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CURRICULUM ELEMENTS

Foundation

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| **Year level description** |
| In Foundation, learning in Science builds on the Early Years Learning Framework and each student’s prior learning and experiences. Science encourages students to explore their environment and be curious about their surroundings.  Students build wonder and their natural curiosity by observing everyday objects, materials and living things and by exploring changes in the world around them, including changes they can effect, such as making things move or change shape. They learn that observations can be organised to make patterns and that these patterns can be used to make predictions about phenomena. They seek answers to questions they pose using their senses to gather different types of information. They understand that making observations and predictions is a core part of science.  Inquiry questions can help excite students’ curiosity and challenge their thinking. Following are examples of inquiry questions that could be used to prompt discussion and exploration:   * Why do we have different senses? How do we use them? * Why is sorting important? * How are a spider and a fly alike and different? * Are wheels the only way to get around? * Why do people describe things differently? |
| **Achievement standard** |
| By the end of Foundation students group plants and animals based on external features. They identify factors that influence the movement of objects. They describe the observable properties of the materials that make up objects. They identify examples of people using observation and questioning to learn about the natural world.  Students pose questions and make predictions based on their experiences. They engage in investigations and make observations safely. With guidance, they represent observations and identify patterns. With guidance, they compare their observations with their predictions. They share questions, predictions, observations and ideas about their experiences with others. |

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| **Strand: Science understanding** | | **Foundation** |
| **Sub-strand: Biological sciences** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| observe external features of plants and animals and describe ways they can be grouped based on these features  AC9SFU01 | * observing fruits and vegetables and identifying them as parts of plants such as roots, flowers, fruits or leaves * recognising humans as animals, describing external features of humans and exploring similarities and differences compared with other animals * using magnifying glasses or digital cameras to observe and identify external features of plants including seeds, flowers, fruits and roots, or of animals such as eyes, body covering, legs and wings * sorting collections of model animals and explaining different grouping strategies * recognising First Nations Australians’ use of observable features to group living things * exploring how First Nations Australians’ observations of external features of living things are replicated in traditional dance | |
| **Sub-strand: Physical sciences** | | |
| describe how objects move and how factors including their size, shape or material influence their movement  AC9SFU02 | * observing how toys move, and grouping them based on their movement * observing and describing ways different and unusually shaped objects such as blocks, tubes or eggs move when rolled down a slope * comparing the way different-sized, similar-shaped objects such as tennis balls, golf balls, marbles or basketballs roll and bounce * exploring how the material a ball is made from affects the way it moves, such as plastic, foam, cloth or rubber balls on a surface * exploring how the size and shape of traditional instructive toys used by First Nations Australians influence their movement | |

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| **Sub-strand: Chemical sciences** | |
| recognise that objects can be composed of different materials and describe the observable properties of those materials  AC9SFU03 | * observing and manipulating objects to identify the materials they are made of and recognising that some objects are made of more than one type of material * recognising that tools such as magnifying glasses enable more-detailed observations * sorting and grouping materials based on observed properties such as colour, hardness, texture and flexibility * creating a display of different materials, naming each material and exploring language to describe properties of materials * using a digital camera to collect images of objects on a materials scavenger hunt * suggesting why different parts of everyday objects, such as saucepans and clothing, are made from different materials * investigating the ways in which First Nations Australians make utensils for different purposes by combining different materials |

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| **Strand: Science as a human endeavour** | | **Foundation** |
| **Sub-strand: Use and influence of science** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| explore the ways people make and use observations and questions to learn about the natural world  AC9SFH01 | * using their senses to make observations and exploring how scientists use their senses as well as equipment to make observations * viewing examples of observations such as rock paintings, bark drawings, age-appropriate written reports, labelled drawings or photographs to explore ways they can make and record observations * exploring how First Nations Australians gain knowledge about the land and its vital resources, such as water and food, through observation * interacting with stories or documentaries about scientists such as Dame Jane Goodall or Sir Joseph Banks and noticing the ways they make their observations such as through drawings, collections, sound recordings and photography and how they ask questions about what they think they will observe and find * watching an age-appropriate documentary; noticing how people including scientists, engineers, naturalists or citizen scientists ask questions; and posing their own questions | |
| **Strand: Science inquiry** | | **Foundation** |
| **Sub-strand: Questioning and predicting** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| pose questions and make predictions based on experiences  AC9SFI01 | * posing questions based on experiences, such as: ‘What part of a plant is broccoli?’ or ‘How high do balls bounce?’ * posing questions about everyday objects and the materials that they may be made of * making predictions before field work, such as which plants and animals they may observe in the school grounds * making predictions about how an unusually shaped object such as an egg or a hexagonal block might move down a slope | |
| **Sub-strand: Planning and conducting** | | |
| engage in investigations safely and make observations using their senses  AC9SFI02 | * discussing ways to conduct investigations safely, such as by being sun safe, not running with equipment, not tasting objects or materials, and following teacher instructions * explaining safety considerations for using the senses of touch, smell, sight and hearing, and discussing why we do not use taste to make observations in science * using provided tools such as binoculars, magnifying glasses, digital photography or video to enhance their observations of plants and animals * recording observations using numbers, dots, drawings, voice recordings, digital photography or video | |
| **Sub-strand: Processing, modelling and analysing** | | |
| represent observations in provided templates and identify patterns with guidance  AC9SFI03 | * using provided tables or graphic organisers to sort images or models of plants and animals into groups based on external features * collaborating to create a floor or wall display to link images or samples of materials to images of observed objects * identifying common features of familiar groups of animals, such as fish, birds or reptiles * identifying patterns of movement of objects, with guidance, such as that balls roll easily in a straight line when pushed, or toy cars move in certain ways because of their wheels * identifying patterns in uses of everyday objects made of similar materials, such as wood, plastic, metal or glass | |

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| **Sub-strand: Evaluating** | |
| compare observations with predictions with guidance  AC9SFI04 | * revisiting their predictions and with guidance identifying whether their predictions matched their observations * comparing, with guidance, observations of plants or animals made during field work with their predictions * using a provided table to draw or dictate their prediction and their observation and identifying whether they are the same or different |
| **Sub-strand: Communicating** | |
| share questions, predictions, observations and ideas with others  AC9SFI05 | * sharing questions, making predictions and describing observations to others through discussions and circle groups * recounting stories and posing questions about their own experiences learning about the natural world, such as when gardening or observing plants and animals at home or visits to conservation areas or centres * acknowledging and exploring First Nations Australians’ ways of communicating information about anatomical features of plants and animals * showing or describing how objects can be moved in different ways and responding to questions * role-playing or showing how people use different equipment to make scientific observations * representing external features of animals and plants using a range of materials such as blocks, modelling clay, craft materials or paper * communicating questions, predictions and observations using posters, collages, digital displays, drawings or storyboards |

Year 1

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| **Year level description** |
| In Year 1 students extend their understanding of patterns by exploring patterns in daily and seasonal events, recognising that all living things share the same basic needs, and that objects can behave in predictable ways. They infer relationships from their observations and experiences and begin to link function with observable properties. They observe that changes to objects and events can be large or small and happen quickly or slowly. Students pose questions and make predictions based on their observations and are introduced to ways of organising their observations to identify patterns. They appreciate that science involves observing, asking questions about and describing changes in objects and events.  Inquiry questions can help excite students’ curiosity and challenge their thinking. Following are examples of inquiry questions that could be used to prompt discussion and exploration:   * Does a fish have a home? * How do we know what season it is? * What makes playgrounds fun? How do playground designers come up with ideas? * How can we tell if something has changed? * How does science help us care for ourselves and other living things? |
| **Achievement standard** |
| By the end of Year 1 students identify how living things meet their needs in the places they live. They identify daily and seasonal changes and describe ways these changes affect their everyday life. They describe how different pushes and pulls change the motion and shape of objects. They describe situations where they use science in their daily lives and identify examples of people making scientific predictions.  Students pose questions to explore observations and make predictions based on experiences. They follow safe procedures to make and record observations. They use provided tables and organisers to sort and order data and information and, with guidance, represent patterns. With guidance, they compare observations with predictions and identify further questions. They use everyday vocabulary to communicate observations, findings and ideas. |

