Education Perfect Science

NSW Curriculum Map

As of Friday 28th August 2025

Science Stage 4 Curriculum Map

Observing the Universe			
SC4-OTU-01 - explains how observations are used by scientists to increase knowledge and understanding of the Universe			
	Lesson Title	**Learning Intention**	**Success Criteria**
Explain that predictable and observable phenomena on the Earth are caused by the relative positions of the Sun, the Earth and the Moon	The Earth's Tilt and Seasons	Seasons occur because of Earth's axial tilt and its position in orbit around the Sun. These factors change the angle and intensity of sunlight reaching different parts of the Earth throughout the year. In this lesson, we will explore how these predictable changes create seasonal variations in temperature and daylight hours.	- Explain how Earth's tilt affects the amount of sunlight received at different times of the year - Describe how Earth's orbit around the Sun results in changing seasons - Interpret diagrams and data to describe how daylight hours and temperatures vary across seasons
Explain that predictable and observable phenomena on the Earth are caused by the relative positions of the Sun, the Earth and the Moon Data Science outcome: Create a model that can be used to explain an observable phenomenon	Investigation: Modelling Earth's Tilt and Orbit	Seasons change because of Earth's tilt and movement around the Sun. In this lesson, we will create a model to explain how Earth's axial tilt and orbit cause seasonal changes.	- Describe how Earth's tilt and orbit affect the seasons. - Identify the relationship between the Sun's position and seasonal changes - Create a model demonstrating how the tilt of Earth affects sunlight distribution - Explain how the model represents the cause of the seasons and its limitations
Explain how Aboriginal and Torres Strait Islander Peoples use stars to identify specific weather phenomena Describe how Aboriginal and/or Torres Strait Islander Peoples predicted seasonal phenomena based on their observations of the stars and phases of the Moon to predict animal behaviour, plant cycles and tidal changes	Seasonal Calendars and Celestial Knowledge of First Nations Australians	Aboriginal and Torres Strait Islander Peoples have developed sophisticated seasonal calendars and observations of the stars, Moon, and natural phenomena to predict weather, animal behaviours, and plant cycles. In this lesson, we will investigate examples of these calendars and explore how they connect the environment and the skies to seasonal changes and resource management.	- Describe how Aboriginal and Torres Strait Islander Peoples use the stars, the Moon, and nature to know when seasons are changing - Investigate seasonal calendars, like the D'harawal seasonal calendar, and how they are linked to changes in the environment - Explain how watching the stars, Moon, and nature helps predict plant growth, animal behavior, and ocean tides

Use physical models or virtual simulations to explain the cyclic patterns of lunar phases and eclipses of the Sun and Moon	Lunar Phases and Eclipses: Cyclic Patterns in the Sun-Earth-Moon System	The cyclic patterns of lunar phases and eclipses occur due to the positions and movements of the Earth, Moon, and Sun. In this lesson, we will explore and explain these predictable phenomena.	- Describe the cyclic patterns of lunar phases and their causes - Explain how the positions of the Sun, Earth, and Moon result in solar and lunar eclipses - Create a model showing the phases of the Moon and eclipses
Investigate the similarities between Aboriginal and Torres Strait Islander accounts and mainstream scientific explanations about the phases of the Moon and how the phases affect tides	Understanding Tides: The Role of the Moon and Sun	The gravitational attraction of the Moon and the Sun influences Earth's oceans, creating tides. In this lesson, we will explore how the relative positions of the Moon, Sun, and Earth result in tidal variations and understand the relationship between gravitational forces and tidal patterns.	- Describe how the gravitational forces of the Moon and the Sun affect Earth's oceans - Explain how the relative positions of the Moon, Sun, and Earth create different types of tides (e.g., spring and neap tides) - Use diagrams or models to demonstrate how tidal variations occur - Analyse the connection between the phases of the Moon and tidal patterns
	Indigenous Knowledge of Lunar Phases and Tides	First Nations Australians hold rich cultural knowledge about the relationship between the phases of the Moon and ocean tides. In this lesson, we will explore these understandings, compare them with mainstream scientific explanations, and learn how they are used to predict and navigate environmental conditions.	- Describe the connection between lunar phases and tides from both Indigenous and scientific perspectives - Identify similarities and differences between scientific and Aboriginal and Torres Strait Islander knowledge of lunar cycles and phases and their impact on tides - Explain how these understandings are applied in practices such as reef-diving, fishing, and navigation
	Understanding Solar and Lunar Eclipses: Indigenous Knowledge and Contemporary Science	Aboriginal and Torres Strait Islander Peoples have long observed and recorded solar and lunar eclipses through oral traditions and cultural practices. In this lesson, we will explore these understandings, compare them with contemporary scientific explanations, and appreciate the cultural significance of these celestial events.	- Describe how Aboriginal and Torres Strait Islander Peoples share stories and records about solar and lunar eclipses - Explain what scientists know today about solar and lunar eclipses - Compare Indigenous knowledge with modern science to find what is similar and different
Compare historical and current solar system models to show how models are modified or rejected due to new scientific evidence Data Science outcome:	From Myth to Model: How Science Explains the Solar System	Scientific understanding evolves as new evidence is discovered. In this lesson, we will compare scientific and non-scientific approaches to explaining natural phenomena and examine how historical and current models of the Solar System have changed with new evidence.	- Identify differences between scientific and non-scientific approaches to understanding natural phenomena - Compare historical and current models of the Solar System - Explain how new scientific evidence leads to modifications or rejections of models - Evaluate why scientific inquiry is more reliable than non-scientific explanations

Compare and contrast scientific inquiries of natural phenomena with nonscientific approaches			
Extension	The Work of Wang Zhenyi: Understanding Lunar Eclipses	In the 10th century, Al-Battani made groundbreaking contributions to astronomy, including accurate predictions of eclipses and calculations of the solar year's length. In this lesson, we will explore his achievements and understand how his work advanced our knowledge of astronomy and influenced later scientific developments.	- Describe what Wang Zhenyi discovered about science, especially her work on lunar eclipses - Explain how lunar eclipses happen using scientific ideas - Use models to recreate Wang Zhenyi's experiments and see how lunar eclipses work - Explain why Wang Zhenyi's work was important in 18th-century China and why it still matters today
	The Contributions of Al-Battani: Advancements in Astronomy	In the 10th century, Al-Battani made groundbreaking contributions to astronomy, including accurate predictions of eclipses and calculations of the solar year's length. In this lesson, we will explore his achievements and understand how his work advanced our knowledge of astronomy and influenced later scientific developments.	- Describe what Al-Battani discovered in astronomy, including how he predicted eclipses and measured the length of a year - Explain why Al-Battani's methods were important and how they helped people understand space better. - Investigate the tools and techniques he used to make his calculations - Discuss how Al-Battani's work influenced later discoveries in astronomy and its impact on modern science
Forces and Magnets			
SC4-FOR-01 - describes the effects of forces in everyday contexts			
Explain forces as either direct (contact) or indirect (non-contact)	Understanding Forces	Forces are pushes or pulls that can cause objects to move, stop, or change direction. In this lesson, we will explore the different types of forces and explain how they can be categorised as either direct (contact) forces or indirect (non-contact) forces.	- Define forces as push or pull that can act on objects - Classify forces into contact (direct) and non-contact (indirect) types - Identify examples of contact and non-contact forces in everyday situations - Explain how contact forces require physical interaction, while non-contact forces act at a distance
Conduct a practical investigation on the effects of a range of direct and indirect forces	Investigation: The Effects of Forces on Objects	Forces can cause objects to move, stop, or change direction. The effects of these forces depend on the size of the force and the mass of the object. In this lesson, we will investigate how applying different forces affects objects of the same and different masses, including both direct (contact) and indirect (non-contact) forces.	- Describe how forces affect the motion of objects - Investigate the effects of applying forces of different sizes to objects of the same and different masses - Identify the effects of direct and indirect forces - Explain how the mass of an object influences the effect of a force

Use force diagrams to model balanced and unbalanced forces	Balanced and Unbalanced Forces	The motion of an object depends on whether the forces acting on it are balanced or unbalanced. In this lesson, we will explore how balanced and unbalanced forces affect the motion of objects, such as starting, stopping, and changing direction, and use force diagrams to represent these forces.	- Define balanced and unbalanced forces and describe their effects on motion - Analyse how balanced and unbalanced forces cause objects to start, stop, or change direction - Use force diagrams to model balanced and unbalanced forces acting on objects - Explain real-life examples of balanced and unbalanced forces and their effects on motion
Analyse force diagrams to make predictions	Investigation: Measuring and Representing Forces	Forces have both magnitude and direction, and we can measure and represent them to predict their effects on an object's motion. In this lesson, we will use a force meter to measure the magnitude of forces, represent them with force diagrams, and analyse the diagrams to make predictions.	- Measure the magnitude of forces acting on objects using a force meter - Create a force diagram with arrows showing the magnitude and direction of forces acting on an object - Analyse force diagrams to predict how forces will affect an object's motion - Explain the relationship between the size and direction of forces and their effects
Perform calculations using the equation F = mg to solve for unknowns	Using the Force Equation	The force acting on an object due to gravity can be calculated using the equation $F = mg$ where F is the force, m is the mass, and g is the gravitational acceleration. In this lesson, we will perform calculations using this equation to solve for unknown values and understand the relationship between force, mass, and gravity.	- Explain the relationship between force, mass, and gravitational acceleration using the equation $F = mg$ - Calculate the gravitational force acting on an object given its mass and the gravitational acceleration - Apply the formula to solve for unknowns, such as mass (m) or gravitational acceleration (g)
Examine the relationship between force and energy	Exploring the Relationship Between Force and Energy	Force and energy are closely related concepts in physics. In this lesson, we will explore how forces transfer or transform energy, analsze how energy changes during motion, and examine real-world examples where force and energy interact.	- Describe the relationship between force and energy in terms of motion and work - Explain how forces transfer energy between objects or transform it from one form to another - Apply the concepts of force and energy to real-world scenarios
Describe the electrostatic and gravitational forces exerted between objects	Understanding Electrostatic Forces	Electrostatic forces are forces exerted between objects due to their electric charges. In this lesson, we will explore how these forces work, describe the interactions between charged objects, and understand how these forces can attract or repel objects.	- Describe how charged objects interact, including attraction and repulsion - Explain what electrostatic forces are and how they arise from electric charges - Investigate examples of electrostatic forces in everyday situations

Describe the electrostatic and gravitational forces exerted between objects	Understanding Gravitational Forces	Gravitational force is the attractive force that pulls objects toward the center of Earth and acts between all objects with mass. In this lesson, we will investigate how Earth's gravitational force works, describe how it affects objects, and understand how its magnitude is related to mass.	- Describe the gravitational forces exerted between objects with mass - Describe how Earth's gravitational force pulls objects toward its center - Investigate how the magnitude of gravitational force is related to the mass of an object
Use the concept of forces to describe the motion of objects in orbit	Gravity and Motion in Space	Gravity is a fundamental force that governs the motion of objects in space, from moons and planets to stars, galaxies, and black holes. In this lesson, we will explore how gravity affects objects in space and use the concept of forces to describe their motion, including orbits and interactions.	- Describe how gravity affects the motion of objects in space, including moons, planets, stars, galaxies, and black holes - Explain how gravitational forces cause objects to orbit larger masses - Use the concept of forces to analyse and describe the motion of objects in orbit
Conduct a series of practical investigations using simple machines to investigate the action of forces	Investigation: Designing and Investigating Simple Machines	Simple machines can be designed to perform tasks with precision and efficiency by modifying the action of forces. In this lesson, we will design a series of simple machines to move an object to a specified height within a set time and investigate the action of forces involved in these processes.	- Design a series of simple machines to perform a task within specific parameters (e.g., height and time) - Investigate the action of forces in levers, pulleys and other simple machines - Evaluate the performance of the machines based on their effectiveness and efficiency - Explain how the action of forces affects the motion of objects in simple machines
Investigate how simple machines, such as levers and pulleys, are used to change the magnitude of force needed when performing a task Investigate how simple machines can solve everyday issues Explore the role of simple machines, from now and in the past, as used in everyday life	Simple Machines: Force, Mechanical Advantage, and Everyday Applications	Simple machines, such as levers and pulleys, help us perform tasks by reducing the force needed. In this lesson, we will investigate how these machines work, evaluate their mechanical advantage, and explore their role in solving everyday problems, both historically and in the modern world.	- Describe how levers and pulleys change the magnitude of force needed to perform a task - Investigate the mechanical advantage of levers and pulleys - Evaluate different simple machines based on their mechanical advantage and effectiveness - Explain how simple machines have been used in the past and how they are still relevant today
Identify examples of Aboriginal and Torres Strait Islander Peoples' application of Knowledge about forces	Forces in Action: Simple Machines in Aboriginal and Torres Strait	Aboriginal and Torres Strait Islander Peoples have ingeniously applied knowledge of forces and simple machines to design tools that enhance their capabilities. In this lesson, we will investigate how	- Identify examples of Aboriginal and Torres Strait Islander Peoples' knowledge and application of forces in tool design - Describe how forces are applied through tools such as spearthrowers, and bows and arrows

