soil.

Term 3 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways **Science inquiry** **Planning and conducting** Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • What type of soil do you think you have in your sample? • What evidence do you have to support this? • What type of soil do you think is most common in this area? • Was this a fair investigation? • How could you make it a fairer investigation? • How can you label the rock to know where it came from? • What do you notice about the rocks' size, colour, shape and texture? • Do any of the rocks have similar features? **Support notes** The soil will settle into layers: the top layer will be clay, the middle layer silt and the bottom layer sand. Depending on which layer is the biggest, students can determine the composition of their soil. Some other evidence students could use is the size and texture of the particles of soil. Sandy soil has large textured particles, clay has fine particles with little texture and silt is between the two. Teachers could turn the results into a column graph showing the amount of each type of soil in the class.	**Learning experience 1** 1. In small groups of three or four, ask students to map out a food production chain that leads back to soil, based on the chalk drawings from last week. Reinforce the importance of soil for all living things. 2. Check on the soil samples in the jars. Students should be careful not to shake them, as they have settled over the past week. 3. Ask students to draw a detailed diagram of the soil, including the organic matter (humus) that should have floated to the top. While completing their diagram, students should be thinking about whether they would classify their soil as mainly sand, silt or clay. 4. Ask students to write a sentence in the 'Explain your results' section of the *Fair test investigation* template describing their soil type with some evidence. For example, 'My soil is sandy soil because the bottom grey layer is the biggest. The silt and clay layers are very thin.' 5. Once classified, group the samples together by soil type. In a table, record the frequency of each soil type from the samples in the class. This will give a general indication of the main type of soil in the area. Students can add this information to the 'Explain your results' section. For example, 'The soil in this area is mainly silt because 10 of

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	There is an important connection between soil and rocks. In Year 3, students aren't required to know about the rock cycle. Knowing that soil does include ground-down rocks/minerals is sufficient. If the school does not have many rock samples to show, a lot of museums have photos of their collections on their websites. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Magnifying glasses • A video about geologists **Suggested assessment points** **Diagnostic assessment** • Students make some observations about the features of rocks. **Formative assessment** Observe if students can: • make some observations about the soil with evidence • compare their predictions to their results • discuss whether the investigation is fair, providing a reason.	the samples were silt, and there were only five clay and seven sand samples.' 6. Ask students to compare the results to their prediction and discuss whether it was a fair investigation. Fill out the 'Evaluating' section of the *Fair test investigation* template. **Learning experience 2** 1. Review the types of soil that were covered over the last couple of weeks. Ask students what soil is made of, making sure that the class covers: • organic matter • water • air • living things • ground-up minerals. Students will need to be taught the concept that rocks that have been ground up over a long period of time makes up the mineral content of soil. Rocks are directly related to the make-up of soil. This could be demonstrated by grinding up chalk and adding it to a soil sample. 2. Scientists who study rocks are called geologists. Ask students to brainstorm what kind of things geologists might do and what specifically they might study. Source an online video for a more comprehensive explanation. 3. Look at rocks on the school grounds. If they are too big to be carried, take observations where it stands or use a

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		digital tool to take a photo. Rocks that can be carried can be retrieved. 4. Use magnifying glasses to look at the rocks. Note any interesting colours, patterns, textures or other features that they notice. 5. Students stand in a circle and put all the rocks in the centre. Ask them to share ideas on how the rocks could be categorised, such as shape, colour or size. Notice any similarities or differences, particularly in any patterns visible on the rocks. 6. Students choose a rock, sketch it and make notes about the size, texture, shape, colour and pattern.

Term 3 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

Science understanding
 	
Earth and space sciences
Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways
 	
Science inquiry
 	
Communicating
Communicate ideas using scientific vocabulary
	Focus questions
	• How are rocks used by living things on Earth?
	• What types of rocks are there?
	• How could you categorise the rock samples from the school?
	• What evidence do you have for these categories?
	• What are minerals?
	• How can minerals be identified?
	
	Support notes
	Students are not expected to be able to classify the rocks into igneous, sedimentary and metamorphic conclusively.
	
	Minerals meld together to form rocks. Some interesting pictures of the crystalline structure of minerals can be found on the *What are minerals?* page on the Australian Museum website: https://australian.museum/learn/minerals/what-are-minerals/.
	
	Resources
	• Rock samples from previous lesson
	• A video about everyday mineral use
	
	Connected learning
	There is a curriculum connection with the Three-dimensional space and structures sub-strand from
		Learning experience 1
		1. Students brainstorm ways that rocks are used by humans and other living things. Some examples include:
		  • a habitat for animals
		  • a growing medium for some plants
		  • building materials for humans
		  • mining – extraction of useful minerals from rocks, e.g. gold, diamonds, metals.
		2. On a sticky note, students write how they think rocks are formed.
		3. Pose the question: Are all rocks the same? Students share their answer with a thumbs up or down.
		4. Introduce the three types of rock.
		5. Show students pictures or examples that the school may have of each type of rock.
		6. Place the labels ‘igneous’, ‘sedimentary’ and ‘metamorphic’ around the room and sort the rocks the students harvested in the last lesson. Include any pictures that were taken during this fieldwork.
		7. Ask students to look for evidence that might help them classify the rocks.
		8. Students think about the rock they drew and described in the last lesson and attempt to classify it. They can add this to their drawing. For example, ‘I think this rock is igneous because I can see air bubbles from when it cooled down.’
		9. On the back of their sticky notes, students update their thoughts on how rocks are formed.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	the Mathematics strand Measurement and geometry. **Suggested assessment points** **Diagnostic assessment** • Students' initial ideas around how rocks are formed. **Formative assessment** Observe if students can: • demonstrate understanding about how rocks are formed • create a visual display on mineral use that shows an understanding of how humans utilise minerals on a daily basis.	**Learning experience 2** 1. Write the word 'mineral' on the board and ask students to give a thumbs up or thumbs down to show whether they have heard the word before. 2. Share the definition of mineral with students: minerals are naturally forming inorganic (not from living things) solids that have a crystalline structure. Each type of mineral forms a consistent geometric structure that is always the same. Tell students some common minerals they may know or have heard of: • salt • gold • diamonds • iron • copper. 3. Show students an online video about everyday mineral use. Use questioning to discuss how minerals are used in things we use every day, such as electronics, bikes, cars etc. Minerals join to form rocks, and humans need to extract the minerals to be able to use them. 4. Look at pictures of minerals (see Support notes) or observe any real samples the school may have. Focus on the crystal-like structure of the minerals. One way minerals can be identified is by examining the uniform geometric patterns of the crystals in the mineral. 5. Show students images of crystals and discuss some of their observable features, such as flat faces, edges and geometric shapes.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		6. Have students use an image of a crystal to sketch and label the physical features they observe. 7. Use online searches or books to identify common items that use minerals. For example, electronics, benchtops, supplements, glass, paint etc. Students produce a visual display, such as a poster, to show the common uses of minerals. 8. Discuss with students what would happen if they didn't have access to these minerals. What things would they have to do without?

Term 3 Week 5

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • What do you know about minerals? • What is a crystal? • How do Epsom salt and table salt compare? • What do you think the crystals will look like next week? • How can you stay safe when conducting this investigation? • How did you get your chocolate chips out of your cookie? • What damage occurred to the cookie? • How does this compare to mining? **Support notes** The investigation requires two saturated salt solutions. This means that salt is dissolved into warm water until no more salt can dissolve. 1. Place one cup of water into a saucepan and heat until just before boiling. 2. Stir in salt until the solution reaches saturation, i.e. no more salt will dissolve. 3. Allow solution to cool. If crystals have begun to form in the solution, reheat it to dissolve the crystals before the lesson. **Resources** • Copies of the *Fair test investigation* template (Appendix A)	**Learning experience 1** 1. Using a large piece of poster paper or a digital collaborative app, ask students to share everything they know about minerals and crystals. This could include examples of minerals, uses of minerals, minerals in rocks, crystalline structures etc. 2. Show students the solid Epsom and table salts as examples of minerals. In groups of two to three, students use magnifying glasses to look closely at the salts. Ask students to share the similarities and differences. They are both a similar colour, but table salt has a smaller cubic structure, whereas Epsom salts have long, sharp crystals. 3. Pose the question: If we change the type of salt, will it affect the type of crystals they create? 4. Remind students that metamorphic and igneous rocks are formed when molten rock cools. This is the time that crystals of minerals also form inside the rock. Show students the two saturated solutions and explain the process you used to make them. The solutions may need to be reheated before the investigation set-up. 5. As a class, decide the following. • What are we changing? (the type of salt) • What are we measuring/observing? (the structure of the crystals)