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| **Strand: Science understanding** | | **Year 1** |
| **Sub-strand: Biological sciences** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| identify the basic needs of plants and animals, including air, water, food or shelter, and describe how the places they live meet those needs  AC9S1U01 | * identifying the places where plants and animals live, including in our homes, local areas such as ponds, national parks, gardens or zoos * identifying what they do to look after pets or plants at home and grouping these activities * identifying and comparing the needs of a variety of plants and animals, including humans, based on their own experiences * creating dioramas of a place a plant or animal lives, and identifying the features that enable it to meet its needs * recognising how First Nations Australians care for living things * exploring why caring for plants and animals is important including as sources of food and fibre | |
| **Sub-strand: Earth and space sciences** | | |
| describe daily and seasonal changes in the environment and explore how these changes affect everyday life  AC9S1U02 | * making and recording observations of phenomena such as changes to weather, seasonal changes to plants such as colour or dropping of leaves, and growth of flowers or fruit * noticing how daily weather indicators and seasonal patterns help us to make plans for activities in our daily lives * investigating how seasonal changes affect plants and animals, including animals that hibernate and migrate * investigating how changes in the weather affect plants and animals, including humans * exploring how people make clothing choices using predictions of weather or knowledge of seasonal changes * recognising the extensive knowledges of daily and seasonal changes in weather patterns and landscape held by First Nations Australians * exploring how First Nations Australians’ concepts of time and weather patterns explain how things happen in the world around them | |

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| **Sub-strand: Physical sciences** | |
| describe pushes and pulls in terms of strength and direction and predict the effect of these forces on objects’ motion and shape  AC9S1U03 | * observing and manipulating everyday objects such as playground equipment, toys, windows or doors and identifying the forces used to move these objects * investigating how the design of age-appropriate sporting equipment such as paddles, plastic bats and racquets help to produce stronger pushes and pulls * recognising that pushing or pulling on an object can start or stop its motion or change its direction of travel * exploring ways the shape of playdough can be changed when pushed or pulled * designing playground equipment, toys or games and representing push and pull forces involved using models, digital drawings or role-play * investigating the push and pull movements of traditional First Nations Australians children’s instructive toys * exploring how traditional Asian toys and games such as a kendama, Daruma Otoshi or shuttlecock are played using a push or pull |

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| **Strand: Science as a human endeavour** | | **Year 1** |
| **Sub-strand: Use and influence of science** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| describe how people use science in their daily lives, including using patterns to make scientific predictions  AC9S1H01 | * learning from farmers, bush care volunteers, gardeners or nursery owners about how they observe the needs of plants, and how they have designed or managed habitats to meet those needs * identifying ways that science knowledge is used in the care of the local environment and suggesting ways local gardens or parks could better meet the needs of native animals * investigating how First Nations Australians use science to meet their needs, such as food and water supply and shelter * recognising how First Nations Australians use changes in the landscape and the sky to answer questions about when to gather certain resources * learning from local ecologists or wildlife carers about native animals’ needs and how they observe animal behaviour to design supports for them to meet those needs, such as building frog and insect hotels and nesting boxes or recycling materials to provide habitat * sharing examples of how they have used science knowledge at home, such as by listening to or viewing weather forecasts or observing weather patterns when planning family events or outings, or wearing appropriate clothing for the season * identifying how we use pushes and pulls when preparing meals, and the tools that help us push or pull objects * exploring how engineers use knowledge of forces to create new playground equipment or toys | |

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| **Strand: Science inquiry** | | **Year 1** |
| **Sub-strand: Questioning and predicting** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| pose questions to explore observed simple patterns and relationships and make predictions based on experiences  AC9S1I01 | * posing questions about simple relationships between push and pull forces, such as: ‘Does a toy car go further if it is pushed harder?’ * posing questions about how animals meet their needs in particular places, such as: ‘Where does it shelter? Where does it get water from?’ * making predictions about plant needs, such as: ‘I think a plant will die if it doesn’t get enough water’ * making predictions about types of animals and plants they might observe in a particular place, such as a garden or pond * making predictions about patterns of observable phenomena such as seasonal changes of plants or changes in temperatures across the seasons | |
| **Sub-strand: Planning and conducting** | | |
| suggest and follow safe procedures to investigate questions and test predictions  AC9S1I02 | * suggesting ways to conduct investigations safely, including being sun safe, using age-appropriate equipment such as plastic goggles and aprons, or following teacher instructions promptly * following steps in a guided investigation to determine how different objects move when pushed or pulled * exploring different ways of investigating science questions through guided discussion * suggesting steps for setting up and packing away equipment | |
| make and record observations, including informal measurements, using digital tools as appropriate  AC9S1I03 | * exploring what an observation is, and different ways to make observations through guided discussion * counting and using informal measurements such as cups, handspans, walking paces, blocks, pencil lengths or lengths of string * making suggestions about types of measurements that may be made during an investigation, including using blocks to measure plant growth or paces to measure how far an object has moved * recording observations through text, drawing, counts, informal measurements, digital photography or video | |
| **Sub-strand: Processing, modelling and analysing** | | |
| sort and order data and information and represent patterns, including with provided tables and visual or physical models  AC9S1I04 | * using pictographs featuring drawings or digital photographs and tables of measurements to document patterns of growth of plants * using digital photography to show how pushes and pulls affect the shape of an object and sorting images into before and after columns of a table * using drawings or digital photographs to document changes in weather over a series of days or weeks * ordering images of seasonal changes across the year * using graphic organisers to sort data into groups, such as plants and animals, or objects around the home that need a push or pull force to work | |
| **Sub-strand: Evaluating** | | |
| compare observations with predictions and others’ observations, consider if investigations are fair and identify further questions with guidance  AC9S1I05 | * comparing observations with those of others, such as how many birds each group counted in the playground or how much each group’s seedling has grown in a week * consulting with First Nations Australians to compare observations and evaluate identifications of animal tracks * exploring if making weather observations at different times of day makes a difference and considering how they could compare weather across each day more fairly * comparing observations of movement with predictions, such as how far an object travels * exploring if all ‘big’ pushes are the same by comparing how far an object travels with different students doing the pushing, and discussing how they could have made the investigation fairer | |

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| **Sub-strand: Communicating** | |
| write and create texts to communicate observations, findings and ideas, using everyday and scientific vocabulary  AC9S1I06 | * exploring the difference between everyday and scientific vocabulary when describing objects or events * acknowledging and learning about First Nations Australians’ ways of representing and sharing observations * creating models of the place a plant or animal lives using recycled objects, modelling clay, toys or drawings * representing seasonal changes of plants using sequential drawings, calendars or digital photographs * representing push and pull forces using role-play, labels, arrows or time lapse drawings and describing their representation using everyday and scientific vocabulary * role-playing or recounting how people they know or have observed identify and use patterns to make predictions at work or in their daily lives |

Year 2

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| **Year level description** |
| In Year 2 students build on their experiences of the natural and physical world to identify the components of simple systems. They appreciate that Earth is a planet in space and identify other celestial objects. They explore the ways components in a system interact, such as by using their bodies or combining and manipulating objects to make sounds. They build on their understanding of properties of materials to recognise that those properties stay the same when the material is changed physically. They continue to build their understanding of patterns by observing that some patterns, such as the changing positions of the sun, moon and stars, can only be observed over certain timescales. As they explore patterns and relationships, they use counting and informal measurements to make and compare observations and recognise that organising these observations in tables makes it easier to identify and represent patterns. They appreciate that science involves making and organising observations to identify patterns and relationships, and that these patterns and relationships are the basis of scientific predictions.  Inquiry questions can help excite students’ curiosity and challenge their thinking. Following are examples of inquiry questions that could be used to prompt discussion and exploration:   * Who does science? * How do we know Earth is round? * How can we make and sense music? * What’s the best material? Why? * How does the sky change over time? |
| **Achievement standard** |
| By the end of Year 2 students identify celestial objects and describe patterns they observe in the sky. They demonstrate how different sounds can be produced and describe the effect of sound energy on objects. They identify ways to change materials without changing their material composition. They describe how people use science in their daily lives and how people use patterns to make scientific predictions.  Students pose questions to explore observed patterns or relationships and make predictions based on experience. They suggest steps to be followed in an investigation and follow safe procedures to make and record observations. They use provided tables and organisers to sort and order data and represent patterns in data. With guidance, they compare their observations with those of others, identify whether their investigation was fair and identify further questions. They use everyday and scientific vocabulary to communicate observations, findings and ideas. |

