Australian CURRICULUM Review

# SCIENCE

## CONSULTATION CURRICULUM

**All elements F–6**

AUSTRALIAN CURRICULUM, ASSESSMENT AND REPORTING AUTHORITY

acara

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# F–10 AUSTRALIAN CURRICULUM: SCIENCE

## ABOUT THE LEARNING AREA

### Introduction

The Australian Curriculum: Science has been developed on the basis that all students will study Science from Foundation to Year 10.

### Rationale

Science is a dynamic, collaborative and creative human endeavour arising from our desire to make sense of our world through exploring the unknown, investigating universal mysteries, making predictions and solving problems. Science provides an empirical way of answering interesting and important questions about the changing world in which we live. The knowledge it produces has proved to be a reliable basis for action in our personal, social and economic lives. Science knowledge is contestable and is revised, refined and extended as new evidence arises.

The Australian Curriculum: Science gives students opportunities to develop an understanding of important science concepts and processes, the practices used to develop scientific knowledge, science's contribution to our culture and society, and its applications in our lives. The curriculum supports students to develop the scientific knowledge, understandings and skills needed to make informed decisions about local, national and global issues and to participate in science-related careers.

In addition to its practical applications, learning science is a valuable pursuit in its own right. Students can experience the joy of scientific discovery and nurture their natural curiosity about the world around them. In doing this, they develop critical and creative thinking skills and challenge themselves to identify questions and draw evidence-based conclusions using scientific practices. The wider benefits of this 'scientific literacy' are well established, including giving students the capability to investigate the natural world and changes made to it through human activity.

### Aims

The Australian Curriculum: Science aims to ensure that students develop:

- an interest in science as a means of expanding their curiosity and willingness to explore, ask questions about and speculate on the changing world in which they live
- a solid foundation of knowledge of the biological, Earth and space, physical and chemical sciences, including being able to select and integrate the scientific knowledge and practices needed to explain and predict phenomena, to apply that understanding to new situations and events, and to appreciate the dynamic nature of scientific knowledge

- an understanding of the nature of scientific inquiry and the ability to use a range of scientific inquiry practices, including questioning; planning and conducting experiments and investigations based on ethical principles; collecting and analysing data; evaluating results; and drawing critical, evidence-based conclusions
- an ability to communicate scientific understanding and findings to a range of audiences, to justify ideas on the basis of evidence, and to evaluate and debate scientific arguments and claims
- an ability to solve problems and make informed, evidence-based decisions about current and future applications of science while taking into account ethical and social implications of decisions
- an understanding of historical and cultural contributions to science as well as contemporary science issues and activities and an understanding of the relationship between science and society.

## Organisation of the learning area

### *Content structure*

The Australian Curriculum: Science is presented in year levels from Foundation to Year 10.

### *Year level descriptions*

Year level descriptions give an overview of the learning that students should experience at each year level. Year level overviews include example inquiry questions that could be used to prompt discussion; they are optional only.

### *Achievement standards*

Achievement standards describe the expected quality of learning that students should typically demonstrate by the end of each year.

### *Content descriptions*

Content descriptions specify the essential knowledge, understanding and skills that students are expected to learn, and teachers are expected to teach, in each year. The content descriptions are organised into strands and sub-strands.

### *Content elaborations*

Content elaborations give teachers suggestions and illustrations of ways to teach the content descriptions. They are optional material only; they are not a set of complete or comprehensive content points that all students need to be taught. They illustrate and exemplify content descriptions with a diverse range of examples.

### *Strands and sub-strands*

The Australian Curriculum: Science has three interrelated strands:

- Science understanding
- Science as a human endeavour
- Science inquiry.

Together, the three strands provide students with understanding, knowledge and skills through which they can develop a scientific view of the world. Students are challenged to explore science, its concepts, nature and uses through clearly described inquiry processes.

Content under each strand is further organised into sub-strands as shown in Figure 1 and Table 1.

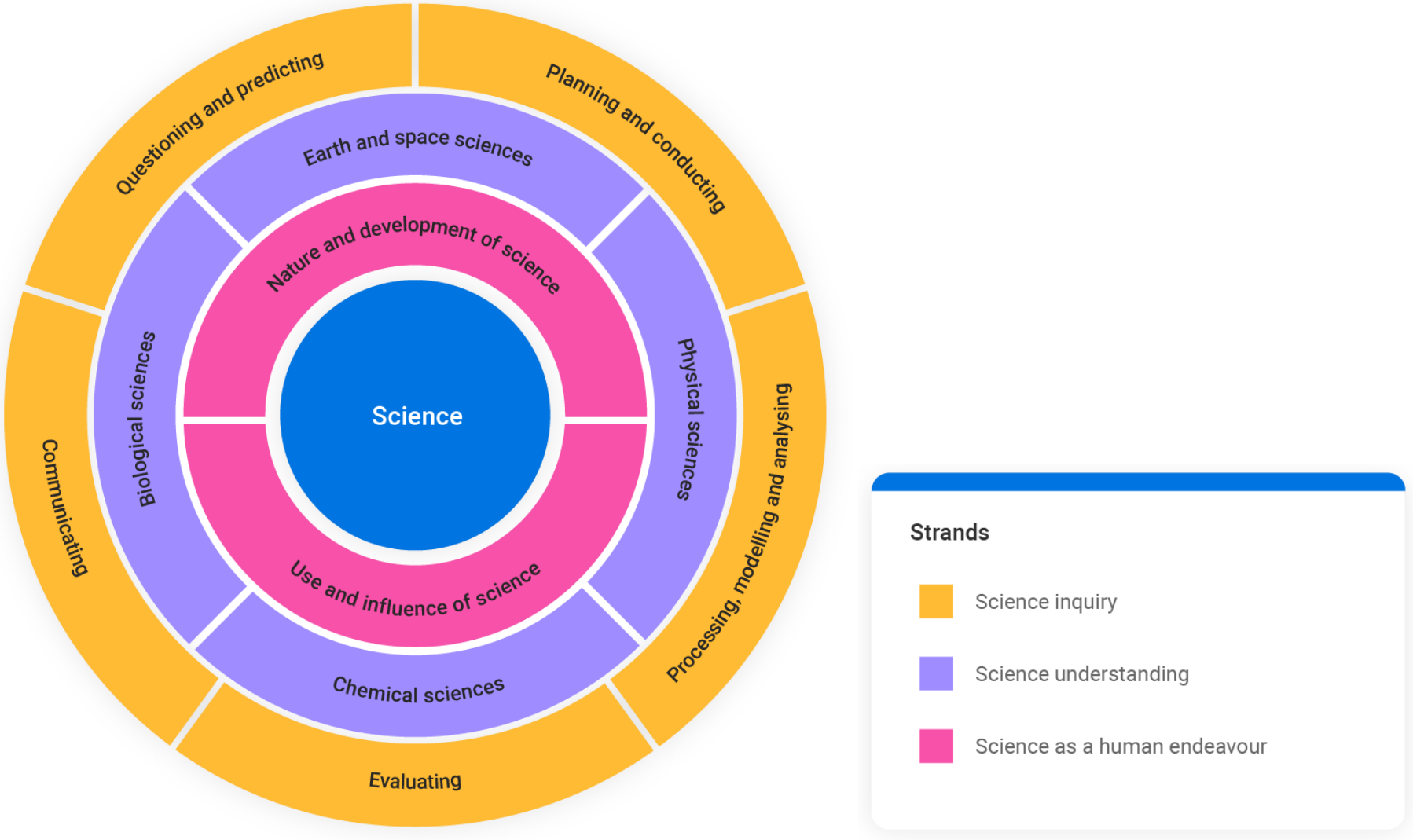


*Figure 1: Science strands and sub-strands*

*Table 1: Relationship between strands and sub-strands*

| Strands | **Science understanding** | **Science as a human endeavour** | **Science inquiry** |
|---|---|---|---|
| Sub-strands | Biological sciences | Nature and development of science | Questioning and predicting |
| | Earth and space sciences | Use and influence of science | Planning and conducting |
| | Physical sciences | | Processing, modelling and analysing |
| | Chemical sciences | | Evaluating |
| | | | Communicating |

***Read more***

### Science understanding

Science understanding is evident when a person selects and integrates appropriate science knowledge to explain and predict phenomena and applies that knowledge to new situations. Science knowledge refers to facts, concepts, principles, laws, theories and models that have been established by scientists over time.

Content for science understanding is described by year level. The science understanding strand comprises four sub-strands:

- **Biological sciences** – The biological sciences sub-strand is concerned with understanding living things. Students investigate living things, including animals, plants and microorganisms, and their interdependence and interactions within ecosystems. They explore their life cycles, body systems, structural adaptations and behaviours; how these features aid survival; and how their characteristics are inherited from one generation to the next.
- **Earth and space sciences** – The Earth and space sciences sub-strand is concerned with Earth's dynamic structure and its place in the cosmos. Through this sub-strand, students view Earth as part of a larger celestial system. They explore how changes on Earth such as day and night and the seasons relate to Earth's rotation and its orbit around the sun. Students investigate the processes that result in change to Earth's surface, recognising that Earth has evolved over 4.5 billion years and that the effect of some of these processes is only evident when

viewed over extremely long timescales. They explore the interactions and interdependencies of the biosphere, geosphere, atmosphere and hydrosphere and appreciate the influence of human activity on the Earth system.

- **Physical sciences** – The physical sciences sub-strand is concerned with understanding the nature of forces and motion, and matter and energy. Students gain an understanding of how an object's motion is influenced by a range of forces such as frictional, magnetic, gravitational and electrostatic forces. They develop an understanding of the concept of energy and how energy transfer is associated with phenomena involving motion, heat, sound, light and electricity. They appreciate that concepts of force, motion, matter and energy apply to systems ranging in scale from atoms to the universe itself.
- **Chemical sciences** – The chemical sciences sub-strand is concerned with understanding the composition and behaviour of substances. Students classify substances based on their properties, such as solids, liquids and gases; or their composition, such as elements, compounds and mixtures. They explore physical changes such as changes of state and dissolving and investigate how chemical reactions result in the production of new substances. Students recognise that all substances consist of atoms, and that chemical reactions involve atoms in substances being rearranged and recombined to form new substances. They explore relationships between rearrangements of atoms, properties of substances and energy.

### Science as a human endeavour

Through science, humans seek to improve their understanding and explanations of the natural world. Science involves the construction of explanations based on evidence, and scientific knowledge can be changed as new evidence becomes available. Science influences society by posing and responding to social and ethical questions, and scientific research is itself influenced by the needs and priorities of society. This strand highlights the development of science as a unique way of knowing and doing, and the role of science in contemporary decision-making and problem-solving. It acknowledges that in making decisions about science practices and applications, ethical and social implications must be taken into account.

The content in the science as a human endeavour strand is described in two-year bands. The science as a human endeavour strand comprises two sub-strands:

- **Nature and development of science** – Through this sub-strand students develop an appreciation of the unique nature of science and scientific knowledge, including how science is based on empirical evidence that can be changed in light of new or reinterpreted evidence. Students learn how scientific knowledge has been revised, refined and extended over time through the individual and collaborative efforts of scientists from diverse cultures.

- **Use and influence of science** – Through this sub-strand students explore how scientific knowledge and applications affect individuals and communities, including informing their decisions and identifying responses to contemporary issues. Students learn that scientific knowledge and applications are also influenced by social, cultural and economic factors.

### Science inquiry

Science inquiry involves identifying and posing questions; planning, conducting and reflecting on investigations; processing, analysing and interpreting evidence; and communicating findings. This strand is concerned with evaluating claims, investigating ideas, solving problems, drawing valid conclusions and developing evidence-based arguments.

Science investigations are activities in which ideas, predictions or hypotheses are tested and conclusions are drawn in response to a question or problem. Investigations can involve a range of activities including experimental testing, field work, locating and using information sources, conducting surveys, and using modelling and simulations. The choice of the approach taken will depend on the context and subject of the investigation.

The content in the science inquiry strand is described in two-year bands. There are five sub-strands. These are:

- **Questioning and predicting** – Students identify and construct questions, propose hypotheses and predict possible outcomes.
- **Planning and conducting** – Students make decisions regarding how to investigate or solve a problem and carry out an investigation, including the generation of data.
- **Processing, modelling and analysing** – Students represent data in meaningful and useful ways and identify trends, patterns and relationships in data.
- **Evaluating** – Students consider the quality of available evidence, and the merit or significance of a claim, proposition or conclusion with reference to that evidence.
- **Communicating** – Students convey information or ideas to others in ways appropriate to the purpose and audience.