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• Magnifying glasses • Table salt • Epsom salt • Jars/cups • String • Popsticks • Saturated Epsom salt solution (see Support notes) • Chocolate chip cookies • Mining tools – toothpicks, tweezers and brushes • A large piece of poster paper or a collaborative app • Video about the uses of minerals • A mineral map of the area **Suggested assessment points** **Diagnostic assessment** • Students' connections between mining and the minerals humans need, and their observations on mining methods and possible impacts on the surrounding environment. **Formative assessment** Observe if students can: • produce a question and prediction relevant to the investigation • identify precautions to complete the investigation safely • follow instructions to conduct the investigation in a safe and reasonable manner.	• What are we keeping the same? (the amount of solution, the container they will be in, the length of string, the environment it is kept in etc.) 6. Provide each student with a copy of the template and discuss the investigation question. Provide the format, 'What happens to _____ when we change _____?' Ask students to make a prediction, 'When we change _____, the crystals will _____.' 7. Fill out the 'Planning and conducting' section of the *Fair test investigation* template. 8. Give each group two jars/cups and ask them to clearly label one with 'Epsom salt' and one with 'table salt'. 9. An adult should pour some of the solution into each jar while students each tie a piece of string on a popstick. Place the popstick across the mouth of the jar with the string hanging down and put the jars somewhere they won't be disturbed for a week. **Learning experience 2** 1. Write 'mining' on the board and ask students to share what they know. This could include minerals that are mined, jobs in mining or equipment used. 2. Ask students to share what materials they know are being mined in Western Australia and establish the connection between what they have learned about minerals and mining.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		3. Watch an online video about the uses of minerals in the products we use daily. Mining involves extracting these minerals from the Earth. 4. Give each student a chocolate chip cookie and some mining tools. Ask students to mine the chocolate chips (the mineral) from the cookie (the rock). Remind students not to put anything in their mouth. 5. Once students have finished mining their cookie, discuss the results. Ask questions: • Was there more mineral or rock? • Did you have to break the rock to get the mineral out? • Are you able to repair the rock? • What can we do with the leftover waste (the broken bits of cookie)? 6. Students look at each other's cookies to see what mines had big deposits of minerals and which didn't. Compare the destructiveness required to extract the mineral. 7. Conduct a search online for a mineral map of the area where the school is situated to see what kind of deposits are nearby. Do another search online to see images of those minerals.

Term 3 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways **Science inquiry** **Planning and conducting** Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • How do the crystals compare to each other? • Are the results the same as your prediction? • Was this a fair investigation? • How could you make the investigation fairer? **Support notes** In Learning experience 2, students are going to 'mine' some minerals out of a sandpit at the school. The first time the students attempt this, it is likely they will move a lot of sand around in their excitement to find the minerals. This creates the opportunity to discuss the damage that can be done by mines. Now mines are required to have a plan to close the mine and restore the environment before they start mining. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Crystal jars from previous week • Blocks or toys should be buried in a sandpit before the lesson to act as minerals **Suggested assessment point** **Formative assessment** Observe if students can: • produce accurate observations • provide reasonable explanations for their results • provide reasons why the investigation was fair or not,	**Learning experience 1** 1. Look at the *Fair test investigation* template from the salt crystal investigation and ask students to share their predictions. 2. Take out the jars with the salt solutions. Students lift the popsticks to see the crystal formation on the string. Students should compare the similarities and difference between their two crystals. 3. The salt crystals should be like the shape they were before the investigation, although differing in size. This means the table salt should be cubic, and the Epsom salt crystals should be longer and sharper. Students draw or use a digital tool to take a photo of their results. 4. As a class, discuss the results and why those results occurred. Minerals have their own unique and predictable crystal structure, so although the same method was used for each type of salt, they are still a different mineral and therefore will always create crystals with a different shape from each other. Assist students to put this into words in the 'Explain your results' section of the *Fair test investigation* template. 5. Compare the results to the predictions students shared at the beginning of the lesson. Discuss whether it was a fair investigation and fill out the 'Evaluating' section of the *Fair test investigation* template.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	and compare the results to their prediction • explain some risks that mining can pose to the local environment.	**Learning experience 2** 1. Review the role of mining from the lesson the week before. 2. Take students to the sandpit and take a photo of it before beginning the activity. Explain to students that minerals are buried in the sandpit (see Resources) and they need to be mined. Show students what the minerals look like and tell them how many are buried in the sandpit before letting them find them all. Once all the minerals have been mined, take a photo of the sandpit. 3. Display both pictures and discuss the changes. Note if sand was moved or displaced, if sand toys were moved etc. Ask students to predict what would have happened if there were animals or plants living in the sandpit when it was mined. 4. Ask students to consider steps the class could take to return the sandpit to the way it looked in the 'before' picture. Revisit the sandpit and return it as close as possible to the way it was before. Take another photo. 5. Display the three photos and as a class, assess how well they did at fixing the sandpit. Does it look exactly how it was before or is it slightly different? 6. In small groups, students come up with a plan of how they would mine the sandpit again while creating as little damage as possible. Each group can share their plan with the class.

Term 3 Week 7

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways **Science inquiry** **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Support notes** Both learning experiences this week are around mitigating the potential detrimental effects of mining on the local environment, including living things. **Resources** • Copies of the *My mine* template (Appendix C) • Trays of sand • Marbles • Toy animals • Leaves from vegetation around the school • Rocks • A video of large mining equipment at work **Connected learning** These activities bring in the Cross-curriculum Priorities of Aboriginal and Torres Strait Islander histories and cultures, and Sustainability. The *My mine* activity addresses several of the content descriptions in Design and Technologies. **Suggested assessment point** **Summative assessment** Observe if students can: • provide some reasonable explanations for the placement of a mine	**Learning experience 1** 1. Review the mining in the sandpit from the previous learning experience and discuss the issues students faced with keeping the sandpit in good condition. 2. Explain to students that these impacts need to be considered by mines when they open, to try to limit any damage to the ecosystem. This includes thinking about underground water, important plant and animal species in the area as well as consulting with traditional landowners for significant cultural sites. There are many regulations that require mines to return the area as close as possible to the way it was before, with minimal impact to the living things in the area. 3. Mines need to conduct a survey of the environment they want to open their mine in, including any living things and sites of significance. Pretend a mine is going to open in the school. 4. Conduct a survey of the school, including the important trees, animals and structures that would need to be considered if a mine were to open on the grounds. This could include counting species of trees, thinking about areas with insect life and areas that humans use. Students record their findings by drawing or taking pictures. 5. Ask students to brainstorm all the things a mine at the school would need to consider and write them on the board. 6. In pairs, students decide where the best place to open a mine in the school would be to limit impact. Each pair shares their area and the reason they chose it. For example, 'We think the

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• identify some ways to mitigate damage to their environment when mining for minerals.	oval is the best place for a mine because there are no big trees there and it is away from buildings.' **Learning experience 2** 1. Watch a brief online video of large mining equipment at work in an open-cut or underground mine. 2. Explain to students that they are going to create their own environment with minerals in the ground. In small groups or individually, give students a tray of sand and ask them to bury five marbles. This will represent their minerals. Students should then add leaves and toy animals to their tray to represent the living things in their environment. Add rocks in different spots in the tray. 3. Show students the *My mine* template (Appendix C). Draw diagrams or take a photo of their mine, labelling important species or other significant sites in their environments. 4. Students develop a plan to extract their minerals and then restore their environment. The plan may include moving important species, moving sand and rocks to a different container and then replacing it, replanting vegetation and only mining specific spots in their environment. 5. Encourage students to consider the equipment they will need and what challenges they might face in returning their environment back to how it was.