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| **Strand: Science understanding** | | **Year 2** |
| **Sub-strand: Earth and space sciences** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| recognise Earth is a planet in the solar system and identify patterns in the changing position of the sun, moon, planets and stars in the sky  AC9S2U01 | * identifying celestial objects that can be observed in space such as the sun, moon, stars and planets * viewing images or video of Earth from space, describing the shape of Earth and discussing how the images or video were taken * exploring representations of the solar system and identifying Earth and other planets * observing that some phenomena in the sky are only visible during the day and others during the night * investigating how shadow length changes with the changing position of the sun, identifying patterns and making predictions * creating a class moon diary across a month, identifying patterns in the changing shape of the moon and making predictions * viewing a time lapse video of the sun, moon, stars or a satellite’s movement across the sky * observing and describing short-term and longer-term patterns of events that occur in the sky, such as the appearance of the moon and stars at different times of the month or year * distinguishing between regular events that occur in the sky, such as the appearance of a full moon, and irregular events such as ‘blue’, ‘blood’ or ‘super’ moons * exploring how cultural stories of First Nations Peoples of Australia describe the patterns in the changing positions of the sun, moon and stars | |
| **Sub-strand: Physical sciences** | | |
| explore different actions to make sounds and how to make a variety of sounds, and recognise that sound energy causes objects to vibrate  AC9S2U02 | * building vocabulary for describing sound, such as loudness and pitch, and comparing sounds made by musical instruments * exploring different ways to produce sound using familiar objects and actions such as striking, blowing, scraping, plucking and shaking * exploring how traditional musical instruments used by First Nations Australians produce their characteristic sounds * exploring how voices have a unique sound by playing games such as guess the speaker * observing vibrations produced by a twanged ruler held on a desk and experimenting with different ways of holding or positioning the ruler to produce observably different vibrations and sounds * investigating how sound energy makes things vibrate such as when speaking, using tuning forks or observing music speakers * investigating which materials best muffle sound * designing and making instruments that produce different sounds, such as drums, rain makers, thongophones or box guitars * discussing situations in which they have heard echoes and exploring how humans with vision impairment and other animals such as dolphins and bats use echolocation to locate objects in their environments | |
| **Sub-strand: Chemical sciences** | | |
| recognise that materials can be changed physically without changing their material composition and explore the effect of different actions on materials including bending, twisting, stretching and breaking into smaller pieces  AC9S2U03 | * exploring how materials can be physically changed to suit a particular purpose, such as twisting strands of cotton or wool together to make the thread stronger, or folding paper to make it fly * manipulating materials such as paper or fabric, and determining ways they can be physically changed by scrunching, twisting or bending, or broken into smaller pieces by cutting, tearing or crushing * crushing a stick of chalk into a powder, comparing the properties of the stick and the powder, and discussing whether it is still the same material * exploring how First Nations Australians make physical changes to natural materials to produce objects such as bowls, baskets and various fibre crafts * creating an ‘odd one out’ game by providing samples of the same material that has been physically changed in different ways, and one sample of a different material, and challenging other students to identify the odd one out | |

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| **Strand: Science as a human endeavour** | | **Year 2** |
| **Sub-strand: Use and influence of science** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| describe how people use science in their daily lives, including using patterns to make scientific predictions  AC9S2H01 | * learning how First Nations Australians use observations of the night sky to assist with navigation * recognising that astronomers use patterns of movement of celestial objects in the sky, such as stars and comets, to make predictions about future appearances * listening to music and learning from musicians about how music can be understood as patterns of sounds and how they use their body or instruments to create music * discussing how we manage sound at home to ensure that we do not disturb each other or our neighbours, such as quietly closing doors, turning down the volume, taking off shoes on wooden floors or using headphones * investigating toys and digital tools that are voice activated, and engaging in guided discussion about how some devices use voice patterns to recognise the unique features of an individual’s voice * exploring how sound-activated and voice-activated tools help people manage daily activities such as turning on lights and communicating with others * learning from people who work with materials, such as woodworkers, product designers or artists such as fibre artists or sculptors, about how they learn about properties of materials and how they use creativity when manipulating materials * exploring how physically changing materials helps us to re-use them in a variety of ways, and decrease waste * considering how First Nations Australians use scientific practices such as sorting, classification and estimation to make predictions | |

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| **Strand: Science inquiry** | | **Year 2** |
| **Sub-strand: Questioning and predicting** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| pose questions to explore observed simple patterns and relationships and make predictions based on experiences  AC9S2I01 | * posing questions about how to make sounds with different instruments, such as: ‘If I do this, will it always produce a higher pitched sound?’ * posing questions about the appearance or position of celestial objects in space across time, such as: ‘I wonder if the moon will look the same tomorrow or next week, as it does today?’ * making predictions about what might occur when materials such as playdough or tissue paper are pulled with different strengths * making predictions about the relationship between vibration and sound, such as: ‘I think that if a ruler is twanged harder, it will make a louder sound’ * making predictions about future appearances of phenomena in the sky at certain times of the week, month or year, such as the moon or satellites | |
| **Sub-strand: Planning and conducting** | | |
| suggest and follow safe procedures to investigate questions and test predictions  AC9S2I02 | * showing appropriate use of materials and equipment to others such as teachers, students or trusted adults and making suggestions about how to make an investigation safe or safer * discussing ways they could conduct observations of the sun in a safe way * following visual or verbal steps to construct a musical instrument or manipulate a material * suggesting ways they could manipulate materials and tools they could use | |
| make and record observations, including informal measurements, using digital tools as appropriate  AC9S2I03 | * recording observations through text, drawing, counts, digital photography or video * engaging in a guided discussion about how to measure something in a fair way * using familiar units of measurement such as cups, handspans, walking paces, blocks or pencil lengths * representing informal measurements with concrete objects, such as drawing chalk lines and using lengths of string to measure shadows * exploring how digital tools can be used to make observations, such as simple clap-o-meter apps that measure sound volume, time lapse digital photography for observing apparent movement of celestial objects or slow-motion videos for observing a vibrating ruler | |
| **Sub-strand: Processing, modelling and analysing** | | |
| sort and order data and information and represent patterns, including with provided tables and visual or physical models  AC9S2I04 | * adding labels to a drawing or digital photograph to indicate key features, such as properties of materials that stay the same when changed physically, or to indicate how sound is produced by an instrument * ordering images of the changing appearance of the moon to show a monthly cycle * using a graphic organiser to sort images of musical instruments and the actions used to produce their sound * constructing simple column graphs and picture graphs with guidance to represent class investigations, such as recording objects that produce or do not produce sound * completing a table to record the number of ways different materials can be changed physically | |
| **Sub-strand: Evaluating** | | |
| compare observations with predictions and others’ observations, consider if investigations are fair and identify further questions with guidance  AC9S2I05 | * comparing their observations of changing shadow length across the day with their predictions and the patterns observed by others * comparing observations of sounds with those of others and considering if we all sense sound in the same way * proposing ways to ensure that the same sound is produced in an investigation, to keep the investigation fair * comparing findings from investigations about physically changing a material, such as cutting and folding, and exploring questions that investigate similar changes to different materials | |
| **Sub-strand: Communicating** | | |
| write and create texts to communicate observations, findings and ideas, using everyday and scientific vocabulary  AC9S2I06 | * using learnt scientific vocabulary and structuring texts to sequence events, processes or ideas * creating and narrating a short animation to show the changing position of the sun across the day and using terms such as ‘sunrise’, ‘sunset’ and ‘horizon’ * creating a class model of the solar system and naming the sun and planets * making a collage to represent and display all the ways a material can be physically changed * presenting and sharing musical instruments, through dance and song, to show what is vibrating to make the sound * presenting findings of investigations using charts, read-alouds, slideshows or displays using everyday and scientific vocabulary * acknowledging and learning about First Nations Australians’ ways of sharing astronomical knowledge across generations through oral traditions that include cultural accounts, stories, song and dance | |

