Work Program

7 - 10 Science

1 RATIONALE (ACARA, 2013)

Rationale

Science provides an empirical way of answering interesting and important questions about the biological, physical and technological world. The knowledge it produces has proved to be a reliable basis for action in our personal, social and economic lives. 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 aims to understand a large number of observations in terms of a much smaller number of broad principles. Science knowledge is contestable and is revised, refined and extended as new evidence arises.

The Australian Curriculum: Science provides opportunities for students to develop an understanding of important science concepts and processes, the practices used to develop scientific knowledge, of 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 to make informed decisions about local, national and global issues and to participate, if they so wish, 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 methods. 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.

The science curriculum promotes six overarching ideas that highlight certain common approaches to a scientific view of the world and which can be applied to many of the areas of science understanding. These overarching ideas are patterns, order and organisation; form and function; stability and change; systems; scale and measurement; and matter and energy.

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
- an understanding of the vision that science provides of the nature of living things, of the Earth and its place in the cosmos, and of the physical and chemical processes that explain the behaviour of all material things
- an understanding of the nature of scientific inquiry and the ability to use a range of scientific inquiry methods, 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 diversity of careers related to science
- a solid foundation of knowledge of the biological, chemical, physical, Earth and space sciences, including being able to select and integrate the scientific knowledge and methods needed to explain and predict phenomena, to apply that understanding to new situations and events, and to appreciate the dynamic nature of science knowledge.

2 ORGANISATION

Content strands

The Australian Curriculum: Science has three interrelated strands: Science Understanding, Science as a Human Endeavour and Science Inquiry Skills.

Together, the three strands of the science curriculum 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.

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.

The **biological sciences** sub-strand is concerned with understanding living things. The key concepts developed within this sub-strand are that: a diverse range of living things have evolved on Earth over hundreds of millions of years; living things are interdependent and interact with each other and their environment; and the form and features of living things are related to the functions that their body systems perform. Through this sub-strand, students investigate living things, including animals, plants, and micro-organisms, 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. Students are introduced to the cell as the basic unit of life and the processes that are central to its function.

The **chemical sciences** sub-strand is concerned with understanding the composition and behaviour of substances. The key concepts developed within this sub-strand are that: the chemical and physical properties of substances are determined by their structure at an atomic scale; and that substances change and new substances are produced by rearranging atoms through atomic interactions and energy transfer. In this sub-strand, 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 which can combine to form molecules, and chemical reactions involve atoms being rearranged and recombined to form new substances. They explore the relationship between the way in which atoms are arranged and the properties of substances, and the effect of energy transfers on these arrangements.

The **Earth and space sciences** sub-strand is concerned with Earth's dynamic structure and its place in the cosmos. The key concepts developed within this sub-strand are that: Earth is part of a solar system that is part of a larger universe; and Earth is subject to change within and on its surface, over a range of timescales as a result of natural processes and human use of resources. Through this sub-strand, students view Earth as part of a solar system, which is part of a galaxy, which is one of many in the universe and explore the immense scales associated with space. 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 ways in which humans use resources from the Earth and appreciate the influence of human activity on the surface of the Earth and the atmosphere.

The **physical sciences** sub-strand is concerned with understanding the nature of forces and motion, and matter and energy. The two key concepts developed within this sub-strand are that: forces affect the behaviour of objects; and that energy can be transferred and transformed from one form to another. Through this sub-strand students gain an understanding of how an object's motion (direction, speed and acceleration) is influenced by a range of contact and non-contact forces such as friction, magnetism, gravity 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.

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 science 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. This strand also recognises that science advances through the contributions of many different people from different cultures and that there are many rewarding science-based career paths.

Nature and development of science: This sub-strand develops an appreciation of the unique nature of science and scientific knowledge, including how current knowledge has developed over time through the actions of many people.

Use and influence of science: This sub-strand explores how science knowledge and applications affect peoples' lives, including their work, and how science is influenced by society and can be used to inform decisions and actions.

Science Inquiry Skills
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.

In science investigations, collection and analysis of data and evidence play a major role. This can involve collecting or extracting information and reorganising data in the form of tables, graphs, flow charts, diagrams, prose, keys, spreadsheets and databases.

The content in the Science Inquiry Skills strand is described in two-year bands. There are five sub-strands of Science Inquiry Skills. These are:

Questioning and predicting: Identifying and constructing questions, proposing hypotheses and suggesting possible outcomes.

Planning and conducting: Making decisions regarding how to investigate or solve a problem and carrying out an investigation, including the collection of data.