Term 3 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Earth and space sciences** Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways **Science inquiry** **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Support notes** Science knowledge is cumulative and as more information is gathered, processes can be refined further. This science knowledge can be used to solve problems. In the second learning experience, teachers should choose career paths in Earth science that are relevant to the area and the students' context. **Resources** • Environment trays constructed in Week 7 • Copies of *My mine* template from Week 7 • Spoons • Popsticks • Tweezers • Spades • Rakes • Other containers • Small ball • Large poster paper with career names • Books or digital tools **Suggested assessment point** **Summative assessment** Observe if students can: • conduct their plan in a safe and reasonable manner	**Learning experience 1** 1. Students review their mining plan and make any necessary changes. 2. Give students an array of equipment to choose from, such as spoons, popsticks, tweezers, spades, rakes and other containers. 3. Students conduct their mining. Any animals or vegetation that is displaced needs to be replaced with new animals and vegetation. 4. When finished, students take a photo or draw a diagram of what their environment looks like. They use the *My mine* template to assess their success and consider any changes they could have made to their method. 5. Students share their 'before' and 'after' photos/diagrams with others to compare methods. **Learning experience 2** 1. Throw a ball to a student and ask them to name a way that living things use soils and rocks. Once they have, the student passes the ball to someone else, and they need to name a different way living things use soils and rocks and so on. 2. Explain to students that there are lots of careers that use Earth science. Put students into small groups and give each one a large piece of poster paper with a career written on it, such as: • geologist • ecologist • palaeontologist

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• evaluate the successfulness of their plan and provide ways to improve their plan • make connections between mining activity and effects on the environment.	• environmental engineer • park ranger. 3. Students use the books and online searches to find out about the career and what each occupation does. 4. Groups present their findings to the class. If students have found any other relevant occupations during their research, add them to the board.

Term 4

Weeks 1–8: Chemical sciences

Overview

Chemical sciences The observable properties of solids and liquids and how adding or removing heat leads to a change of state							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
States of matter introduction	Investigation: melting butter and coconut oil	Recycling: metal	Investigation: melting chocolate shapes	Investigation: melting chocolate shapes	Practical: jelly Set up the freezing investigation	Investigation: freezing solids and liquids	Investigation: heat sources
Practical: characteristics of solids and liquids	Investigation: melting butter and coconut oil	Practical: melting dark, milk and white chocolate	Investigation: melting chocolate shapes	Recycling review: plastic	Investigation: freezing solids and liquids	Investigation: heat sources	Practical: non-Newtonian fluids
Resources							
Week 1	**Week 2**	**Week 3**	**Week 4**	**Week 5**	**Week 6**	**Week 7**	**Week 8**
• pictures of materials • marbles • water • a variety of containers • breakable solid biscuits, marshmallows or cottonwool • wooden blocks	• coconut oil • butter • paper plates • heat source • timers	• books or pamphlets about aluminium recycling • dark, milk and white chocolate buttons • timers • heat source	• milk chocolate frogs, buttons and chips • timers • paper plates • heat source	• digital tools, books or pamphlets about recycling plastic	• premade jelly • jelly crystals • hot water • resealable bags • a variety of solids and liquids (see Support notes)	• ice cubes • containers • a variety of heat sources (see Support notes)	• cornflour • water • containers • a big piece of paper

Term 4 Week 1

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** The observable properties of solids and liquids and how adding or removing heat leads to a change of state **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Communicating** Communicate ideas using scientific vocabulary	**Focus questions** • What are the states of matter? • What does 'change of state' mean? • How does a material change from a solid to a liquid? • How does a material change from a liquid to a solid? • What are the properties of a solid? • What are the properties of a liquid? **Support notes** There are three main states of matter: solid, liquid and gas. In Year 3, students only need to recognise and explain solids and liquids. This unit complements the Physical sciences unit from earlier in the year, where students learned about heat transfer and that heat is energy. A common misconception is that all solids must be hard. Solid refers to the structural bonds and energy the atoms of a substance have, not the hardness of a substance. The three main observable properties of solids and liquids are: if they can pour, if they take the shape of the container they are in and if they have a set volume. The stations in Learning experience 2 are set up to demonstrate these ideas.	**Learning experience 1** 1. Write 'states of matter' on the board and ask students to show with a thumbs up if they have heard the term before. Lead a discussion to help students understand that there are observable states of matter, with the three most familiar being solid, liquid and gas. These states of matter also have certain characteristics. 2. In small groups, give students the prepared pictures and ask them to discuss whether the objects pictured can change between solid and liquid. 3. Ask each group to explain their thoughts on one of the pictures. The class should determine that all the objects are able to be both a liquid and a solid, depending on the surrounding temperature. 4. In the same groups, students order the pictures from the least amount of heat required to change the state of matter to the most. Discuss as a class and come to a consensus on the correct order. 5. Students write a simple flow chart of solid to liquid, with arrows going both ways. To go from solid to liquid, heat needs to be added, and to go from liquid to solid, heat needs to be taken away. 6. Remind students that heat is energy (covered in Physical sciences Term 1) so the hotter objects are, the more energy the atoms have. Use fingers to show that atoms in solids are moving slowly and are close together. In liquids, the molecules are moving faster and are further apart.

<table>
<tr><th>Western Australian Curriculum content</th><th>Teaching and learning intentions</th><th>Learning experiences</th></tr>
<tr>
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Resources
• Pictures of materials that can be both solid and liquid: crayons, icy poles, plastic, butter, chocolate, metal, rocks
• Marbles
• Water
• Variety of containers
• Breakable solid biscuits, cottonwool or marshmallows
• Wooden blocks

Suggested assessment point
Formative assessment
Observe if students can:
• represent information in a table
• explain change of state
• give an example of a liquid
• give an example of a solid
• identify some characteristics of solids and liquids.
</td>
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Learning experience 2
1. Ask students to show you with their fingers how the molecules in a solid move, and then how the molecules in a liquid move.
2. Students are going to look at the characteristics of solids and liquids in practical ways. Set up three stations:
• Pouring: marbles and water. Students attempt to pour both the solids and the liquids into different containers.
• Set volume: use solids that are easy to break up, like biscuits, cottonwool or marshmallows. Students attempt to change the volume of material. Can the volume of the solid change?
• Shape of the container: wooden blocks and water. Students need to move/pour the solids and liquids into different containers. Do the materials change shapes?
3. Come up with some characteristics for solids and liquids in a T-chart.
<table>
<tr><th>Solids</th><th>Liquids</th></tr>
<tr><td>• Can’t be poured
• Has a set shape; doesn’t take the shape of the container it is in
• Has set volume</td><td>• Can be poured
• Takes the shape of the container it is in
• Has set volume</td></tr>
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Term 4 Week 2

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** The observable properties of solids and liquids and how adding or removing heat leads to a change of state **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured or changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks Make and record observations, including formal measurements using familiar scaled instruments **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation **Communicating** Communicate ideas using scientific vocabulary	**Support notes** Students will investigate which solid changes into a liquid the quickest. The Sun will melt both substances, but other heat sources, such as a hair dryer, will also work. Teachers are best placed to decide whether to complete the investigation in small groups or as a whole class. Students could use a digital tool to make a time-lapse recording of the materials changing. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Coconut oil • Butter • Paper plates • Heat source – the Sun should be adequate, if it is a cloudy day, consider a heat source like a hair dryer • Timers **Suggested assessment point** **Formative assessment** Observe if students can: • develop an investigable question, with guidance • make a reasonable prediction • conduct the investigation in a safe and appropriate manner	**Learning experiences** 1. Take students out to a grassed area and ask them to act as water molecules. If they are in the freezer and become ice, they should be moving slowly and close together like a solid. If they are put into the heat of the Sun and melt into a liquid, they should be moving faster and further apart. 2. Pose the question: Will butter melt faster than coconut oil? 3. Use the *Fair test investigation* template to develop the investigable question. 4. As a class, decide the following. • What are we changing? (the type of solid) • What are we measuring/observing? (the time it takes to melt) • What are we keeping the same? (the amount of solid, the heat source, the start time etc.) 5. Review the criteria of the investigation: The solid that changes state and acts like a liquid first will be the winner. 6. Provide each student with a copy of the *Fair test investigation* template and discuss the investigation question. It should be in the format of 'When we change_____, what will happen to _____?' 7. Students record their prediction. 8. Model a sequence of steps to be followed for the investigation set up. If appropriate, fill out the 'Planning

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• draw some plausible conclusions from their results.	and conducting' section of the *Fair test investigation* template. 9. Set up the investigation for students to see and repeat. If appropriate, students should draw a diagram in their template. 10. Conduct the activity to find out whether butter or coconut oil melts faster. 11. Share and discuss results and make a conclusion about which of the solids changed state the fastest. 12. Use a collaborative learning strategy to discuss the fairness of the test and suggest ways in which the test or activity could be improved. 13. Fill out the 'Evaluating' section of the *Fair test investigation* template.