Year 3

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| **Year level description** |
| In Year 3 students explore the value of grouping and classifying objects and events based on similarities and differences. In classifying things as living or non-living they begin to recognise that classifications are not always easy to define or apply. Students contrast patterns of growth and change in living things; compare characteristics of soils, rocks and minerals; and classify states of matter. They learn that key processes such as heat transfer can cause predictable change in simple systems. They recognise that change is described and measured in terms of differences over time and begin to quantify their observations to enable comparison. They learn more-sophisticated ways of identifying and representing relationships, including the use of tables and graphs to identify patterns and relationships. They appreciate that science involves conducting fair tests to answer questions or test predictions, and that scientific explanations are based on data.  Inquiry questions can help excite students’ curiosity and challenge their thinking. Following are examples of inquiry questions that could be used to prompt discussion and exploration:   * Do plants, birds and frogs grow up too? * Is soil alive? * Is jelly a liquid or a solid? * Why is a spoon hot in soup and cold in ice cream? * Can you do science without a fair test? |
| **Achievement standard** |
| By the end of Year 3 students classify and compare living and non-living things and different life cycles. They describe the observable properties of soils, rocks and minerals and describe their importance as resources. They identify sources of heat energy and examples of heat transfer and explain changes in the temperature of objects. They classify solids and liquids based on observable properties and describe how to cause a change of state. They describe how people use data to develop explanations. They identify solutions that use scientific explanations.  Students pose questions to explore patterns and relationships and make predictions based on observations. They use scaffolds to plan safe investigations and fair tests. They use familiar classroom instruments to make measurements. They organise data and information using provided scaffolds and identify patterns and relationships. They compare their findings with those of others, explain how they kept their investigation fair, identify further questions and draw conclusions. They communicate ideas and findings for an identified purpose, including using scientific vocabulary when appropriate. |

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| **Strand: Science understanding** | | **Year 3** |
| **Sub-strand: Biological sciences** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| compare characteristics of living and non-living things and examine the differences between the life cycles of plants and animals  AC9S3U01 | * classifying a collection of objects as living, once living or non-living and explaining their reasoning * observing and describing differences between metamorphic (such as butterflies, beetles or frogs) and non-metamorphic life cycles of animals, including humans * comparing the physical characteristics of an animal such as a frog or moth with its activity at different stages of its life cycle * representing stages of a plant or animal’s life cycle using drawings, digital photographs, graphic organisers or concrete materials * investigating how First Nations Australians understand and utilise the life cycles of certain species | |
| **Sub-strand: Earth and space sciences** | | |
| compare the observable properties of soils, rocks and minerals and investigate why they are important Earth resources  AC9S3U02 | * examining different soils from local areas and using magnifying glasses to observe their components, such as pebbles, sand or plant matter as well as living things such as earthworms and insects * exploring the school grounds or a local area and observing or collecting different types of rocks and describing similarities or differences such as texture, colour, grain or crystal size * recognising that minerals are the building blocks of rocks and that the different characteristics of rocks depend on the minerals they are made up of * identifying rocks as key components of the built and natural environment and recognising uses of minerals such as gemstones in jewellery, graphite in pencils, and table salt in food * investigating First Nations Australians’ knowledges of different rock and mineral types, and how they were used such as for stone blades, grindstones and pigments * describing ways in which living things including humans depend on soils, such as for food, growing plants, providing habitat for organisms, and holding and cleaning water * examining information on plant tags and exploring the vocabulary used to describe soils and different plant soil requirements * investigating which rocks or minerals are quarried or mined locally or regionally and how those resources are used | |
| **Sub-strand: Physical sciences** | | |
| identify sources of heat energy and examine how temperature changes when heat energy is transferred from one object to another  AC9S3U03 | * exploring how we sense heat and identifying sources of heat such as the sun, fire, electrical devices and geothermal springs * recognising that changes in heat energy can be measured using a thermometer * observing and, with assistance, measuring, what happens when a cold object is placed in direct contact with a warm object and proposing explanations * modelling the movement of heat from one object to another using drawing or role-play * investigating how well heat is transferred by different types of materials such as metals, plastics and ceramics and identifying how materials are used to keep things hot and cold * exploring how First Nations Australians developed clothing from animal skins such as possum furs and kangaroo skin cloaks that trap heat close to the body to stay warm | |
| **Sub-strand: Chemical sciences** | | |
| investigate the observable properties of solids and liquids and how adding or removing heat energy leads to a change of state  AC9S3U04 | * observing the properties of substances and classifying them as solids (that hold their shape) or liquids (that fill the bottom of containers) * investigating ice melting or water freezing in a sealed bag and explaining their observations * using ice cubes, butter or chocolate to explore how changes of state involve the removal of heat or the addition of heat * investigating how changes of state in materials used by First Nations Australians such as beeswax or resins are important for their use * exploring how changes from solid to liquid and liquid to solid can help us recycle materials such as glass or plastics | |

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| **Strand: Science as a human endeavour** | | **Year 3** |
| **Sub-strand: Nature and development of science** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| examine how people use data to develop scientific explanations  AC9S3H01 | * investigating the stories of people who used multiple observations to develop scientific explanations, such as 17th-century entomologist and naturalist Maria Sibylla Merian, who was the first to record the nature of metamorphosis * exploring how farmers use soil tests to monitor and manage the health of farms * investigate how 18th-century physicists such as Jean Ingenhousz and Sir Benjamin Thompson collected data on conduction of heat to determine the best conductors or insulators * exploring age-appropriate science reports and journal articles and identifying where in the text the author has included data, findings or explanations * viewing a documentary or webinar and observing how scientists and researchers share their data and explanations | |
| **Sub-strand: Use and influence of science** | | |
| consider how people use scientific explanations to meet a need or solve a problem  AC9S3H02 | * recognising how First Nations Australians observe and describe developmental changes in plants and animals to make decisions about when to harvest certain resources * exploring the history of manure and compost use in agriculture and how composting can help improve soil condition and plant growth * investigating how understanding of life cycles of insect pests such as fruit flies led to effective control strategies * investigating why salt, was so important to people’s diets, food preservation and medicine in ancient times that it was known as ‘white gold’ * exploring how science knowledge of heat transfer has helped people develop different ways to cook food, such as by boiling, frying or roasting * investigating how engineers test the insulation properties of materials, and how this information is used to design food and beverage packaging, building insulation or clothing | |

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| **Strand: Science inquiry** | | **Year 3** |
| **Sub-strand: Questioning and predicting** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| pose questions to explore observed patterns and relationships and make predictions based on observations  AC9S3I01 | * acknowledging and using information from First Nations Australians to guide the development of questions regarding life cycles * posing questions about the relationship between soil characteristics and the growth of particular plants, such as: ‘Will beans grow best in sandy, loamy or clay soils?’ * comparing simple maps of Australian agriculture and soil types and posing questions about observed patterns, such as: ‘Does wheat grow in particular soils?’ * posing questions about substances that are difficult to classify as a solid or liquid, such as toothpaste, slime or hair gel * predicting whether the mass of ice in a sealed container will change when the ice has melted * predicting which material will be the most effective insulator of heat * predicting how quickly ice will melt at different ambient temperatures based on previous observations | |
| **Sub-strand: Planning and conducting** | | |
| use provided scaffolds to plan and conduct investigations to answer questions or test predictions, including identifying the elements of fair tests, and considering the safe use of materials and equipment  AC9S3I02 | * collaboratively identifying and ordering the steps in an investigation * using a provided framework or graphic organiser to plan and identify what to change, what to keep the same and what to measure to make a test fair * examining an example of a soil profile after soil has settled in water and planning an investigation to compare and contrast the components and particle sizes of different soils * planning an investigation to determine which material is the best to keep substances cold * discussing safety rules to follow when conducting investigations, such as following teacher instructions, manipulating equipment and materials with care and wearing appropriate personal safety gear, such as gloves, safety goggles and face masks when handling soils * consulting with First Nations Australians to guide the planning of scientific investigations, including safety considerations for field investigations | |
| follow procedures to make and record observations, including making formal measurements using familiar scaled instruments and using digital tools as appropriate  AC9S3I03 | * using appropriate equipment to make and record observations, such as digital cameras, video, voice recorders and scaled instruments with appropriate increments * exploring how to use equipment such as thermometers or measuring cylinders and making readings with guidance * collaboratively designing a table to collect observations in the form of numerical data, written descriptions, drawings or photos * identifying and taking on roles in group work, such as setting up the equipment, making observations, recording observations and ensuring safe behaviours | |
| **Sub-strand: Processing, modelling and analysing** | | |
| construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns  AC9S3I04 | * representing observed life stages by constructing models using recycled or craft materials * constructing pictorial maps to show the location of different soil and rock types in the local environment * constructing and using tables to explore the relationship between ambient temperature and time taken to melt * using graphic organisers to compare properties of solids and liquids * using column graphs to show melting time for ice in containers with different insulating layers | |
| **Sub-strand: Evaluating** | | |
| compare findings with those of others, consider if investigations were fair, identify questions for further investigation and draw conclusions  AC9S3I05 | * comparing findings, such as about best insulators, with those of others and identifying further questions based on differences in findings * discussing the factors that make investigations fair and evaluating the fairness of their own and others’ investigations * drawing conclusions based on consideration of their own and others’ findings * identifying further questions for investigation based on observations, differences in findings or new ideas | |