### Relationship between the strands

In the practice of science, the three strands of science understanding, science inquiry and science as a human endeavour are closely integrated; the work of scientists reflects the nature and development of science, is built around scientific inquiry and seeks to respond to and influence society's needs. Students' experiences of science at school should mirror and connect to this multifaceted view of science.

To achieve this, the three strands of the Australian Curriculum: Science should be taught in an integrated way. The content descriptions of the three strands have been written so that at each year this integration is possible. In the earlier years, the nature and development of science sub-strand within the science as a human endeavour strand focuses on how scientists engage in scientific inquiry. This enables students to make clear connections between the inquiry skills that they are learning and the work of scientists. As students progress through the curriculum they will be able to investigate how science understanding has developed, including considering some of the people and stories behind advances in science.

Students will also recognise how science understanding can be applied to their lives and the lives of others. As students develop a more sophisticated understanding of the knowledge and skills of science, they are increasingly able to appreciate the role of science in society. The content of the science understanding strand will inform students' understanding of contemporary issues such as climate change, use of resources, emerging technologies and protection of biodiversity. The importance of these areas of science can be emphasised through the content of the science as a human endeavour strand, and students can be encouraged to view contemporary science critically through aspects of the science inquiry strand; for example, by analysing, evaluating and communicating.

### *Core concepts*

Core concepts are the big ideas, understandings, skills or processes that are central to the Science curriculum. They give clarity and direction about what content matters most in the learning area. In the curriculum development process, core concepts help identify the essential content students should learn to develop a deep and increasingly sophisticated understanding of Science across the years of schooling. They ensure content is connected within and across the strands, building in sophistication across the year levels.

In Science, the core concepts are complemented by a set of key ideas. Figure 2 gives an overview of the design of the Australian Curriculum: Science.

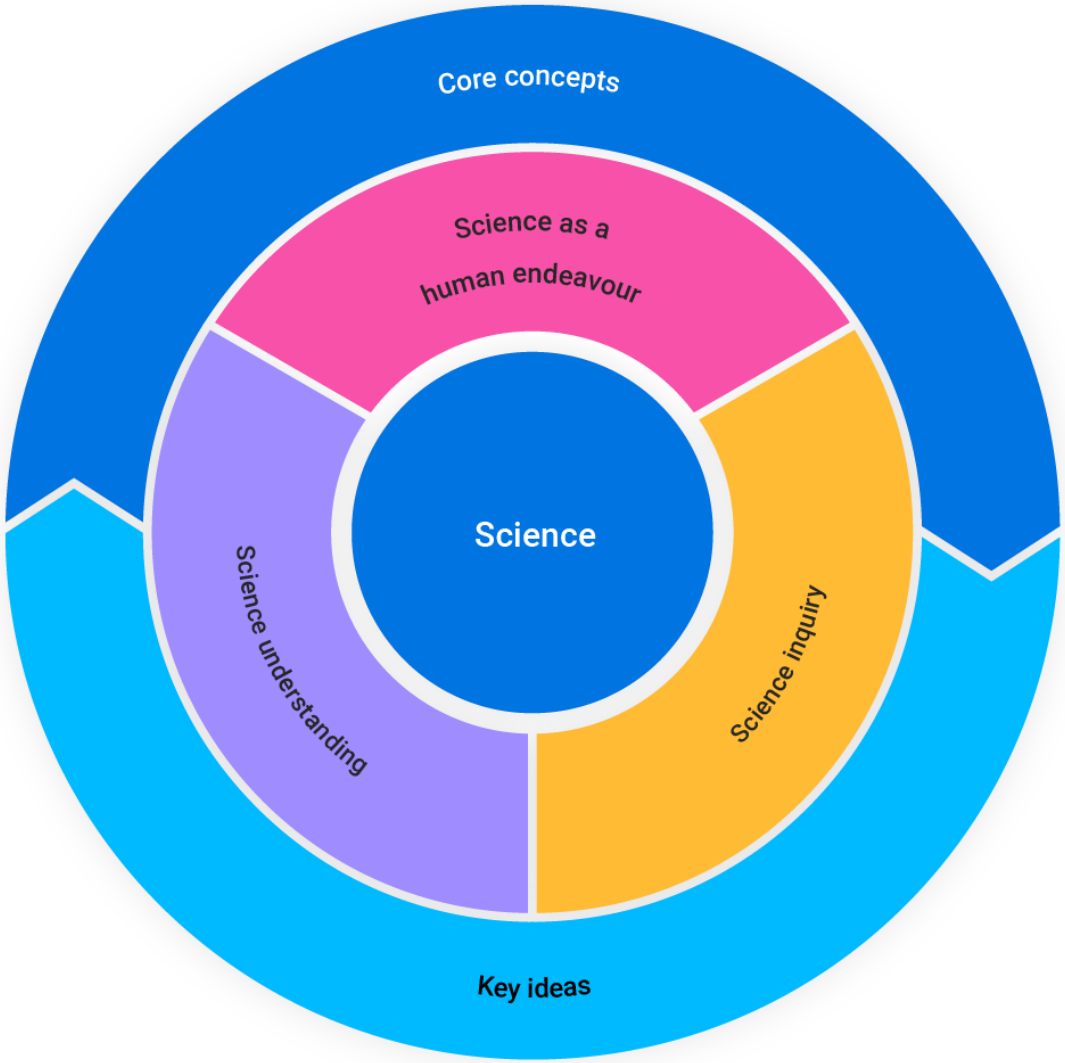


*Figure 2: Overview of the design of the Australian Curriculum: Science*

In Science, core concepts are identified for each strand, as shown in Table 2.

*Table 2: Science core concepts by strand*

| Science core concepts | | |
|---|---|---|
| **Science understanding** | **Science as a human endeavour** | **Science inquiry** |
| • Earth is part of an astronomical system; interactions between Earth and celestial bodies influence Earth's systems<br>• Earth's systems are dynamic and interdependent; interactions between the systems cause continuous change over a range of scales<br>• A diverse range of living things have evolved on Earth over hundreds of millions of years<br>• Biological systems are interdependent and interact with each other and their environment<br>• The form and features of living things are related to the functions that their body systems perform<br>• The chemical and physical properties of substances are determined by their structure at a range of scales<br>• Substances change and new substances are produced by rearranging atoms; these changes involve energy transfer and transformation<br>• Forces affect the motion and behaviour of objects<br>• Energy can be transferred and transformed from one form to another and is conserved within systems | • Science inquiry values curiosity, creativity, accuracy, objectivity, perseverance and scepticism<br>• Science knowledge is a result of individual and collaborative efforts, and advances reflect historical and cultural contributions<br>• Science knowledge is built on empirical evidence; however, all science knowledge can be changed in light of new or reinterpreted evidence<br>• Scientific knowledge, practices and products are influenced by social, ethical and economic factors<br>• Science, technology and engineering are interconnected; advances in one field can lead to advances in other fields<br>• Science knowledge, balanced with ethical and social considerations, contributes to understanding complex contemporary issues and identifying responses | • Science inquiry involves making observations and predictions, asking questions, and constructing evidence-based explanations for natural and physical phenomena<br>• Science inquiry may be undertaken to describe a phenomenon, explore relationships, test a theory or model, or design solutions<br>• Science inquiries should be designed to systematically collect valid and reliable primary and secondary data in a safe, ethical and interculturally aware manner<br>• Mathematical thinking underpins science practices of representing objects and events, analysing data and modelling relationships<br>• Evaluating evidence enables development of explanations, decision-making and designed solutions<br>• Critiquing and communicating science ideas effectively is critical to advancing science and influencing environmental, social and economic futures |

### Key ideas

Science core concepts are further underpinned by a set of key ideas. The key ideas support the coherence and development of science knowledge within and across year levels. They frame the development of core concepts in the science understanding strand, support key aspects of the science inquiry strand and contribute to developing students' appreciation of the nature of science in the science as a human endeavour strand.

***Read more***

The key ideas are:

#### Patterns, order and organisation

An important aspect of science is recognising patterns in the world around us and ordering and organising phenomena at different scales. As students progress from Foundation to Year 10, they build skills and understanding that will help them to observe and describe patterns at different scales and develop and use classifications to organise events and phenomena and make predictions. Classifying objects and events into groups (such as solid, liquid or gas, or living or non-living) and developing criteria for those groupings relies on making observations and identifying patterns of similarity and difference. As students progress through the primary years, they become more proficient in identifying and describing the relationships that underpin patterns, including cause and effect. Students increasingly recognise that scale plays an important role in the observation of patterns; some patterns may only be evident at certain time and spatial scales. For example, the pattern of day and night is not evident over the timescale of an hour.

#### Form and function

Many aspects of science are concerned with the relationships between form (the nature or make-up of an aspect of an object or organism) and function (the use of that aspect). As students progress from Foundation to Year 10, they see that the functions of living and non-living objects rely on their forms. Students' understanding of forms such as the features of living things or the nature of a range of materials, and their related functions or uses, is initially based on observable behaviours and physical properties. In later years, students recognise that function often relies on form and that this relationship can be examined at many scales. They apply an understanding of microscopic and atomic structures, interactions of force, and flows of energy and matter to describe relationships between form and function.

#### Stability and change

Many areas of science involve the recognition, description and prediction of stability and change. Early in their schooling, students recognise that in their observations of the world around them, some properties and phenomena appear to remain stable or constant over time whereas others change. As they progress from Foundation to Year 10, they also recognise that phenomena (such as properties of objects and relationships

between living things) can appear to be stable at one spatial or time scale, but at a larger or smaller scale may be seen to be changing. Students begin to appreciate that stability can be the result of competing but balanced forces. They become increasingly adept at quantifying change through measurement and looking for patterns of change by representing and analysing data in tables or graphs.

### Scale and measurement

Quantification of time and spatial scale is critical to the development of science understanding as it enables the comparison of observations. Students often find it difficult to work with scales that are outside their everyday experience – these include the huge distances in space, the incredibly small size of atoms and the slow processes that occur over geological time. As students progress from Foundation to Year 10, their understanding of relative sizes and rates of change develops and they conceptualise events and phenomena at a wider range of scales. They progress from working with scales related to their everyday experiences and comparing events and phenomena using relative language (such as 'bigger' or 'faster') and informal measurement, to working with scales beyond human experience and quantifying magnitudes, rates of change and comparisons using formal units of measurement.

### Matter and energy

Many aspects of science involve identifying, describing and measuring transfers of energy and matter. As students progress through the year levels, they become increasingly able to explain phenomena in terms of the flow of matter and energy. In the early years, students focus on direct experience and observation of phenomena and materials. As they progress, they begin to connect observable phenomena with more abstract notions of particles, forces and energy transfer and transformation. They use these understandings to describe and model phenomena and processes involving matter and energy.

### Systems

Science often involves thinking, modelling and analysing in terms of systems to understand, explain and predict events and phenomena. As students progress from Foundation to Year 10, they explore, describe and analyse increasingly complex systems. Initially, students identify the observable components of a clearly identified 'whole' such as features of plants and animals and parts of mixtures. Across Years 3 to 6 they learn to identify and describe relationships between components within simple systems, and they begin to appreciate that components within living and non-living systems are interdependent. In Years 7 to 10 they are introduced to the processes and underlying phenomena that structure systems such as ecosystems, body systems and the carbon cycle. They recognise that within systems, interactions between components can involve forces and changes acting in opposing directions and that for a system to be in a steady state, these factors need to be in a state of balance or equilibrium. They are increasingly aware that systems can exist as components within larger systems, and that one important part of thinking about systems is identifying boundaries, inputs and outputs.

## Key connections

### *General capabilities*

In the Australian Curriculum, general capabilities equip young Australians with the knowledge, skills, behaviours and dispositions to live and work successfully. General capabilities are developed through learning area content; they are not separate learning areas, subjects or isolated skills.

Opportunities to develop general capabilities in learning area content vary. The general capabilities of most relevance and application to Science are Literacy, Numeracy, Critical and Creative Thinking, Digital literacy, Ethical Understanding and Personal and Social capability.

Literacy and numeracy are fundamental to all learning. While literacy and numeracy development is core to the curriculum in English and Mathematics, literacy and numeracy skills are required and applied in all learning areas, including Science.

General capabilities are identified in content descriptions when they are developed or applied through learning area content. They are also identified in content elaborations when they offer opportunities to add depth and richness to student learning.

### *Read more*

#### Literacy

In Science, students develop literacy capability as they explore and investigate their world. They comprehend and compose texts including those that give information; describe events and phenomena; recount experiments; present and evaluate data; give explanations; and present ideas, opinions and claims. They comprehend and compose multimodal texts such as charts, graphs, diagrams, pictures, maps, animations, models and visual media. Language structures and text structures are used to link information and ideas, give descriptions and explanations, formulate hypotheses and construct evidence-based arguments capable of expressing an informed position.