Processing and analysing data and information: Representing data in meaningful and useful ways; identifying trends, patterns and relationships in data, and using this evidence to justify conclusions.

Evaluating: Considering the quality of available evidence and the merit or significance of a claim, proposition or conclusion with reference to that evidence.

Communicating: Conveying information or ideas to others through appropriate representations, text types and modes.

Science across Foundation to Year 12

Years 7–10, typically students from 12 to 15 years of age, Curriculum focus: explaining phenomena involving science and its applications

During these years, students continue to develop their understanding of important science concepts across the major science disciplines. It is important to include contemporary contexts in which a richer understanding of science can be enhanced. Current science research and its human application motivates and engages students.

Within the outlined curriculum, students should undertake some open investigations that will help them refine their science inquiry skills. The quantitative aspects of students' inquiry skills are further developed to incorporate consideration of uncertainty in measurement. In teaching the outlined curriculum, it is important to provide time to build the more abstract science ideas that underpin understanding.

Students further develop their understanding of systems and how the idea of equilibrium is important in dynamic systems. They consider how a change in one of the components can affect all components of the system because of the interrelationships between the parts. They consider the idea of form and function at a range of scales in both living and non-living systems. Students move from an experiential appreciation of the effects of energy to a more abstract understanding of the nature of energy.

As students investigate the science phenomena outlined in these years, they begin to learn about major theories that underpin science, including the particle theory, atomic theory, the theory of evolution, plate tectonic theory and the Big Bang theory.

Diversity of Learners

Australian students have multiple, diverse, and changing needs that are shaped by individual learning histories and abilities as well as personal, cultural and language backgrounds and socio-economic factors.

ACARA is committed to the development of a high-quality curriculum for all Australian students that promotes excellence and equity in education. Teachers will use the Australian Curriculum to develop teaching and learning programs that build on student's current learning and which are not limited by an individual student's gender, language, sexual orientation, pregnancy, culture, ethnicity, religion, health or disability, socio economic background or geographic location.

General capabilities

In the Australian Curriculum, the general capabilities encompass the knowledge, skills, behaviours and dispositions that, together with curriculum content in each learning area and the cross-curriculum priorities, will assist students to live and work successfully in the twenty-first century.

There are seven general capabilities:

- Literacy
- Numeracy
- Information and communication technology (ICT) capability
- Critical and creative thinking
- Personal and social capability
- Ethical understanding
- Intercultural understanding.

Cross-curriculum priorities

There are three Cross-curriculum priorities in the Australian Curriculum:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability.

The Cross-curriculum priorities are embedded in the curriculum and will have a strong but varying presence depending on their relevance to each of the learning areas.

Links to the other learning areas

Learning in science involves the use of knowledge and skills learnt in other areas, particularly in English, mathematics and history.

3 COURSE ORGANISATION

Time allocation
The number of hours of timetabled school time including assessment for this course of study is approximately 30 hours per term for each of Years 7, 8, 9, and 10.

Year 7

Chapter 1 Science Inquiry Skills

Questioning and Predicting

★ Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124).

Planning and Conducting

★ Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125).

★ In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (ACSIS126).

Processing and Analysing Data and Information

★ Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including using digital technologies as appropriate (ACSIS129).

★ Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions (ACSIS130).

Evaluating

★ Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (ACSIS131).

★ Use scientific knowledge and findings from investigations to evaluate claims (ACSIS132).

Communicating

★ Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate (ACSIS133).

Chapter 2 Collaborative Problem Solving

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124)

★ working collaboratively to identify a problem to investigate.

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125)

★ working collaboratively to decide how to approach an investigation.

Chapter 3 Food Webs

Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions (ACSSU112).

★ use food chains to show feeding relationships in a habitat.

★ construct and interpret food webs to show relationships between organisms in an environment.

★ classify organisms of an environment according to their position in a food chain.

★ recognise the role of microorganisms within food chains and food webs.

★ investigate the effect of human activity on local habitats, such as deforestation, agriculture or the introduction of new species.

★ explore how living things can cause changes to their environment and impact other living things, such as the effect of cane toads.

★ research specific examples of human activity, such as the use of fire by traditional Aboriginal people and the effects of palm oil harvesting in Sumatra and Borneo.

Chapter 4 Mixtures

Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques (ACSSU113).

- ★ Recognise the differences between pure substances and mixtures and identify examples of each.
- ★ Identify the solvent and solute in solutions.
- ★ Investigate and use a range of physical separation techniques such as filtration, decantation, evaporation, crystallisation, chromatography and distillation.
- ★ Explore and compare separation methods used in the home.

Chapter 5 Classification

There are differences within and between groups of organisms; classification helps organise this diversity (ACSSU111).