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| **Sub-strand: Communicating** | |
| write and create texts to communicate findings and ideas for identified purposes and audiences, using scientific vocabulary and digital tools as appropriate  AC9S3I06 | * discussing how to construct simple reports of their investigations to share their predictions, methods, results and conclusions with their peers * consulting First Nations Australians’ representations of living things as evidenced and communicated through formal and informal sharing of information * writing a life-cycle story from the perspective of a living thing, including appropriate scientific terms for life stages * creating posters to display around school on the importance of placing compostable lunchtime food scraps such as apple cores in compost bins for use in kitchen gardens * collaborating to create a pictorial map of the school grounds showing where different rocks or soils can be found as part of the built or natural environment and creating a class display of rocks and soils collected * creating an advertisement to promote a new insulated container design to parents of primary-school-aged children * representing heat transfer using diagrams, digital drawings, arrows or labels using scientific vocabulary |

Year 4

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| **Year level description** |
| In Year 4 students extend their understanding of systems as interactions between related components and analyse patterns to identify that these interactions can occur in predictable ways. They classify system components and create simple models of system interactions, such as food chains and representations of the water cycle. They learn that these models can be used to predict the effect of missing or malfunctioning components. They explore the relationship between form and function by investigating different materials and their properties and learn that classification can enable prediction. They investigate forces that operate from a distance and learn that some interactions result from phenomena that cannot be seen with the naked eye. Students use fair testing to explore relationships between system components. They appreciate the value of using standard units of measurement to measure and compare attributes of systems and the importance of fair methods for drawing conclusions.  Inquiry questions can help excite students’ curiosity and challenge their thinking. Following are examples of inquiry questions that could be used to prompt discussion and exploration:   * How can we keep food fresh and safe to eat without using plastic? * Why do we measure things? * What would happen if there were no ants in a local habitat? * How does friction help or hinder motion? * What’s the big deal about the water cycle? |
| **Achievement standard** |
| By the end of Year 4 students identify the roles of organisms in a habitat and construct food chains. They identify key processes in the water cycle and describe how water cycles through the environment. They identify forces acting on objects and describe their effect. They relate the uses of materials to their properties. They explain the role of data in science inquiry. They identify solutions based on scientific explanations and describe the needs these meet.  Students pose questions to identify patterns and relationships and make predictions based on observations. They plan investigations using planning scaffolds, identify key elements of fair tests and describe how they conduct investigations safely. They use simple procedures to make accurate formal measurements. They construct representations to organise data and information and identify patterns and relationships. They compare their findings with those of others, assess the fairness of their investigation, identify further questions for investigation and draw conclusions. They communicate ideas and findings for an identified audience and purpose, including using scientific vocabulary when appropriate. |

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| **Strand: Science understanding** | | **Year 4** |
| **Sub-strand: Biological sciences** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| explain the roles and interactions of consumers, producers and decomposers within a habitat and how food chains represent feeding relationships  AC9S4U01 | * describing how animals, including humans, obtain their food from plants and other animals * observing living things in a local habitat and categorising them as producers, consumers or decomposers * researching the different types of decomposers and their importance within a habitat * representing feeding relationships of producers and consumers as a food chain and comparing food chains across different habitats * recognising how First Nations Australians perceive themselves as being an integral part of the environment * investigating the impact of introduced predators such as foxes on small mammal species in Australia * researching how the removal of a food source from within a habitat, such as through an insect or rodent infestation, affected other living things within that habitat | |
| **Sub-strand: Earth and space sciences** | | |
| identify sources of water and describe key processes in the water cycle, including movement of water through the sky, landscape and ocean; precipitation; evaporation; and condensation  AC9S4U02 | * identifying everyday examples of precipitation (rain or snow), evaporation (wet washing or paint drying) and condensation of water (water droplets on a cold water bottle) * identifying local water sources and exploring how they change over time, such as rain puddles that evaporate or a local creek that flows faster after rain * exploring where tap water comes from and predicting what happens to water that goes down the drain * exploring a game or simulation of the water cycle, identifying key processes and creating their own representation of the water cycle * recognising that clouds are tiny water droplets suspended in air, observing a ‘cloud in a bottle’ demonstrated by a teacher and discussing what conditions are needed for clouds to form and for rain or snow to fall * exploring First Nations Australians’ connections with and valuing of water and water resource management * recognising First Nations Australians’ knowledges and understandings of evaporation and how the effect of evaporation can be reduced to conserve water, such as by covering surfaces * considering why we are encouraged to save and recycle water, and actions people can take to reduce water consumption and waste | |
| **Sub-strand: Physical sciences** | | |
| identify how forces can be exerted by one object on another and investigate the effect of frictional, gravitational and magnetic forces on the motion of objects  AC9S4U03 | * exploring the effect of magnets on other magnets and how magnetic forces can pull objects from a distance * exploring the positive and negative effects of friction on their everyday experiences, such as how friction causes objects to slow down and stop * recognising that gravity is the force that pulls all objects to towards the centre of Earth and that gravitational force acts on an object regardless of whether it is moving or not moving * observing how the pushing force of a liquid enables an object to float * investigating the effect of forces on the movement of objects in traditional First Nations Australians’ children’s instructive toys and games * examining shoe sole design and identifying patterns in sole design and use related to friction * watching a video of astronauts walking on the moon or dropping objects on its surface, and discussing the force they are observing * exploring how force arrows can be used to represent the direction and magnitude of forces acting on an object | |
| **Sub-strand: Chemical sciences** | | |
| examine the properties of natural and made materials including fibres, metals, glass and plastics and consider how these properties influence their use  AC9S4U04 | * identifying and naming materials in the classroom, and grouping objects made of similar materials or combinations of materials * exploring vocabulary for describing properties; observing different fibres, metals, glass and plastics; and using appropriate terms to describe, compare and contrast their properties * investigating familiar objects, such as shoes, drink containers or backpacks, examining the combination of materials from which they are made and suggesting reasons for those combinations based on properties of materials * considering how First Nations Australians use materials for different purposes, such as tools, clothing and shelter, based on their properties * designing, building and testing an object or structure for a specific purpose, such as a tent, lunchbox or bird feeder * investigating which materials can be recycled and researching alternatives for materials such as single use plastics | |

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| **Strand: Science as a human endeavour** | | **Year 4** |
| **Sub-strand: Nature and development of science** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| examine how people use data to develop scientific explanations  AC9S4H01 | * examining age-appropriate scientific journal articles, identifying common text features and exploring why the scientific community might have conventions for sharing information about data and explanations * viewing or listening to documentaries or news reports that feature researchers and identifying how they talk about their area of research, particularly references to observations, data and evidence * investigating how ecologists use food chain data to develop explanations for population decline of native species such as the Richmond birdwing butterfly, and to develop strategies to increase their population * explore how hydrologists use rainfall and water use data to explain the amount of water flowing in rivers and why this changes over time * investigating how First Nations Australians test predictions and gather data in the development of technologies and processes | |
| **Sub-strand: Use and influence of science** | | |
| consider how people use scientific explanations to meet a need or solve a problem  AC9S4H02 | * investigating how knowledge of the role of decomposers has helped people design industrial composting systems to manage plant and animal waste * investigating how First Nations Australians of arid regions of Australia use scientific knowledge to manage precious water resources * considering how knowledges of plant biology enable First Nations Australians to sustainably harvest and use plants to make tools and weapons, musical instruments, clothing, cosmetics and artworks * exploring how knowledge of the properties of plastic has influenced people to change how they purchase, use and dispose of plastic products * examining how people use knowledge of friction to improve car or bicycle safety on slippery surfaces such as wet or icy roads * investigating how knowledge of magnetic force is used to sort metals in recycling, mining and food processing | |