	Islander Technologies	forces are applied through traditional technologies, such as spearthrowers and bows and arrows, and analyze their effectiveness as tools that utilize principles of levers and projectiles.	- Explain how the spearthrower functions as a lever and how it enhances the force applied to a projectile
	The Science of Boomerangs: Forces and Airfoil Design	Boomerangs are ingenious tools designed by Aboriginal and Torres Strait Islander Peoples that rely on an understanding of forces and airfoil profiles. In this lesson, we will analyse the forces acting on boomerangs, explore their airfoil design, and understand how variations in shape and profile allowed for multiple applications.	- Describe the forces that affect a boomerang when it flies, including lift, drag, and gravity - Explain how the shape of a boomerang (airfoil) helps it fly the way it does - Analyse how Aboriginal and Torres Strait Islander Peoples designed different boomerangs for hunting, sport, and other uses - Investigate how changing the shape or design of a boomerang affects how well it flies
	David Unaipon and the Vertical Lift Flying Machine	David Unaipon, a Ngarrindjeri man from South Australia, applied his cultural knowledge of boomerangs and their aerodynamic properties to conceptualise a vertical lift flying machine in 1914. In this lesson, we will explore how Unaipon's understanding of forces and flight informed his invention and examine the significance of his contribution to aerodynamics and engineering.	- Describe how David Unaipon used his cultural knowledge to design a flying machine with vertical lift - Explain the science behind vertical lift and how it connects to Unaipon's ideas - Explain why Unaipon's work was important in engineering and how it shows the innovation in Aboriginal knowledge systems
Investigate examples of forces and magnetism in familiar contexts Investigate examples of forces and magnetism in familiar contexts	Investigation: Exploring Simple Machines in Complex Systems: Building a Rube Goldberg Machine	Complex machines, like Rube Goldberg machines, are made up of multiple simple machines working together to perform a task. In this lesson, we will identify the simple machines within complex systems, then design and construct a Rube Goldberg machine using at least three different simple machines to achieve a specified goal.	- Identify the simple machines used in a complex system, such as a Rube Goldberg machine - Explain how simple machines work together to perform tasks in a complex system - Design a Rube Goldberg machine that incorporates at least three different simple machines - Construct and test a Rube Goldberg machine to successfully perform a specified task.
Describe how magnets attract or repel each other based on their polarity	Introduction to Magnets: Understanding Polarity	Magnets interact with each other through forces of attraction and repulsion, depending on their polarity. In this lesson, we will explore how magnets work, identify their poles, and describe how they attract or repel each other based on their polarity.	- Identify the poles of a magnet (north and south). - Describe how magnets attract or repel each other based on their polarity. - Investigate the forces of attraction and repulsion between magnets.

Conduct a practical investigation to test the effect of distance on the action of a magnet Data Science outcomes: Collecting, using and analysing datasets	Investigation: How Distance Affects a Magnet's Strength	Scientific investigations rely on careful planning, data collection, and analysis. In this lesson, we will formulate and investigate a scientific question about magnets, conduct repeated trials to test the effect of distance on a magnet's strength, and analyse our results to determine accuracy and reliability.	- Formulate a testable scientific question about the effect of distance on magnet strength. - Conduct a practical investigation using repeated trials. - Calculate the mean and range of collected data to analyse trends. - Discuss the accuracy and reliability of results.
Observe and map the magnetic fields of magnets	Investigation: Mapping Magnetic Fields	Magnets create invisible magnetic fields that can be observed and mapped to understand their strength and direction. In this lesson, we will visualise and map the magnetic fields of magnets.	- Describe what a magnetic field is and how it surrounds a magnet. - Observe the magnetic field of a magnet using iron filings and a compass. - Create a map of the magnetic field lines of a magnet, including the direction from the north and south pole.
Conduct a practical investigation to construct electromagnets and compare their strength	Investigation: Building and Investigating Electromagnets	Electromagnets are temporary magnets created by passing an electric current through a coil of wire. In this lesson, we will construct electromagnets, test their strength, and compare how the number of coils affect their magnetic force.	- Construct an electromagnet using basic materials. - Compare the strength of electromagnets under different conditions. - Investigate how the number of coils affects the strength of an electromagnet.
Extension	Forces in Flight: How Engineers Shape Aircraft Design	The forces acting on an aircraft—lift, weight, thrust, and drag—are crucial to flight. Aeronautical engineers use their understanding of these forces to improve aircraft design for efficiency, safety, and performance. In this lesson, we will investigate how the understanding of these forces has influenced changes in the design of aircraft over time.	- Describe the forces acting on an aircraft in flight (lift, weight, thrust, and drag) - Explain how changes in aircraft design minimise or optimise these forces - Explore key advancements in aeronautical engineering that have improved flight

Cells and Classification			
SC4-CLS-01 - describes the unique features of cells in living things and how structural features can be used to classify organisms			
Classification			
Describe the characteristics of living things Discuss the role and importance of classification in ordering and organising the diversity of life on Earth	Why do we classify?	You might think it is easy to identify things as living and non-living, but if I asked you to describe what it is to be living, what would you say? In this lesson, we will learn about the characteristics of living things and how, as scientists, we can define things as living or non-living.	- Define classification - Discuss why it is important to classify organisms - Describe two reasons for classification (identification and communication); - Describe the characteristics of living things
Discuss the role and importance of classification in ordering and organising the diversity of life on Earth	Classification of Life	If we look at a rabbit and a fish, they are very different animals, not just in looks, but also in the way they survive in their environment. If you put a rabbit in the water, they would not be able to breathe and the same with a fish out of water. In this lesson, we will look at the similarities and differences in features of organisms that help them to move, breathe, grow and live.	- Identify key features that aid groups of organisms in surviving in their environment - Compare key features between groups of organisms that help them with movement, respiration, sensitivity, growth, reproduction, excretion and nutrition.
Classify species using scientific conventions from the binomial system of classification, including kingdom, phylum, class, order, family, genus and species	Binomial Classification	Now that we can organise and order organisms around us, we must learn about how they are named so we can talk to other scientists about them. In this lesson, we will classify organisms based on scientific convention from the Linnaean hierarchical classification system.	- Explain the Linnaean hierarchical classification system - Identify seven scientific conventions that make up the Linnaean hierarchical classification system - Classify three species based on the Linnaean hierarchical classification system
Explain how plants and animals are classified in Aboriginal and Torres Strait Islander Cultures based on their uses, forms and functions	How First Nations Australians Classify Organisms	In this lesson, we will investigate the classification system of Aboriginal and/or Torres Strait Islander People's systems for classifying organisms. We will also identify differences between this system and the Linnaean system of classification.	- Describe the Aboriginal and/or Torres Strait Islander system of classification - Compare the Aboriginal and/or Torres Strait system of classification and the Linnaean system of classification
Interpret dichotomous keys to identify organisms surveyed in an Australian habitat	Introduction to Dichotomous Keys	In this lesson, we will explore dichotomous keys. These are one of the ways that scientists are able to classify things based on their characteristics.	- Define the term dichotomous key - Use a dichotomous key to identify an organism based on its characteristics

			- Explain how a dichotomous key can be used to classify organisms into groups
	Investigation: Building and Using Dichotomous Keys	We have spoken about how important it is to be able to classify organisms, now it's your turn. In this lesson, it's time for us to learn create and use a dichotomous key to identify different organisms.	- Identify the key features of a dichotomous key - Create a dichotomous key using everyday objects. - Use a dichotomous key to identify at least three species - Create a dichotomous key for an Australian habitat.
Investigate how organisms in an Australian habitat are adapted to their environment and document findings in a written scientific report; Conduct an investigation to observe and identify the similarities and differences of structural features within and between groups of organisms	Adaptations of Australian Organisms	In this lesson, we will investigate the Australian habitat and observe and identify similarities and differences in structural features within and between groups of organisms.	- Identify key structural features that aid organism survival in an Australian habitat - Compare groups of organisms and their structural features that aid in their survival
Extension	Research: Classification Through Time	Throughout this topic, we have looked at the reasons we classify organisms and the importance of classifying organisms in science. In this lesson, we will research how microscopy has improved biological classification	- Identify how microscopy has changed biological classification - Create a timeline of biological classification, including major changes
Cells			
Outline cell theory	Introduction to Cells	In this lesson, we will dive into the incredible world of cells and see how they play a key role in shaping the ultimate athlete. We'll explore how cells make up every part of your body and help athletes run faster, jump higher, and stay strong.	- Identify that cells are the basic units of life - Outline the cell theory - Define unicellular (single-celled) and multicellular organisms - Compare the size of cells to everyday objects
Identify which cell structures and organelles are common in plant and animal cells Describe the functions of the cell membrane, cytoplasm, nucleus	Parts of a Cell	Although cells are tiny, they are actually made up of even tinier structures called organelles. In this lesson, we are going to explore some of these 'mini organs' that are found in cells and understand how they work together like a sports team.	- Define the term "organelle" - Identify key organelles found in cells - Describe the structure and function of organelles, including the nucleus, cell membrane, cell wall, cytoplasm, chloroplasts, mitochondria, and vacuoles

containing DNA, mitochondria and chloroplasts			
	Skills: Using a Microscope	In this investigation, we are going to look a little closer… We will go through the steps of using a microscope and how to calculate magnification. You will then use these skills to observe some everyday objects under a microscope.	- Identify the parts of a light microscope and their functions - Describe how to correctly use a light microscope - Calculate the magnification of a microscope
Conduct an investigation to observe and record the similarities and differences between different cells, including fungi, bacteria, plant and animal cells, using microscopes and/or images obtained from microscopes Draw single-celled organisms observed under a microscope	Skills: Drawing Scientific Cell Diagrams	When observing cells under the microscope, we want to document what we see! In this lesson, we will learn how to draw scientific diagrams to keep a record of what we have observed.	- Identify and calculate the total magnification of a microscope - Outline the requirements for drawing an accurate scientific cell diagram - Create accurate scientific cell diagrams of a range of cells
	Observing Single-Celled Organisms	Did you know there are millions of single-celled organisms surrounding you right this very minute? In this lesson, we are going to going to view and draw single-celled organisms as they are seen under a range of different microscopes.	- Observe single-celled organisms using a light microscope and photomicrographs - Create scientific drawings of single-celled organisms observed under the light microscope
Compare the structure of plant and animal cells to identify similarities and differences	Comparing Plant and Animal Cells	Plants and animals are made up of different cells in order to help them carry out their specific needs. In this lesson, we are going to compare the similarities and differences between these two types of cells.	- Identify the organelles that are found in plant cells and relate this to their requirements - Identify the organelles that are found in animals cells and relate this to their requirements - Compare the similarities and differences between plant cells and animal cells
Compare the structure of plant and animal cells to identify similarities and differences Conduct an investigation to observe and record the similarities and differences between different cells, including fungi, bacteria, plant and animal cells, using microscopes and/or images obtained from microscopes	Investigation: Observing Different Types of Cells	In this investigation, we are going to observe plant, animal, bacterial and fungi cells under the light microscope. To do this, we are going to look at prepared slides of cells and prepare our own wet mount slide to observe onion cells.	- Create and observe a wet mount slide of onion cells - Observe prepared slides of cells found in plants, animals, bacteria and fungi under the light microscope - Sketch accurate scientific cell diagrams - Compare the similarities and differences between the cells found in plants, animals, bacteria and fungi