- ★ consider the reasons for classifying such as identification and communication.
- ★ group a variety of organisms on the basis of similarities and differences in particular features.
- ★ consider how biological classifications have changed over time.
- ★ classify using hierarchical systems such as kingdom, phylum, class, order, family, genus, species.
- ★ use scientific conventions for naming species.
- ★ use provided keys to identify organisms surveyed in a local habitat.

Chapter 6 Earth's Resources

Some of Earth's resources are renewable, but others are non-renewable (ACSSU116)

- ★ Consider what is meant by the term 'renewable' in relation to the Earth's resources.
- ★ Consider timescales for regeneration of resources.
- ★ Compare renewable and non-renewable energy sources, including how they are used in a range of situations.

Chapter 7 The Water Cycle

Water is an important resource that cycles through the environment (ACSSU222).

- ★ Consider the water cycle in terms of changes of state of water.
- ★ Investigate factors that influence the water cycle in nature.
- ★ Explore how human management of water impacts on the water cycle.

Chapter 8 Forces

Change to an object's motion is caused by unbalanced forces acting on the object (ACSSU117).

- ★ Investigate the effects of applying different forces to familiar objects.
- ★ Investigate common situations where forces are balanced, such as stationary objects, and unbalanced, such as falling objects.
- ★ Investigate a simple machine such as lever or pulley system.

Chapter 9 Gravity

Earth's gravity pulls objects towards the centre of the Earth (ACSSU118).

- ★ Explore how gravity affects objects on the surface of Earth.
- ★ Consider how gravity keeps planets in orbit around the Sun.

Chapter 10 Sun, Earth, Moon

Predictable phenomena on Earth, including seasons and eclipses, are caused by the relative positions of the sun, Earth and the moon (ACSSU115).

- ★ Investigate natural phenomena such as lunar and solar eclipses, seasons and phases of the moon.
- ★ Compare times for the rotation of Earth, the sun and moon, and compare the times for the orbits of Earth and the moon.
- ★ Model the relative movements of the Earth, sun and moon and how natural phenomena such as solar and lunar eclipses and phases of the moon occur.
- ★ Explain why different regions of the Earth experience different seasonal conditions.

Year 8

Chapter 1 Science Inquiry Skills

Questioning and predicting

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)

★ consider whether investigation use available resources is possible when identify questions or problems to investigate
★ recognise that the solution of some questions and problems requires consideration of social, cultural, economic or moral aspects rather than or as well as scientific investigation
★ use information and knowledge from their own investigations and secondary sources to predict the expected results from an investigation

Planning and conducting

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)

★ work collaboratively to decide how to best approach an investigation
★ identify any ethical considerations that may apply to the investigation
★ take into consideration all aspects of fair testing, available equipment and safe investigation when planning investigations

In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (ACSIS141)

★ use specialised equipment to increase the accuracy of measurement within an investigation
★ identify and explain the differences between controlled, dependent and independent variables

Processing and analysing data and information

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including use digital technologies as appropriate (ACSIS144)

★ describe measures of central tendency and identify outliers for quantitative data
★ explain the strengths and limitations of representations such as physical models, diagrams and simulations in terms of the attributes of systems included or not included

Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions (ACSIS145)

★ construct tables, graphs, keys and models to represent relationships and trends in collected data
★ draw conclusions based on a range of evidence including primary and secondary sources

Evaluating

Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (ACSIS146)

★ suggest improvements to investigation methods that would improve the accuracy of the data recorded
★ discuss investigation methods with others to share ideas about the quality of the inquiry process

Use scientific knowledge and findings from investigations to evaluate claims (ACSIS234)

★ identify the scientific evidence available to evaluate claims
★ decide whether or not to accept claims based on scientific evidence
★ identify where science has been used to make claims relating to products and practices

Communicating

Communicate ideas, findings and solutions to problems use scientific language and representations use digital technologies as appropriate (ACSIS148)

★ use digital technologies to construct a range of text types to present science ideas
★ select and use appropriate language and representations to communcate science ideas within a specified text type and for a specified audience.