Scientific vocabulary is often technical and includes specific terms for concepts and features of the world, as well as terms that encapsulate an entire process in a single word, such as a ‘photosynthesis’. Language is therefore essential in providing the link between the concept itself and student understanding and assessing whether the student has understood the concept.

#### Numeracy

Students use and develop numeracy through investigation of science understanding concepts and application of science inquiry practices. The key ideas of science which underpin science understanding and science as a human endeavour are closely linked to numeracy through their focus on scale and measurement, and patterns, order and organisation.

Through inquiry practices, students develop numeracy through a focus on measurement and data collection. They identify patterns in data and use mathematical relationships to represent those patterns. They represent observed and secondary data using tables, displays and visualisations and interpret data to construct evidence-based conclusions and arguments. In later years, they engage in statistical analysis of data and consider issues of validity and reliability of data.

### Critical and Creative Thinking

Students develop critical and creative thinking as they learn to generate and evaluate ideas and possibilities when seeking new pathways or solutions. In the Science learning area, critical and creative thinking are embedded in the skills of questioning and predicting, solving problems through planning and conducting investigations, and analysing and evaluating evidence to make decisions and draw conclusions. Students develop an understanding of science concepts through active inquiry that involves selecting appropriate information, evaluating sources of information to formulate hypotheses and reflecting on the processes used to reach evidence-based conclusions.

Creative thinking enables the development of ideas that are new to the individual, and this is intrinsic to the development of scientific understanding. Scientific inquiry promotes critical and creative thinking by encouraging flexibility and open-mindedness as students speculate about their observations of the world and the ability to use and design new processes to solve problems and create solutions. Students' conceptual understanding becomes more sophisticated as they actively acquire an increasingly scientific view of their world and the ability to examine it from new perspectives.

### Digital Literacy

Students develop digital literacy as they operate and manage digital systems and practise digital safety and wellbeing while investigating, creating and communicating. In particular, they use digital literacy to access information; collect, analyse and represent data and information; model and interpret concepts and relationships; and communicate science ideas, processes and information.

Digital tools such as animations and simulation software can support student understanding of abstract phenomena, as they give opportunities to view phenomena and test predictions that cannot be investigated through practical investigations in the classroom.

### Ethical Understanding

Students develop their understanding of ethical concepts and ethical decision-making processes in relation to science investigations, codes of practice, and the use of scientific information and science applications. They learn about ethical procedures for investigating and working with people, animals, data and materials. Students use scientific information to evaluate claims and to inform ethical decisions about a range of social, environmental and personal issues. They consider their own roles as discerning citizens and learn to analyse biases and assumptions as they apply ethical concepts when making decisions in complex situations.

### Personal and Social capability

Students develop self-awareness and self-management skills as they direct their own learning, plan and carry out investigations, and become independent learners who can apply science understanding and practices to make decisions. They build skills in social awareness and social management as they engage in collaborative investigations that require them to work cooperatively in teams, share resources and processes, make group decisions and show leadership. Empathy and respect are developed as students identify and learn about the diverse world views and perspectives that have informed the development of science, and the ways in which different individuals and groups may perceive scientific knowledge, advances or solutions.

### *Cross-curriculum priorities*

Cross-curriculum priorities support the Australian Curriculum to be a relevant, contemporary and engaging curriculum that reflects regional, national and global contexts. Cross-curriculum priorities are incorporated through learning area content; they are not separate learning areas or subjects. They give opportunities to enrich the content of the learning areas where most appropriate and authentic, allowing students to engage with and better understand their world.

Opportunities to apply cross-curriculum priorities to learning area content vary. The cross-curriculum priorities of most relevance and meaning to the Science curriculum are Sustainability and Aboriginal and Torres Strait Islander Histories and Cultures.

### *Read more*

### Sustainability

In Science, the sustainability priority provides contexts for investigating and understanding biological, Earth and space, physical and chemical systems. Students explore a range of systems that operate at different time and spatial scales. By investigating the relationship between systems and system components and how systems respond to change, students develop an appreciation for the interconnectedness of Earth's biosphere, geosphere, hydrosphere and atmosphere. Students also explore how science is used to predict possible effects of human and other activity and to develop management plans or alternative technologies that minimise or mitigate these effects.

Through the lens of science as a human endeavour, students explore the relationship between science and society and the importance of understanding and considering competing viewpoints, values and interests. Students appreciate that science provides the basis for decision-making in many areas of society and that these decisions can impact the sustainability of environmental, social and economic systems.

### Aboriginal and Torres Strait Islander Histories and Cultures

In Science, students will have opportunities to learn that First Nations Peoples of Australia have longstanding scientific knowledge traditions and developed knowledge about the world by making observations, using all the senses, engaging in prediction, hypothesising and testing (trial and error), and making generalisations within specific contexts such as the use of food, natural materials, navigation and sustainability of the environment.

Science provides opportunities for students to become aware that First Nations Australians have worked scientifically for millennia and continue to provide significant contributions to developments in science. Content elaborations in each strand include examples of particular First Nations Australians' science knowledges and suggestions for how students can explore cultural techniques and processes employed by First Nations Australians such as stone knapping, skin tanning, cooking methods, production of pigments and dyes, and fire lighting methods that relate to Australian Curriculum: Science. Through the exploration of the contributions of First Nations Peoples of Australia to areas such as medicine, mining, ecology, fire management, habitat restoration and water management, students can investigate the ways First Nations Australians knowledges and Western knowledges can be used in combination to advance scientific understanding and to care for Country and Place.

Science inquiry provides an opportunity for students to engage in reconciliation, respect and recognition of First Nations Peoples of Australia and their cultures through respectful approaches to field work, consultation and collaboration. Students consider ethical considerations regarding access to Country and Place, the treatment of cultural heritage sites and respect for intellectual property rights.

#### *Learning Areas*

The Australian Curriculum: Science gives opportunities to integrate and connect content to other learning areas; in particular, Mathematics, Technologies, Humanities and Social Sciences and Health and Physical Education.

#### *Read more*

### Science and Mathematics

Science and Mathematics share a focus on measurement, empirical reasoning, inquiry, experimentation and investigation. In both learning areas students are introduced to measurement, first using informal units, then using formal units. Later, they consider issues of uncertainty and reliability in measurement. As students progress, they collect qualitative and quantitative data, which are analysed and represented in graphical forms. Students learn data analysis skills, including identifying trends and patterns from numerical data and graphs. In later years, students explore the use of mathematical relationships to model interactions between system components and make predictions.

### Science and Technologies

Science and Technologies share a focus through the Design and Technologies sub-strand: technologies contexts, which gives students an opportunity to apply the core concepts and explanatory models they learn in Science to designed solutions. Physical sciences inform engineering principles and systems; chemical sciences inform materials and technologies specialisations, and food specialisations; and biological sciences share concepts and models with food and fibre production.

### Science and Humanities and Social Sciences

Science and Humanities and Social Sciences share a focus on understanding patterns of continuity and change in the world. Humanities and Social Science subjects draw on students' scientific understandings of biological and Earth and space sciences and give students an opportunity to explore socio-scientific issues through the lens of science as a human endeavour. Science and Humanities and Social Sciences also share a focus on developing students' inquiry practices, with an emphasis on questioning and data collection and analysis to form evidence-based conclusions and arguments.

### Science and Health and Physical Education

Science and Health and Physical Education share a focus on the human body and movement. In Health and Physical Education, students investigate human anatomy, movement performance in a practical context, and body responses to exercise and activity. Science approaches these topics through the lenses of biological systems and interactions of force and energy. Health and Physical Education also gives students an opportunity to explore applications of scientific concepts in ways that directly relate to their sense of self and wellbeing within their community.

## Key considerations

### *Safety*

Identifying and managing risk in Science addresses the safe use of equipment and materials as well as safe behaviours in field, classroom or laboratory contexts. It covers all necessary aspects of health, safety and injury prevention and the use of potentially dangerous materials and equipment.

Science learning experiences may involve the use of potentially hazardous substances and hazardous equipment. It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students and that school practices meet the requirements of the *Work Health and Safety Act 2011* and Work Health and Safety Regulation 2017, in addition to relevant state or territory health and safety guidelines.

In implementing investigations involving food, care must also be taken with regard to food safety and specific food allergies that may result in anaphylactic reactions. The Australasian Society of Clinical Immunology and Allergy has published guidelines for the prevention of anaphylaxis in schools. Some states and territories have their own specific guidelines that should be followed.

When state and territory curriculum authorities integrate the Australian Curriculum into local courses, they will include more specific advice on safety. For more information about relevant guidelines, contact your state or territory curriculum authority.

### *Animal ethics and biosecurity*

Any teaching activities that involve caring for, using or interacting with animals must comply with the *Australian code of practice for the care and use of animals for scientific purposes 2013*, in addition to relevant state or territory guidelines. The Australian Government and state and territory governments may have extra legislation for animal ethics, protection of native animals and biosecurity that could affect how schools use animals.

When state and territory curriculum authorities integrate the Australian Curriculum into local courses, they will include specific advice on the care and use of, or interaction with, animals. Schools must ensure they are aware of and comply with all state, territory and Commonwealth legislation or regulation about the use of animals in schools. For more information about relevant guidelines or to access your animal ethics committee, contact your state or territory curriculum authority.

Australian code of practice for the care and use of animals for scientific purposes, 2013

https://www.nhmrc.gov.au/about-us/publications/australian-code-care-and-use-animals-scientific-purposes

Information correct as at 1 April 2021

### *Protocols for engaging with First Nations Australians*

When planning teaching activities involving engagement with First Nations Australians, teachers should follow protocols that describe principles, procedures and behaviours for recognising and respecting First Nations' Australians people and their intellectual property. Teachers should use approved resources such as those provided by their state or territory school system, First Nations Australians education consultative groups or other protocols accredited by First Nations Australians.

## CURRICULUM ELEMENTS

### Foundation

#### Year level description

In Foundation students learn that observations can be organised to reveal patterns, and that these patterns can be used to make predictions about phenomena. They observe and describe the characteristics of everyday objects, materials and living things and identify similarities and differences. They explore changes in the world around them, including changes they can affect, such as making things move or change shape. They learn that seeking answers to questions they pose and making observations is a core part of science and use their senses to gather different types of information.

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 is a tree like an octopus? A bird like a fish? A spider like a fly?
- How do different objects move?
- Why are objects made of different materials?
- How can I use my senses to learn about the natural world?

#### Achievement standard

By the end of Foundation students group plants and animals based on external features. They identify factors that affect the movement of objects. They describe the observable properties of materials that make up objects. They describe how scientists investigate the world around them.

Students pose questions and state predictions. They engage in explorations safely. With guidance, they make and represent observations and identify patterns. They reflect on their explorations by comparing their observations with their predictions. They share observations and ideas with others.

| Strand / Sub-strand | | Content description<br>*Students learn to:* | Elaboration<br>*This may involve students:* |
|---|---|---|---|
| Science understanding | Biological sciences | explore external features of plants and animals and ways they can be grouped based on these features (AC9SFU01) | exploring how First Nations Australians' observations of external features of living things are mimicked and replicated in traditional dance (AC9SFU01_E1) |
| | | | recognising First Nations Australians' use of observable features to group living things (AC9SFU01_E2) |
| | | | 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 (AC9SFU01_E3) |
| | | | recognising humans as animals, describing external features of humans and exploring similarities and differences from other animals (AC9SFU01_E4) |
| | | | sorting collections of model animals and explaining different grouping strategies (AC9SFU01_E5) |
| | | | observing fruits and vegetables and identifying them as parts of plants such as roots, fruits or leaves (AC9SFU01_E6) |
| | Physical sciences | explore how objects move and how factors including their size, shape and material, affect their motion (AC9SFU02) | exploring how the size and shape of traditional instructive toys used by First Nations Australians influence their movement (AC9SFU02_E1) |
| | | | comparing the way different-sized, similar-shaped objects such as tennis balls, golf balls, marbles or basketballs roll and bounce (AC9SFU02_E2) |
| | | | observing and describing ways different and unusually shaped objects such as blocks, tubes or eggs move when rolled down a slope (AC9SFU02_E3) |
| | | | exploring how the material a ball is made from affects the way it moves, such as tennis, cloth or rubber balls on a surface (AC9SFU02_E4) |
| | | | observing how toys such as bathtub toys move, and grouping them based on their movement (AC9SFU02_E5) |
| | Chemical sciences | explore how objects can be composed of different materials, and describe observable properties of those materials (AC9SFU03) | investigating the ways in which First Nations Australians use different materials (AC9SFU03_E1) |
| | | | creating a display of different materials, naming each material and exploring language for describing properties of materials (AC9SFU03_E2) |
| | | | 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 (AC9SFU03_E3) |