Describe the role of specialised cells in multicellular organisms and explain why they are needed Represent the arrangement of specialised cells in tissues and in organs Examine the relationship between structure and function for a range of specialised cells Conduct a practical investigation to observe and compare prepared slides of specialised cells	Specialised Cells	Just like plants and animal cells having slightly different organelles to help carry out their different functions, multicellular organisms have specialised cells to help them carry out specific jobs. In this lesson, we are going to explore what kind of specialised cells exist and why they are important.	- Define the term specialised cell - Identify specialised cells found in both plants and animals and describe their role - Outline the arrangement of specialised cells in tissues and organs - Explain the need for specialised cells in multicellular organisms and compare this with unicellular organisms
	Investigation: Observing Specialised Cells	Want to have a look at what cells help us move or what cells help a plant draw up water from the soil? In this investigation, we are going to observe specialised cells under a light microscope using prepared slides.	- Observe prepared slides of specialised cells - Compare the structures of specialised cells and relate this to their function
Identify cellular respiration via mitochondria, and photosynthesis via chloroplasts, as examples of important processes that take place in specialised organelles	Mitochondria & Chloroplasts - Powerhouses of the Cell	Have you ever wondered how all cells get the energy they need to function? In this lesson we are going to explore the two organelles that provide organisms with energy — the mitochondria and chloroplast.	- Identify the mitochondria as the site of cellular respiration - Outline the role of cellular respiration and its importance - Identify the chloroplast as the site of photosynthesis - Outline the role of photosynthesis and its importance
	Investigation: Modelling Respiration with Yeast	There are many specialised organelles in cells that help us to perform really specific functions. In this lesson, we will investigate how cells get oxygen via respiration. We will learn to use a model to show how the mitochondria converts energy to oxygen to keep us alive.	- Recall the function of the mitochondria in respiration - Define respiration - Observe respiration in yeast - Explain the process of respiration in yeast
Identify which cell structures and organelles are common in plant and animal cells	Investigation: Make a Cell Model	In this lesson, we will be letting your creative juices flow! We are going to make a model of a cell using everyday items.	- Design and construct a model of a cell using everyday items - Explain how the items used in the model represent the organelles within the cell - Discuss the strengths and limitations of using models in science
Extension	Prokaryotic vs Eukaryotic Cells	Not all cells are the same. Organisms that evolved millions of years ago were much simpler than the organisms that roam the Earth today. In this lesson, we are going to compare the prokaryotic and eukaryotic cells by exploring their features.	- Define the terms prokaryotic and eukaryotic - Describe the features of prokaryotic cells - Describe the features of eukaryotic cells - Compare prokaryotic and eukaryotic cells and provide examples of each

Properties of Matter and Properties of Water			
SC4-SOL-01 - explains how the properties of substances enable separation in a range of techniques			
Identify the 3 main states of matter and how they are represented in the movement of water on Earth	States of Matter and Particle Theory	Matter exists in different states, and these states can change depending on various factors. In this lesson, we will explore the particle arrangement in solids, liquids, and gases, and how these arrangements change as substances change state. We will use models and simulations to represent these changes.	- Identify the three main states of matter: solid, liquid, and gas - Describe how particles are arranged and behave in each state of matter - Use models, diagrams, or simulations to represent changes in particle arrangement as substances change state - Construct a diagram or model to demonstrate the water cycle and the movement of water through its states on Earth
Conduct an investigation to measure and graph the temperature of water to identify the changes of state as heated over time	Forces and Energy in Changing States of Matter	The states of matter—solid, liquid, and gas—are influenced by the forces between particles and their energy. In this lesson, we will explore how heating or cooling affects particle motion and energy, and how these changes result in state transitions.	- Compare the attractive forces between particles in solids, liquids, and gases - Describe how heat energy affects the motion and energy of particles during state changes - Analyse temperature graphs to identify key changes in particle behaviour during transitions between states
	Investigation: Temperature Change During State Transitions	The changes in state of matter—melting, boiling, and evaporation—occur when particles gain or lose energy. In this investigation, we will measure how temperature changes over time as heat energy is absorbed or released during these transitions.	- Conduct an experiment to safely heat water and measure its temperature over time - Collect accurate temperature readings at regular times while water melts, boils, and evaporates - Create a graph to show how temperature changes when water moves between solid, liquid, and gas states - Interpret the graph to find when phase changes happen and explain how energy is involved in these changes
Represent changes in the state of matter in terms of particle arrangement and movement	Particle Motion, Energy, and Changes in State	The states of matter—solid, liquid, and gas—depend on how particles move, the energy they have, and the distances between them. In this lesson, we will examine how heat energy affects the motion and arrangement of particles, leading to changes in state.	- Describe how heat energy influences the motion and energy of particles during state changes - Represent the changes in particle arrangement and movement as substances change state using diagrams or models - Explain the relationship between heat energy absorption or release and the resulting changes in particle behaviour
Compare the properties of matter in different states, including the relative strength of attractive forces between solid, liquid and gas particles, to explain	Comparing States of Matter Using Particle Theory	The properties of solids, liquids, and gases are determined by the strength of the attractive forces between particles and their arrangement and motion. In this lesson, we will compare the properties of	- Compare the properties of solids, liquids, and gases, such as shape, volume, and compressibility - Describe the relative strength of attractive forces in solids, liquids, and gases and how this relates to particle behaviour

differences in the behaviours of the 3 states of matter		substances in different states and explain these differences using particle theory.	- Explain the differences in the behaviours of substances in different states using particle theory
Investigate the other physical properties of water, such as density, buoyancy and surface tension	Exploring the Physical Properties of Substances	Substances have unique physical properties such as viscosity, density, melting point, buoyancy and surface tension, which can be explained using particle theory. In this lesson, we will compare these properties and represent our findings with models and explanations.	- Define the terms viscosity, density, buoyancy and surface tension - Explain these physical properties of materials in terms of particle arrangement and behaviour - Describe how density, buoyancy, and surface tension relate to the behaviour of water particles
	Investigation: Surface Tension	Different substances have unique physical properties that can be explored and explained using particle theory. In this investigation, we will measure and observe surface tension of selected materials to understand their behaviour.	- Observe the effects of surface tension in water and other liquids through simple experiments - Compare the surface tension of different liquids - Explain the results of these investigations using the arrangement of particles in different substances
	Investigation: Comparing the Viscosity of Substances	Viscosity is the measure of a substance's resistance to flow and is influenced by the interactions and arrangement of its particles. In this investigation, we will measure and compare the viscosities of honey, treacle, and oil, and develop explanations for their differences.	- Compare the viscosity of substances like honey, treacle, and oil by observing how fast they flow and how much they resist movement - Create diagrams or graphs to show the differences in viscosity between these substances - Explain the differences in viscosity using particle theory, focusing on how strongly the particles stick together
Determine the volume and mass of regular-shaped and irregular-shaped objects to calculate their density using the formula Conduct a practical investigation and select appropriate equipment to measure the density of water and other substances, and record the results in a table to compare the calculated density with SI data	Exploring Density	Density is a property of matter that relates an object's mass to its volume. In this lesson, we will learn how to calculate the density of both regular-shaped and irregular-shaped objects using the formula Density = Mass/Volume, and explore how differences in density affect how materials behave.	- Define density and explain the relationship between mass, volume, and density - Calculate the density of regular-shaped objects using measured mass and volume - Determine the volume of irregular-shaped objects using water displacement and calculate their density
	Investigation: Understanding Density (Creating a Density Column)	Liquids with different densities will naturally layer when combined, creating a density column. In this investigation, we will construct a density column by layering various liquids and observe how differences in density affect their arrangement.	- Construct a density column using liquids of varying densities - Determine the mass and volume of regular-shaped and irregular-shaped objects - Explain how differences in density relate to the behaviour of liquids and objects in the density column
Extension	Understanding Diffusion	Diffusion is the process where particles spread out from areas of high concentration to areas of low concentration. In this lesson, we will explore how	- Describe the process of diffusion in liquids and gases - Explain diffusion in terms of particle motion - Explain diffusion in terms of interactions

		diffusion occurs in liquids and gases and explain the process using particle theory.	
	Investigation: Diffusion in Liquids and Gases	Diffusion is the movement of particles from areas of high concentration to areas of low concentration. In this investigation, we will observe diffusion in liquids and gases, analyse how particles behave during the process, and compare the rates of diffusion in different states of matter.	- Observe diffusion in liquids and gases through experiments - Relate experimental observations to the arrangement and behaviour of particles during diffusion - Compare the rates of diffusion in liquids and gases and explain the differences based on particle theory
Solutions and Separating Mixtures			
SC4-SOL-01 - explains how the properties of substances enable separation in a range of techniques			
Distinguish between atoms, mixtures and compounds and explain their properties using particle theory Classify matter as pure substances, including elements and compounds, and impure substances, including mixtures based on their particle composition	Pure Substances vs Mixtures	All matter is made up of particles, and these particles form either pure substances or mixtures. In this lesson, we will use particle representations to understand the difference between pure substances and mixtures, identify examples of each, and classify matter based on its composition.	- Distinguish between atoms, mixtures, and compounds using particle theory - Classify matter as pure substances (elements and compounds) and impure substances (mixtures) based on their particle composition - Identify examples of pure substances and mixtures in everyday life - Use particle diagrams to represent and explain the differences between pure substances and mixtures
Investigate what substances dissolve in water and discuss findings using key terms, including soluble, insoluble, solubility, solute, solvent and solution Describe how solutions can be modelled using particle theory Compare the properties of dilute, concentrated, saturated and supersaturated solutions	Exploring Mixtures and Solutions	Mixtures can be uniform (homogeneous) or non-uniform (heterogeneous), and solutions are a specific type of mixture. In this lesson, we will use models to represent mixtures and solutions, identify solutes and solvents, and compare the properties of solutions such as dilute, concentrated, saturated, and supersaturated.	- Classify mixtures as homogeneous or heterogeneous - Identify the solvent and solute in various solutions - Compare the properties of dilute, concentrated, saturated, and supersaturated solutions using particle theory and models

Investigate what substances dissolve in water and discuss findings using key terms, including soluble, insoluble, solubility, solute, solvent and solution Conduct and document a practical investigation to measure solubility of different solutes in water, and present data using tables and relevant graphs	Investigation: Measuring Solubility of Different Substances in Water	Solubility is the ability of a substance to dissolve in a solvent, forming a solution. In this investigation, we will test the solubility of various solutes in water, measure the amount that dissolves, and document the results to better understand how solubility varies between substances.	- Conduct an investigation on the solubility of different substances in water - Create a table and a graph of solubility by incorporating observations and measurements
Qualitatively investigate the effect of temperature on solubility	Investigation: The Effect of Temperature on Solubility	The solubility of a substance in water can change with temperature. In this investigation, we will explore how heating water impacts the amount of solute that dissolves.	- Conduct an investigation to observe how temperature affects solubility - Compare solubility patterns for substances dissolved in cold, warm, and hot water - Explain how temperature influences the dissolving process using particle theory
Explain how the physical properties of substances are used to separate mixtures	Physical Properties and Separation Techniques	The physical properties of substances in mixtures—such as particle size, density, and volatility—play a key role in determining how they can be separated. In this lesson, we will analyse these properties and explore how they influence the choice of separation techniques.	- Identify key physical properties of substances in mixtures, including particle size, density, and volatility - Explain how these physical properties influence the selection of separation techniques - Analyse examples of mixtures and determine suitable separation methods based on their physical properties
Conduct a series of practical investigations to explore common techniques to separate mixtures	Investigation: Filtration and Evaporation	Different physical separation techniques can be used to separate mixtures based on the properties of their components. In this investigation, we will use filtration to separate sand from a saltwater mixture and evaporation to recover the dissolved salt, exploring how these techniques work in real-world applications.	- Conduct an investigation to use filtration and evaporation techniques to separate a mixture - Describe how the properties of different substances determine the most effective separation techniques - Draw a labelled diagram to represent the steps of the separation process
	Investigation: Candy Crystals	Crystallisation is a physical separation technique that allows dissolved substances to form solid structures as a solution cools or evaporates. In this hands-on investigation, we will create candy crystals to observe	- Describe how crystallisation separates a dissolved substance from a solution - Investigate the factors that affect crystal formation, such as temperature and evaporation rate

		how crystallisation works and explore its applications in real-world separation processes.	- Observe and record the growth of crystals over time, noting their shape and structure
	Investigation: Exploring Paper Chromatography	Paper chromatography is a powerful technique used to separate the components of mixtures, such as inks and food dyes. In this lesson, we will explore how this method works and use it to separate the components of different coloured mixtures.	- Conduct a paper chromatography experiment to separate the components of coloured inks or food dyes - Explain the separation process to the solubility and movement of particles in the solvent
Investigate techniques used by Aboriginal and/or Torres Strait Islander Peoples to separate mixtures	Traditional Separation Techniques of First Nations Australians	For thousands of years, Aboriginal and Torres Strait Islander Peoples have used separation techniques to process natural resources for food, medicine, and materials. In this lesson, we will investigate and understand how different techniques like are used to separate mixtures and extract valuable substances.	- Identify traditional methods used by Aboriginal and Torres Strait Islander Peoples to separate different substances - Investigate how these methods are used to separate mixtures or collect materials, like plant oils or seeds - Describe how each method works by using properties like particle size, density, or solubility - Describe why these techniques are important culturally, environmentally, and in everyday life
Model how a body of water can become polluted, and plan and conduct a practical investigation that attempts to remove the pollutants	Investigation: Designing and Testing Separation Solutions	Mixtures often need to be separated to remove unwanted materials or pollutants. In this lesson, we will design and test a 'separating machine' to remove components from a mixture and investigate how pollutants can be removed from a body of water.	- Model how a body of water becomes polluted and observe the effects of different pollutants - Design a separating machine or system to separate components of a mixture, considering the physical properties of the materials, to remove the pollutants
Investigate an industrial separation technique	Separation Techniques in Everyday Life and Industry	Separation methods are used in a variety of contexts, from everyday tasks at home to large-scale industrial processes. In this lesson, we will explore and compare separation techniques used in different situations, such as recycling, water purification, and refining crude oil, and investigate how these methods work.	- Identify separation techniques used in homes, recycling industries, and water purification processes - Compare how these techniques work and the properties they rely on (e.g., density, solubility, boiling point) - Investigate an industrial separation technique and explain its purpose and process - Discuss the effectiveness of separation methods and relate effectiveness to the physical properties of the materials being separated