Chapter 2 Cells

Cells are the basic units of living things and have specialised structures and functions (ACSSU149)

- ★ examine a variety of cells use a light microscope, by digital technology or by viewing a simulation
- ★ distinguish plant cells from animal or fungal cells
- ★ identify structures within cells and describe their function
- ★ recognise that some organisms consist of a single cell
- ★ recognise that cells reproduce via cell division
- ★ describe mitosis as cell division for growth and repair

Chapter 3 Multi-cellular Organisms

Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce (ACSSU150)

- ★ identify the organs and overall function of a system of a multicellular organism in supporting the life processes
- ★ describe the structure of each organ in a system and relating its function to the overall function of the system
- ★ examine the specialised cells and tissues involved in structure and function of particular organs
- ★ compare similar systems in different organisms such as digestive systems in herbivores and carnivores, respiratory systems in fish and mammals

Chapter 4 Reproduction

Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce (ACSSU150)

- ★ distinguish between asexual and sexual reproduction
- ★ compare reproductive systems of organisms

Chapter 5 Matter

The properties of the different states of matter can be explained in terms of the motion and arrangement of particles (ACSSU151)

- ★ explain why a model for the structure of matter is needed
- ★ model the arrangement of particles in solids, liquids and gases
- ★ use the particle model to explain observed phenomena linking the energy of particles to temperature changes

Chapter 6 Elements and Compounds

Differences between elements, compounds and mixtures can be described at a particle level (ACSSU152)

- ★ model the arrangement of particles in elements and compounds
- ★ recognise that elements and simple compounds can be represented by symbols and formulas
- ★ locate elements on the periodic table

Chapter 7 Chemical Reactions

Chemical change involves substances reacting to form new substances (ACSSU225)

- ★ identify the differences between chemical and physical changes
- ★ identify evidence that a chemical change has taken place
- ★ investigate simple reactions such as combining elements to make a compound
- ★ recognise that the chemical properties of a substance, for example its flammability and ability to corrode, will affect its use

Chapter 8 Rocks

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

- ★ represent the stages in the formation of igneous, metamorphic and sedimentary rocks, including indications of timescales involved
- ★ identify a range of common rock types use a key based on observable physical and chemical properties
- ★ consider the role of forces and energy in the formation of different types of rocks and minerals

Chapter 9 Minerals

Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)

- ★ recognise that rocks are a collection of different minerals
- ★ recognise that some rocks and minerals, such as ores, provide valuable resources
- ★ consider the role of forces and energy in the formation of different types of rocks and minerals

Chapter 10 Forms of Energy

Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems (ACSSU155)

- ★ recognise that kinetic energy is the energy possessed by moving bodies
- ★ recognise that potential energy is stored energy, such as gravitational, chemical and elastic energy
- ★ investigate different forms of energy in terms of the effects they cause, such as gravitational potential cause objects to fall and heat energy transferred between materials that have a different temperature
- ★ recognise that heat energy is often produced as a by-product of energy transfer, such as brakes on a car and light globes
- ★ use flow diagrams to illustrate changes between different forms of energy

Year 9

Chapter 1 Science Inquiry Skills

Questioning and predicting

Formulate questions or hypotheses that can be investigated scientifically (ACSIS164)

- ★ use internet research to identify problems that can be investigated.
- ★ evaluate information from secondary sources as part of the research process.
- ★ revise and refine research questions to target specific information and data collection or finde a solution to the specific problem identified.
- ★ develop ideas from students own or others' investigations and experiences to investigate further.

Planning and conducting

Plan, select and use appropriate investigation methods, include field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS165)

- ★ explain the choice of variables to be controlled, changed and measured in an investigation.
- ★ identify the potential hazards of chemicals or biological materials used in experimental investigations.
- ★ ensure that any investigation involve or impacte on animals is justified, humane and considerate of each animal's needs.
- ★ use model and simulations, include use digital technology to investigate situations and events.
- ★ combine research use primary and secondary sources with students' own experimental investigation.
- ★ consider how investigation methods and equipment may influence the reliablity of collected data.

Select and use appropriate equipment, include digital technologies, to systematically and accurately collect and

record data (ACSIS166)

- ★ use probes and data loggers to record information.
- ★ apply specific skills for the use of scientific instruments.

Processing and analysing data and information

Analyse patterns and trends in data, include describe relationships between variables and identifye inconsistencies (ACSIS169)

- ★ use spreadsheets to present data in tables and graphical forms and to carry out mathematical analyses on data.
- ★ describe sample properties (such as mean, median, range, large gaps visible on a graph) to predict characteristics of the larger population.
- ★ design and construct appropriate graphs to represent data and analyse graphs for trends and patterns.

Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS170)
- ★ compare conclusions with earlier predictions and reviewe scientific understande where appropriate.
- ★ suggest more than one possible explanation of the data presented.

Evaluating

Evaluate conclusions, include identifye sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171)
- ★ identify gaps or weaknesses in conclusions (their own or those of others).
- ★ identify alternative explanations that are also consistent with the evidence.