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| | | | using a digital camera to collect images of objects on a materials scavenger hunt (AC9SFU03_E4) |
| | | | sorting and grouping materials based on observed properties such as colour, hardness, texture and flexibility (AC9SFU03_E5) |
| | | | recognising that tools such as magnifying glasses enable more-detailed observations (AC9SFU03_E6) |
| | | | suggesting why different parts of everyday objects, such as saucepans and clothing, are made from different materials (AC9SFU03_E7) |
| **Science as a human endeavour** | Nature and development of science | explore how scientists use observation and questioning to learn about the natural world (AC9SFH01) | exploring how First Nations Australians gain knowledge about the land and its vital resources, such as water and food, through observation (AC9SFH01_E1) |
| | | | 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 (AC9SFH01_E2) |
| | | | using their senses to make observations and exploring how scientists use their senses as well as equipment to make observations (AC9SFH01_E3) |
| | | | viewing examples of scientific observations such as rock paintings, bark drawings, simple written reports, labelled drawings or photographs to explore ways to make and record observations (AC9SFH01_E4) |
| | | | watching an age-appropriate documentary, noticing how scientists ask questions and posing their own questions (AC9SFH01_E5) |
| **Science inquiry** | Questioning and predicting | pose questions and make predictions based on experiences (AC9SFI01) | asking questions based on experiences such as: ‘What part of a plant is broccoli?’ or ‘How high do balls bounce?’ (AC9SFI01_E1) |
| | | | posing questions about everyday objects and the materials that they may be made of (AC9SFI01_E2) |
| | | | making predictions before field work, such as which plants and animals they may observe in the school grounds (AC9SFI01_E3) |
| | | | making predictions about how an unusually shaped object such as an egg or a hexagonal block might roll down a slope (AC9SFI01_E4) |

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| | Planning and conducting | engage in explorations safely and make observations using their senses (AC9SFI02) | observing external features of plants and animals (AC9SFI02_E1) |
| | | | recording observations using numbers, dots, drawings, voice recordings or digital photography or video (AC9SFI02_E2) |
| | | | 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 (AC9SFI02_E3) |
| | | | explaining safety considerations for using the senses of touch, smell, sight, hearing and taste (AC9SFI02_E4) |
| | | | using provided tools such as magnifying glasses and digital photography or video to enhance their observations (AC9SFI02_E5) |
| | 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 (AC9SFI30_E1) |
| | | | identifying common features of familiar groups of animals, such as fish, birds or reptiles (AC9SFI03_E2) |
| | | | identifying patterns of movement of objects, with guidance, such as that balls roll easily in a straight line when pushed, or toys move in certain ways because of their wheels (AC9SFI03_E3) |
| | | | collaborating to create a floor or wall display to link images or samples of materials to images of observed objects (AC9SFI03_E4) |
| | | | identifying patterns in uses of everyday objects made of similar materials, such as wood, metal or glass (AC9SFI03_E5) |
| | Evaluating | compare observations with predictions (AC9SFI04) | revisiting their predictions with guidance and identifying whether the prediction matched their observations (AC9SFI04_E1) |
| | | | comparing with guidance plants or animals observed during field work with their initial predictions (AC9SFI04_E2) |
| | | | using a provided table to draw or dictate their prediction and their observation and identifying whether they are the same or different (AC9SFI04_E3) |

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| Communicating | share observations and ideas with others (AC9SFI05) | describing observations to others through discussions and circle groups (AC9SFI05_E1) |
| | | recounting stories about scientists and how they learn about the natural world (AC9SFI05_E2) |
| | | role-playing or showing how scientists use different equipment to make observations (AC9SFI05_E3) |
| | | representing external features of animals and plants using a range of materials such as blocks, modelling clay, craft materials or paper (AC9SFI05_E4) |
| | | communicating observations using posters, collages, displays, drawings or storyboards (AC9SFI05_E5) |

## Year 1

### Year level description

In Year 1 students learn that common characteristics within groups of living things, objects and events can be identified. They infer simple relationships from their observations and experiences and begin to link function with observable properties and to ask questions. They observe changes, including changes that impact on them, that 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.

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 does the weather affect our decisions?
- How many different ways can we make objects move?
- How do we use science at school or at home?

### Achievement standard

By the end of Year 1 students describe where plants and animals live and how they meet their needs. They recognise patterns of change in their environment and describe how these affect their everyday life. They explain how to change the motion and shape of objects. They describe how scientists make predictions and they identify science in their daily life.

Students pose questions and make predictions to explore observations. They follow safe procedures to make and record observations. They sort and order data and information using provided templates and with guidance, represent patterns. They compare observations with predictions and identify further questions. They use provided scaffolds to communicate observations, findings and ideas.

| Strand / Sub-strand | | Content description<br>*Students learn to:* | Elaboration<br>*This may involve students:* |
|---|---|---|---|
| Science understanding | Biological sciences | explore the basic needs of plants and animals, including air, water, food and shelter and how the place they live meets those needs (AC9S1U01) | recognising how First Nations Australians care for living things (AC9S1U01_E1) |
| | | | identifying and comparing the needs of a variety of plants and animals, including humans, based on their own experiences (AC9S1U01_E2) |
| | | | identifying the places where plants and animals live, including in our homes, local areas such as ponds, bush areas, gardens or zoos (AC9S1U01_E3) |
| | | | identifying what we do to look after pets or plants at home and grouping these activities (AC9S1U01_E4) |
| | | | creating dioramas of a place a plant or animal lives, and identifying the features that enable it to meet its needs (AC9S1U01_E5) |
| | | | exploring why caring for plants and animals is important including as sources of food and fibre (AC9S1U01_E6) |
| | Earth and space sciences | explore daily and seasonal changes in the environment and how these changes affect everyday life (AC9S1U02) | exploring how First Nations Australians' concepts of time and weather patterns explain how things happen in the world around them (AC9S1U02_E1) |
| | | | recognising the extensive knowledges of daily and seasonal changes in weather patterns and landscape held by First Nations Australians (AC9S1U02_E2) |
| | | | 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 (AC9S1U02_E3) |
| | | | investigating how seasonal changes affect plants and animals, including animals that hibernate and migrate (AC9S1U02_E4) |
| | | | investigating how changes in the weather affect plants and animals, including humans (AC9S1U02_E5) |
| | | | making and recording observations of phenomena such as daily movement of the sun, changes to weather, or seasonal changes to plants such as colour, dropping of leaves, or growth of flowers or fruit (AC9S1U02_E6) |
| | | | noticing how daily weather indicators and seasonal patterns help us to make plans for activities in our daily lives (AC9S1U02_E7) |

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| | Physical sciences | explore pushes and pulls in terms of strength and direction and the effect of these forces on objects motion and shape (AC9S1U03) | investigating the push and pull movements of traditional First Nations Australians children's instructive toys (AC9S1U03_E1) |
| | | | observing and manipulating everyday objects such as playground equipment, toys, windows or doors and identifying the forces used to move these objects (AC9S1U03_E2) |
| | | | investigating ways that pushing or pulling on an object can start or stop its motion, and change its direction (AC9S1U03_E3) |
| | | | exploring ways the shape of playdough can be changed when pushed or pulled (AC9S1U03_E4) |
| | | | designing playground equipment, toys or games and representing push and pull forces involved using models, drawings or role-play (AC9S1U03_E5) |
| | | | investigating how age-appropriate sporting equipment such as paddles, plastic bats and racquets help to produce stronger pushes and pulls (AC9S1U03_E6) |
| **Science as a human endeavour** | Nature and development of science | explore how scientists use patterns to make predictions and apply their understanding creatively to develop new ideas or propose solutions (AC9S2H01) | recognising how First Nations Australians use changes in the landscape and the sky to answer questions about when to gather certain resources (AC9S2H01_E1) |
| | | | learning from local ecologists about native animals' needs and how they use patterns of animal behaviour to design creative supports for them to meet those needs, such as building frog and insect hotels and nesting boxes or recycling materials to provide habitat (AC9S2H01_E2) |
| | | | learning from farmers, bush care volunteers, gardeners or nursery owners about the patterns they observe in the needs of plants, and how they have designed or managed habitats to meet those needs (AC9S2H01_E3) |
| | | | exploring how engineers use knowledge of forces to create new playground equipment or toys (AC9S2H01_E4) |
| | | | exploring the products that have been designed by scientists and engineers to help us live in very hot or cold conditions (AC9S2H01_E5) |

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| | Use and influence of science | explore how people use science in their daily lives (AC9S2H02) | investigating how First Nations Australians use science to meet their needs, such as food supply (AC9S2H02_E1) |
| | | | exploring how people use science knowledge to care for plants and animals at home or in local environments (AC9S2H02_E2) |
| | | | 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 (AC9S2H02_E3) |
| | | | identifying how we use pushes and pulls when preparing meals, and the tools that help us push or pull objects (AC9S2H02_E4) |
| **Science inquiry** | Questioning and predicting | pose questions and make predictions to explore observed simple patterns or relationships (AC9S2I01) | posing questions about simple relationships between push and pull forces, such as: 'Does a toy car go further if it is pushed harder?' (AC9S2I01_E1) |
| | | | making predictions about plant needs, such as: 'I think a plant will die if it doesn't get enough water' (AC9S2I01_E2) |
| | | | making predictions about patterns of observable phenomena such as the sun's movement across the sky, or seasons (AC9S2I01_E3) |
| | | | making predictions about types of animals and plants they might observe in a particular place, such as a garden or pond (AC9S2I01_E4) |
| | | | posing questions about how animals meet their needs in particular places, such as: 'Where does it shelter? Where does it get water from?' (AC9S2I01_E5) |
| | Planning and conducting | suggest and follow safe procedures to investigate questions and test predictions (AC9S2I02) | following steps in a guided investigation to determine how different objects move when pushed or pulled (AC9S2I02_E1) |
| | | | suggesting steps for setting up and packing away equipment (AC9S2I02_E2) |
| | | | exploring different ways of solving science questions through guided discussion (AC9S2I02_E3) |
| | | | 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 (AC9S2I02_E4) |

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| | | make and record observations, including informal measurements, using digital technologies as appropriate (AC9S2I03) | counting and using informal measurements such as cups, handspans, walking paces, blocks, pencil lengths or lengths of string (AC9S2I03_E1) |
| | | | making suggestions about types of measurements that may be made during an investigation, including measuring plant growth or how far an object has moved (AC9S2I03_E2) |
| | | | recording observations through text, drawing, counts, informal measurements, digital photography or video (AC9S2I03_E3) |
| | Processing, modelling and analysing | sort and order data and information and represent patterns, including with provided tables and visual or physical models (AC9S2I04) | using pictographs featuring drawings or photographs and tables of measurements to document patterns of growth of plants (AC9S2I04_E1) |
| | | | using photography to show how pushes and pulls affect the shape of object and sorting images into before and after columns of a table (AC9S2I04_E2) |
| | | | using drawings or photographs to document changes in weather over a series of days or weeks (AC9S2I04_E3) |
| | | | 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 (AC9S2I04_E4) |
| | | | ordering images of seasonal changes across the year (AC9S2I04_E5) |
| | Evaluating | compare observations with predictions and others' observations, consider if investigations are fair and identify further questions (AC9S2I05) | consulting with First Nations Australians to compare observations and evaluate identifications of animal tracks (AC9S2I05_E1) |
| | | | comparing observations of movement with predictions, such as how far an object travels (AC9S2I05_E2) |
| | | | 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 (AC9S2I05_E3) |
| | | | 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 more fair (AC9S2I05_E4) |
| | | | 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 (AC9S2I05_E5) |

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| Communicating | communicate observations, findings and ideas through multimodal texts (AC9S2I06) | acknowledging and learning about First Nations Australians' ways of representing and sharing observations (AC9S2I06_E1) |
| | | consulting First Nations Australians' representations of living things as evidenced and communicated through formal and informal sharing of information (AC9S2I06_E2) |
| | | creating models of the place a plant or animal lives using recycled objects, modelling clay, toys or drawings (AC9S2I06_E3) |
| | | representing seasonal changes of plants using sequential drawings, calendars or photographs (AC9S2I06_E4) |
| | | representing push and pull forces using role-play, labels, arrows or time-lapse drawings and describing their representation (AC9S2I06_E5) |
| | | role-playing or recounting how a scientist makes predictions in their work, or how they think of new ideas or solutions (AC9S2I06_E6) |

## Year 2

### Year level description

In Year 2 students learn that some patterns can only be observed over certain time scales. They observe growth and change in living things, describe patterns and make predictions. They describe the components of simple systems, such as how objects can be put together and manipulated to make sounds. Students order their observations by grouping and classifying. In classifying things as living or non-living they begin to recognise that classifications are not always easy to define or apply. They use counting and informal measurements to make and compare observations and begin to recognise that organising these observations in tables makes it easier to show patterns.