Living systems			
SC4-LIV-01 - describes the role, structure and function of a range of living systems and their components			
Body Systems and Plant Systems			
Explain the interrelationship among cells, tissues and organs	The Interrelationship Among Cells, Tissues, and Organs	Cells are the basic building blocks of life, and they work together to form tissues and organs that perform specific functions. In this lesson, we will explore how cells, tissues, and organs are interrelated and how their structure supports their roles within living systems.	- Identify the hierarchical organisation of cells, tissues, and organs - Describe how specialised cells work together to form tissues and organs - Explain the interrelationship among cells, tissues, and organs in performing specific functions
Describe how the structures of organ systems, and the specialised cells within these systems, enable them to carry out their functions	Specialised Cells and Tissues in Organ Systems	Specialised cells and tissues work together to enable organs to perform specific functions within an organ system. In this lesson, we will examine the structures of specialised cells and tissues, their roles in particular organs, and how these enable organ systems to carry out their functions.	- Identify the specialised cells and tissues in a selected organ - Describe the relationship between the structure of specialised cells and their function - Explain how tissues and cells contribute to the overall function of an organ
Draw or annotate representations of models of organ systems to describe their processes and functions	Comparing Organ Systems in Plants and Animals	Plants and animals have organ systems that perform similar functions to sustain life. In this lesson, we will compare the structure and function of these systems and explore how organs are positioned within the body to carry out their processes.	- Identify the main organ systems in plants and animals - Draw or annotate representations of plant and animal organ systems - Compare the structure and function of similar systems in plants and animals - Explain how the positioning of organs within these systems supports their function
Identify the role of the digestive, circulatory, respiratory and excretory systems of humans, and name the major organs	The Digestive System	Each organ in a body system has a specific structure that enables it to perform its function. In this lesson, we will identify the major organs of the digestive system and explore how their structure contributes to their roles within the system and the overall functioning of the human body.	- Identify the organs of the digestive system - Describe the structure of each organ and how it enables its specific function - Explain the function of each organ
	The Circulatory System	Each organ in a body system has a specific structure that enables it to perform its function. In this lesson, we will identify the major organs of the circulatory system and explore how their structure contributes to their roles within the system and the overall functioning of	- Identify the organs of the circulatory system - Describe the structure of each organ and how it enables its specific function - Explain the function of each organ

		the human body.	
	The Respiratory System	Each organ in a body system has a specific structure that enables it to perform its function. In this lesson, we will identify the major organs of the respiratory system and explore how their structure contributes to their roles within the system and the overall functioning of the human body.	- Identify the organs of the respiratory system - Describe the structure of each organ and how it enables its specific function - Explain the function of each organ
	The Excretory System	Each organ in a body system has a specific structure that enables it to perform its function. In this lesson, we will identify the major organs of the excretory system and explore how their structure contributes to their roles within the system and the overall functioning of the human body.	- Identify the organs of the excretory system - Describe the structure of each organ and how it enables its specific function - Explain the function of each organ
Describe how the components of each body system interact to allow the efficient functioning of an organism	Interconnected Body Systems: How They Work Together	The components of body systems interact to ensure the efficient functioning of an organism. In this lesson, we will examine how different body systems work together, exploring their roles and interconnections to maintain overall health and balance.	- Describe the role of each body system in maintaining the efficient functioning of the organism - Explain how the components of body systems interact to support processes like energy production, waste removal, and movement - Use examples to illustrate the interdependence of body systems
Explain how a disorder or disease affecting the components of a body system, or the removal of any component in the body system, impacts on the overall functioning of the system and the organism as a whole	The Impact of Disorders on Organ and System Function	Disorders affecting cells or tissues can impair the function of an organ, impacting the entire body system and the organism as a whole. In this lesson, we will explore examples of disorders or diseases, such as hardening of the arteries, and investigate how they affect organ function and overall health.	- Identify disorders or diseases that affect specific organs and body systems - Describe how a disorder in cells or tissues impacts the function of an organ - Explain how the malfunctioning of one organ affects the overall functioning of a body system
Determine the role, structure and function of the components of a plant, including the xylem and phloem, in maintaining plants as multicellular organisms	The Role of Xylem and Phloem in Plant Structure and Function	Plants are multicellular organisms that rely on specialised structures to transport water, nutrients, and food. In this lesson, we will investigate the structure and function of components of a plant, including the xylem and phloem, and explore how they work to maintain the plant's survival.	- Identify the main components of a plant that support its survival - Describe the structure and function of the xylem and phloem - Explain how the xylem and phloem transport water, nutrients, and sugars in a multicellular plant - Relate the role of these components to the overall functioning of plants as multicellular organisms

Use scientific tools and instruments to observe the specialised cells and tissues involved in the structure and function of plants	Investigation: Observing Specialised Cells and Tissues in Plants	Plants contain specialised cells and tissues that support their structure and allow them to function. In this lesson, we will use scientific tools and instruments to observe plant tissues, such as xylem, phloem, and epidermal cells.	- Identify specialised plant cells and tissues, including xylem, phloem, and epidermis - Observe and draw various plant cells - Describe the structure and function of these specialised cells
Extension	Promoting Organ Donor Registration: Campaigns for Community Engagement	Organ donation campaigns aim to increase community awareness and encourage action. In this lesson, we will investigate campaigns that promote organ donor registration, analyse their strategies, and explore their effectiveness in engaging and influencing communities.	- Identify the purpose and importance of organ donation campaigns - Investigate strategies used in organ donation campaigns to increase community engagement - Analyse the effectiveness of a specific campaign based on its goals and outcomes - Evaluate the impact of these campaigns on attitudes and behaviours in the community
	Ethical Issues in Organ Transplantation	Organ transplantation saves lives, but it also raises complex ethical issues. In this lesson, we will explore the science of organ transplantation, research the ethical considerations involved, and discuss how society addresses these challenges.	- Describe the process of organ transplantation and its importance in medicine - Identify ethical issues related to organ transplantation - Discuss differing perspectives on these ethical issues - Explain how ethical frameworks guide decisions about organ transplantation
	Investigation: Mimicking the Function of Real Organs	Artificial organs are designed to mimic or enhance the functions of real organs, supporting or replacing the body's natural processes. In this lesson, we will explore examples of artificial organs, investigate how they work, and compare their functionality to real organs.	- Identify examples of artificial organs and their purposes - Describe how an artificial organ mimics or augments the function of a real organ - Compare the structure and function of artificial and natural organs - Evaluate the benefits and challenges of using artificial organs
	The Effects of Losing Non-Vital Organs on Body Systems	Some organs in the human body, while important, are considered non-vital because their loss does not immediately affect survival. In this lesson, we will investigate the roles of non-vital organs and explore how their removal impacts body systems.	- Identify examples of non-vital organs in the human body - Describe the function of non-vital organs within their respective systems - Explain the effects of removing a non-vital organ on body systems and overall health

Ecosystems			
Identify the components that make up an ecosystem Investigate the interactions of biotic and abiotic factors in an ecosystem	Introduction to Ecosystems	There are many components that make up the ecosystem around us. In this lesson, we will learn about what makes up an ecosystem, including biotic and abiotic factors.	- Define the term ecosystem - Identify the components that make up an ecosystem; - Define biotic and abiotic factors - Describe the interaction between biotic and abiotic factors within an ecosystem
Identify how matter and energy are cycled through an ecosystem Create a food web and ecological energy pyramid based on local area observations to describe how matter and energy move through an ecosystem	Food Webs	Inside ecosystems, there are many organisms fighting for survival. We can use food webs and energy flow diagrams to show how an ecosystem sustains the life within it. In this lesson, we will create and analyse food webs and understand how energy is transferred from organism to organism to keep the ecosystem alive.	- Identify the components of a food web - Use a food web to describe feeding relationships between organisms in an ecosystem - Create a food web for an ecosystem
Create a food web and ecological energy pyramid based on local area observations to describe how matter and energy move through an ecosystem Create written texts to explain how energy pyramids show the amount of energy or matter at each trophic level	Ecological Energy Pyramids	In this lesson, we will learn how food pyramids can be used to show the amount of energy or matter at each trophic level, including producers and consumers.	- Define ecological energy pyramid - Identify the different trophic levels that make up a food pyramid - Identify how matter and energy move within an ecosystem by using an ecological energy pyramid. - Explain how food pyramids show the amount of energy or matter at each trophic level
Examine secondary-source data on the factors that change populations, including the introduction of a new species to an ecosystem, to identify trends, patterns and relationships, and draw conclusions	Populations	Imagine all the bees have disappeared from an ecosystem. This might not seem like a big thing, and in fact might seem like a good thing, as we won't get stung by bees, but there can be huge impacts on the ecosystem. In this lesson, we will predict what happens when organisms such as pollinators (bees) or predators are removed from an ecosystem due to seasonal changes, destruction of habitat and	- Define pollinators and predators - Explain what can happen when they are removed from the ecosystem - Describe how pollinators and predators can be removed from ecosystems

		introduction of new species that change the ecosystem.	
Examine secondary-source data on the factors that change populations, including the introduction of a new species to an ecosystem, to identify trends, patterns and relationships, and draw conclusions Data Science Outcome: Recognise that data science is an interdisciplinary field that uses statistics, scientific methods and processes, algorithms and systems to develop knowledge by extracting or extrapolating insights from data	Using Science and Statistics to Track Ecosystem Changes	Scientists use data science to understand how ecosystems change over time. In this lesson, we will explore how data science combines statistics, scientific methods, and technology to analyse population changes, including the impact of introducing new species.	- Recognise data science as an interdisciplinary field that combines scientific methods, statistics, and algorithms. - Identify how data science is used to analyse population changes in ecosystems. - Examine secondary-source data to identify trends, patterns, and relationships in population changes. - Draw conclusions from data about the impact of introducing new species into an ecosystem.
Extension	Research: Impacts on Ecosystems	In this lesson, we will explore the factors that cause ecosystems to change. You will be researching a local ecosystem and applying what you have learned about ecosystems to explain the changes and predict future changes.	- Identify factors (seasonal changes, destruction of habitat and introduction of a species) that can impact ecosystems - Research and examine one real-life example of changes to a local ecosystem and predict/explain what will/has happened to the ecosystem
	First Nations Australians and Invasive Species	In this lesson, we will investigate how Aboriginal and/or Torres Strait Islander Peoples' respond to invasive species in their communities and the effect these have on food webs.	- Define the term invasive species - Explain the impact of invasive species on food webs in Aboriginal and/or Torres Strait Islander Peoples' - Describe management strategies used by Aboriginal and/or Torres Strait Islander Peoples to reduce the impact of invasive species on communities and food webs
	First Nations Australians' Fire Management Practices	Bushfires are a natural disaster that occurs in the Australian summer. In this lesson, we will learn about fire management practices of the Aboriginal and/or Torres Strait Islander Peoples' that have changed the	- Identify fire management practices used by Aboriginal and/or Torres Strait Islander Peoples' - Describe the changes in flora and fauna across regional Australia due to fire management