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| **Strand: Science inquiry** | | **Year 4** |
| **Sub-strand: Questioning and predicting** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| pose questions to explore observed patterns and relationships and make predictions based on observations  AC9S4I01 | * posing questions about why some materials are used more often than others for particular products * predicting the effect on food chains when living things are removed from or die out in an area * consulting with First Nations Australians about how to predict the location of water sources from observation of landscape features * making predictions about the distances over which magnets will attract or repel each other | |
| **Sub-strand: Planning and conducting** | | |
| use provided scaffolds to plan and conduct investigations to answer questions or test predictions, including identifying the elements of fair tests, and considering the safe use of materials and equipment  AC9S4I02 | * using an investigation scaffold to design a fair test to identify which shoe provides the greatest or least friction or which materials are attracted to a magnet * predicting the interactions of forces in a game or toy design, and building and testing a prototype * predicting effects of changing numbers of producers or consumers, and using a virtual or roleplay food chain simulation to explore possible outcomes by running the simulation multiple times * following safety rules when conducting investigations, such as wearing personal safety gear correctly, using equipment according to guidelines and demonstrating safe behaviours in field sites or when interacting with biological specimens | |
| follow procedures to make and record observations, including making formal measurements using familiar scaled instruments and using digital tools as appropriate  AC9S4I03 | * identifying animals in field locations using procedures such as direct or virtual observation, call or scat identification or pitfall traps * using appropriate equipment to make and record observations, such as digital cameras, video, voice recorders and familiar scaled instruments with appropriate increments * describing how to use rounding up or down when reading scaled instruments, and the effect of the scale size on the accuracy of the measurement * constructing tables or graphic organisers to record observations | |

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| **Sub-strand: Processing, modelling and analysing** | |
| construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns  AC9S4I04 | * using virtual or role-play food chain simulations to explore effects of changing numbers of producers or consumers in a habitat * using maps to locate water sources in the local area, or constructing maps to show sites of water wastage in the school grounds * constructing column graphs to compare numbers of objects made of particular materials or distances moved by objects experiencing frictional forces * using force arrows to show forces operating on objects |
| **Sub-strand: Evaluating** | |
| compare findings with those of others, consider if investigations were fair, identify questions for further investigation and draw conclusions  AC9S4I05 | * identifying instances during investigations where elements may have been changed in error, resulting in an unfair test * comparing findings of water use surveys and discussing differences between home and school, or between each other’s homes * comparing designed solutions, such as toys, lunchboxes or structures, to determine fitness for purpose of selected materials * comparing findings from investigations with peers and asking questions about factors that may have led to any differences in findings * identifying unexpected findings and posing questions for further investigation * drawing conclusions that reflect their data and information |
| **Sub-strand: Communicating** | |
| write and create texts to communicate findings and ideas for identified purposes and audiences, using scientific vocabulary and digital tools as appropriate  AC9S4I06 | * discussing the purpose of a text and identifying vocabulary appropriate to the topic and audience * acknowledging and learning about First Nations Australians’ ways of representing and sharing information about water sources * sharing ideas about ways to represent feeding relationships including using drawings, labels, images or models * producing an informative text using scientific vocabulary to explain the impact of introduced predators on food chains * constructing a report using scientific vocabulary to explain which materials are best suited to be used for making particular products, such as nylon for tents, rubber for shoes or wool for warm clothing * creating posters, a song, slideshow or performance to encourage the school community to save water |

Year 5

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| **Year level description** |
| In Year 5 students continue to explore the relationship between form and function by investigating how features of living things enable them to survive in their habitat. They identify stable and dynamic aspects of systems and appreciate that current systems, such as Earth’s surface, have characteristics that have resulted from past changes. They recognise that models are useful for investigating relationships between system components and can be used to predict the effects of changes. They explore observable phenomena associated with light and analyse patterns to identify that these phenomena have sets of characteristic behaviours. They begin to explain how matter structures the world around them. They develop explanations for the patterns they observe and recognise the importance of reflecting on their methods to identify potential sources of error before drawing conclusions.  Inquiry questions can help excite students’ curiosity and challenge their thinking. Following are examples of inquiry questions that could be used to prompt discussion and exploration:   * Why has the Australian coastline changed over time? * Is an empty glass really empty? * Why does my shadow change? * How has science shaped our community? * What if emus could fly? |
| **Achievement standard** |
| By the end of Year 5 students explain how the form and behaviour of living things enables survival. They describe key processes that change Earth’s surface. They identify sources of light and model the transfer of light to explain observed phenomena. They relate the particulate arrangement of solids, liquids and gases to their observable properties. They describe examples of collaboration leading to advances in science, and scientific knowledge that has changed over time. They identify examples where scientific knowledge informs the actions of individuals and communities.  Students plan safe investigations to identify patterns and relationships and make reasoned predictions. They identify risks associated with investigations and key intercultural considerations when planning field work. They identify variables to be changed and measured. They use equipment to generate data with appropriate precision. They construct representations to organise data and information and describe patterns, trends and relationships. They compare their methods and findings to those of others, identify possible sources of error in their investigation, pose questions for further investigation and draw reasoned conclusions. They use language features that reflect their purpose and audience when communicating their ideas and findings. |

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| **Strand: Science understanding** | | **Year 5** |
| **Sub-strand: Biological sciences** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| examine how particular structural features and behaviours of living things enable their survival in specific habitats  AC9S5U01 | * identify physical and behavioural characteristics that enable a plant or animal to survive, such as being able to see in dim light and being nocturnal * exploring features of plants and animals that enable them to survive in Australia’s desert environments, such as bottle (or boab) trees and the water-holding frog * investigating how camouflage is used by animals to hide from predators and to ambush prey * using physical or digital simulations to explore how the shape of animals’ body parts, such as the beak of a particular bird species, influence their ability to find food and survive in a given environment * investigating First Nations Australians’ knowledges of the structural features of certain species and how those features can be exploited | |
| **Sub-strand: Earth and space sciences** | | |
| describe how weathering, erosion, transportation and deposition cause slow or rapid change to Earth’s surface  AC9S5U02 | * identifying types of weathering caused by mechanical means such as by wind abrasion, cycles of extreme heat or cold, and frost wedging; and biological means such as by plants and tree roots * exploring how erosion can be caused by moving air or moving water and how substances such as surface soil are relocated, and identifying examples of erosion on a local or regional scale * analysing the difference between weathering and erosion and comparing the timescales over which these processes can occur * modelling the effects of erosion on a simulated landscape and exploring factors that mitigate its effects * investigating how humans have changed local landscapes and predicting the effect these changes might have on rates of erosion * considering how First Nations Australians are impacted by the rapid erosion of sand dunes and the resulting effect of saltwater on culturally significant freshwater swamps * considering the effects of significant rainfall, such as a monsoon, on the transportation and deposition of river sediments in the Asia-Pacific region | |

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| **Sub-strand: Physical sciences** | |
| identify sources of light, recognise that light travels in a straight path and describe how shadows are formed and light can be reflected and refracted  AC9S5U03 | * distinguishing between natural (such as glow worms, the sun and stars) and artificial (such as light bulbs or candles) sources of light * investigating the shadows that are formed when light is completely or partially blocked by an object, such as when using a sundial or shadow puppets * drawing ray diagrams to show how the path of light from a source reflects off surfaces into the eye * observing refraction of light using prisms or water droplets and examining the rainbow effect produced * exploring how 'holograph' videos use the refractive properties of light to create an image that appears to be 3-dimensional * exploring the use of reflection of light by mirrors such as in periscopes and mirror mazes * recognising First Nations Australians’ understanding of refraction as experienced in spearfishing and in shimmering body paint, and reflection as evidenced by materials selected for construction of housing |
| **Sub-strand: Chemical sciences** | |
| explain observable properties of solids, liquids and gases by modelling the motion and arrangement of particles  AC9S5U04 | * classifying substances as solids, liquids and gases and investigating their properties * exploring examples that demonstrate that gases have mass, such as blowing air through straws to move objects or using a balance to compare an empty balloon to one filled with air * using role-play to model the arrangement and motion of particles in solids, liquids and gases * observing a virtual demonstration of coloured gases being compressed and providing an explanation for the change in colour intensity * exploring, through guided discussion, ideas about what is between particles * recognising First Nations Australians’ knowledges and understandings of solids, liquids and gases and how these knowledges are applied in a range of processes and practices, including the extraction of oils, medical therapies and cooking |