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 or frogs 'grow up' the way humans do?
- How can we decide if something is living or non-living?
- How do we make and sense sound?
- Do we all see, hear, smell or otherwise sense events in our world in the same ways?

### Achievement standard

By the end of Year 2 students identify common characteristics of living things, including life cycles. They describe how sound energy can be observed and explain how to produce a variety of sounds. They describe ways materials can be physically changed without changing their composition. They explain why creativity is important in science and describe ways people use science in their daily lives.

Students pose questions and make predictions to explore observed patterns or relationships. They suggest steps to be followed in an investigation, and independently follow safe procedures safely to make and record observations. They sort and order data and information using provided scaffolds and represent patterns in data. They compare their observations with those of others, consider the fairness of the investigation with guidance and identify further questions. They communicate observations, findings and ideas through multimodal texts.

| Strand / Sub-strand | | Content description<br>*Students learn to:* | Elaboration<br>*This may involve students:* |
|---|---|---|---|
| Science understanding | Biological sciences | explore the differences between living and non-living things and the life cycles of plants and animals (AC9S2U01) | investigating First Nations Australians' systems of classifying living things and how these systems differ from those used in contemporary science (AC9S2U01_E1) |
| | | | investigating how First Nations Australians understand and utilise the life cycles of certain species (AC9S2U01_E2) |
| | | | classifying a collection of objects as living, once living or non-living and explaining their reasoning (AC9S2U01_E3) |
| | | | identifying common features of living and non-living things (AC9S2U01_E4) |
| | | | representing stages of a plant or animal's life cycle using drawings, photographs, graphic organisers or concrete materials (AC9S2U01_E5) |
| | | | observing and describing differences between metamorphic (butterflies, beetles or frogs) and non-metamorphic life cycles of animals, including humans (AC9S2U01_E6) |
| | | | engaging in a guided discussion about why life cycles are represented as a cycle, and whether each stage of the cycle should be considered 'alive' (AC9S2U01_E7) |
| | Physical sciences | explore how vibrating objects make sounds, how sound energy causes objects to vibrate, and how to produce a variety of sounds (AC9S2U02) | exploring how traditional musical instruments used by First Nations Australians produce their characteristic sounds (AC9S2U02_E1) |
| | | | exploring different ways to produce sound using familiar objects and actions such as striking, blowing, scraping, plucking and shaking (AC9S2U02_E2) |
| | | | 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 (AC9S2U02_E3) |
| | | | investigating how sound energy makes things vibrate such as through speaking, tuning forks or music speakers (AC9S2U02_E4) |
| | | | exploring vocabulary for describing sound, such as volume and pitch, and comparing sounds made by musical instruments (AC9S2U02_E5) |
| | | | designing instruments that produce different sounds, such as drums, rain-makers, thongophones or box guitars (AC9S2U02_E6) |

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| | | | 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 (AC9S2U02_E7) |
| | | | investigating which materials best muffle sound (AC9S2U02_E8) |
| | Chemical sciences | explore how everyday materials can be physically changed without changing their material composition, including by bending, twisting, stretching and being broken into smaller pieces (AC9S2U03) | exploring how First Nations Australians make physical changes to natural materials to produce objects such as bowls, baskets and various fibre crafts (AC9S2U03_E1) |
| | | | 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 or tearing (AC9S2U03_E2) |
| | | | crushing chalk into a powder, comparing the properties of the stick and the powder, and discussing whether it is still the same material (AC9S2U03_E3) |
| | | | creating an 'odd one out' game by providing samples of the same material that have been physically changed in different ways, and one sample of a different material and challenging other students to identify the odd one out (AC9S2U03_E4) |
| | | | 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 (AC9S2U03_E5) |
| **Science as a human endeavour** | Nature and developme nt of science | explore how scientists use patterns to make predictions and apply their understanding creatively to develop new ideas or propose solutions (AC9S2H01) | recognising how First Nations Australians observe and describe developmental changes in living organisms and answer questions about when to harvest certain resources (AC9S2H01_E6) |
| | | | considering how technologies used by First Nations Australians require an understanding of how materials can be sustainably sourced to make tools and weapons, musical instruments, clothing, cosmetics and artworks (AC9S2H01_E7) |
| | | | 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 (AC9S2H01_E8) |
| | | | 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 (AC9S2H01_E9) |

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| | Use and influence of science | explore how people use science in their daily lives (AC9S2H02) | considering why living and non-living things are important in our lives (AC9S2H02_E5) |
| | | | exploring how humans use knowledge of animal life cycles to meet the needs of pets, local wildlife or captive animals at each life stage (AC9S2H02_E6) |
| | | | exploring how we manage sound at home to ensure that we do not disturb each other or our neighbours, such as closing doors, turning down the volume, taking off shoes on wooden floors, or using headphones (AC9S2H02_E7) |
| | | | exploring how making physical changes to materials helps us to re-use them in a variety of ways, and decrease waste (AC9S2H02_E8) |
| **Science inquiry** | Questioning and predicting | pose questions and make predictions to explore observed simple patterns or relationships (AC9S2I01) | posing questions about patterns in life cycles such as: 'Do all plants produce flowers? How long do things live for?' (AC9S2I01_E6) |
| | | | posing questions about how to make sounds with different instruments, such as: 'How do I make a higher pitched sound?' (AC9S2I01_E7) |
| | | | making predictions about what might occur when materials such as playdough or tissue paper are pulled with different strengths (AC9S2I01_E8) |
| | | | making predictions about what type of plant or animal will develop from pictured or actual seeds, eggs or newborn animals (AC9S2I01_E9) |
| | | | 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' (AC9S2I01_E10) |
| | Planning and conducting | suggest and follow safe procedures to investigate questions and test predictions (AC9S2I02) | investigating the growth and development of plants or animals such as mealworms or silkworms and suggesting what they might need to do to meet their needs through the investigation, such as providing water, sunlight or food (AC9S2I02_E5) |
| | | | following visual or verbal steps to construct a musical instrument or manipulate a material (AC9S2I02_E6) |
| | | | suggesting ways they could manipulate materials (AC9S2I02_E7) |
| | | | 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 (AC9S2I02_E8) |

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| | | make and record observations, including informal measurements, using digital technologies as appropriate (AC9S2I03) | using familiar units of measurement such as cups, handspans, walking paces, blocks or pencils (AC9S2I03_E4) |
| | | | selecting appropriate forms of measurement to suit the purpose of an investigation, such as using blocks to measure the height of a plant (AC9S2I03_E5) |
| | | | using a range of equipment to make observations, such as magnifying glasses, handheld microscopes, digital cameras and video (AC9S2I03_E6) |
| | | | recording observations using drawing, photography, text, counts, video or voice recording (AC9S2I03_E7) |
| | Processing, modelling and analysing | sort and order data and information and represent simple patterns, including with provided tables and visual or physical models (AC9S2I04) | representing observed life stages by constructing models using recycled or craft materials (AC9S2I04_E6) |
| | | | using a graphic organiser to sort images of life stages for a plant or animal (AC9S2I04_E7) |
| | | | constructing simple column graphs and picture graphs with guidance to represent class investigations, such as recording objects that produce or do not produce sound AC9S2I04_E8) |
| | | | completing a table to record the first life stage of different types of animals as either eggs or live birth and identifying patterns (AC9S2I04_E9) |
| | | | adding labels to a drawing or photograph to indicate key features, such as properties of materials that stay the same when physically changed, or to indicate how sound is produced by an instrument (AC9S2I04_E10) |
| | Evaluating | compare observations with predictions and others' observations, consider if investigations are fair and identify further questions (AC9S2I05) | comparing observations of mature plants and animals with predictions made about what the seed, egg or immature animal might develop into (AC9S2I05_E6) |
| | | | comparing findings from investigations about physical changes to a material, such as cutting and folding, and exploring questions that investigate similar physical changes to different materials (AC9S2I05_E7) |
| | | | comparing observations of sounds with those of others and considering if we all sense sound in the same way (AC9S2I05_E8) |
| | | | considering when investigating sounds how to ensure that same sound is produced in order to keep the investigation fair (AC9S2I05_E9) |

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| | Communicating | communicate observations, findings and ideas through multimodal texts (AC9S2I06) | creating and narrating a short animation to show the life cycle of a plant or animal (AC9S2I06_E7) |
| | | | making a collage to represent and display all the ways a material can be physically changed (AC9S2I06_E8) |
| | | | presenting and sharing musical instruments, through dance and song, to show what is vibrating to make the sound (AC9S2I06_E9) |
| | | | presenting findings of investigations using charts, read-alouds, slideshows or displays (AC9S2I06_E10) |

## Year 3

### Year level description

In Year 3 students begin to recognise that processes can describe the relationships between components of systems. They explore systems such as the water cycle through the lens of key processes and are introduced to the idea of the flow of matter when considering how water moves through the environment. They classify states of matter and observe how changes in heat energy can cause changes to a system, such as water changing state. They observe temperature changes in objects and begin to develop an understanding of energy flows through simple systems. Students use their understanding of relationships between components of simple systems to make predictions. They begin to quantify their observations to enable comparison and learn more sophisticated ways of identifying and representing relationships, including the use of tables and graphs to identify trends.

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:

- Is there enough water for everyone?
- Why do jumpers keep us warm?
- Why do puddles disappear?
- How is slime like a solid? How is it like a liquid?
- How does science help us to solve problems?

### Achievement standard

By the end of Year 3 students identify key processes in the water cycle and describe how water is cycled through the environment. They identify sources of heat energy and predict temperature changes as a result of heat transfer. They classify solids, liquids and gases based on observable properties and describe how to cause a change of state. They explain why data and evidence are important in science inquiry and describe an everyday solution that reflects science knowledge.

Students pose questions and make predictions to explore cause-and effect-relationships. 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 to show relationships and patterns. They compare their findings with those of others, consider the fairness of the investigation, identify further questions and draw conclusions. They show awareness of purpose when communicating ideas and findings.

| Strand / Sub-strand | | Content description<br>*Students learn to:* | Elaboration<br>*This may involve students:* |
|---|---|---|---|
| Science understanding | Earth and space sciences | investigate sources of water and key processes in the water cycle, including movement of water through the sky, landscape and ocean; precipitation; evaporation; and condensation (AC9S3U01) | exploring First Nations Australians' connections with and valuing of water and water resource management (AC9S3U01_E1) |
| | | | identifying local water sources and exploring how they change over time (AC9S3U01_E2) |
| | | | tracing the water in the tap back to its source and predicting what happens to water that goes down the drain (AC9S3U01_E3) |
| | | | identifying everyday examples of precipitation, evaporation and condensation of water (AC9S3U01_E4) |
| | | | 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 to fall (AC9S3U01_E5) |
| | | | exploring a game or simulation of the water cycle, identifying key processes and creating their own representation of the water cycle (AC9S3U01_E6) |
| | | | considering why we are encouraged to save water, and actions people can take to reduce water consumption and waste (AC9S3U01_E7) |
| | Physical sciences | investigate sources of heat energy and temperature changes when heat energy is transferred from one object to another (AC9S3U02) | investigating the production and transfer of heat in First Nations Australians' methods of cooking, such as the use of ground ovens (AC9S3U02_E1) |
| | | | exploring how we sense heat energy and identifying sources of heat energy such as the sun, fire, electrical devices and geothermal springs (AC9S3U02_E2) |
| | | | recognising that changes in heat energy can be measured using a thermometer (AC9S3U02_E3) |
| | | | observing what happens when a cold object is placed in direct contact with a warm object and proposing explanations (AC9S3U02_E4) |
| | | | modelling the movement of heat from one object to another using drawing or role-play (AC9S3U02_E5) |
| | | | 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 (AC9S3U02_E6) |