Term 4 Week 3

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** The observable properties of solids and liquids and how adding or removing heat leads to a change of state **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Focus questions** • What is recycling? • How is heat used when recycling aluminium? • What type of chocolate do you think will melt first? • How could you explain your results? **Support notes** In the second learning experience, students can time their melting process or simply compare first, second and third. **Resources** • Books or pamphlets about aluminium recycling • Dark, milk and white chocolate buttons • Timers • Heat source **Connected learning** Recycling highlights the Cross-curriculum Priority of Sustainability. **Suggested assessment point** **Formative assessment** Observe if students can: • identify the role of heat and changing states of matter in recycling aluminium • use appropriate scientific vocabulary • compare observations with others • articulate some plausible reasons for their results.	**Learning experience 1** 1. Ask students to name solids that can turn into liquids. Record the ideas on the board. If students haven't mentioned metal, add it to the board. 2. Discuss how metal is used in our everyday life. Explain how aluminium cans are a popular item that can be recycled in Western Australia. Ask students to predict whether recycling aluminium uses heat in the recycling process. 3. Students research how aluminium cans are recycled specifically in Western Australia. This can be done via an online search, books or pamphlets. 4. In pairs, students conduct their research to come up with a list of steps that happen after the aluminium can has been put into recycling. 5. Discuss their ideas as a class and decide on the commonalities. Make a flow chart showing the cyclical nature of recycling. Students can copy the flow chart or use their own set of steps to create their own. **Learning experience 2** 1. Remind students of the investigation completed in Physical sciences that involved testing how different colours absorb heat. Highlight that the darker colours absorbed more heat. Pose the question: Does darker chocolate melt quicker than white chocolate? 2. Show students the dark, milk and white chocolate buttons and ask them to predict which one they think

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
		would melt the fastest. Create a class tally chart showing predictions. 3. Discuss how to make a fair investigation to answer the question. The chocolate buttons need to be exposed to a heat source, such as a heater, hair dryer, the Sun or held tightly in their hands. 4. Review the characteristics of a liquid and how students will know the buttons have melted. 5. In groups of three, give students one of each type of chocolate button and a timer. Allow them to conduct their investigation. 6. Come together and discuss the results as a class. Students should have discovered that the dark chocolate melted first. Discuss why this may be the case. Ask students to put forward hypotheses and then explain that is because dark chocolate has a higher amount of cocoa butter. The amount of time it took each type of chocolate to melt was not related to its colour but to the ingredients. Examine the ingredients on the packet of each. 7. Use a collaborative strategy to discuss whether the investigation was fair. 8. Compare the results to the class prediction tally chart.

Term 4 Week 4

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences

Science understanding
 	
Chemical sciences
The observable properties of solids and liquids and how adding or removing heat leads to a change of state
 	
Science inquiry
 	
Questioning and predicting
Pose questions and make predictions based on planned observations of phenomena that include variables to be measured or changed
 	
Planning and conducting
Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks
 	
Make and record observations, including formal measurements using familiar scaled instruments
 	
Evaluating
Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation
 	
Communicating
Communicate ideas using scientific vocabulary
	Focus questions
	• What shape of chocolate will melt first?
	• How can we find out?
	• What is a fair test?
	• Why is a fair test necessary?
	• How is the sequence of steps in an investigation an important part of fairness?
	
	Support notes
	Understanding the importance of a clear and accurate sequence of steps in a method is an important part of a science investigation. The practical approach adopted in this teaching and learning exemplar facilitates opportunity to demonstrate and discuss a sequence of steps and method, information, and the importance of fair testing.
	
	All the chocolate should be milk chocolate to eliminate any other variables. The largest chocolate piece might start to melt first due to the extra surface area to absorb heat. The chocolate in the smallest pieces should melt all the way through first.
	
	Resources
	• Copies of the *Fair test investigation* template (Appendix A)
	• Chocolate of different shapes, such as bars, frogs, buttons, chips
	• Timers
		Learning experiences
		1. Review the investigation from the previous learning experience. The chocolate buttons all melted at different times because they had different ingredients. The buttons were all the same size and shape.
		2. Pose the question: If we change the shape of the chocolate, what will happen to the time it takes to melt?
		3. Show students the different shapes of chocolate. Ask them to predict, with a show of hands, which one they think will melt the quickest.
		4. As a class, decide the following.
		  • What are we changing? (the shape of the chocolate)
		  • What are we measuring/observing? (the time it takes to melt)
		  • What are we keeping the same? (the type of chocolate, the weight of the chocolate, the heat source etc.)
		5. Provide each student with a copy of the *Fair test investigation* template and discuss the investigation question. It should be in the format of 'When we change _____, what will happen to _____?' Ask students to make a prediction.
		6. Fill in the 'Planning and conducting' section of the *Fair test investigation* template.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• Paper plates • Heat source (Sun, heater, hair dryer) **Suggested assessment point** **Formative assessment** Observe if students can: • identify an investigable question, with guidance • make a reasonable prediction • conduct an investigation in a reasonable and safe manner • compare the results to their prediction • identify and explain if the test was fair or not • suggest improvements to the investigation.	7. Weigh out the chocolate on paper plates and give them to small groups. Students conduct the investigation using the agreed upon heat source and record the time it took for each item to melt. 8. As a class, discuss the results. The chocolate in the smallest pieces should have melted completely first. 9. Ask students to compare their results to their prediction. What were the differences between them? Fill out the rest of the investigation template.

Term 4 Week 5

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** The observable properties of solids and liquids and how adding or removing heat leads to a change of state **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Focus questions** • What are the features of a column graph? • What is the purpose of showing data in a column graph? • Was this a fair investigation? Why or why not? • What is recycling? • Why do we need to recycle materials? • What things can be recycled? • How can you help the environment? • What is the role of science in helping the environment? **Support notes** A focus should be on the lack of sustainability of plastic as a material, and ways to avoid using it altogether. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Digital tools, books or pamphlets about plastic recycling **Connected learning** Like the previous recycling lesson, there is the Cross-curriculum Priority of Sustainability. Plastic is a very prevalent material that never	**Learning experience 1** 1. Review the results from the investigation in the last lesson. Finish filling out the 'Processing, modelling and analysing' section of the *Fair test investigation* template. 2. Show students a column graph of sample data from their investigation on the same template that they will use. Draw attention to features of the graph, such as: • the X-axis (shape of chocolate) and Y-axis (time to melt) • title • axis labels. 3. Students create their own graph using their own data. The column graph can also be completed digitally if appropriate for the school context. If not completing digitally, the times may need to be rounded to the nearest 30 seconds for ease of use. 4. Discuss whether it was a fair investigation and whether it is possible to make it fairer. Fill out the rest of the *Fair test investigation* template. **Learning experience 2** 1. Use a collaborative learning strategy to identify and tally the number of items made of plastic in the classroom and the wider school community. Share the information on a graffiti wall or digital word cloud builder. 2. Count the number of items listed. State the observable qualities of plastic. For example, usually hard, waterproof, can be flexible and transparent or opaque. 3. Consider and discuss if plastic is a solid or a liquid, and why this material is so popular to use. Conversations about the durability

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	breaks down completely and so is an important and current issue to be explored. **Suggested assessment point** **Formative assessment** Observe if students can: • create a column graph that shows data accurately, with guidance • explain why an investigation was or wasn't fair • identify actions that can make a difference in plastic use.	of plastics, the fact that it can change shape, colour, texture and appearance are relevant to aspects of most students' lives. 4. Let students know that most plastics are made primarily from fossil fuels, such as oil, coal or gas. Review what students understand about resources. 5. Review the fact that most plastics can be melted and this is an example of a change of state. A possible connection is discussing 3D printers that melt a plastic thread named filament to build objects. 6. Discuss the environmental impact of plastics or how science knowledge has helped people to understand the effect of their actions regarding use of plastics. Look at pictures or videos talking about the inability of plastic to break down and microplastics. For example, a video on the Great Pacific Garbage Patch. 7. In Western Australia, steps have been taken to limit the prevalence of single-use plastics. Discuss alternatives to single-use plastics that students may know about and use. Ask students to investigate, using online searches or books, whether plastic can be recycled in Western Australia and what the process is. 8. Discuss an action plan that can be adopted or a message that students can share to communicate how science knowledge can create changes in the decisions and action that people take. 9. Discuss strategies and ideas to promote information to the school community. For example, information posters, pamphlets or a short video. 10. Give students time to complete one of these ideas, e.g. work as a class to make a video message.