		distribution of flora and fauna across most regions of Australia.	- Explain the impact these fire management strategies have on local wildlife - Research one example of a local species affected by fire management practices
Periodic table and atomic structure			
SC4-PRT-01 - explains how uses of elements and compounds are influenced by scientific understanding and discoveries relating to their properties			
Classification of Matter, Atomic Structure and the Periodic Table			
Identify some common elements in everyday objects Identify the atom as the smallest unit of an element that retains the properties of that element Explain how the properties of some common elements, compounds and alloys relate to their use(s)	Atoms, Elements & Compounds	Everything around us is made of elements, compounds, and alloys, each with unique properties that determine how they are used in everyday life. In this lesson, we will identify common elements found in everyday objects and explore how the properties of elements, compounds, and alloys make them suitable for specific purposes.	- Describe how atoms are the smallest units that make up elements - Identify some common elements found in everyday objects - Compare the differences between atoms, elements, and compounds - Explain how the properties of elements, compounds, and alloys determine their everyday uses
Identify protons, neutrons and electrons as subatomic particles Describe the location, relative charge and mass of protons, neutrons and electrons using the planetary atomic model	The Structure of an Atom	Atoms are the smallest units of matter but are made up of smaller particles called subatomic particles: protons, neutrons, and electrons. In this lesson, we will identify these particles, describe their location within the atom, and explain their relative charge and mass using the planetary atomic model.	- Identify protons, neutrons, and electrons as subatomic particles - Describe the location of protons, neutrons, and electrons within an atom - State the relative charge of protons, neutrons, and electrons - Compare the relative mass of protons, neutrons, and electrons
Data Science outcome: Create a model that can be used to explain an observable phenomenon	Investigation: Modelling Subatomic Particles Using the Planetary Atomic Model	Atoms are too small to see, but models help us understand their structure. In this lesson, we will create a model based on the planetary atomic model to explain the arrangement and behaviour of subatomic particles.	- Describe how the planetary atomic model (Bohr model) represents atomic structure - Create a model demonstrating the arrangement of subatomic particles - Evaluate how well the planetary model represents real atoms and its limitations
Outline how models of atomic structure have changed over time	Building the Atom: How Data and Technology	Scientists couldn't always see atoms, but by observing how matter behaves, they built models to explain what's happening at the smallest scale. As technology	- Identify key technologies that helped scientists see inside atoms - Describe how atomic models changed with new discoveries - Explain why scientific models keep changing as new evidence is

Explain how observations made possible by new technologies have led to a more detailed understanding of atomic structure Data Science outcomes: Identify data and observations used by scientists for the development of a model Outline how scientists develop workable theories from models	Changed Our Understanding	improved, so did these models. In this lesson, we will explore how atomic models have changed over time and how new technologies have helped reveal the atom's hidden structure.	found - Create a timeline or visual representation of the development of atomic models
Describe how the historical development of the periodic table demonstrated understanding of the chemical and physical properties of elements	The Historical Development of the Periodic Table: Understanding Chemical and Physical Properties of Elements	The periodic table was developed through the work of many scientists, each building on previous discoveries. In this lesson, we will explore how the historical development of the periodic table demonstrated an understanding of the chemical and physical properties of elements.	- Describe the contributions of key scientists in the development of the periodic table - Explain how early attempts at organising the elements laid the foundation for the modern periodic table - Identify how the periodic table reflects patterns in the chemical and physical properties of elements - Compare early periodic tables with the modern version to show how our understanding has evolved
Identify the unique symbol of a range of elements	Identifying the Unique Symbols of Elements	Every element on the periodic table has a unique symbol that helps scientists identify and communicate about elements efficiently. In this lesson, we will explore the symbols of a range of elements and learn how to identify them.	- Identify the unique symbols for a range of elements - Match element names to their corresponding symbols - Explain the rules for creating element symbols - Use the periodic table to locate and identify elements and their symbols
Model the atomic structure of the first 18 elements to identify that atomic structure changes with increasing atomic number	Modelling the Atomic Structure of the First 18 Elements	The atomic structure of elements changes in a predictable way as the atomic number increases. In this lesson, we will model the atomic structure of the first 18 elements of the periodic table to observe how protons, neutrons, and electrons are arranged.	- Identify the relationship between atomic number and the number of protons, neutrons, and electrons - Model the atomic structure of the first 18 elements using Bohr diagrams - Explain how atomic structure changes as the atomic number increases. - Compare the electron arrangement across periods and groups

Use the periodic table to identify the elements in some common compounds	Identifying Elements in Common Compounds Using the Periodic Table	Compounds are made up of two or more elements chemically bonded together. In this lesson, we will use the periodic table to identify the elements present in common compounds based on their chemical formulas.	- Identify elements in common compounds using their chemical formulas - Find the elements on the periodic table and state their symbols - Describe how chemical formulas show the types and numbers of atoms in a compound
Outline patterns and relationships found in the periodic table, including reactivity Predict the properties of elements based on their position and location on the periodic table	The Magic in the Periodic Table: Understanding Patterns & Making Predictions	The periodic table is organised in a way that reveals patterns and relationships among elements. In this lesson, we will explore how the periodic table shows trends in reactivity, atomic structure and other properties of elements.	- Identify patterns and trends in the periodic table (groups, periods and element types) - Compare the properties of elements in different groups and periods - Predict properties such as reactivity, state of matter, and conductivity based on an element's position
Investigate some tests that could be used to identify metal and non-metal elements Conduct a series of investigations to identify and compare the physical properties of metals, non-metals and metalloids	Investigation: Identifying Metal, Non-Metal and Metalloids	Metals, non-metals and metalloids have unique properties that can be identified through various tests. In this lesson, we will investigate a range of tests used to distinguish between them based on their physical and chemical properties.	- Describe the properties of metals, non-metals and metalloids - Conduct tests to identify whether a substance is a metal, non-metal or metalloid - Determine if a sample is a metal, non-metal or metalloid - Explain how the results of the tests relate to the properties of a metal, non-metal or metalloid
Change			
SC4-CHG-01 - explains how energy causes geological and chemical change			
Energy transfers			
Describe, using the terms 'potential energy' (PE) or 'kinetic energy' (KE), how systems can store different forms of energy, including thermal, elastic, chemical and gravitational energy	Introduction to Energy	In this first lesson, we'll explore energy, how we measure it, and the two main types of energy, potential and kinetic energy.	- Define the term energy - Identify the units (joules and kilojoules) used to measure energy - Calculate conversions between joules and kilojoules. Identify the two types of energy (potential and kinetic energy)
	Potential and Kinetic Energy	In this lesson, we will learn about potential and kinetic energy, where they occur and be able to state if an example is potential or kinetic energy.	- Define the terms potential and kinetic energy - Identify examples of each type of energy - Classify a situation as an example of potential or kinetic energy

Identify examples of how energy can change from one form into another Define open and closed systems to describe how energy is transferred into and out of systems, and how it cycles within a system Apply the law of conservation of energy to familiar examples Use representations to illustrate energy transformations, including how radiant energy from the Sun can be transformed into a different form of energy	Energy Transfers and Transformations	In this lesson, we'll explore how energy moves and changes, focusing on two key ideas: the law of conservation of energy and energy transformations. These concepts are essential to understanding how rollercoasters work — and much more!	- Identify the key concept in the law of conservation of energy (energy is not created nor destroyed, it is only transformed) - Identify similarities and differences in energy transfer and energy transformation - Identify three common examples of energy transfer and transformation - Create energy flow diagrams to represent examples of energy transfer and transformation
Use practical investigations and representations to illustrate energy transformations in a system Use representations to illustrate energy transformations, including how radiant energy from the Sun can be transformed into a different form of energy	Investigation: Energy Transformations	In this investigation, we'll observe several energy transformations in the lab and discuss what happens in each scenario using our understanding of energy transformations.	- Identify energy transformations that take place in four different scenarios - Discuss these energy transformations in terms of energy stored, used and produced - Draw a flow diagram to demonstrate an energy transformation
Identify conduction, convection and radiation as different ways that energy can be transferred, and distinguish between these forms	Heat Transfer	In this lesson, we will compare heat and temperature and learn to describe the different mechanisms for heat transfer.	- Identify one similarity and one difference between heat and temperature. - Identify where heat energy is produced as a by-product of energy transfer. - Describe three mechanisms for heat transfer (conduction, convection and radiation) using examples. - Describe how energy is transferred into and out of open and closed systems and how it cycles within a system.

Identify conduction, convection and radiation as different ways that energy can be transferred, and distinguish between these forms	Investigation: Heat Transfer	Heat transfer via conduction and convection allows us to stay warm and even helps us stay fed! In this lesson, we will investigate ways we can transfer heat from one material to another.	- Conduct an experiment on conduction as a method of heat transfer - Conduct an experiment to model convection as a method of heat transfer - Determine the changes in temperature and movement of particles during heat transfer
Use practical investigations and representations to illustrate energy transformations in a system Use representations to illustrate energy transformations, including how radiant energy from the Sun can be transformed into a different form of energy	Energy Transformations with Electricity	In this lesson, we will learn to define electricity and explain what electricity is used for in our daily lives.	- Define electricity using keywords such as electrons and flow - Identify the role of electrons in electricity flow - Describe how electrical energy is transformed into other forms of energy
	Investigation: Rube Goldberg Machines	In this investigation, you will use your understanding of energy transformations, energy transfers and the law of conservation of energy to create a Rube Goldberg machine.	- Create a working Rube Goldberg machine to carry out a simple task - Explain the energy transfers and energy transformations that take place in the Rube Goldberg machine - Explain how you could reduce the amount of waste energy produced by your Rube Goldberg machine to make it more efficient
Extension	Energy Efficiency	In this lesson, we will examine the energy efficiency of rollercoasters and other appliances and the amounts of useful and waste energy produced.	- Distinguish between useful and waste energy - Discuss the importance of energy efficiency - Calculate the efficiency of common appliances and a rollercoaster - Calculate the amount of useful energy that they produce
	Investigation: Energy Efficiency	In this lesson, you will determine the efficiency of different bouncy balls by analysing the energy transformations that take place.	- Define the term energy efficiency - Conduct an investigation to determine the energy efficiency of different bouncy balls - Calculate the energy efficiency of bouncy balls - Explain the energy transformations that occur when bouncing a ball using the law of conservation of energy

Chemical Change			
Undertake experiments to identify the indicators of physical and chemical changes	What's the Difference Between Physical and Chemical Changes?	Not all changes result in new substances. In this lesson, we will compare physical changes and chemical changes to understand their differences.	- Define physical and chemical changes - Compare physical changes and chemical changes - Classify examples of changes as physical or chemical - Explain how indicators help identify chemical changes
	Investigation: Signs of a Chemical Change	When a chemical change occurs, certain indicators can tell us that a new substance has formed. In this lesson, we will conduct experiments to observe and identify the signs of chemical change.	- Identify the key indicators of chemical change: gas production, solid formation, colour change, and temperature change - Conduct simple chemical reactions to observe these indicators - State observations from chemical reactions clearly and accurately - Explain why these indicators suggest a chemical change
	Analysing Changes: Physical or Chemical?	Substances can change in many ways when they interact, but not all changes result in new substances. In this lesson, we will analyse and interpret data to determine whether changes are physical or chemical based on the properties of the substances before and after interaction.	- Classify the changes as physical or chemical based on evidence - Explain how the evidence supports the classification
Describe the initial and final changes that are observed in a chemical reaction, including writing a word equation to represent a chemical reaction	Chemical Reactions and Writing Word Equations	Chemical reactions involve changes that result in the formation of new substances. In this lesson, we will observe the initial and final changes during chemical reactions and represent them using word equations.	- Describe the observable changes that occur during a chemical reaction - Identify the reactants and products in a chemical reaction - Write word equations to represent chemical reactions accurately
Investigate and observe energy changes in different chemical reactions	How Energy Changes in Chemistry	Chemical reactions can release or absorb energy, causing temperature changes. In this lesson, we will explore the concepts of exothermic and endothermic reactions and understand how energy is transferred during these changes.	- Define exothermic and endothermic reactions - Describe how energy is transferred during chemical reactions - Identify examples of exothermic and endothermic reactions in everyday life - Interpret energy diagrams that show energy changes in reactions
	Investigation: Energy Changes in Chemical Reactions	Chemical reactions can release or absorb energy, often causing temperature changes. In this lesson, we will investigate and identify energy changes in different chemical reactions, and observe how energy is transferred during these processes.	- Identify energy changes (e.g., heat release or absorption) in chemical reactions - Identify temperature changes during chemical reactions through simple experiments - Classify reactions as exothermic or endothermic based on energy changes