Critically analyse the validity of information in secondary sources and evaluate the approaches used to solve problems (ACSIS172)
- ★ discuss what is meant by 'validity' and how we can evaluate the validity of information in secondary sources.
- ★ research the methods used by scientists in studies reported in the media.
- ★ describe how scientific arguments are used to make decisions regarde personal and community issues.

Communicating

Communicate scientific ideas and information for a particular purpose, include constructe evidence-based arguments and use appropriate scientific language, conventions and representations (ACSIS174)
- ★ present results and ideas use formal experimental reports, oral presentations, slide shows, poster presentations and contribute to group discussions.
- ★ use secondary sources as well as students' own findings to help explain a scientific concept.
- ★ use the internet to facilitate collaboration in joint projects and discussions.

Chapter 2 Multi-cellular Organisms (36 pages)

Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment (ACSSU175)
- ★ describe how the requirements for life (for example oxygen, nutrients, water and removal of waste) are provided through the coordinated function of body systems such as the respiratory, circulatory, digestive, nervous and excretory systems.
- ★ explain how body systems work together to maintain a functioning body using models, flow diagrams or simulations.
- ★ identify responses using nervous and endocrine systems.
- ★ investigate the response of the body to changes as a result of the presence of micro-organisms.
- ★ investigate the effects on humans of exposure to electromagnetic radiations such as X-rays and microwaves.

Chapter 3 Ecosystems (26 pages)

Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems (ACSSU176)
- ★ explore interactions between organisms such as predator/prey, parasites, competitors, pollinators and disease.
- ★ examine factors that affect population sizes such as seasonal changes, destruction of habitats, introduced species.
- ★ consider how energy flows into and out of an ecosystem via the pathways of food webs, and how it must be replaced to maintain the sustainability of the system.
- ★ investigate how ecosystems change as a result of events such as bushfires, drought and flooding.

Chapter 4 Matter (26 pages)

All matter is made of atoms which are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (ACSSU177)

- ★ describe and modelling the structure of atoms in terms of the nucleus, protons, neutrons and electrons.
- ★ compare the mass and charge of protons, neutrons and electrons.
- ★ describe in simple terms how alpha and beta particles and gamma radiation are released from unstable atoms.

Chapter 5 Chemical Reactions I (34 pages)

Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed (ACSSU178)

- ★ identify reactants and products in chemical reactions.
- ★ model chemical reactions in terms of rearrangement of atoms.
- ★ describe observed reactions using word equations.
- ★ consider the role of energy in chemical reactions.
- ★ recognise that the conservation of mass in a chemical reaction can be demonstrated by simple chemical equations.

Chapter 6 Chemical Reactions II (34 pages)

Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer (ACSSU179)

- ★ investigate reactions of acids with metals, bases, and carbonates.
- ★ investigate a range of different reactions to classify them as exothermic or endothermic.
- ★ recognise the role of oxygen in combustion reactions and comparing combustion with other oxidation reactions.
- ★ compare respiration and photosynthesis and their role in biological processes.
- ★ describe how the products of combustion reactions affect the environment.

Chapter 7 Plate Tectonics (30 pages)

The theory of plate tectonics explains global patterns of geological activity and continental movement (ACSSU180)

- ★ recognise the major plates on a world map.
- ★ model sea-floor spreading.
- ★ relate the occurrence of earthquakes and volcanic activity to constructive and destructive plate boundaries.
- ★ consider the role of heat energy and convection currents in the movement of tectonic plates.
- ★ relate the extreme age and stability of a large part of the Australian continent to its plate tectonic history.

Chapter 8 Energy Transfer (36 pages)

Energy transfer through different mediums can be explained using wave and particle models (ACSSU182)

- ★ explore how and why the movement of energy varies according to the medium through which it is transferred
- ★ discuss the wave and particle models and how they are useful for understanding aspects of phenomena
- ★ investigate the transfer of heat in terms of convection, conduction and radiation, and identifying situations in which each occurs
- ★ understand the processes underlying convection and conduction in terms of the particle model
- ★ investigate factors that affect the transfer of energy through an electric circuit
- ★ explore the properties of waves, and situations where energy is transferred in the form of waves, such as sound and light

Year 10

Chapter 1 Science Inquiry Skills

Questioning and predicting

Formulate questions or hypotheses that can be investigated scientifically (ACSIS198)

- ★ develop hypotheses based on well-developed models and theories.
- ★ use internet research to identify problems that can be investigated.
- ★ formulate questions that can be investigated within the scope of the classroom or field with available resources.
- ★ develop ideas from students own or others' investigations and experiences to investigate further.
- ★ evaluate information from secondary sources as part of the research process.