Term 4 Week 6

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** The observable properties of solids and liquids and how adding or removing heat leads to a change of state **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns	**Focus questions** • Is jelly a liquid or a solid? How do we know? • Do all solids and liquids act the same when you remove heat? • What do you think will happen to substances in the freezer? • What patterns do you notice? • How could we record our results? **Support notes** Jelly should be premade at least 24 hours before Learning experience 1 to ensure it has time to fully set. Examples of materials to put in the freezer are honey, water, hand sanitiser, a biscuit, a pencil, a tissue, hand soap and a bar of soap. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Premade jelly, enough for the class to all have some to touch • Jelly crystals • Hot water • Resealable bags • Solids and liquids to freeze	**Learning experience 1** 1. Discuss some examples of substances that are difficult to categorise as liquids or solids: peanut butter, jam, ice cream, slushie etc. In pairs, students discuss whether they think these items are solids or liquids and why. 2. Identify the example of jelly and show students the premade jelly. Ask students to share whether they think jelly is a liquid or a solid. Review the characteristics of liquids and solids. 3. Give each student a small amount of jelly to feel and investigate its characteristics. Does it seem to have more characteristics of a liquid or a solid? Students should discuss their ideas with each other. 4. Make another batch of jelly as a class to show that it starts off as a liquid with sugar crystals dissolved into it. Then it is put into the fridge. When the fridge takes away heat, what is it doing to the jelly? Discuss with students if any of them changed their thoughts from before investigating the jelly. 5. Students draw some jelly and list some of its characteristics, e.g. wobbly, set volume and set shape, cannot be poured. 6. Pose the question: If we put substances in the freezer, will they change? 7. Set up the investigation for the next lesson. Show students materials for freezing. There should be a selection of solids and liquids. Ask students to make predictions of what they think they will see in the next lesson after the materials have been in the freezer. 8. Put a small amount of each material into a resealable bag, label and put into the freezer.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• Substances placed in the freezer from the last lesson **Suggested assessment point** **Formative assessment** Observe if students can: • apply their knowledge of solids and liquids to come to a conclusion on jelly • identify what will be changed • write a question that can be investigated • make a prediction.	**Learning experience 2** 1. Remind students of the materials in the freezer from last lesson and ask them to predict what they think may have happened. 2. Before taking the substances out of the freezer, complete the 'Questioning and predicting' section of the *Fair test investigation* template. 3. Students could predict something about one solid and one liquid substance, or a more general prediction on how solids and liquids will act, rather than about every substance. 4. If appropriate, fill out the 'Planning and conducting' section of the *Fair test investigation* template. 5. Take the substances out of the freezer and encourage students to touch them through the resealable bags. Write any scientific vocabulary they use on the board. For example, hard, frozen, cold, solid. Students might observe that some of the materials seem the same apart from their temperature. 6. Sort the substances into those that did change state of matter and those that didn't. Students should notice that the substances that were solid before the freezer have remained solid. The liquids are the substances that changed states of matter. 7. Decide as a class how to record the data. For example, creating their own T-chart or drawing diagrams to demonstrate the changes the substances went through. 8. Give students examples of solids and liquids and ask them to predict whether they would change state of matter in the freezer or not based on the patterns the students observed in the investigation.

Term 4 Week 7

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** The observable properties of solids and liquids and how adding or removing heat leads to a change of state **Science inquiry** **Questioning and predicting** Pose questions and make predictions based on planned observations of phenomena that include variables to be measured and changed **Planning and conducting** Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks Make and record observations, including formal measurements using familiar scaled instruments **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation	**Focus questions** • What happened in your investigation? • How could you explain your results? • How could we display our results? • What other variables could we change other than the material we are melting? • What things would we have to keep the same? **Support notes** In the second learning experience, alternative heat sources may include heaters, hair dryers, warm water, concrete and playground equipment heated by the Sun or body heat. As this is the last investigation, students should have moved significantly towards independence with planning, conducting and evaluating investigations. **Resources** • Copies of the *Fair test investigation* template (Appendix A) • Ice cubes • Containers • A variety of heat sources	**Learning experience 1** 1. Review the vocabulary from last lesson. 2. Ask students to pretend to be molecules like earlier in the term. Pretend to be a liquid, moving around freely with a bit of speed. Once that liquid is put into the freezer, the molecules should slow down and come closer together. Draw the parallels between the results from the previous investigation and the demonstration. 3. Encourage students to summarise what they have learned into general statements. For example, 'When heat is removed from a liquid, the molecules slow down and become closer together. This makes the liquid turn into a solid.' 4. In pairs, ask students to discuss the fairness of the investigation. They should consider what was changed, what was measured and what was kept the same. Choose some pairs to share their thoughts. **Learning experience 2** 1. Review the investigations and activities conducted during the term. Change of state investigations and activities include butter or coconut oil as the fastest melting; white, milk or dark chocolate as the fastest melting; melting different chocolate shapes; and freezing liquids and solids. 2. All the investigations so far have involved changing the type of substance, such as the type of chocolate. Identify and discuss the heat source as a variable to

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Communicating Communicate ideas using scientific vocabulary	**Suggested assessment point** **Summative assessment** Observe if students can: • identify variables • produce an investigable question, with guidance • make a prediction that is plausible • follow steps to conduct an investigation in a safe and sensible manner.	change. Use the 'Questioning and predicting' section of the *Fair test investigation* template as a teaching tool to demonstrate how the variables can be manipulated and how the investigable question is written. 3. Consider different heat sources that may be used. Identify two or three methods to melt ice quickly (see Support notes). 4. As a class, decide the following. • What are we changing? (the heat source) • What are we measuring/observing? (the time the ice cube takes to melt) • What are we keeping the same? (the ice cube size, the container, the distance from the heat source etc.) 5. Provide each student with a copy of the *Fair test investigation* template and discuss the investigation question. It should be in the format of 'When we change _____, what will happen to _____?' Ask students to make a prediction. 6. Explain the use of a timer to record time taken for the ice to melt. 7. Conduct the investigation and record the results in a table.

Term 4 Week 8

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
Science understanding **Chemical sciences** The observable properties of solids and liquids and how adding or removing heat leads to a change of state **Science inquiry** **Processing, modelling and analysing** Organise and represent data using tables, column graphs and models to identify patterns **Evaluating** Compare findings with those of others, and to predictions; consider if investigations were fair; and identify questions for further investigation **Communicating** Communicate ideas using scientific vocabulary **Collaborating and applying** Use science knowledge to propose explanations for observed phenomena and solutions to problems	**Focus questions** • How could we display our results? • What features does a column graph need? • Was this a fair investigation? • How could we make it fairer? • What characteristics do you notice about oobleck? • Is it a solid or a liquid? • How do other non-Newtonian fluids change? **Support notes** Teachers may choose to use the graphing template (Appendix A) to record data. Data does not have to be real or true data. The purpose is for students to identify patterns and trends in the information that is presented. **Resources** • Cornflour • Water • Containers • A big piece of paper **Suggested assessment point** **Summative assessment** Observe if students can: • create a column graph that is readable	**Learning experience 1** 1. Review the results from the last investigation. Ask students if they wanted to keep their iced drink cold, what should they avoid? Compare predictions to results. 2. Discuss whether the investigation was fair and any constraints there were on making it fair. For example, one of the variables to be kept the same was the distance from the heat source. If the Sun was one of the heat sources, it would not have been possible to keep the ice the same distance. Does this make the investigation fair? 3. Show students a column graph of sample data from their investigation on the same template that they will use. Draw attention to features of the graph, such as: • the X-axis (type of heat source) and Y-axis (time to melt) • title • axis labels. 5. Students create their own graph with their own data. The column graph can also be completed digitally if appropriate for the school context. If not completing digitally, the times may need to be rounded to the nearest 30 seconds for ease of use. **Learning experience 2** 1. On a big piece of paper, ask students to write down all the characteristics of solids and liquids. Review after a few minutes and add any that have been missed. 2. Find a simple recipe or video online explaining how to make oobleck. Don't show students any of the properties of oobleck yet.