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| | Chemical sciences | investigate the observable properties of solids, liquids and gases and how adding or removing heat energy changes the state of water (AC9S3U03) | investigating how changes of state in materials used by First Nations Australians such as beeswax or resins are important for their use (AC9S3U03_E1) |
| | | | observing the properties of substances and classifying them as solids (that can be handled), liquids (that require an open container to be handled) or gases (that require a closed container to be handled) (AC9S3U03_E2) |
| | | | observing how gases take up space by blowing up balloons, exploring inverting clear cups in water and blowing through straws to move small objects (AC9S3U03_E3) |
| | | | using ice cubes, butter or chocolate to explore how changes of state involve the removal of heat or the addition of heat (AC9S3U03_E4) |
| | | | investigating ice melting in a sealed bag and explaining their observations (AC9S3U03_E5) |
| | | | observing key processes in the water cycle and identifying them as changes of state (AC9S3U03_E6) |
| | | | exploring everyday experiences of change of state, including clothes drying, water boiling or iceblocks melting (AC9S3U03_E7) |
| **Science as a human endeavour** | Nature and development of science | investigate how scientists use data and evidence to develop explanations, and how scientists share scientific knowledge (AC9S4H01) | investigating how engineers test the insulation properties of materials, and how other scientists use this information to design food and beverage packaging, building insulation or clothing (AC9S4H01_E1) |
| | | | investigating how hydrologists monitor water sources and the movement of water through the water cycle to develop water conservation and preservation plans (AC9S4H01_E2) |
| | | | exploring age-appropriate science reports and journal articles and identifying where in the text the author has included data, evidence, findings or explanations (AC9S4H01_E3) |
| | | | viewing a webinar and observing how scientists share their findings, such as through presentations, reports or conversations (AC9S4H01_E4) |

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| | Use and influence of science | investigate how scientific knowledge helps people to meet a need or solve a problem (AC9S4H02) | investigating how First Nations Australians of arid regions of Australia use scientific knowledge to manage precious water resources (AC9S4H02_E1) |
| | | | identifying how people use knowledge of the water cycle to design urban and rural environments that conserve water (AC9S4H02_E2) |
| | | | exploring how science knowledge about heat transfer has helped people develop different ways to cook food, such as by boiling, frying or roasting (AC9S4H02_E3) |
| | | | examining how knowledge of gases enabled people to design hot air balloons and zeppelins for transport (AC9S4H02_E4) |
| **Science inquiry** | Questioning and predicting | pose questions and make predictions to explore observed patterns or relationships (AC9S4I01) | posing questions about patterns in rainfall during different seasons, and the effects on local water sources (AC9S4I01_E1) |
| | | | posing questions about substances that are difficult to classify, such as toothpaste, slime or hair gel (AC9S4I01_E2) |
| | | | predicting whether the weight of ice in a sealed container will change when the ice has melted (AC9S4I01_E3) |
| | | | predicting which material will be the most effective insulator (AC9S4I01_E4) |
| | | | predicting how quickly ice will melt at different ambient temperatures based on previous observations (AC9S4I01_E5) |
| | 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) | consulting with First Nations Australians to guide the planning of scientific investigations, including safety considerations for field investigations (AC9S4I02_E1) |
| | | | collaboratively identifying and ordering the steps in an investigation (AC9S4I02_E2) |
| | | | using a provided framework or graphic organiser to plan and identify what to change, what to keep the same and what to measure (AC9S4I02_E3) |
| | | | planning an investigation to determine which material is the best insulator for cold substances (AC9S4I02_E4) |
| | | | planning an investigation to identify sites of water wastage around the school (AC9S4I02_E5) |
| | | | 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 (AC9S4I02_E6) |

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| | | follow procedures to make and record observations, including making formal measurements using familiar scaled instruments and using digital technologies as appropriate (AC9S4I03) | using appropriate equipment to make and record observations, such as digital cameras, video, voice recorders and scaled instruments with appropriate increments (AC9S4I03_E1) |
| | | | exploring how to use equipment such as thermometers or rain gauges and making readings with guidance (AC9S4I03_E2) |
| | | | collaboratively designing a table to collect observations in the form of numerical data, written descriptions, drawings or photos (AC9S4I03_E3) |
| | | | identifying and taking on roles in group work, such as setting up the equipment, making observations, recording observations and ensuring safe behaviours (AC9S4I03_E4) |
| | 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) | constructing and using tables to explore the relationship between ambient temperature and time taken to melt (AC9S4I04_E1) |
| | | | using maps to locate water sources in the local area, or constructing maps to show sites of water wastage in the school grounds (AC9S4I04_E2) |
| | | | using column graphs to show melting time for ice in containers with different insulating layers (AC9S4I04_E3) |
| | | | constructing flowcharts to show how water moves through the water cycle (AC9S4I04_E4) |
| | | | using graphic organisers to compare properties of solids and liquids (AC9S4I04_E5) |
| | Evaluating | compare findings with those of others, identify questions for further investigation and draw conclusions (AC9S4I05) | comparing findings about best insulators with those of others and identifying further questions based on differences in findings (AC9S4I05_E1) |
| | | | comparing findings of water use surveys and discussing differences between home and school, or between each others' homes (AC9S4I05_E2) |
| | | | drawing conclusions based on consideration of their own and others' findings (AC9S4I05_E3) |
| | | | identifying further questions for investigation based on observations, differences in findings or new ideas (AC9S4I05_E4) |

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| | Communicating | create multimodal texts to communicate findings and ideas for identified audiences, using digital technologies as appropriate (AC9S4I06) | creating an imaginative text or an interactive ‘choose your own adventure’ that recounts the journey of a water droplet through the water cycle for an audience of their peers (AC9S4I06_E1) |
| | | | creating a poster to promote a new insulated container design to parents of primary-school-aged children (AC9S4I06_E2) |
| | | | representing heat transfer using diagrams, drawings, arrows or labels (AC9S4I06_E3) |
| | | | constructing simple reports of their investigations to share their predictions, methods, results and conclusions with their peers (AC9S4I06_E4) |

## Year 4

### Year level description

In Year 4 students extend their understanding of systems as interactions between related components. They broaden their understanding of classification and form and function through an exploration of different materials and their properties and begin to appreciate that classification can enable prediction. They learn that forces can operate from a distance and begin to appreciate that some interactions result from phenomena that cannot be seen with the naked eye. They begin to appreciate that current systems, such as Earth's surface, have characteristics that have resulted from past changes and that living things form part of systems. They apply their knowledge to make predictions based on interactions within systems, including those involving the actions of humans. 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:

- What eats a crocodile?
- How do we know how local landforms have changed over time?
- How do roller-coasters work?
- Why do engineers need to know about properties of materials?

### Achievement standard

By the end of Year 4 students identify the roles of organisms in a habitat and construct food chains. They identify frictional, gravitational and magnetic forces and represent the effect of forces on interactions between objects. They describe key processes that change Earth's surface and identify factors that impact change. They relate the uses of materials to their physical properties. They explain the role of evidence in developing explanations and identify different ways scientific knowledge is shared. They describe a science-based design and the needs it meets.

Students pose questions and make predictions to explore patterns and cause-and-effect relationships. 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 organise data and information to show relationships and patterns. They compare their findings with those of others, analyse the fairness of the investigation, identify further questions for investigation and draw conclusions. They show awareness of audience and purpose when communicating ideas and findings.

| Strand / Sub-strand | | Content description<br>*Students learn to:* | Elaboration<br>*This may involve students:* |
|---|---|---|---|
| Science understanding | Biological sciences | investigate the roles and interactions of consumers, producers and decomposers within a habitat and how food chains represent feeding relationships (AC9S4U01) | recognising how First Nations Australians perceive themselves as being an integral part of the environment (AC9S4U01_E1) |
| | | | describing how animals, including humans, obtain their food from plants and other animals (AC9S4U01_E2) |
| | | | observing living things in a local habitat and categorising them as producers, consumers or decomposers (AC9S4U01_E3) |
| | | | researching the different types of decomposers and their importance within a habitat (AC9S4U01_E4) |
| | | | representing feeding relationships of producers and consumers as a food chain and comparing food chains across different habitats (AC9S4U01_E5) |
| | | | investigating how the removal of a food source from within a habitat, such as through an insect or rodent infestation, affects other living things within that habitat (AC9S4U01_E6) |
| | | | investigating the impact of introduced predators such as foxes on small mammal species in Australia (AC9S4U01_E7) |
| | Earth and space sciences | investigate how physical weathering, erosion and deposition cause slow or rapid change to Earth's surface and the factors that can impact erosion in local environments (AC9S4U02) | 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 (AC9S4U02_E1) |
| | | | identifying types of physical 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 (AC9S4U02_E2) |
| | | | observing and describing erosion and deposition caused by wind or water action, on a local or regional scale (AC9S4U02_E3) |
| | | | investigating changes to a landscape over time: identifying weathering, erosion or deposition; and inferring the timescales over which these processes occur (AC9S4U02_E4) |
| | | | modelling the effects of erosion on a simulated landscape and exploring factors that mitigate its effects (AC9S4U02_E5) |
| | | | investigating how humans have changed local landscapes and predicting the effect these changes might have on rates of erosion (AC9S4U02_E6) |

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| | Physical sciences | investigate how forces can be exerted by one object on another and how frictional, gravitational and magnetic forces can affect the motion of objects (AC9S4U03) | investigating the effect of forces on the movement of objects in traditional First Nations Australians' children's instructive toys and games (AC9S4U03_E1) |
| | | | exploring how magnetic forces can push or pull objects from a distance (AC9S4U03_E2) |
| | | | exploring how friction causes objects to slow down (AC9S4U03_E3) |
| | | | 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 (AC9S4U03_E4) |
| | | | exploring how force arrows can be used to represent the direction and magnitude of forces acting on an object (AC9S4U03_E5) |
| | | | describing the pushes, pulls, gravitational and frictional forces involved in erosion, weathering and deposition (AC9S4U03_E6) |
| | | | watching a video of astronauts walking on the moon or dropping objects on its surface, and discussing the force they are observing (AC9S4U03_E7) |
| | | | examining shoe sole design and identifying patterns in sole design and use related to friction (AC9S4U03_E8) |
| | Chemical sciences | investigate the properties of materials including fibres, metals, ceramics, glass and plastics and how these properties influence their use (AC9S4U04) | considering how First Nations Australians use materials for different purposes, such as tools, clothing and shelter, based on their properties (AC9S4U04_E1) |
| | | | considering how First Nations Australians' knowledge of materials informs the preparation of effective, vibrant and long-lasting paints (AC9S4U04_E2) |
| | | | identifying and naming materials in the classroom, and grouping objects made of similar materials or combinations of materials (AC9S4U04_E3) |
| | | | investigating the properties of different fibres, metals, ceramics, glass and plastics (AC9S4U04_E4) |
| | | | investigating familiar objects, such as shoes or backpacks, examining the combination of materials from which they are made and suggesting reasons for those combinations based on properties of materials (AC9S4U04_E5) |
| | | | investigating which materials can be recycled and researching alternatives for materials such as single-use plastics (AC9S4U04_E6) |

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| | | | designing, building and testing an object or structure for a specific purpose, such as a tent, lunchbox or bird feeder (AC9S4U04_E7) |
| **Science as a human endeavour** | Nature and development of science | investigate how scientists use data and evidence to develop explanations, and how scientists share scientific knowledge (AC9S4H01) | investigating how scientists used data and evidence to develop explanations about population decline of native species such as the Richmond birdwing butterfly, and to develop strategies to increase their population (AC9S4H01_E5) |
| | | | examining how scientists share their findings, such as the impact of single-use plastics on marine ecosystems, through social media, brochures, media presentations and documentaries (AC9S4H01_E6) |
| | | | examining age-appropriate scientific journal articles, identifying common text features and exploring why the scientific community might have conventions for sharing information (AC9S4H01_E7) |
| | | | viewing or listening to documentaries or news reports that feature scientists and identifying how they talk about their area of research, particularly references to observations, data and evidence (AC9S4H01_E8) |
| | Use and influence of science | investigate how scientific knowledge helps people to meet a need or solve a problem (AC9S4H02) | investigating how knowledge of the role of decomposers has helped scientists design industrial composting systems to manage organic waste (AC9S4H02_E5) |
| | | | examining how communities use knowledge of erosion processes to design landscape features that reduce erosion in fragile environments (AC9S4H02_E6) |
| | | | exploring how knowledge of the properties of plastic has influenced people to change how they purchase, use and dispose of plastic products (AC9S4H02_E7) |
| | | | examining how people use knowledge of friction to improve car or bicycle safety on slippery surfaces such as wet or icy roads (AC9S4H02_E8) |
| | | | investigating how knowledge of magnetic force is used to sort metals in recycling, mining and food processing (AC9S4H02_E9) |
| **Science inquiry** | Questioning and predicting | pose questions and make predictions to explore observed patterns or relationships (AC9S4I01) | consulting with First Nations Australians to clarify questions based on their traditional ecological knowledge, such as predictions regarding the impact of invasive species (AC9S4I01_E6) |
| | | | posing questions about landscape features and how they were changed by weathering, erosion or deposition (AC9S4I01_E7) |
| | | | making predictions about potential future changes to local areas through erosion due to wind or wave action (AC9S4I01_E8) |