Planning and conducting

Plan, select and use appropriate investigation methods, include field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS199)

- ★ combine research using primary and secondary sources with a student's own experimental investigation.
- ★ use models and simulations, include use digital technology, to investigate situations and events.
- ★ Decide how much data are needed to produce reliable measurements.
- ★ consider possible confounding variables or effects and ensure these are controlled.
- ★ identify the potential hazards of chemicals or biological materials used in experimental investigations.
- ★ identify safety risks and impacts on animal welfare and ensure these are effectively managed within the investigation.

Select and use appropriate equipment, include digital technologies, to systematically and accurately collect and record data (ACSIS200)

- ★ select and use probes and data loggers to record information.
- ★ apply specific skills for the use of scientific instruments identifying where human error can influence the reliability of data.

Processing and analysing data and information

Analyse patterns and trends in data, include describe relationships between variables and identifye inconsistencies (ACSIS203)

- ★ use spreadsheets to present data in tables and graphical forms and to carry out mathematical analyses on data.
- ★ describe sample properties (such as mean, median, range, large gaps visible on a graph) to predict characteristics of the larger population, acknowledge uncertainties and the effects of outliers.
- ★ explore relationships between variables use spreadsheets, databases, tables, charts, graphs and statistics.

Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS204)

- ★ use primary or secondary scientific evidence to support or refute a conclusion.
- ★ construct a scientific argument showing how their evidence supports their claim.

Evaluating

Evaluate conclusions, include identifye sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS205)

- ★ evaluate the strength of a conclusion that can be inferred from a particular data set.
- ★ distinguish between random and systematic errors and how these can affect investigation results.
- ★ identify alternative explanations that are also consistent with the evidence.

Critically analyse the validity of information in secondary sources and evaluate the approaches used to solve problems (ACSIS206)

- ★ research the methods used by scientists in studies reported in the media.
- ★ judge the validity of science-related media reports and how these reports might be interpreted by the public.
- ★ describe how scientific arguments, as well as ethical, economic and social arguments, are used to make decisions regarding personal and community issues.

Communicating

Communicate scientific ideas and information for a particular purpose, include constructing evidence-based arguments and use appropriate scientific language, conventions and representations (ACSIS208)

★ use the internet to facilitate collaboration in joint projects and discussions.
★ construct evidence based arguments and engage in debate about scientific ideas.
★ present results and ideas use formal experimental reports, oral presentations, slide shows, poster presentations and contribute to group discussions.
★ use a range of representations, include mathematical and symbolic forms, to communicate science ideas.
★ use the internet to facilitate collaboration in joint projects and discussions.

Chapter 2 DNA and Genes

The transmission of heritable characteristics from one generation to the next involves DNA and genes (ACSSU184)

describe the role of DNA as the blueprint for controlle the characteristics of organisms

★ use models and diagrams to represent the relationship between DNA, genes and chromosomes.
★ recognise that genetic information passed on to offspre is from both parents by meiosis and fertilisation.
★ represent patterns of inheritance of a simple dominant/recessive characteristic through generations of a family.
★ predict simple ratios of offspre genotypes and phenotypes in crosses involve dominant/recessive gene pairs or in genes that are sex-linked.
★ describe mutations as changes in DNA or chromosomes and outline the factors that contribute to cause mutations.

Chapter 3 Theory of Evolution

The theory of evolution by natural selection explains the diversity of live things and is supported by a range of scientific evidence (ACSSU185)

★ outline processes involved in natural selection include variation, isolation and selection.
★ describe biodiversity as a function of evolution.
★ investigate changes caused by natural selection in a particular population as a result of a specified selection pressure such as artificial selection in breede for desired characteristics.
★ relate genetic characteristics to survival and reproductive rates.
★ evaluate and interprete evidence for evolution, include the fossil record, chemical and anatomical similarities, and geographical distribution of species.

Chapter 4 The Periodic Table

The atomic structure and properties of elements are used to organise them in the Periodic Table (ACSSU186)

★ recognise that elements in the same group of the periodic table have similar properties.
★ describe the structure of atoms in terms of electron shells .
★ explain how the electronic structure of an atom determines its position in the periodic table and its properties.
★ investigate the chemical activity of metals.

Chapter 5 Chemical Reactions

Different types of chemical reactions are used to produce a range of products and can occur at different rates (ACSSU187)

★ investigate how chemistry can be used to produce a range of useful substances such as fuels, metals and pharmaceuticals.
★ predict the products of different types of simple chemical reactions.
★ use word or symbol equations to represent chemical reactions.
★ investigate the effect of a range of factors, such as temperature and catalysts, on the rate of chemical reactions.