Western Australian Curriculum content	Teaching and learning intentions	Learning experiences
	• provide reasonable explanation for their results • compare their prediction to their results • identify whether an investigation is fair or not • apply knowledge of solids and liquids to investigate the properties of a non-Newtonian fluid • recognise and explain some ways that science is cumulative knowledge and is used to help others.	3. Walk students through making their own oobleck in small groups. Take note of any observations the students are making during the process. For example, they may remark on it becoming hard to stir. 4. Give students time to use and observe the characteristics of the oobleck and then discuss as a class. Guide students to recognise that oobleck has different characteristics in different circumstances. When the oobleck is under pressure, it acts as a solid and when it is not under pressure, it acts as a liquid. 5. Write the term 'non-Newtonian fluid' on the board. Explain that a non-Newtonian fluid is simply a substance that doesn't follow the expected behaviour of a fluid or a liquid. Isaac Newton described how liquids should act, and so a non-Newtonian fluid is just a substance that doesn't follow these observations. 6. Give each group an example of a non-Newtonian fluid: • honey (liquifies when stirred) • cream (thickens when stirred) • toothpaste (flows out of the tube but sits thicker on the toothbrush) • quicksand (solid until pressure is applied, then becomes liquid) • tomato sauce (thick in the bottle but becomes liquid when you shake or squeeze it). 7. Each group discusses their non-Newtonian fluid and thinks about ways it can change viscosity or show behaviour that is not expected for a liquid.

Appendix A

Resources

Fair test investigation template Name: _____

Questioning and predicting

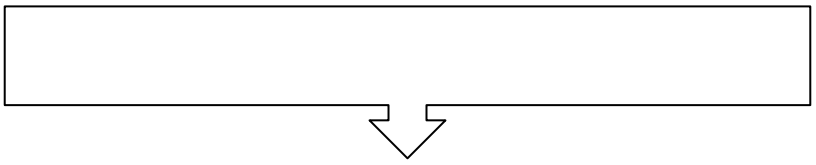
Group members: _____

Task title: _____

What will I change?	What will I measure or observe?

What is the question?

When we change …



… what do you think will happen?

Marking key

Description	✓
Questioning and predicting	
Identifies the variable to be changed	
Identifies the variable to be measured or observed	
Communicates a question that can be investigated **OR** With guidance, communicates a question that may be investigated **OR** With guidance, communicates a question that is reasonable	
Makes a prediction that is reasonable	
Makes a prediction that is related to the investigation	
Makes a prediction based on prior knowledge	

Fair test investigation template Name: _____

Planning and conducting

Group members: _____

Task title: _____

List the equipment that you used or that you may need.

Explain what you did. Use numbers to order the steps that you followed.

1.

How can we stay safe?

Risks	Solutions

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

Marking key

Description	✓
Planning and conducting	
Identifies the equipment required for the activity	
Communicates a sequenced method	
Includes variables changed	
Includes variables measured or observed	
Identifies risks	
Suggests solutions to promote safety	
Draws a suitable and clear diagram **OR** Draws a diagram	
Diagram includes labels	

Fair test investigation template Name: _____

Processing, modelling and analysing

Group members: _____

Task title: _____

Show your results.

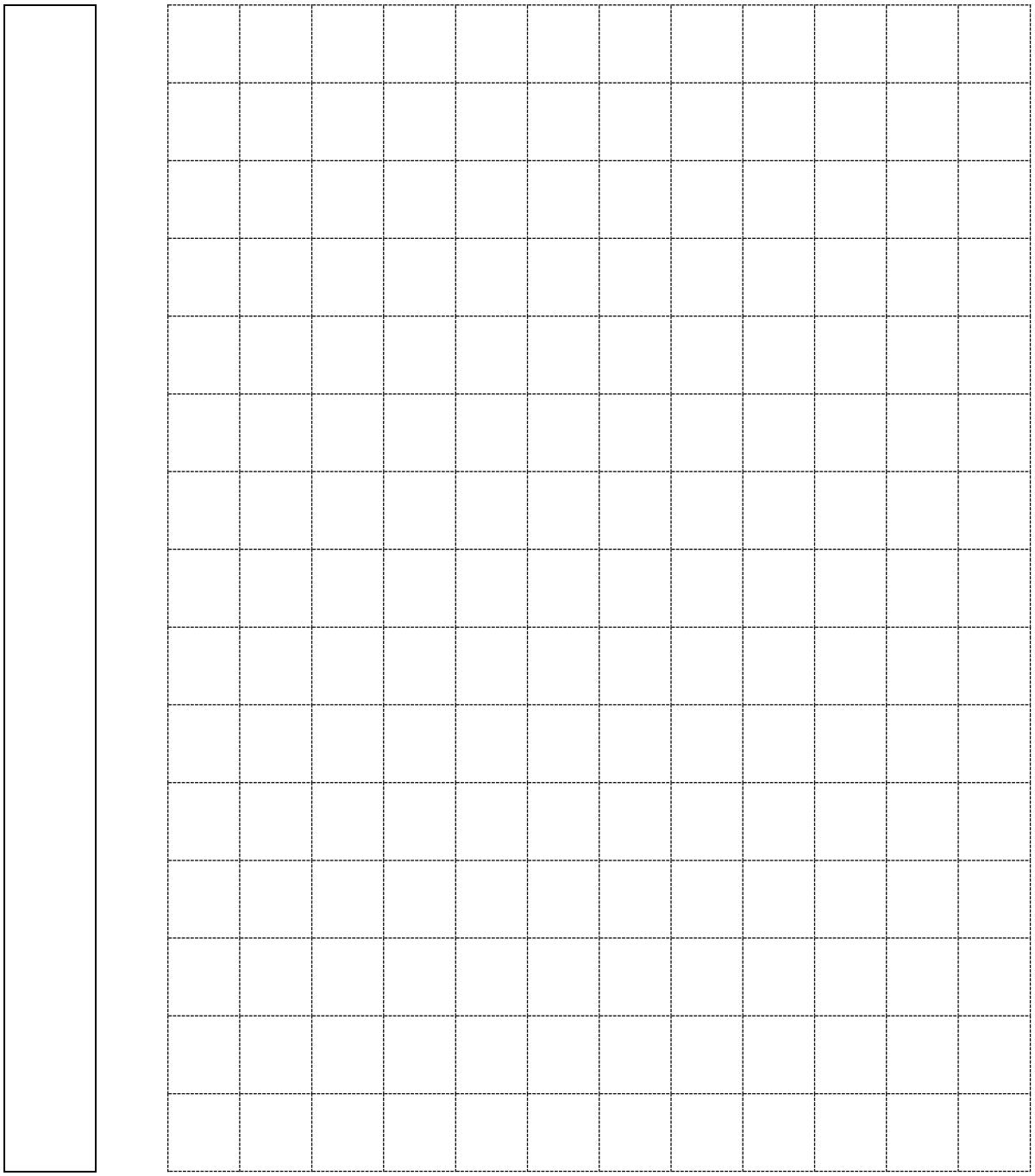
Table title: _____

Explain your results. What happened?

Fair test investigation template Name: _____

Group members: _____

Graph title: _____



Marking key

Description	✓
Processing, modelling and analysing	
Displays results in a table	
Table includes a title	
Provides a reasonable explanation of the results	
OR	
Provides an explanation of the results	
Uses the graph template to represent data using a simple column graph	
Includes a graph title	
Labels the X-axis (horizontal) appropriately	
Uses correct headings	
Labels the Y-axis (vertical) appropriately	
Uses a scale	

Fair test investigation template Name: _____

Evaluating

Group members: _____

Task title: _____

Was it fair?

Explain why.

_____

_____

_____

Could it be better?

Explain how.

_____

_____

_____

Was my prediction correct?

Explain why.