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| **Strand: Science as a human endeavour** | | **Year 5** |
| **Sub-strand: Nature and development of science** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| examine why advances in science are often the result of collaboration or build on the work of others  AC9S5H01 | * researching how the recent discovery of a biofluorescent flying squirrel led to discoveries of more fluorescent mammals, such as wombats, bilbies, echidna and bandicoots as scientists collaborated with other scientists across fields of science and internationally * researching why European naturalists and scientists first thought the platypus was a faked animal, and how scientists such as those in the Platypus Conservation Initiative are collaborating in ongoing research to understand the features and behaviours of platypuses * investigating how contemporary soil erosion management practices adapt and build on First Nations Australians’ fire management and agricultural practices * exploring why developing new erosion mitigation techniques such as contour banks and strip cropping requires geologists, hydrologists and farmers to collaborate * exploring how understanding of light and optics has developed by comparing the ideas of Plato, Euclid, Ptolemy, Ibn al-Haytham and Roger Bacon | |
| **Sub-strand: Use and influence of science** | | |
| investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions  AC9S5H02 | * considering how decisions are made to farm particular crops or animals depending on local habitats, such as considering their ability to withstand drought or cold weather * examining how communities use knowledge of erosion processes to design landscape features that reduce erosion in fragile environments * examining how knowledge of erosion is used by park rangers to design rules such as keeping to the path and not climbing sandstone, and built features such as channel drains on paths, railings and barriers to protect the park environment and First Nations Australians’ heritage sites * researching the impacts of light pollution and exploring how communities have used scientific knowledge to reduce light pollution, such as through the use of covered bulbs facing downwards in streetlights, automated systems to turn off streetlights and motion sensors on outdoor lights at home and in public places * investigating how and why people used properties of light to design signal lamps to communicate via Morse code and where they continue to be used | |

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| **Strand: Science inquiry** | | **Year 5** |
| **Sub-strand: Questioning and predicting** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| pose investigable questions to identify patterns and test relationships and make reasoned predictions  AC9S5I01 | * posing questions that can be investigated scientifically, such as: ‘Do all animals which live in desert habitats have ways to survive without water?’ * acknowledging and using information from First Nations Australians to guide the formulation of investigable questions about structural features and behaviours of living things * posing investigable questions about landscape features and how they were changed by weathering, erosion, transportation or deposition * asking questions and making predictions to test relationships, such as: ‘Will there be more erosion of steeper slopes? Will this organisation of mirrors enable me to see around corners? Are animals that camouflage well more likely to survive predation?’ * making reasoned predictions about the habitat a plant or animal lives in or the observable effect of light interacting with an object | |
| **Sub-strand: Planning and conducting** | | |
| plan and conduct repeatable investigations to answer questions, including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place  AC9S5I02 | * considering different ways to approach investigations, such as researching, using trial and error, experimental testing, field observations, using digital tools to record observations or development of virtual simulations * planning and recording the method to be used in an investigation so that it could be repeated by someone else * making decisions on the variables to be changed, measured and controlled in fair tests, such as measuring the length and size of a shadow formed by different light sources * using a map or aerial photographs to predict local sites likely to be affected by erosion, and collaboratively planning a field excursion to collect observations * explaining rules for safe processes and use of equipment and materials, and potential risks to themselves or others when conducting an investigation * consulting with First Nations Australians to identify local areas that require permission before accessing * consulting with First Nations Australians to guide the planning of scientific investigations, considering potential risks for field investigations | |
| use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriate  AC9S5I03 | * exploring which equipment gives the most reasonable precision for the measurements of data required in the investigation * exploring the precision of measurements of different equipment such as a cup compared with a measuring jug and discussing why precision is important in measurement * recording data using standard units, such as grams, second and metre, and developing the use of standard prefixes for metric units such as kilo- and milli- * recording data in tables and diagrams or electronically as digital images and spreadsheets | |
| **Sub-strand: Processing, modelling and analysing** | | |
| construct and use appropriate representations, including tables, graphs and visual or physical models, to organise and process data and information and describe patterns, trends and relationships  AC9S5I04 | * using annotated digital photography or field sketches to describe structural features of plants or animals * constructing a column graph to illustrate the relationship between predation and an animal feature such as colour as indicated by a simulation, and using values to represent the outcomes of repeated simulations * modelling landscapes using materials such as sand, gravel, soil and rocks to show effects of erosion by water * constructing labelled ray diagrams to represent observations and compare how light interacts with different objects * using maps to identify patterns in erosion site locations or aerial photographs to show effects of erosion over time | |
| **Sub-strand: Evaluating** | | |
| compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions  AC9S5I05 | * comparing methods and findings with those of others to determine if the investigation was a fair test * recognising errors that could have occurred during investigations including changing too many variables, incorrect or misreading of measurements, or changes in environmental factors * comparing, in small groups, proposed reasons for findings and explaining their reasoning and posing further questions * discussing the difference between data and evidence and examining how evidence is selected * reflecting on inferences made from observations and analysis of the data to draw a reasoned conclusion | |

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| **Sub-strand: Communicating** | |
| write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate  AC9S5I06 | * exploring how language features such as vocabulary and sentence structure help shape a text and give it meaning * acknowledging and exploring First Nations Australians’ ways of representing and communicating information about anatomical features * developing a digital presentation to share information about the structural features or behaviours of animals and plants in a particular habitat * constructing a persuasive text for local council to argue the use of an erosion mitigation strategy in a local area * co-authoring a scientific report on an investigation into the behaviours of light using appropriate vocabulary, data representations and sentence structures * exploring whether there is a ‘correct’ way of representing particles and creating an animation to teach other students about the particulate nature of matter |

Year 6

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| **Year level description** |
| In Year 6 students develop an understanding of interdependencies between systems as they explore the relationship between physical conditions of habitats and the growth and survival of living things and investigate the effect of the relative positions of Earth and the sun on phenomena such as day length. They identify and classify components in electrical circuits and learn to describe energy flows in terms of transfer and transformation. They are introduced to ways to classify changes to substances. Students begin to appreciate the role of controlling variables in fair testing and the value of accuracy in measurements. They generalise about relationships between events, phenomena and systems and use identified patterns, trends and relationships to develop scientific explanations and draw reasoned conclusions.  Inquiry questions can help excite students’ curiosity and challenge their thinking. Following are examples of inquiry questions that could be used to prompt discussion and exploration:   * How would life be different if we couldn’t harness electrical energy? * What if Earth were not on a tilt? * Are you more likely to win a Nobel prize in science as a team or an individual? * Why is it important for a test to be ‘fair’? * How does the weather affect local habitats? |
| **Achievement standard** |
| By the end of Year 6 students explain how changes in physical conditions affect living things. They model the relationship between the sun and planets of the solar system and explain how the relative positions of Earth and the sun relate to observed phenomena on Earth. They identify the role of circuit components in the transfer and transformation of electrical energy. They classify and compare reversible and irreversible changes to substances. They explain why science is often collaborative and describe different individuals’ contributions to scientific knowledge. They describe how individuals and communities use scientific knowledge.  Students plan safe, repeatable investigations to identify patterns and test relationships and make reasoned predictions. They describe risks associated with investigations and key intercultural considerations when planning field work. They identify variables to be changed, measured and controlled. They use equipment to generate and record data with appropriate precision. They construct representations to organise and process data and information and describe patterns, trends and relationships. They identify possible sources of error in their own and others’ methods and findings, pose questions for further investigation and select evidence to support reasoned conclusions. They select and use language features effectively for their purpose and audience when communicating their ideas and findings. |