Chapter 6 The Universe

The universe contains features include galaxies, stars and solar systems and the Big Bang theory can be used to explain the origin of the universe (ACSSU188)

★ identify the evidence supporte the Big Bang theory, such as Edwin Hubble's observations and the

detection of microwave radiation.
- ★ recognise that the age of the universe can be derived using knowledge of the Big Bang theory.
- ★ describe how the evolution of the universe, include the formation of galaxies and stars, has continued since the Big Bang.

Chapter 7 Global Systems

Global systems, include the carbon cycle, rely on interactions involve the biosphere, lithosphere, hydrosphere and atmosphere (ACSSU189)

- ★ investigate how human activity affects global systems .
- ★ model a cycle, such as the water, carbon, nitrogen or phosphorus cycle within the biosphere.
- ★ explain the causes and effects of the greenhouse effect investigate the effect of climate change on sea levels and biodiversity.
- ★ consider the long-term effects of loss of biodiversity.
- ★ investigate currently occurre changes to permafrost and sea ice and the impacts of these changes.
- ★ examine the factors that drive the deep ocean currents, their role in regulate global climate, and their effects on marine life.

Chapter 8 Energy Conservation

Energy conservation in a system can be explained by describe energy transfers and transformations (ACSSU190)

- ★ recognise that the Law of Conservation of Energy explains that total energy is maintained in energy transfer and transformation.
- ★ recognise that in energy transfer and transformation, a variety of processes can occur, so that the usable energy is reduced and the system is not 100% efficient.
- ★ compare energy changes in interactions such as car crashes, pendulums, lifting and dropping.
- ★ use models to describe how energy is transferred and transformed within systems.

Chapter 9 Motion

The motion of objects can be described and predicted use the laws of physics (ACSSU229)

- ★ gather data to analyse everyday motions produced by forces, such as measurements of distance and time, speed, force, mass and acceleration.
- ★ recognise that a stationary object, or a move object with constant motion, has balanced forces acting on it.
- ★ use Newton’s Second Law to predict how a force affects the movement of an object.
- ★ recognise and apply Newton’s Third Law to describe the effect of interactions between two objects.

4 CURRICULUM AUDIT

Year 7 Content Descriptions	Chapter
Science Understanding	
Biological sciences	
There are differences within and between groups of organisms; classification helps organise this diversity (ACSSU111)	5
Interactions between organisms can be described in terms of food chains and food webs; human activity can affect these interactions (ACSSU112)	3
Chemical sciences	
Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques (ACSSU113)	4
Earth and space sciences	
Predictable phenomena on Earth, including seasons and eclipses, are caused by the relative positions of the sun, Earth and the moon (ACSSU115)	10
Some of Earth's resources are renewable, but others are non-renewable (ACSSU116)	6
Water is an important resource that cycles through the environment (ACSSU222)	7
Physical sciences	
Change to an object's motion is caused by unbalanced forces acting on the object (ACSSU117)	8
Earth's gravity pulls objects towards the centre of the Earth (ACSSU118)	9
Science Inquiry Skills	
Questioning and predicting	
Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124)	1, 2, 3-10
Planning and conducting	
Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125)	1, 2, 3-10
In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (ACSIS126)	1, 3-10
Processing and analysing data and information	
Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including using digital technologies as appropriate (ACSIS129)	1, 3-10
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions (ACSIS130)	1, 3-10
Evaluating	
Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (ACSIS131)	1, 3-10
Use scientific knowledge and findings from investigations to evaluate claims (ACSIS132)	1, 3-10
Communicating	
Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate (ACSIS133)	1, 3-10
Science as a Human Endeavour	
Nature and development of science	Throughout
Use and influence of science	

Year 8 Content Descriptions	Chapter
Science Understanding	
Biological sciences Cells are the basic units of living things and have specialised structures and functions (ACSSU149)	2
Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce (ACSSU150)	3, 4
Chemical sciences The properties of the different states of matter can be explained in terms of the motion and arrangement of particles (ACSSU151)	5
Differences between elements, compounds and mixtures can be described at a particle level (ACSSU152)	6
Chemical change involves substances reacting to form new substances (ACSSU225)	7
Earth and space sciences Sedimentary, igneous and metamorphic rocks contain minerals and are formed by processes that occur within Earth over a variety of timescales (ACSSU153)	8,9
Physical sciences Energy appears in different forms including movement (kinetic energy), heat and potential energy, and causes change within systems (ACSSU155)	10
Science Inquiry Skills	
Questioning and predicting Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS139)	1, 2-10
Planning and conducting Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS140)	1, 2-10
In fair tests, measure and control variables, and select equipment to collect data with accuracy appropriate to the task (ACSIS141)	1, 2-10
Processing and analysing data and information Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships, including using digital technologies as appropriate (ACSIS144)	1, 2-10
Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions (ACSIS145)	1, 2-10
Evaluating Reflect on the method used to investigate a question or solve a problem, including evaluating the quality of the data collected, and identify improvements to the method (ACSIS146)	1, 2-10
Use scientific knowledge and findings from investigations to evaluate claims (ACSIS234)	1, 2-10
Communicating Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate (ACSIS148)	1, 2-10
Science as a Human Endeavour *Nature and development of science* *Use and influence of science*	Throughout