_____

_____

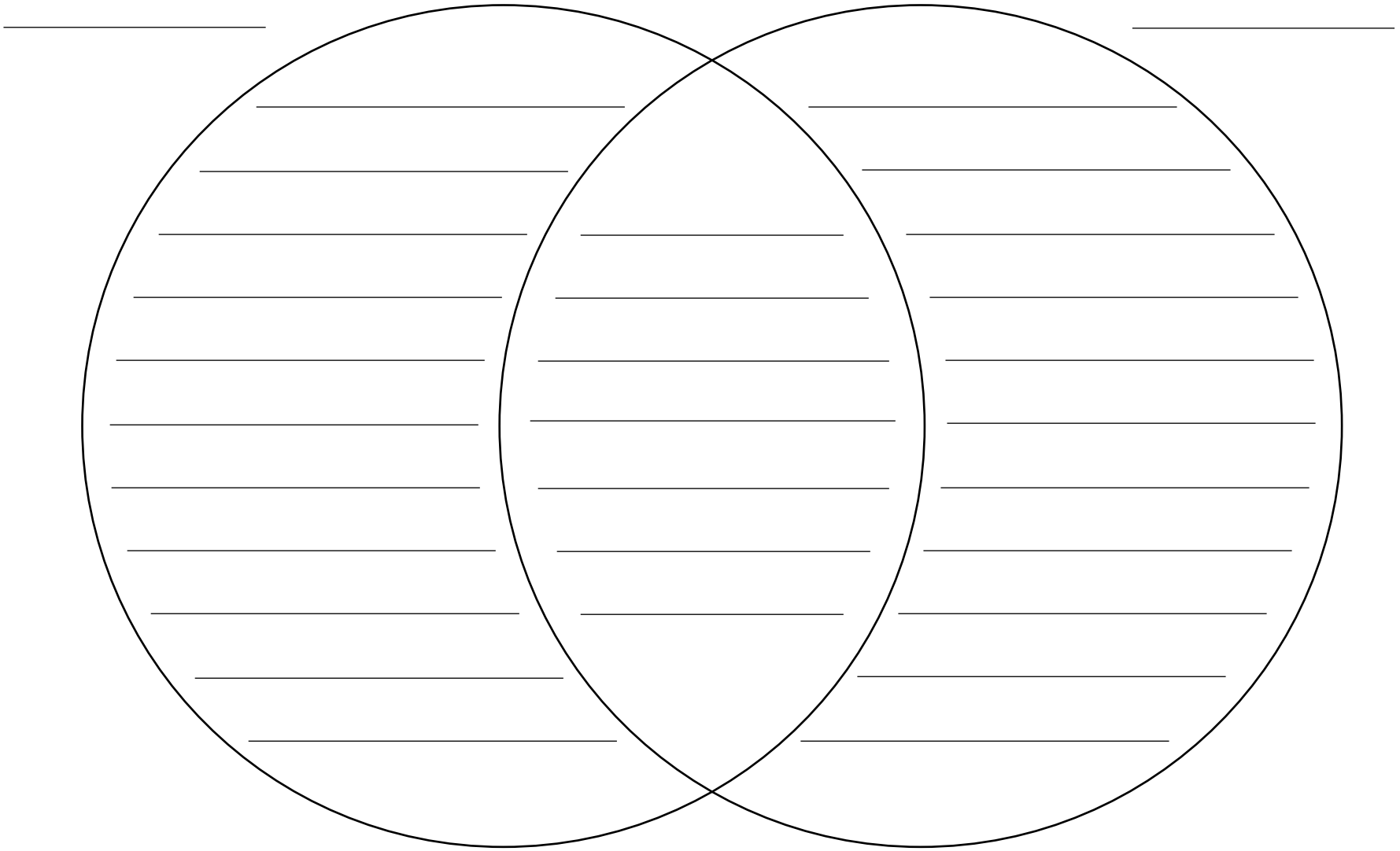
_____

Marking key

Description	✓
Evaluating	
Identifies if the investigation was fair	
Explains why it was/was not fair	
Identifies if the investigation could be improved	
Provides reasonable suggestions as to how the investigation may be improved **OR** Provides suggestions as to how the investigation may be improved	
Identifies if their prediction was correct	
Provides a reason their prediction was correct/incorrect	

Compare and **contrast** these two things

Name: _____



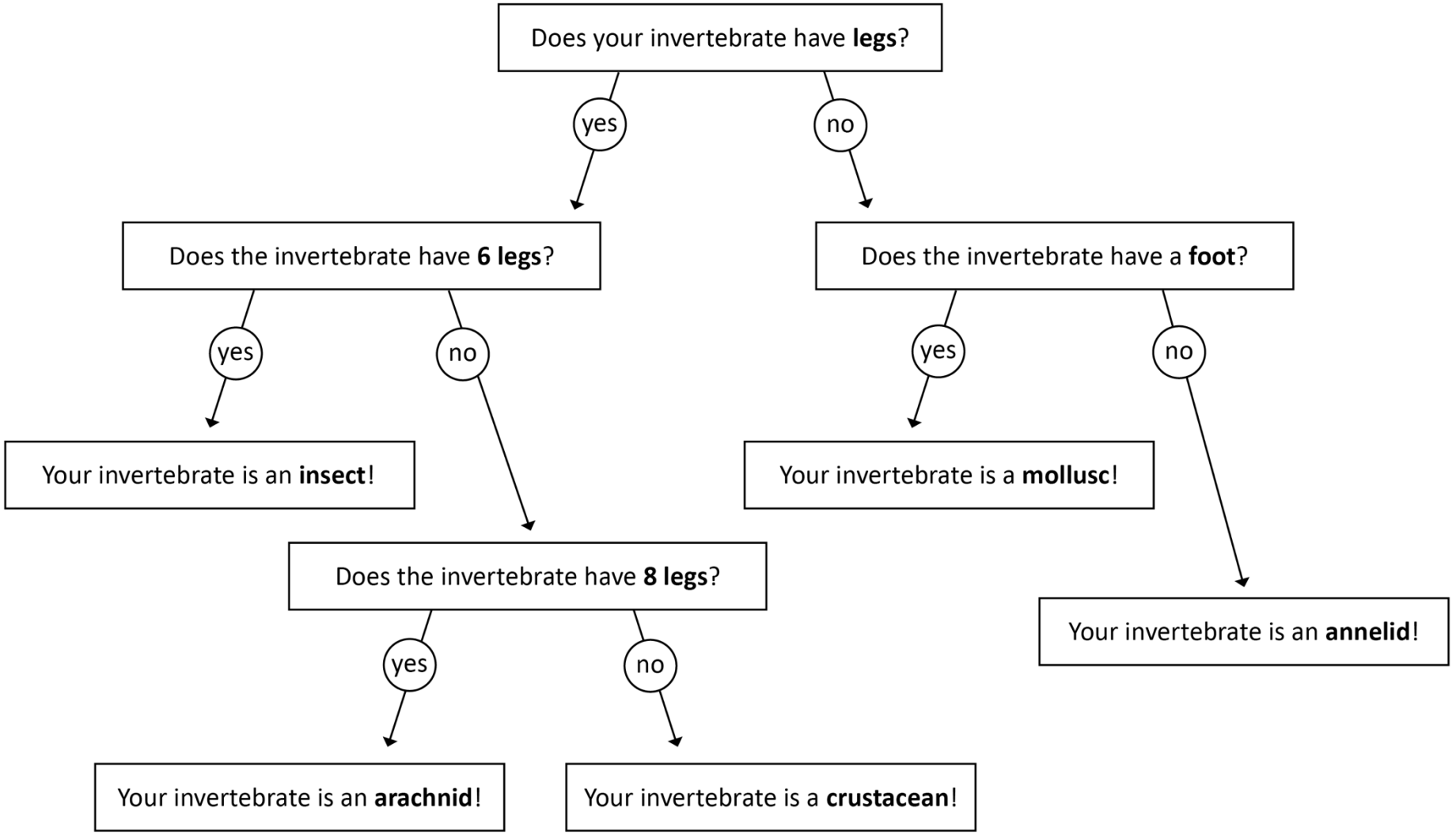
Vertebrates

Name: _____

Mammals 	Reptiles 	Amphibians 	Birds 	Fish 

Images: DreamDigitalArtist, 2021; Kelly, 2011; Kelly, 2011; MostafaElTurkey36, 2020; Clker-Free-Vector-Images, 2014.