Conduct a practical investigation to model cellular processes, including respiration and photosynthesis, and document findings in a written report	Investigation: Modelling Cellular Processes	Photosynthesis is the process that allows plants to convert light energy into chemical energy. In this hands-on investigation, we will model photosynthesis to observe how plants produce oxygen and store energy. We will document our findings and analyse how this process supports life on Earth.	- Conduct an investigation to model the process of photosynthesis - Observe and record evidence of photosynthesis, such as oxygen production or colour changes - Analyse results to identify evidence of photosynthesis
Extension	How Do Indicators Detect Substances?	Chemical indicators are substances that help identify the presence of other substances through observable changes, such as colour change or gas production. In this lesson, we will explore how indicators work and their importance in real-world contexts.	- Identify chemical indicators and what they are used to detect - Describe how indicators reveal the presence of specific substances through chemical changes - Discuss examples of indicators used in soil, water, and medical testing - Explain the importance of indicators in scientific and everyday applications
	Investigation: Using Indicators to Detect Substances	We can use chemical indicators to observe chemical changes and identify the presence of specific substances. In this lesson, we will perform tests using indicators to observe colour changes, gas production, and other signs of chemical reactions.	- Perform experiments using chemical indicators to detect specific substances - State and record changes such as colour or gas production - Interpret experimental results to identify whether a chemical change has occurred
	Investigation: Identifying Mystery Powders Through Chemical Tests	We can identify unknown substances by observing their chemical reactions with different indicators. In this lesson, we will conduct experiments to identify mystery powders.	- Conduct chemical tests using iodine solution, vinegar, water, and universal indicator - Compare test results to reference data to identify each mystery powder - Explain how the observed chemical changes helped identify the substances
	Fairness in Sport: How Worldviews Shape Drug Testing	Worldviews about fairness in sport influence how we develop tools to ensure a level playing field. In this lesson, we will explore how concerns about fairness have driven the development of rapid chemical tests for detecting performance-enhancing drugs.	- Identify examples of performance-enhancing drugs and their effects - Describe the role of fairness in sport and how it influences rules and regulations - Explain how worldviews about fairness have shaped the need for drug testing
	Investigation: Simulating Rapid Chemical Testing	Rapid chemical tests allow scientists to detect performance-enhancing drugs efficiently. In this lesson, we will simulate these tests to understand how they work and the science behind them.	- Perform a simulated chemical test to detect substances - Explain how chemical tests can identify the presence of banned substances - Discuss the strengths and limitations of rapid testing methods

Geological Change - Plate Tectonics			
Identify the evidence used to develop the theory of plate tectonics	The Theory of Plate Tectonics	The theory of plate tectonics explains how Earth's surface is shaped by the movement of large crustal plates. This theory was developed using multiple lines of evidence, including seafloor mapping, fossil distribution, and earthquake patterns. In this lesson, we will examine the evidence that led to the acceptance of plate tectonics, focusing on how Marie Tharp's topographic maps of the Atlantic Ocean floor provided key support for this theory.	- Identify different types of evidence that contributed to the development of the theory of plate tectonics - Describe Marie Tharp's role in mapping the ocean floor and how her discoveries supported plate tectonic theory - Describe how mid-ocean ridges and deep-sea trenches provide evidence for the movement of tectonic plates
Describe the processes associated with the movement of tectonic plates	Interactions at Plate Boundaries	Earth's surface is constantly moving because of interactions at plate boundaries. In this lesson, we will model these interactions to understand how they cause earthquakes, volcanic eruptions, and the formation of mountains.	- Identify the types of plate boundaries: convergent, divergent, and transform - Describe how different boundary interactions lead to specific geological features and events - Classify boundary interactions based on specific geological features and events
	Different Forces in Plate Movements	The movement of tectonic plates is driven by powerful forces beneath Earth's surface. In this lesson, we will investigate these forces—slab pull, ridge push, and convection—and evaluate how they contribute to plate movement.	- Define slab pull, ridge push, and convection and their roles in plate tectonics - Compare the relative contributions of slab pull, ridge push, and convection to plate motion - Explain how these forces interact to shape Earth's surface over time
Describe the processes associated with the movement of tectonic plates Data Science outcome: Create a model that can be used to explain an observable phenomenon	Investigation: Modelling Plate Interactions	Earth's surface is constantly changing due to the movement of tectonic plates. In this lesson, we will create a model to explain how plate interactions cause observable phenomena such as earthquakes, volcanoes, and mountain formation.	- Describe the different types of plate interactions (convergent, divergent, transform) - Identify real-world phenomena caused by plate movement - Create a model to demonstrate how tectonic plates interact - Explain how the model represents plate interactions and their effects

Identify that earthquakes and volcanoes are natural phenomena that provide evidence of geological changes in the Earth's crust and surface	Earthquake and Volcano Patterns	Earthquakes and volcanoes don't happen randomly—they follow patterns linked to Earth's structure. In this lesson, we will explore where and when earthquakes and volcanic eruptions happen and learn to propose explanations for these patterns based on scientific data.	- Describe the relationship between earthquakes, volcanoes, and tectonic plate boundaries - Analyse historical data to identify trends in earthquake and volcanic activity - Explain these patterns using evidence from maps and scientific research
Describe how Aboriginal and/or Aboriginal and Torres Strait Islander Cultural accounts provide evidence of earthquakes and volcanoes on-Country or under the sea	First Nations Australians' Accounts of Tectonic Activity	First Nations Australians have preserved knowledge of Earth's geological history through cultural accounts. In this lesson, we will research how their oral records provide evidence of earthquakes and volcanic events, such as the volcanic activity at Budj Bim National Park.	- Identify First Nations Australians' cultural accounts related to earthquakes and volcanic events - Explain how these cultural accounts align with geological evidence of past tectonic events - Explore the significance of these accounts in understanding the long-term history of Australia's landscape
Extension	Impacts of Tectonic Events	Tectonic events like earthquakes and volcanic eruptions can cause devastating effects on human lives and communities. In this lesson, we will evaluate how these events impact people and explore innovative engineering solutions designed to minimise damage and keep people safe.	- Identify the effects of tectonic events on human populations, such as damage to infrastructure and loss of life - Describe engineering solutions, such as earthquake-resistant buildings, that reduce the impact of tectonic events - Justify the use of specific engineering designs in reducing the effects of tectonic activity
	Solutions to Reduce the Impact of Tectonic Events	To help reduce the damage caused by tectonic events, scientists and engineers have developed smart solutions like earthquake-resistant buildings and tsunami warning systems. In this lesson, we will explore different engineering designs and evaluate how effective they are at keeping people and communities safe.	- Identify different engineering strategies used to reduce the damage from tectonic events - Explain how these solutions help protect people and communities - Evaluate the effectiveness of at least one solution using a real-world example
	Australia's Tectonic History	Australia's land is ancient and remarkably stable compared to many other parts of the world. In this lesson, we will explore how the extreme age and stability of the Australian continent are linked to its unique plate tectonic history.	- Describe the tectonic history of the Australian plate, including its location and movement over time - Explain how Australia's position within a tectonic plate contributes to its geological stability - Relate Australia's geological features, such as ancient rock formations, to its tectonic history

Geological Change - Rocks			
Conduct investigations or simulations to compare the observable properties of different types of minerals and rocks	Types of Rocks	Rocks are all around us, and they tell the story of Earth's history. In this lesson, we will learn about the three main types of rocks—igneous, sedimentary, and metamorphic—and how to classify them based on their properties.	- Define the three main types of rocks: igneous, sedimentary, and metamorphic - Classify rocks as igneous, sedimentary, or metamorphic based on their observable properties - Provide examples of common rocks within each type and their uses
	Investigation: Observing Rocks	Rocks may look similar at first glance, but their unique properties tell us a lot about their formation and classification. In this lesson, we will compare the observable properties of different types of rocks and learn to identify them using a dichotomous key.	- Describe the physical properties of rocks, such as color, texture, and hardness - Use a dichotomous key to identify specific types of rocks - Compare the physical properties between different types of rocks
Use the rock cycle to explain the geological processes that lead to the formation and transformation of different types of rocks	The Rock Cycle	The rock cycle is a continuous journey where rocks are transformed through natural processes over time. In this lesson, we will explore the major processes of the rock cycle, including weathering, erosion, deposition, melting, crystallisation, uplift, heat, and pressure, and how they form different types of rocks.	- Identify the major processes of the rock cycle - Describe how these processes contribute to the formation of different rocks - Explain the connections between processes in the rock cycle, such as how weathering leads to erosion and deposition - Create a rock cycle through diagrams or flowcharts to demonstrate the transformation of rocks over time
	The Role of Forces and Heat on Rock Formation	Forces and heat energy play a crucial role in shaping the rocks we see today. In this lesson, we will explore how these factors contribute to the formation of different types of rocks and compare how quickly or slowly these processes occur.	- Describe the role of forces, such as pressure and tectonic activity, in the formation of igneous, sedimentary, and metamorphic rocks - Explain how heat energy contributes to processes like melting, crystallisation, and metamorphism - Compare how quickly or slowly different rock-forming processes occur
	Investigation: Fast and Slow Cooling Crystals	Crystals form in fascinating ways depending on how quickly or slowly they cool. In this investigation, we will explore how cooling rates affect the size and structure of crystals and relate this to real-world examples of rock formation.	- Conduct an investigation to observe how crystals form under different cooling conditions - Compare the size and structure of crystals formed when cooled quickly versus slowly - Identify examples of rocks formed through rapid processes (e.g., volcanic eruptions) and slow processes (e.g., sedimentation and metamorphism)

Describe the elemental composition of the Earth and one or more other planets	The Elemental Composition of Planets	Earth and other planets are made up of unique combinations of elements that influence their structure and characteristics. In this lesson, we will describe the elemental composition of Earth and compare it to that of another planet.	- Identify the major elements that make up Earth's crust, mantle, and core - Describe the elemental composition of Mars and compare the similiarities and differences with Earth - Explain how the elemental composition of a planet affects its surface features and atmosphere
Recognise that the law of superposition allows scientists to determine the relative age of rock strata	Examining Fossil Evidence	Fossils provide important clues about Earth's past, helping scientists determine the age of rocks and ancient environments. In this lesson, we will explore different types of fossils and how they can be used to predict when and how rock layers formed. We will also examine how the law of superposition helps scientists determine the relative age of rock strata.	- Identify different types of fossils, including body, trace, and opalised fossils - Explain how fossils can be used to determine the age and formation of rock layers - Describe how the law of superposition helps scientists determine the relative age of rock strata
Model the formation of fossils and explain how fossils show evidence that different organisms existed at different times in the past	Investigation: Modelling Fossil Formation	Fossils are like nature's time capsules, preserving evidence of life from long ago. In this lesson, we will model how fossils form and learn how they provide evidence of different organisms that lived at various times in Earth's history.	- Create a model of the process of fossil formation, including the roles of burial, sedimentation, and mineralisation - Describe the different conditions required for the formation of different fossils - Use examples of fossils to demonstrate how they reveal changes in Earth's environments and ecosystems over time
Extension	Uses of Rocks	Different types of rocks have unique properties that make them useful for various purposes. In this lesson, we will explore how the properties and formation of rocks determine their uses in construction, art, industry, and everyday life.	- Explain how the properties of rocks influence their uses - Describe the connection between a rock's formation process and its suitability for specific applications - Identify real-world examples of how different rocks are used in construction, decoration, and industry
	First Nations Australians' Use of Rocks	Aboriginal and/or Torres Strait Islander Peoples have a deep understanding of the land and its resources. In this lesson, we will investigate how quarrying has been used to access rocks for creating everyday tools and objects, and the significance of these practices in their culture and daily life.	- Identify examples of tools and objects made by Aboriginal and Torres Strait Islander Peoples using quarried rocks, such as grindstones, hammerstones, and stone hatchets - Describe the process of quarrying and how specific rocks were chosen based on their properties - Investigate how these tools were used for food gathering, construction, canoe building, and the manufacture of items like shields, clubs, and spears