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| | | posing questions about why some materials are used more often than others for particular products (AC9S4I01_E9) |
| | | predicting the effect on food chains when living things are removed from or die out in an area (AC9S4I01_E10) |
| 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 pair of magnets has the greatest attractive force (AC9S4I02_E7) |
| | | predicting the interactions of forces in a game or toy design, and building and testing a prototype (AC9S4I02_E8) |
| | | using a map or aerial photography to predict local sites likely to be affected by erosion, and collaboratively planning a field excursion to collect observations (AC9S4I02_E9) |
| | | predicting effects of changing numbers of producers or consumers, and using a virtual or role-play food chain simulation to explore possible outcomes by running the simulation multiple times (AC9S4I02_E10) |
| | | 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 (AC9S4I02_E11) |
| | follow procedures to make and record observations, including making formal measurements using familiar scaled instruments and using digital technologies as appropriate (AC9S4I03) | identifying animals in field locations using procedures such as direct or virtual observation, call or scat identification or pitfall traps (AC9S4I03_E5) |
| | | using appropriate equipment to make and record observations, such as digital cameras, video, voice recorders and familiar scaled instruments with appropriate increments (AC9S4I03_E6) |
| | | 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 (AC9S4I03_E7) |
| | | constructing tables or graphic organisers to record observations (AC9S4I03_E8) |

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| | Processing, modelling and analysing | construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show relationships and identify patterns and trends (AC9S4I04) | using food chain simulations to explore effects of changing numbers of producers or consumers in a habitat (AC9S4I04_E6) |
| | | | constructing column graphs to compare numbers of objects made of particular materials or distances moved by objects experiencing frictional forces (AC9S4I04_E7) |
| | | | modelling landscapes using materials such as sand, gravel, soil and rocks to show effects of erosion by water (AC9S4I04_E8) |
| | | | using maps to identify patterns in erosion site locations or aerial photographs to show effects of erosion over time (AC9S4I04_E9) |
| | | | using force arrows to show forces operating on objects (AC9S4I04_E10) |
| | 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 (AC9S4I05_E5) |
| | | | comparing designed solutions, such as toys, lunch boxes or structures, to determine fitness for purpose of selected materials (AC9S4I05_E6) |
| | | | comparing findings from investigations with peers and asking questions about factors that may have led to any differences in findings (AC9S4I05_E7) |
| | | | drawing conclusions that reflect their data and information (AC9S4I05_E8) |
| | Communicating | create multimodal texts to communicate findings and ideas for identified audiences, using digital technologies as appropriate (AC9S4I06) | acknowledging and exploring First Nations Australians' ways of communicating information about anatomical features of organisms (AC9S4I06_E5) |
| | | | sharing ideas about ways to represent feeding relationships including using drawings, labels, images or models (AC9S4I06_E6) |
| | | | constructing a persuasive text for local council to argue the use of an erosion mitigation strategy in a local area (AC9S4I06_E7) |
| | | | producing an informative text to explain why introduced predators should be removed (AC9S4I06_E8) |
| | | | constructing a report 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 (AC9S4I06_E9) |

## Year 5

### Year level description

In Year 5 students begin to identify how patterns inform predictions about cause-and-effect relationships. They investigate the relationship between form and function by exploring how features of living things enable them to survive in their habitat. They explore observable phenomena associated with light and begin to appreciate that phenomena have sets of characteristic behaviours. Students begin to identify stable and dynamic aspects of systems and learn how to look for patterns and relationships between components of systems at scales ranging from the very small to the astronomical. They begin to explain how matter structures the world around them. They consider Earth as a component within a solar system and use observable phenomena to predict the relative positions of Earth and the sun. They develop explanations for the patterns they observe and begin to reflect on their methods and potential sources of error.

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 don't we see rainbows every time it rains?
- How is the view from the surface of Mars different from that here on Earth?
- What lives in the desert? What lives in the sea? How are they the same and different?
- Is an empty glass really empty?

### Achievement standard

By the end of Year 5 students explain how the form and behaviour of living things enables survival. They model the solar system and demonstrate how the relative positions of Earth and the sun result in observed phenomena on Earth. They identify sources of light and model the transfer of light to explain observed phenomena. They relate the particulate structure of solids, liquids and gases to their observable properties. They explain the role of collaboration in science inquiry and describe an example of scientific knowledge that has changed over time. They describe how science knowledge has helped people make decisions.

Students plan safe investigations to identify patterns or relationships. They identify risks associated with investigations and identify key intercultural considerations when planning field work. They identify variables to be changed and kept constant. They use equipment to collect data with appropriate precision. They organise data and information and describe patterns, trends and relationships. They compare their methods and findings with those of others, posing questions for further investigation and drawing reasonable conclusions. They use language features to reflect their purpose and audience when communicating their ideas and findings.

| Strand / Sub-strand | | Content description *Students learn to:* | Elaboration *This may involve students:* |
|---|---|---|---|
| Science understanding | Biological sciences | investigate how particular structural features and behaviours of living things enable their survival in specific habitats (AC9S5U01) | investigating First Nations Australians' knowledges of the structural features of certain species and how those features can be exploited (AC9S5U01_E1) |
| | | | exploring features of plants and animals that enable them to survive in Australia's desert environments, such as the water-holding frog (AC9S5U01_E2) |
| | | | investigating how camouflage is used by animals to hide from predators and to ambush prey (AC9S5U01_E3) |
| | | | using simulations to explore how the shape of animals' body parts, such as beaks on birds, influence their ability to find food and survive in a given environment (AC9S5U01_E4) |
| | | | researching and reporting on a plant or animal that has features and behaviours that enable its survival in a particular environment (AC9S5U01_E5) |
| | Earth and space sciences | investigate the relationship between the sun and planets in the solar system and how Earth's tilt, rotation on its axis and revolution around the sun cause cyclic observable phenomena, including variable day and night length (AC9S5U02) | exploring how cultural stories of First Nations Australians explain cyclic phenomena involving the sun and stars and how those explanations differ from contemporary science understanding (AC9S5U02_E1) |
| | | | researching First Nations Australians' understandings of the night sky and its use for timekeeping purposes as evidenced in oral cultural records, petroglyphs, paintings and stone arrangements (AC9S5U02_E2) |
| | | | constructing a scale model of elements of the solar system on the school oval, and exploring simulations of the solar system such as a pocket solar system, to appreciate the distances and relationships between the sun and planets (AC9S5U02_E3) |
| | | | explaining the role of gravity in keeping the planets in orbit around the sun (AC9S5U02_E4) |
| | | | observing the movement and length of shadows across the day and comparing these with simulations of the sun's movement through the sky (AC9S5U02_E5) |
| | | | using 3-dimensional models or role-play to model how Earth's rotation on its axis causes day and night (AC9S5U02_E6) |
| | | | exploring 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 (AC9S5U02_E7) |

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| | | 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 predict how this affects the amount of sunlight in different regions on Earth (AC9S5U02_E8) |
| Physical sciences | investigate sources of light and how light travels in a straight path, interacts with objects to form shadows and can be reflected and refracted (AC9S5U03) | recognising First Nations Australians' understanding of refraction as experienced in spear fishing and in shimmering body paint, and reflection as evidenced by materials selected for construction of housing (AC9S5U03_E1) |
| | | distinguishing between natural and artificial sources of light (AC9S5U03_E2) |
| | | 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 (AC9S5U03_E3) |
| | | drawing ray diagrams to show the path of light such as from a source to the eye (AC9S5U03_E4) |
| | | exploring refraction of light using prisms or water droplets and examining the rainbow effect produced (AC9S5U03_E5) |
| | | exploring the use of reflection of light by mirrors such as in periscopes and mirror mazes (AC9S5U03_E6) |
| Chemical sciences | investigate how the observable properties of solids, liquids and gases can be described by modelling the motion and arrangement of particles and how adding or removing heat energy affects particle movement (AC9S5U04) | 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 (AC9S5U04_E1) |
| | | recognising First Nations Australians' knowledges and understandings of solids, liquids and gases (AC9S5U04_E2) |
| | | classifying substances as solids, liquids and gases and investigating their properties (AC9S5U04_E3) |
| | | using role-play to model the arrangement and motion of particles in solids, liquids and gases including changes that occur when heat is added or removed (AC9S5U04_E4) |
| | | explaining change of state with reference to changes in the motion and arrangement of particles (AC9S5U04_E5) |

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| **Science as a human endeavour** | Nature and development of science | investigate why advances in science are often the result of collaboration of many different scientists and describe how scientific knowledge has changed over time (AC9S6H01) | investigating how First Nations Australians' traditional ecological and zoological knowledges have informed sustainable harvesting practices of certain species such as dugongs and turtles, and how through collaboration these knowledges have led to the co-development of current conservation practices (AC9S6H01_E1) |
| | | | constructing a timeline to show how contributions of scientists, mathematicians and astronomers from many countries have shaped our ideas about space and the solar system through development of models, gathering of evidence and more recently space exploration (AC9S6H01_E2) |
| | | | 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 (AC9S6H01_E3) |
| | | | exploring how the recent discovery of a biofluorescent flying squirrel led to discoveries of more fluorescent mammals, such as wombats, bilbies, echidna and bandicoots (AC9S6H01_E4) |
| | | | investigating how astronauts and scientists from many different countries have collaborated in the International Space Station program (AC9S6H01_E5) |
| | | | exploring how understanding of light and optics has changed by comparing the ideas of Plato, Euclid, Ptolemy, Ibn al-Haytham and Roger Bacon (AC9S6H01_E6) |
| | Use and influence of science | investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions (AC9S6H02) | learning how First Nations Australians gathered data on the patterns in night sky to overcome problems associated with navigation (AC9S6H02_E1) |
| | | | researching how First Nations Australians' knowledge of the local natural environment, such as the characteristics of plants and animals, has long-informed fire management practices which ensure sustainability of ecosystems and increase productivity of resources (AC9S6H02_E2) |
| | | | considering how decisions are made to grow particular plants and crops depending on environmental conditions (AC9S6H02_E3) |
| | | | exploring objects and devices that include parts that involve the reflection or refraction of light, such as mirrors, sunglasses and prisms (AC9S6H02_E4) |
| | | | 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 (AC9S6H02_E5) |
| | | | considering why some individuals and communities are making decisions not to use throwaway plastics such as plastic plates and spoons (AC9S6H02_E6) |

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| | | | identifying the benefits and problems of using solid, liquid or gaseous fuels to heat a home and how that knowledge would influence their decision on which one to use (AC9S6H02_E7) |
| Science inquiry | Questioning and predicting | pose investigable questions and make predictions to identify patterns or test relationships (AC9S6I01) | acknowledging and using information from First Nations Australians to guide the formulation of investigable questions about structural features and behaviours of living things (AC9S6I01_E1) |
| | | | posing questions that can be investigated scientifically, such as: 'Do all animals which live in desert habitats have ways to survive without water? Why is it night-time in England when it is daytime here?' (AC9S6I01_E2) |
| | | | making predictions about the pattern of shadow movement across the day, the habitat a plant or animal lives in or the observable effect of light interacting with an object (AC9S6I01_E3) |
| | | | asking questions and making predictions to test relationships, such as: 'Will this organisation of mirrors enable me to see around corners? Does evaporation only occur when water is boiled? Are animals that camouflage well more likely to survive predation?' (AC9S6I01_E4) |
| | Planning and conducting | plan and conduct repeatable investigations to answer questions, including, as appropriate, deciding the variables to be changed and measured in fair tests, describing potential risks, planning for the safe use of equipment and materials and identifying required permissions to conduct investigations on Country or Place (AC9S6I02) | consulting with First Nations Australians to guide the planning of scientific investigations, considering potential risks for field investigations (AC9S6I02_E1) |
| | | | identifying local areas that require permissions before accessing (AC9S6I02_E2) |
| | | | planning and recording the method to be used in an investigation so that it could be repeated by someone else (AC9S6I02_E3) |
| | | | making decisions on the variables to be changed and measured in fair tests, such as measuring the length and size of a shadow formed by different light sources (AC9S6I02_E4) |
| | | | explaining rules for safe processes and use of equipment and materials, and potential risks to themselves or others when conducting an investigation (AC9S6I02_E5) |
| | | | considering different ways to approach investigations, such as researching, using trial and error, experimental testing, field observations or development of simulations (AC9S6I02_E6) |