Invertebrates at our school



Appendix B

Assessment task 1

Living, once-living and non-living

Task details

Title	Living, once-living and non-living
Description	Students demonstrate understanding of living, once-living and non-living things. They consider the characteristics that aid the classification of animals. They compare the observable characteristics of living things.
Type of assessment	Summative
Purpose of assessment	To demonstrate knowledge and understanding of living, once-living and non-living things and group living things based on their characteristics
Evidence to be collected	Written responses to questions asked
Suggested time	One hour (or teachers may present the assessment in sections) 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

- Living things can be distinguished from non-living and once-living things, and grouped by their characteristics

Science inquiry

- Communicate ideas using scientific vocabulary

Task preparation

Prior learning

Students have engaged with practical learning about distinguishing living, once-living and non-living things as well as grouping animals based on their distinguishable features. They have tested the characteristics of living things and learned the characteristics around classifying living things.

This summative assessment is timetabled to be done in Week 7 of Term 2 on the completion of the teaching and learning sequence that started in Week 1 of Term 2.

Resources

- Assessment task provided

Instructions for teacher

1. Explain to students that this is their chance to show everything they have learned this term about living, once-living and non-living things.
2. Ask each student to think of some important things they learned and with a *Think-pair-share* strategy, call out some of those things.
3. Distribute the assessments, then read and paraphrase any questions. Ensure all students know what to do.
4. Discuss and set some success criteria, such as clear explanations, evidence where required and the use of scientific terms.

Year 3: Biological sciences **Name:** _____

Write **living**, **once-living** or **non-living** under each of the images.

water

giraffe

log

dead spider

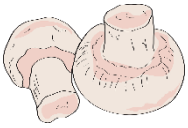
_____ _____ _____ _____

chair

plant

fire

mushroom



_____ _____ _____ _____

How can this horse be **classified** and what **evidence** do you have for that classification?

_____

_____

_____

_____

_____

_____

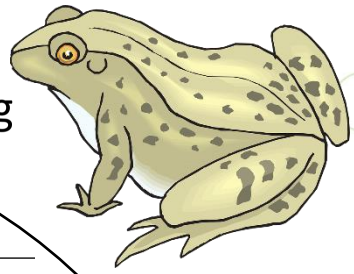
_____

Image acknowledgements: see Acknowledgements p. 121.

Compare and **contrast** these two living things.

snake

frog



Images: Kelly, 2011.

Marking key

Description	✓
Write living, once-living or non-living under each of the images	✓
Distinguishes all the images as living, once-living and non-living **OR** Distinguishes most of the images as living, once-living and non-living	
How can this horse be classified and what evidence do you have for that classification?	✓
Uses scientific vocabulary to accurately classify horse as part of one group of living **OR** Uses scientific vocabulary to accurately classify horse as part of more than one group of living things, e.g. vertebrate, mammal, animal kingdom	
Gives explanations for their classification based on scientific criteria, including physical features and behaviour, e.g. has fur, gives live birth, cares for its young **OR** Gives reasonable explanations for their classification based on some observable features	
Compare and contrast two living things	✓
Sorts information into Venn diagram appropriately	
Uses classification vocabulary to compare, e.g. reptile and amphibian	
Compares physical features using scientific language that has been learned in class **OR** Compares physical features using a mixture of scientific and colloquial language, e.g. scary, slimy, yuck	
Compares observable behavioural features, e.g. lays eggs, habitats	
Compares common physiological features, e.g. cold-blooded, breathes through their skin	

Appendix C

Assessment task 2

My mine

Task details

Title	My mine
Description	Students demonstrate their understanding of how humans and other living things use minerals, soil and rocks as a resource in interconnected ways by planning a mine. Students consider the effect on the living things by using mitigating strategies to protect the environment while also extracting necessary minerals. Students plan and conduct their investigation, and demonstrate their understanding of how science knowledge can solve problems.
Type of assessment	Summative
Purpose of assessment	To demonstrate knowledge and understanding of soils, rocks and minerals as important Earth resources that are used by humans and other living things in different and interconnected ways
Evidence to be collected	*My mine* plan and reflection, photographs of the students' environments
Suggested time	Two 60-minute lessons 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

- Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways

Science inquiry

- Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks
- Communicate ideas using scientific vocabulary
- Use science knowledge to propose explanations for observed phenomena and solutions to problems

Task preparation

Prior learning

Students have learned about soil, rocks and minerals through a series of practical and fieldwork activities. They have explored how living things use these resources in a variety of ways, such as for habitat and food. They have investigated the need for extracting minerals and the potential effect it can have on the environment, including damage to other living things and destruction of significant sites.

Resources

The summative task requires trays of sand, marbles, rocks, leaves and toy animals as well as copies of the *My mine* template. Additional resources may be required for lessons leading up to the summative task. Review the lessons accordingly for necessary resources or refer to the Overview document at the start of Term 3.

Instructions for teacher

1. Prepare the materials needed.
2. Explain to students that they need to construct an environment using the materials available, and then plan out how to mine a specific mineral from their environment while mitigating any detrimental impacts. Explain to them that they will then need to follow their plan to conduct the mining. Make sure all students are clear about what to do and answer any questions they may have about the task.
3. Negotiate success criteria with students prior to starting the assessment. Chart these for easy reference.
4. After the mining, direct students to reflect on the success of their plan and the impacts on their environment.

Instructions to students

1. Bury five marbles into your tray of sand. Add vegetation, toy animals and rocks. This is your environment. The marbles will represent a mineral. Decide what this mineral is.
2. Draw and label your diagram in the template, then name your mineral and explain what it is used for. List important things in your environment. For example, rare vegetation, endangered animals or significant sites.
3. Write down some ideas on how you can mine your mineral while protecting your environment. Think about things you can do before, during and after mining to lessen environmental impacts.
4. Carry out your plan.
5. Reflect on how your mining plan went. Colour in a face to show how you feel about it and then explain what went well in your mining plan and what you would change if you had to do it again. Reflect on how you managed to lessen the impact on the environment.

Year 3: Earth and space sciences Name: _____

My mine

Important things in my environment:

_____

_____

_____

_____

_____

_____

Labelled diagram of my environment:

I am going to mine _____ for _____
(mineral) (use)

_____.

Steps I can take to protect my environment while mining

Think about things you can do **before**, **during** and after **mining**.

Before:

_____

_____

_____

_____

_____

_____

During:

_____

_____

_____

_____

_____

_____

After:

_____

_____

_____

_____

_____

_____

Photo or diagram of my environment after mining:

Colour the face:

How I feel I protected my environment

How successful my mining was

Things that went well:

_____

_____

_____

_____

_____

_____

_____

Things I would change:

_____

_____

_____

_____

_____

_____

_____

Marking key

Description	✓
Science understanding: Earth and space sciences Soils, rocks and minerals are important Earth resources, and are used by humans and other living things in different and interconnected ways	✓
Identifies a common mineral that has been discussed throughout the unit	
Identifies a reasonable way to use the mineral	
Identifies some important parts of their environment with an explanation of its importance	
OR Identifies some important parts of their environment	
Mentions other living things' reliance on some of the elements in their environment	
Science inquiry: Planning and conducting Plan and conduct investigations, including elements of fair tests, and consider the material and equipment risks	✓
Devises detailed plans for before, during and after mining to mitigate the damage to the environment and the living things in it, based on strategies learned throughout the unit	
OR Devises plans for before, during and after mining to mitigate the damage to their environment and the living things in it	
OR Devises some plans to mitigate the damage to their environment and the living things in it	
Science inquiry: Communicating Communicate ideas using scientific vocabulary	✓
Uses appropriate scientific language learned in the unit throughout	
OR Use a mixture of appropriate scientific and colloquial language throughout	
Science inquiry: Collaborating and applying Use science knowledge to propose explanations for observed phenomena and solutions to problems	✓
Uses some mitigation strategies in their mining process	
In the evaluation of their success, identifies some problems that were solved	
In the evaluation of their success, identifies problems that occurred	

Acknowledgements

Appendix A

Vertebrates

DreamDigitalArtist. (2021). [Graphic of a giraffe]. Retrieved December, 2025, from https://pixabay.com/vectors/giraffe-animal-mammal-cutout-6664788/

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Kelly. (2011). *Speckled Frog* [Graphic]. Retrieved December, 2025, from https://www.clker.com/clipart-158515.html

MostafaElTurkey36. (2020). *Duckling, Duck, Mallard.* [Graphic]. Retrieved March, 2026, from https://pixabay.com/vectors/duckling-duck-mallard-cute-animal-5558195/

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Appendix B

Year 3: Biological sciences task

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Compare and contrast these two living things task

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