	Impact of Mining on the Environment	Mining is essential for obtaining the ores and minerals we use in everyday life, but it also impacts local environments. In this lesson, we will explore these impacts and investigate how environmental rehabilitation helps restore mined areas.	- Describe the environmental impacts of mining on local ecosystems, including habitat destruction and pollution - Identify examples of ores and minerals commonly mined and their uses - Examine environmental rehabilitation initiatives, such as revegetation and soil restoration, used in mining areas
	Investigation: Exploring the Impacts of Mining	Mining methods like open-cut and surface mining are used to extract valuable resources, but they have different impacts on the environment. In this investigation, we will model these methods using chocolate chip cookies to explore their effects and compare their efficiency.	- Create a model of an open-cut and surface mining techniques using chocolate chip cookies - Compare the efficiency of resource extraction between the two methods - Analyse the environmental impact of each mining method - Propose strategies for restoring the "cookie ecosystem."
Data Science 1			
SC4-DA1-01 - explains how data is used by scientists to model and predict scientific phenomena			
Examine a range of sources of data and their applications	Decoding Data: Understanding How Scientists Use Information	Scientists collect and use data in different ways to understand the world. In this lesson, we will examine different types of data, how they are collected, and their applications in scientific investigations.	- Identify different sources of data, including observational and experimental data - Distinguish between qualitative and quantitative data - Explain how different types of data are used in scientific investigations - Classify data from real-world examples based on its type and source
Examine a range of sources of data and their applications Examine the digital footprint created by different online activities to recognise the importance of engaging safely with digital systems	Understanding Scientific Data and Your Digital Footprint	Data is everywhere—scientists use it to make discoveries, and we create it every time we go online. In this lesson, we will explore different sources of scientific data and how they are used, while also recognising how our online activities contribute to a digital footprint.	- Identify different sources of scientific data and their applications - Describe how data is collected and used in science and everyday life - Explain what a digital footprint is and how online activities contribute to it - Evaluate ways to engage safely with digital systems to protect personal data
Examine a range of sources of data and their applications Examine the digital footprint created by different online	Training Machines: How Data is Collected, Used, and Shared	Data is collected from many sources, and it shapes the way technology works. In this lesson, we will explore different sources of data, their applications, and how online activities contribute to our digital footprint. We will also use Google's Teachable Machine	- Identify different sources of data and their applications in science and technology - Describe how data is collected and used in machine learning - Recognise how digital footprints are created through online activities

activities to recognise the importance of engaging safely with digital systems		to see how computers collect and use data to recognise patterns.	- Evaluate the importance of engaging safely with digital systems
Identify that a scientific model is a representation based on data and observations of real-world phenomena Identify examples of the types of models used by scientists	Models in Science: Representing the Real World	Scientific models help us understand complex real-world phenomena. In this lesson, we will explore how models are based on data and observations and identify different types of models used by scientists.	- Define scientific models and explain their purpose - Identify how models are based on data and observations - Describe different types of models used in science - Classify examples of scientific models based on their type
Analyse a model to identify data and trends, and generate predictions	Analysing Models to Predict Trends	Scientific models help us understand patterns and make predictions about the world. In this lesson, we will analyse models to identify data and trends and use them to generate predictions.	- Identify data and trends in a scientific model - Analyse how the model represents real-world patterns - Use the model to generate predictions - Evaluate the accuracy and limitations of the model
Identify that computer-based models enable phenomena to be simulated, and variables can be easily changed to investigate their effect	Exploring Computer-Based Models	Computer-based models allow scientists to simulate real-world events and test different scenarios by adjusting variables. In this lesson, we will explore how these models work and how changing variables can help investigate their effects.	- Define computer-based models and explain their purpose - Identify how simulations help scientists study real-world phenomena - Modify variables in a computer-based model to observe changes - Explain the benefits and limitations of using simulations in science

Science Stage 5 Curriculum Map

Energy			
SC5-EGY-01 - evaluates current and alternative energy use based on ethical and sustainability considerations			
Law of Conservation of Energy			
	Lesson Title	**Learning Intention**	**Success Criteria**
Use the law of conservation of energy, and calculations, to explain that total energy is maintained in energy transfers and transformations in a closed system	Understanding the Law of Conservation of Energy	The Law of Conservation of Energy states that energy cannot be created or destroyed but is transferred and transformed within a system. In this lesson, we will explore how energy behaves in closed systems and use calculations to demonstrate that total energy remains constant.	- Define the Law of Conservation of Energy - Explain how energy is transferred and transformed within a system - Apply calculations to show that total energy is conserved in a closed system - Create a model of energy transfers and transformations in a system diagram
Explain efficiency in relation to energy transfers Explain how to improve energy efficiency in energy transfers and transformations	Understanding Energy Efficiency in Transfers and Transformations	Energy transfers and transformations involve multiple steps, and no system is 100% efficient. In this lesson, we will explore why energy efficiency is reduced, how to calculate efficiency, and identify ways to improve energy use in systems.	- Describe what energy efficiency is and why systems are not 100% efficient - Explain how energy is lost during transfers and transformations - Calculate energy efficiency using the efficiency formula - Propose strategies to improve energy efficiency in real-world systems
Use the law of conservation of energy, and calculations, to explain that total energy is maintained in energy transfers and transformations in a closed system	Using Sankey Diagrams to Represent Energy Transformations	Energy transformations can be represented visually to understand how energy inputs, outputs, and losses occur in a system. In this lesson, we will create and analyse Sankey diagrams to explore how energy from the Sun is transformed as it travels to Earth and is used by different systems.	- Define a Sankey diagram and its purpose in representing energy transformations - Create Sankey diagrams to show the transformation of energy, including from the Sun to Earth - Analyse Sankey diagrams to identify energy inputs, outputs, and losses. - Critique the accuracy and usefulness of Sankey diagrams in representing energy changes
Explain how to improve energy efficiency in energy transfers and transformations	Investigating the Energy Efficiency of Ground Ovens	Ground ovens used by Aboriginal and Torres Strait Islander Peoples demonstrate efficient energy use through traditional practices. In this lesson, we will explore how these ovens work, evaluate their energy efficiency, and discuss their importance in sustainable food preparation.	- Describe how ground ovens function and their traditional use by Aboriginal and Torres Strait Islander Peoples - Investigate the energy efficiency of ground ovens, considering heat transfer and retention - Evaluate the sustainability of ground ovens compared to modern cooking methods

			- Discuss the cultural and environmental significance of ground ovens in traditional practices
Describe how electrical energy can be produced from different types of sources Evaluate the advantages and disadvantages of using renewable and non-renewable sources of energy to generate electricity, including efficiency, economical and technological considerations	Comparing the Efficiency of Electricity Generation	Electricity generation can vary significantly in efficiency depending on the energy source. In this lesson, we will compare the efficiency of electricity generation from various sources, and analyse their advantages and disadvantages.	- Define efficiency in the context of electricity generation - Describe how energy is transferred and transformed in different electricity generation methods - Compare the efficiency of coal, nuclear, hydroelectricity, gas, solar, and wind energy sources - Evaluate the advantages and disadvantages of each energy source
Extension	Energy Efficiency in Sports: Improving Athletic Performance	Athletes rely on efficient energy transfers and transformations to optimise their performance. In this lesson, we will examine how improving energy efficiency in sports like pole vaulting and archery enhances athletic outcomes.	- Describe how energy transfers and transformations occur in sporting activities - Identify factors that influence energy efficiency in sports like pole vaulting and archery - Evaluate how improving energy efficiency enhances athletic performance - Analyse examples of energy efficiency in action within sporting contexts
Electrical Energy and Global Future Energy Needs			
Identify the elements of a complete circuit	Understanding Electrical Circuits	Electrical circuits are made up of key components that work together to transfer energy. In this lesson, we will identify the elements of a complete circuit, learn to draw circuit diagrams, and compare parallel and series circuits.	- Identify the key components of an electrical circuit - Identify and draw standardised circuit symbols to represent components - Compare the features of parallel and series circuits
Construct circuits and draw circuit diagrams that contain several components to show the flow of electricity through a complete circuit	Investigation: Constructing Electrical Circuits	Electricity flows through a circuit when components are connected correctly. In this lesson, we will construct circuits with multiple components, observe how electricity flows, and create accurate circuit diagrams to represent these circuits.	- Construct complete series and parallel circuits using multiple components - Observe the flow of electricity through a circuit - Draw circuit diagrams with correct symbols to represent the constructed circuits - Explain how the components in the circuit interact to allow current flow

Measure and compare voltage and current at different points in series and parallel circuits	Investigation: Measuring Voltage and Current in Series and Parallel Circuits	Voltage and current behave differently in series and parallel circuits. In this lesson, we will measure voltage and current at various points in these circuits to compare how energy and current flow through them.	- Measure voltage and current at different points in a circuit using appropriate tools - Compare the behaviour of voltage and current in series and parallel circuits - Explain how energy is distributed and current flows through series and parallel circuits
Conduct an investigation to determine the relationship between voltage (V), current (I), and resistance (R), as described by Ohm's law (V = IR)	Investigation: Investigating Ohm's Law	Ohm's Law describes the relationship between voltage, current, and resistance in an electrical circuit. In this lesson, we will conduct an investigation to determine this relationship experimentally and apply the formula $V = IR$.	- Construct a circuit to investigate the relationship between voltage, current, and resistance - Measure voltage, current, and resistance using appropriate tools - Calculate resistance using Ohm's Law $R = V/I$ - Explain the relationship between voltage, current, and resistance based on experimental data
Conduct an investigation to compare the energy transformed over time in model circuits or appliances	Investigation: Energy Transformation in Circuits and Appliances	Electrical energy is transformed into other forms of energy (e.g., light, heat, sound) in circuits and appliances. In this lesson, we will conduct an investigation to compare the energy transformed over time in different circuits or appliances and evaluate their efficiency.	- Measure energy transformed by circuits or appliances using appropriate tools - Compare the energy transformations in different circuits or appliances over time - Analyse the efficiency of energy transformations - Explain how different components affect energy transformation
Investigate the energy star ratings of a range of appliances and explain the criteria used to determine these ratings	Understanding Energy Star Ratings	Energy star ratings provide consumers with information about the energy efficiency of appliances. In this lesson, we will examine what energy star ratings mean, how they are determined, and why they are important for reducing energy consumption and environmental impact.	- Define what energy star ratings represent - Describe the criteria used to determine energy star ratings for appliances - Compare the energy efficiency of appliances based on their star ratings - Evaluate the benefits of choosing energy-efficient appliances
Evaluate ways to optimise current energy use	Optimising Energy Use for Australia's Future	Optimising energy use is crucial for meeting Australia's energy needs sustainably. In this lesson, we will evaluate strategies to optimise energy use in households, industries, and communities.	- Identify strategies to optimise energy use in different contexts (e.g., households, industries) - Explain how optimising energy use can reduce environmental impact and improve efficiency - Evaluate the benefits and challenges of implementing energy optimisation strategies in Australia
Examine data to identify past trends in energy use, and predict possible future demands, at a state, national and global level	Examining Energy Trends and Predicting Future Demands	Energy use has changed significantly over time due to advancements in technology, population growth, and climate considerations. In this lesson, we will analyse data to identify past trends in energy use at state,	- Examine data sets to identify trends in energy use over time - Interpret how historical events and advancements have shaped energy consumption patterns - Predict future energy demands based on identified trends and