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| **Strand: Science understanding** | | **Year 6** |
| **Sub-strand: Biological sciences** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| investigate the physical conditions of a habitat and analyse how the growth and survival of living things is affected by changing physical conditions  AC9S6U01 | * identifying the physical conditions in an aquatic or terrestrial habitat and how they change over time * investigating how changes to physical conditions such as salinity, soil type, sunlight or temperature affect plant growth * examining how changes in physical conditions such as temperature, light availability and rainfall affect animals, such as corals, honey bees or flying foxes, and predict impacts of these changes * investigating changes in physical conditions that are the result of human activity and exploring the impact of these on living things, such as the impact of urban lighting on nocturnal and migratory animals * investigating the effect of physical conditions on the growth of bread mould colonies in sealed plastic bags * recognising that environmental conditions can affect stages of life, such as ponds drying up, seeds requiring water to germinate, or temperatures being too hot or cold for eggs to hatch * investigating First Nations Australians’ knowledges and understandings of the physical conditions necessary for the survival of certain plants and animals | |
| **Sub-strand: Earth and space sciences** | | |
| describe the movement of Earth and other planets relative to the sun and model how Earth’s tilt, rotation on its axis and revolution around the sun relate to cyclic observable phenomena, including variable day and night length  AC9S6U02 | * exploring simulations of the solar system such as a pocket solar system to appreciate the distances and relationships between the sun and planets * recognising the role of gravity in keeping the planets in orbit around the sun * using 3-dimensional models or role-play to model how Earth’s rotation on its axis causes day and night * using virtual simulations or real-time views of Earth from space to explore why different regions on Earth, such as the South Pole, experience long periods of sunlight or darkness over the cycle of one revolution of Earth around the sun * using 3-dimensional models to explore how the tilt of Earth points one hemisphere towards the sun and the other away at different times of the year, and predicting how this affects the amount of sunlight on the surface of different regions on Earth * researching First Nations Australians’ understandings of the night sky and its use for timekeeping purposes as evidenced in oral cultural records, rock paintings, paintings and stone arrangements | |
| **Sub-strand: Physical sciences** | | |
| investigate the transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors  AC9S6U03 | * identifying necessary components for an electric circuit such as a source of electrical energy and conducting material such as metal wires * constructing a real or virtual circuit to examine requirements to allow the flow of electricity, including exploring the construction and role of switches * constructing representations of electrical circuits and their components using accepted conventions * examining the purpose of different components such as switches and bulbs and exploring use of ammeters to measure current * investigating different electrical conductors and insulators and examining why they may be used * exploring how electricity is used in the home and identifying electrical hazards and safety measures used to mitigate these hazards | |
| **Sub-strand: Chemical sciences** | | |
| compare reversible changes, including dissolving and changes of state, and irreversible changes, including cooking and rusting that produce new substances  AC9S6U04 | * discussing what makes a change reversible or irreversible, using everyday examples * examining the substances produced in cooking and rusting and comparing them with the original substances * comparing how the amount of heat energy added affects whether a change in state or an irreversible change occurs * describing how dissolved substances are reclaimed from solutions * exploring how reversible changes can be used to recycle materials * investigating First Nations Australians’ knowledges of reversible processes such as the application of adhesives and of irreversible processes such as the use of fuels for torches | |

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| **Strand: Science as a human endeavour** | | **Year 6** |
| **Sub-strand: Nature and development of science** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| examine why advances in science are often the result of collaboration or build on the work of others  AC9S6H01 | * investigating how contemporary restorative ecology adapts and builds on the traditional ecological knowledges of First Nations Australians * exploring how international scientific collaboration can answer complex questions about the abiotic factors that affect the growth and survival of living things in Antarctica * examining why ecologists collaborate with engineers and computer scientists to develop remote sensing techniques, identify patterns in habitat change and make predictions * constructing a timeline to show how contributions and collaboration of scientists, mathematicians and astronomers from many countries have advanced our ideas about space and the solar system through development of models, gathering of evidence and, more recently, space exploration * investigating how astronauts and scientists from many different countries have collaborated in the International Space Station program * investigating why scientists changed the phosphate levels in detergents to prevent algal blooms | |
| **Sub-strand: Use and influence of science** | | |
| investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions  AC9S6H02 | * exploring how communities consider the impact of aquatic noise pollution when designing guidelines for water sports * investigating how people use knowledge of conditions that reduce mould or bacterial growth when considering food packaging and storage * considering how people use electrical device guidelines to help ensure safety of children * investigating why underground power cables were developed and how local government authorities use scientific knowledge about power safety when considering converting to underground power | |

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| **Strand: Science inquiry** | | **Year 6** |
| **Sub-strand: Questioning and predicting** | | |
| **Content descriptions** *Students learn to:* | **Content elaborations**  *This may involve students:* | |
| pose investigable questions to identify patterns and test relationships and make reasoned predictions  AC9S6I01 | * posing investigable questions to identify patterns, such as: ‘What type of material is the best conductor and what is the best insulator?’ * posing investigable questions to test relationships, such as: ‘Will more salt dissolve in warm water than in cold water?’ * discussing and refining questions to enable scientific investigation * making reasoned predictions about the physical conditions that will result in the largest mould colonies growing on bread * making reasoned predictions about electrical circuit function based on a picture or diagram of a circuit | |
| **Sub-strand: Planning and conducting** | | |
| plan and conduct repeatable investigations to answer questions including, as appropriate, deciding the variables to be changed, measured and controlled in fair tests; describing potential risks; planning for the safe use of equipment and materials; and identifying required permissions to conduct investigations on Country/Place  AC9S6I02 | * considering different ways to approach investigations including researching, using trial and error, experimental testing, field observations, accessing digital tools to collect and manage data and using virtual simulations * determining which is the variable being tested and which variable is being measured, and which other variables might affect their investigations and need to be kept the same * identifying potential risks to themselves or others when conducting an investigation and explaining rules for safe processes and use of equipment and materials * consulting with First Nations Australians land councils in seeking permissions to conduct scientific investigations on traditional Lands and seeking guidance regarding culturally sensitive locations during field work | |
| use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriate  AC9S6I03 | * selecting and using instruments with the correct scale for measuring data with appropriate accuracy, such as a multimeter * recording data in tables and diagrams or electronically as digital images and spreadsheets * discussing why precision is important in measurement, and the possible effect of low precision on investigation findings * recording data using standard units, such as volt, ampere, gram, second and metre, and developing the use of standard prefixes for metric units such as kilo- and milli- * using digital tools such as digital thermometers or soil moisture probes to collect data over time and record data in spreadsheets | |
| **Sub-strand: Processing, modelling and analysing** | | |
| construct and use appropriate representations, including tables, graphs and visual or physical models, to organise and process data and information and describe patterns, trends and relationships  AC9S6I04 | * exploring how different representations can be used to show different aspects of relationships, processes and trends * representing circuits using virtual simulations or circuit diagrams and indicating the direction of electricity flow * using line graphs to show changes in growth over time under different physical conditions * developing a physical model of the sun and Earth using objects or role-play to describe their relative positions when a place on Earth is in day or night * organising information in graphic organisers to describe patterns and trends | |
| **Sub-strand: Evaluating** | | |
| compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions  AC9S6I05 | * working collaboratively to identify the strengths and weaknesses of their own and others’ investigations including where testing was not fair and practices could be improved * recognising errors that could have occurred during investigations, including changing too many variables, incorrect or misreading of measurements, or changes in environmental factors * comparing and contrasting data collected by different individuals or groups to discuss similarities and differences in their findings and posing questions about differences for further investigation * comparing and contrasting evidence selected by different individuals or groups from similar data * evaluating the inferences made from observations and analysis of the data to draw a reasoned conclusion | |

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| **Sub-strand: Communicating** | |
| write and create texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital tools as appropriate  AC9S6I06 | * constructing a scientific report to share findings, such as how plants responded to changes in physical conditions such as temperature or salinity, and using appropriate vocabulary, data representations, units and sentence structures * creating an imaginative text about a future in which humans live on other planets with differing day lengths, and how they manage the social implications of this, such as keeping track of time or calculating human ages * acknowledging and exploring First Nations Australians’ ways of representing and communicating understandings of the night sky and its use for timekeeping purposes through rock paintings, paintings and stone arrangements * designing a product that uses electrical circuits and performing a sales pitch to have the product mass produced * constructing a poster or slideshow comparing everyday examples of reversible and irreversible change |