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| | | use equipment to observe, measure and record data with reasonable precision, using digital technologies as appropriate (AC9S6I03) | exploring which equipment gives the most accurate measurements (AC9S6I03_E1) |
| | | | recording data using standard units, such as gram, second and metre and developing the use of standard multipliers such as kilometre and millimetre (AC9S6I03_E2) |
| | | | recording data in tables and diagrams or electronically as digital images and spreadsheets (AC9S6I03_E3) |
| | 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 identify patterns, trends and relationships (AC9S6I04) | developing a physical model of the sun and Earth using objects or role-play to identify their relative positions where a place on Earth experiences day or night (AC9S6I04_E1) |
| | | | constructing a role-play or animation to show how heat energy affects particle movement (AC9S6I04_E2) |
| | | | using a spreadsheet to sort data about the planets in the solar system to answer questions or identify patterns (AC9S6I04_E3) |
| | | | using digital photography or field sketches to identify structural features of plants or animals (AC9S6I04_E4) |
| | | | constructing a column graph to illustrate the relationship between an animal feature such as colour and predation as indicated by a simulation, and using mean values to represent the outcomes of repeated simulations (AC9S6I04_E5) |
| | Evaluating | compare methods and findings with those of others, including recognising possible sources of error, posing questions for further investigation and drawing reasonable conclusions (AC9S6I05) | comparing methods and findings with those of others to determine if the investigation was a fair test (AC9S6I05_E1) |
| | | | recognising errors that could have occurred during investigations including changing too many variables, incorrect or misreading of measurements, or changes in environmental factors (AC9S6I05_E2) |
| | | | comparing, in small groups, proposed reasons for findings and explaining their reasoning and posing further questions (AC9S6I05_E3) |
| | | | reflecting on inferences made from observations and analysis of the data to draw a conclusion (AC9S6I05_E4) |

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| | Communicating | create multimodal texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital technologies as appropriate (AC9S6I06) | acknowledging and exploring First Nations Australians' ways of representing and communicating information about anatomical features (AC9S6I06_E1) |
| | | | exploring whether there is a 'correct' way of representing particles and creating an animation to teach other students about the particulate nature of matter (AC9S6I06_E2) |
| | | | creating an imaginative text about a future in which humans live on other planets (AC9S6I06_E3) |
| | | | developing a presentation to share information about the structural features or behaviours of animals and plants in a particular habitat (AC9S6I06_E4) |
| | | | co-authoring a scientific report on an investigation into the behaviours of light using appropriate vocabulary, data representations and sentence structures (AC9S6I06_E5) |

## Year 6

### Year level description

In Year 6 students continue to develop their understanding of how systems change over time and are shaped by flows of matter and energy. They begin to appreciate interdependencies between systems as they explore the relationship between physical conditions of ecosystems and the growth and survival of living things. They continue to develop a view of Earth as a dynamic system, in which change occurs across a range of timescales. They explore 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 see the role of variables in measuring changes and the value of accuracy in these measurements. They learn how to look for patterns and to use these to identify and explain relationships by drawing on evidence. They begin to generalise about relationships between events, phenomena and systems.

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:

- Is concrete 'rock'?
- How can we live without electricity?
- How and why do we use different methods to prepare food to eat?
- What makes a decision a good one? How can understanding science help us to make good decisions?

### Achievement standard

By the end of Year 6 students explain how the growth and survival of living things are impacted by changes in physical conditions. They represent changes in Earth materials as they move through the rock cycle and relate their properties to their uses. They represent the transfer and transformation of electrical energy in electrical circuits. They classify and compare reversible and irreversible changes to substances. They explain why science is often collaborative and describe how scientific knowledge has changed over time. They describe how individuals and communities use scientific knowledge.

Students plan safe, repeatable investigations to identify patterns or test relationships. They describe risks associated with investigations and describe key intercultural considerations when planning field work. They identify variables to be changed and kept constant. They use equipment to collect and record data with appropriate precision. They organise and process data and information to examine patterns, trends and relationships. They compare their own and others' methods and findings, considering possible sources of error, posing questions for further investigation and drawing reasonable conclusions. They select and use language features effectively for their purpose and audience when communicating their ideas and findings.

| Strand / Sub-strand | | Content description<br>*Students learn to:* | Elaboration<br>*This may involve students:* |
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| Science understanding | Biological sciences | investigate the physical conditions of aquatic and terrestrial ecosystems and how the growth and survival of living things is affected by changing physical conditions (AC9S6U01) | investigating First Nations Australians' knowledges and understandings of the physical conditions necessary for the survival of certain plants and animals (AC9S6U01_E1) |
| | | | identifying the physical conditions in an aquatic or terrestrial ecosystem and how they change over time (AC9S6U01_E2) |
| | | | investigating how changes to physical conditions such as salinity, soil type or temperature affect plant growth (AC9S6U01_E3) |
| | | | 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 (AC9S6U01_E4) |
| | | | investigating changes in physical conditions that are the result of human activity and exploring the impact of these on living things, such as sound from oil rigs impacting on the migration of whales or algal blooms affecting fish (AC9S6U01_E5) |
| | | | investigating the effect of physical conditions on the growth of bread mould colonies (AC9S6U01_E6) |
| | Earth and space sciences | investigate the key processes of the rock cycle, the timescales over which they occur, and how the characteristics of sedimentary, igneous and metamorphic rocks reflect their formation and influence their use (AC9S6U02) | exploring the traditional geological knowledges of First Nations Australians that are used in the selection of different rock types for different purposes (AC9S6U02_E1) |
| | | | investigating how First Nations Australians have used quarrying to access rocks for use or production of everyday objects such as grindstones, hammerstones, anvils and cutting tools (AC9S6U02_E2) |
| | | | comparing the observable properties of different types of rocks and grouping them using a provided key (AC9S6U02_E3) |
| | | | examining how the properties of different rocks determine their use (AC9S6U02_E4) |
| | | | identifying the role of forces and heat energy in the formation of different types of rocks and comparing how quickly or slowly different processes can occur (AC9S6U02_E5) |
| | | | examining fossil evidence, including opalised fossils, to predict how and when a rock was formed (AC9S6U02_E6) |
| | | | exploring how rocks are quarried and examining impacts on local environments, including to land features, vegetation and rivers (AC9S6U02_E7) |

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| | Physical sciences | investigate the transfer and transformation of energy in electrical circuits, including the role of electric current, circuit components, insulators and conductors (AC9S6U03) | identifying necessary components for an electric circuit including a source of electrical energy and conducting material such as wires (AC9S6U03_E1) |
| | | | constructing a real or virtual circuit to examine requirements to allow the flow of electricity and discussing electric current as the movement of small particles through the circuit (AC9S6U03_E2) |
| | | | constructing representations of electrical circuits and their components using accepted conventions (AC9S6U03_E3) |
| | | | examining the purpose of different components such as switches and bulbs and exploring use of ammeters to measure current (AC9S6U03_E4) |
| | | | investigating different electrical conductors and insulators and examining why they may be used (AC9S6U03_E5) |
| | | | exploring how electricity is used in the home and identifying electrical hazards and safety measures used to mitigate these hazards (AC9S6U03_E6) |
| | Chemical sciences | investigate why dissolving, mixing and changes of state are classified as reversible changes and compare with irreversible changes, including burning, cooking and rusting, that produce new substances (AC9S6U04) | 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 (AC9S6U04_E1) |
| | | | investigating the ways in which First Nations Australians combine different materials to produce utensils, including hafting, weaving, sewing and gluing (AC9S6U04_E2) |
| | | | identifying what makes a change reversible or irreversible, using examples (AC9S6U04_E3) |
| | | | examining the substances produced in burning, cooking and rusting and comparing them to the original substance (AC9S6U04_E4) |
| | | | exploring the impact of irreversible changes, such as burning petrol, on the environment (AC9S6U04_E5) |
| | | | exploring how reversible changes can be used to recycle materials (AC9S6U04_E6) |

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| **Science as a human endeavour** | Nature and development of science | investigate why advances in science are often the result of collaboration of many different scientists and describe how scientific knowledge has changed over time (AC9S6H01) | exploring how international scientific collaboration can answer complex questions about the abiotic factors that affect the growth and survival of living things in Antarctica (AC9S6H01_E7) |
| | | | examining why ecologists collaborate with computer scientists to learn more about the effects of ecosystem changes and make predictions (AC9S6H01_E8) |
| | | | investigating how knowledge about the effects of mining Earth's resources has changed over time (AC9S6H01_E9) |
| | | | investigating how knowledge of the location and extraction of mineral resources relies on expertise and collaboration from across the disciplines of science (AC9S6H01_E10) |
| | | | investigating why scientists changed the phosphate levels in detergents to prevent algal blooms (AC9S6H01_E11) |
| | Use and influence of science | investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions (AC9S6H02) | discussing how modern approaches to fire ecology in Australia are being informed by First Nations Australians' traditional ecological knowledges and fire management practices (AC9S6H02_E8) |
| | | | exploring how communities consider the impact of aquatic noise pollution when designing guidelines for water sports (AC9S6H02_E9) |
| | | | considering how people use electrical device guidelines to help ensure safety of children (AC9S6H02_E10) |
| | | | exploring how people use knowledge of rocks and their properties to select building materials (AC9S6H02_E11) |
| | | | investigating how people use knowledge of conditions that favour mould or bacterial growth when considering food packaging and storage (AC9S6H02_E12) |
| **Science inquiry** | Questioning and predicting | pose investigable questions and make predictions to identify patterns or test relationships (AC9S6I01) | posing questions that can be investigated scientifically, such as observing different rock samples and asking how they were made and where they came from (AC9S6I01_E5) |
| | | | making predictions about the physical conditions that will result in the largest mould colonies growing on bread (AC9S6I01_E6) |
| | | | making predictions about electrical circuit function based on a picture or diagram of a circuit (AC9S6I01_E7) |
| | | | posing questions to identify patterns, such as: 'What type of material is the best conductor and what is the best insulator?' (AC9S6I01_E8) |
| | | | discussing and refining questions to enable scientific investigation (AC9S6I01_E9) |

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| Planning and conducting | plan and conduct repeatable investigations to answer questions, including, as appropriate, deciding the variables to be changed and measured in fair tests, describing potential risks, planning for the safe use of equipment and materials and identifying required permissions to conduct investigations on Country or Place (AC9S6I02) | 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 (AC9S6I02_E7) |
| | | identifying local areas that require permissions before accessing (AC9S6I02_E8) |
| | | 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 (AC9S6I02_E9) |
| | | considering different ways to approach investigations including researching, using trial and error, experimental testing, field observations and using simulations (AC9S6I02_E10) |
| | use equipment to observe, measure and record data with reasonable precision, using digital technologies as appropriate (AC9S6I03) | selecting and using instruments with the correct scale for measuring data with appropriate accuracy, such as a multimeter (AC9S6I03_E4) |
| | | recording data in tables and diagrams or electronically as digital images and spreadsheets (AC9S6I03_E5) |
| | | recording data using standard units, such as volt, ampere, gram, second and metre and developing the use of standard multipliers such as kilometre and millimetre (AC9S6I03_E6) |
| | | using digital technologies such as digital thermometers or soil moisture probes to collect data over time and record data in spreadsheets (AC9S6I03_E7) |

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| | 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 identify patterns, trends and relationships (AC9S6I04) | exploring how different representations can be used to show different aspects of relationships, processes and trends (AC9S6I04_E6) |
| | | | representing circuits using circuit diagrams and indicating the direction of current flow (AC9S6I04_E7) |
| | | | using line graphs to show changes in growth over time under different physical conditions (AC9S6I04_E8) |
| | | | constructing physical models to show the forces involved in the rock cycle (AC9S6I04_E9) |
| | | | organising information in graphic organisers to identify patterns and trends (AC9S6I04_E10) |
| | Evaluating | compare methods and findings with those of others, including recognising possible sources of error, posing questions for further investigation and drawing reasonable 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 (AC9S6I05_E5) |
| | | | recognising errors that could have occurred during investigations including changing too many variables, incorrect or misreading of measurements, or changes in environmental factors (AC9S6I05_E6) |
| | | | comparing and contrasting data collected by different groups to discuss similarities and differences in their findings (AC9S6I05_E7) |
| | | | evaluating the inferences made from observations and analysis of the data to draw a conclusion (AC9S6I05_E8) |
| | Communicating | create multimodal texts to communicate ideas and findings for specific purposes and audiences, including selection of language features, using digital technologies as appropriate (AC9S6I06) | constructing a scientific report to share findings about how a plant responds to physical conditions such as temperature or soil moisture and using appropriate vocabulary, data representations, units and sentence structures (AC9S6I06_E6) |
| | | | designing a map to highlight local sites of geological interest, including the rock types that can be found there (AC9S6I06_E7) |
| | | | constructing a poster comparing everyday examples of reversible and irreversible change (AC9S6I06_E8) |
| | | | designing a product that uses electrical circuits and performing a pitch to have the product mass produced (AC9S6I06_E9) |