Year 9 Content Descriptions	Chapter
Science Understanding *Biological sciences*	
Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment (ACSSU175)	2
Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems (ACSSU176)	3
Chemical sciences All matter is made of atoms which are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (ACSSU177)	4
Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed (ACSSU178)	5
Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer (ACSSU179)	6
Earth and space sciences The theory of plate tectonics explains global patterns of geological activity and continental movement (ACSSU180)	7
Physical sciences *Energy transfer through different mediums can be explained using wave and particle models (ACSSU182)*	8
Science Inquiry Skills	
Questioning and predicting Formulate questions or hypotheses that can be investigated scientifically (ACSIS164)	1-8
Planning and conducting Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS165)	1-8
Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data (ACSIS166)	1-8
Processing and analysing data and information Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169)	1-8
Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS170)	1-8
Evaluating Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171)	1-8
Critically analyse the validity of information in secondary sources and evaluate the approaches used to solve problems (ACSIS172)	1-8
Communicating Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS174)	1-8
Science as a Human Endeavour *Nature and development of science* *Use and influence of science*	Throughout

Year 10 Content Descriptions	Chapter
Science Understanding	
Biological sciences The transmission of heritable characteristics from one generation to the next involves DNA and genes (ACSSU184)	2
The theory of evolution by natural selection explains the diversity of living things and is supported by a range of scientific evidence (ACSSU185)	3
Chemical sciences The atomic structure and properties of elements are used to organise them in the Periodic Table (ACSSU186)	4
Different types of chemical reactions are used to produce a range of products and can occur at different rates (ACSSU187)	5
Earth and space sciences The universe contains features including galaxies, stars and solar systems and the Big Bang theory can be used to explain the origin of the universe (ACSSU188)	6
Global systems, including the carbon cycle, rely on interactions involving the biosphere, lithosphere, hydrosphere and atmosphere (ACSSU189)	7
Physical sciences Energy conservation in a system can be explained by describing energy transfers and transformations (ACSSU190)	8
The motion of objects can be described and predicted using the laws of physics (ACSSU229)	9
Science Inquiry Skills	
Questioning and predicting Formulate questions or hypotheses that can be investigated scientifically (ACSIS198)	1, 2-9
Planning and conducting Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS199)	1, 2-9
Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data (ACSIS200)	1, 2-9
Processing and analysing data and information Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS203)	1, 2-9
Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS204)	1, 2-9
Evaluating Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS205)	1, 2-9
Critically analyse the validity of information in secondary sources and evaluate the approaches used to solve problems (ACSIS206)	1, 2-9
Communicating Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS208)	1, 2-9
Science as a Human Endeavour *Nature and development of science,* *Use and influence of science*	Throughout

5 ASSESSMENT PLAN

Teachers use the achievement standards, at the end of a period of teaching, to make on-balance judgments about the quality of learning demonstrated by the students – that is whether they have achieved below, at, or above the standard. To make these judgments, teachers draw on assessment data that they have collected as evidence during the course of the teaching period. These judgments about the quality of learning are one source of feedback to students and their parents and inform formal reporting processes (ACARA, 2013).

Assessment takes place in different levels and for different purposes, including (ACARA, 2013):

- ★ ongoing formative assessment within classrooms for the purposes of monitoring learning and providing feedback, to teachers to inform their teaching, and for students to inform their learning
- ★ summative assessment for the purposes of twice-yearly reporting by schools to parents and carers on the progress and achievement of students
- ★ periodic sample testing of specific learning areas within the Australian Curriculum as part of the National Assessment Program (NAP).

Summative assessment per term

Task	Teacher assistance	Class time	Open book	Time	Group/ individual
Unit tests	No	100%	No	40 mins	Individual
Class work	Yes	100%	Yes	Throughout unit	Individual
Practical reports	Yes	80%	Yes	40 mins	Individual
Rich tasks	Yes	80%	Yes	1 week	Group