Data science outcome: Use data to make evidence-based decisions about a familiar issue and assess the implications of these decisions		national, and global levels and predict possible future energy demands.	current factors - Explain how Australia's energy needs compare to global demands
Explain reasons for the development of alternative sources of energy Use data, evidence and research to evaluate the development of alternative energy sources to meet and reduce global energy demand Data science outcome: Use data to make evidence-based decisions about a familiar issue and assess the implications of these decisions	Using Data to Make Decisions on Alternative Energy	The world is searching for sustainable energy solutions to meet growing demands. In this lesson, we will use data and evidence to evaluate the development of alternative energy sources and assess their potential to reduce global energy demand.	- Discuss the reasons for developing alternative energy sources. - Use data and research to evaluate different alternative energy sources - Make an evidence-based decision on the most effective alternative energy source - Assess the implications of energy decisions for society, the economy, and the environment
Diease			
SC5-DIS-01 - explains how an understanding of the causes of disease can be used to prevent and manage the spread of disease			
Homeostasis			
Identify the importance of maintaining stable internal conditions in the body Investigate examples of an organism's observable response to a stimuli	How Does Your Body Respond to Stimuli?	Your body needs to respond to changes in the environment to stay alive and healthy. In this lesson, we'll explore how the body reacts to external and internal stimuli and why maintaining stable internal conditions (homeostasis) is important.	- Identify examples of external and internal stimuli that trigger responses in the body - Explain the importance of maintaining stable internal conditions (homeostasis) - Describe observable responses of the body to specific stimuli (e.g., light, temperature, dehydration)
	From Response to Stimuli	Your body systems don't work alone—they coordinate and communicate to respond to changes in the environment. In this lesson, we will use models, flow diagrams, and virtual simulations to explore how body	- Identify the body systems involved in responding to a stimulus - Use (models, flow diagrams, or simulations) to represent the relationships between body systems - Explain how the body systems ensure the response maintains

		systems interact to coordinate responses to stimuli.	balance (homeostasis)
Compare and contrast the responses of the nervous and endocrine systems Describe how the nervous and endocrine systems coordinate the body's response to stimuli	How Does Your Body Respond to Stimuli? Nervous System vs. Endocrine System	The nervous and endocrine systems both help your body respond to changes in the environment, but they work in different ways. In this lesson, we'll compare how the nervous and endocrine systems coordinate your body's response to external stimuli.	- Identify the role of the nervous system and endocrine system in responding to stimuli - Describe how electrical impulses and hormones carry signals in the body - Compare the speed, duration, and functions of responses in the nervous and endocrine systems - Explain how the two systems work together to maintain balance (homeostasis)
Identify the role of feedback loops in maintaining homeostasis	Feedback Loops and Homeostasis	Your body uses feedback loops to monitor and adjust internal conditions, keeping everything in balance. In this lesson, we will model how receptors, command centres, and effectors work together to regulate processes and maintain homeostasis.	- Identify the roles of receptors, command centres, and effectors in maintaining homeostasis - Model how feedback loops regulate processes in the body - Analyse examples of feedback loops (e.g., body temperature regulation) to understand their role in homeostasis
Extension	How Negative Feedback Maintains Balance in the Body	Your body uses negative feedback mechanisms to keep internal systems in balance, like body temperature, blood sugar, iron levels, and pH. In this lesson, we'll examine how these systems work to maintain homeostasis and why they are critical for survival.	- Identify examples of internal systems regulated by negative feedback (e.g., body temperature, blood sugar, iron levels, and pH) - Describe the role of negative feedback in maintaining balance in these systems - Explain why negative feedback is essential for maintaining homeostasis
	How Understanding Feedback Mechanisms Helps Develop Life-Changing Products	Feedback mechanisms help the body maintain balance, and understanding how they work has allowed scientists to develop products like insulin for diabetes and electrolyte solutions to improve performance. In this lesson, we'll explore how these products address disruptions to homeostasis.	- Describe how insulin helps people with Type 1 diabetes regulate blood sugar levels - Analyse how electrolyte solutions support hydration and enhance performance - Evaluate the importance of feedback mechanisms in developing pharmaceuticals and other products
	When Feedback Systems Fail	Feedback systems keep the body balanced, but when they fail, disorders can occur. In this lesson, we will examine how disruptions in feedback systems can lead to serious health conditions and what happens when balance is not restored.	- Explain how feedback system failure can lead to conditions like diabetes-induced blindness and hypothermia - Describe the effects of broken feedback systems on the body - Explain the consequences of failing to restore homeostasis

Disease			
Distinguish between infectious and non-infectious diseases Identify causes of non-infectious and infectious diseases	Understanding Infectious Diseases and Their Causes	Infectious diseases are caused by pathogens such as bacteria, viruses, fungi, and parasites. In this lesson, we'll explore the differences between these pathogens, learn how they cause diseases, and distinguish between infectious and non-infectious diseases.	- Define infectious diseases and identify their causes - Distinguish between infectious and non-infectious diseases - Differentiate between pathogens such as bacteria, viruses, fungi, and parasites - Provide examples of diseases caused by each type of pathogen
Use modelling to investigate how infectious diseases can be spread	Investigation: How Do Infectious Diseases Spread?	Infectious diseases spread through various pathways, including direct contact, airborne transmission, and contaminated surfaces. In this lesson, we will use models to investigate how these diseases are transmitted and explore strategies to reduce their spread.	- Identify different modes of disease transmission - Use models to simulate how infectious diseases spread in a population - Describe factors that influence the spread of infectious diseases
Identify how the body prevents the entry of pathogens and describe how it responds to pathogens that enter the body	How the Body Defends Against Pathogens	Our body uses multiple strategies to prevent pathogens from entering and responds with complex systems when they do. In this lesson, we will explore the body's defence mechanisms and its responses to pathogens.	- Identify the body's physical, chemical, and biological barriers that prevent pathogen entry - Describe how the immune system responds to pathogens that enter the body - Create a model outlinging the steps of the body's defence and response to pathogens
Assess ways to reduce the incidence and spread of infectious diseases	Strategies for Reducing the Spread of Infectious Diseases	Infectious diseases can spread rapidly through communities. In this lesson, we'll assess various strategies for reducing the incidence and spread of infectious diseases, focusing on public health measures, personal hygiene, and technological interventions.	- Identify strategies to reduce the spread of infectious diseases - Explain how personal hygiene, vaccination, and public health measures contribute to disease prevention - Assess the effectiveness of these strategies in controlling outbreaks - Propose a plan to minimise the spread of an infectious disease based on evidence
	Investigation: How Effective Is Handwashing in Reducing Bacteria?	Handwashing is a key practice for preventing the spread of infectious diseases. In this lesson, we will conduct an investigation to compare the effectiveness of different handwashing methods by analysing the growth of bacterial colonies on agar plates.	- Design an investigation to test the effectiveness of handwashing - Collect and record data on bacterial growth from agar plates - Compare the effectiveness of different handwashing techniques or materials - Analyse results to draw conclusions about the role of hand hygiene in disease prevention
Outline how a vaccination stimulates the body to produce	How Vaccines Work	Vaccines play a crucial role in protecting the body from infectious diseases. In this lesson, we will visualise	- Define vaccination and explain its purpose - Visualise the biological process of how a vaccine works

antibodies to fight infection		and explain the biological processes behind vaccination and understand how it stimulates the production of antibodies to fight infections.	- Describe how vaccination stimulates the immune system to produce antibodies - Outline the steps in the body's immune response to a vaccine
Analyse data about immunisation programs and the occurrence of infectious diseases to identify trends, patterns and relationships, and document conclusions in a written text Data Science outcome: Use data to make evidence-based decisions about a familiar issue and assess the implications of these decisions	Analysing Immunisation and Infection Rates	Immunisation programs help control the spread of infectious diseases, but how do we know they work? In this lesson, we will analyse data on immunisation rates and disease occurrence to identify trends, patterns, and relationships, and document conclusions in a scientific report.	- Analyse data about immunisation rates and infectious disease occurrence - Identify trends and patterns in the data - Draw conclusions about the effectiveness of immunisation programs using evidence - Document findings in a structured written text
Compare the features and incidences of epidemics, endemics and pandemics	Understanding Epidemics, Endemics, and Pandemics	Diseases can spread in different ways, leading to epidemics, endemics, or pandemics. In this lesson, we will compare their features, examine real-world examples, and understand the factors contributing to their occurrence.	- Define epidemics, endemics, and pandemics with key features - Identify examples of each type from history or current events - Compare the differences in scale, spread, and duration of these disease classifications - Describe the factors that influence the incidence and spread of diseases
	The Impact of Diseases Introduced by Europeans to Australia	Diseases introduced by Europeans had a devastating impact on Aboriginal and Torres Strait Islander communities due to the lack of prior exposure and immunity. In this lesson, we will research the effects of diseases like smallpox and explore how they influenced Indigenous populations and cultures.	- Describe how diseases like smallpox were introduced to Australia - Explain why Aboriginal and Torres Strait Islander Peoples were particularly vulnerable to introduced diseases - Describe the social and cultural impacts of introduced diseases on Indigenous communities - Research and present information on the historical effects of disease introduction
Investigate Aboriginal and/or Torres Strait Islander Peoples' use of plants to prevent or control disease	Aboriginal and Torres Strait Islander Peoples' Use of Plants to Prevent and Control Disease	For thousands of years, Aboriginal and Torres Strait Islander Peoples have used plants for medicinal purposes to prevent and control disease. In this lesson, we will investigate examples of these practices and understand the scientific basis behind them.	- Identify examples of plants used by Aboriginal and Torres Strait Islander Peoples for disease prevention and control - Explain the traditional methods of preparing and using these plants - Investigate the scientific properties of selected plants and their medicinal benefits

			- Discuss the importance of this knowledge for modern medicine and sustainability
Distinguish between infectious and non-infectious diseases Identify causes of non-infectious and infectious diseases	Understanding Non-Infectious Diseases	Non-infectious diseases are caused by factors other than pathogens, such as genetics, lifestyle, or environmental influences. In this lesson, we will explore the causes of non-infectious diseases and distinguish them from infectious diseases.	- Define what non-infectious diseases are and distinguish them from infectious diseases - Identify examples of non-infectious diseases and their causes - Explain how factors such as genetics, lifestyle, and the environment contribute to non-infectious diseases - Analyse the impact of non-infectious diseases on individuals and society
Investigate data relating to a common non-infectious disease affecting Australians today Data Science outcome: Conduct a univariate analysis and a bivariate analysis using large datasets	Data Detectives: Analysing Non-Infectious Diseases in Australia	Data plays a crucial role in understanding health trends. In this lesson, we will conduct univariate and bivariate analyses of large datasets to explore patterns and relationships related to non-infectious diseases in Australia.	- Define univariate and bivariate analysis and explain their purposes - Conduct a univariate analysis on a large dataset related to non-infectious diseases - Perform a bivariate analysis to explore relationships between variables - Interpret findings to draw conclusions about non-infectious disease trends in Australia
Investigate technological advances developed in Australia to address disease, disorders or physical trauma in the human body	Technological Advances in Australia for Addressing Diseases, Disorders, and Physical Trauma	Australia has been at the forefront of developing technologies to improve health outcomes. In this lesson, we will investigate examples of technological advances developed in Australia that address diseases, disorders, or physical trauma in the human body.	- Identify Australian-developed technologies that address diseases, disorders, or physical trauma - Explain how these technologies function and improve health outcomes - Research and document specific examples of Australian innovations in healthcare - Evaluate the impact of these technologies on individuals and society
Extension	Creating a Social Media Video on Healthy Lifestyles and Non-Infectious Diseases	Social media is a powerful tool for sharing health messages. In this lesson, we will create a storyboard for a social media clip to explain how healthy lifestyles can reduce the risk of non-infectious diseases.	- Identify key healthy lifestyle factors that lower the risk of non-infectious diseases - Explain the relationship between lifestyle choices and disease prevention - Design a storyboard for a social media clip with clear visuals, text, and audio cues - Propose engaging and memorable messaging suitable for a social media platform

Materials and Environmental Sustainability			
SC5-MAT-01 - assesses the uses of materials based on their physical and chemical properties ***SC5-ENV-01 - analyses the impact of human activity on the natural world***			
Resources and Alternative resource use and recycling			
Identify the finite nature of the minerals and resources extracted in Australia	Understanding the Finite Nature of Australia's Resources	Australia is rich in natural resources, but many of these are finite. This lesson explores the finite nature of minerals and resources extracted in Australia and why it is important to use them sustainably.	- Identify the key minerals and resources extracted in Australia - Describe why these resources are considered finite - Explain the implications of resource depletion on the environment and economy
Investigate the products produced from Australian minerals and resources	Products from Australian Minerals and Resources	Australia's minerals and resources are transformed into products that are essential for modern life. In this lesson, we will investigate the products produced from Australian minerals and resources and understand their significance in various industries.	- Identify key minerals and resources extracted in Australia - Investigate the products produced from these resources and their uses - Explain the importance of Australian resources in global and domestic industries
Explain how Aboriginal and Torres Strait Islander Peoples used minerals and resources for a wide range of purposes	Traditional Use of Minerals and Resources by Aboriginal and Torres Strait Islander Peoples	Aboriginal and Torres Strait Islander Peoples have sustainably used minerals and resources for thousands of years for various purposes, including tools, art, and cultural practices. This lesson explores their ingenious use of natural resources and the knowledge systems that guided their applications.	- Identify examples of minerals and resources traditionally used by Aboriginal and Torres Strait Islander Peoples - Describe the purposes of these resources in tools, art, and cultural practices - Explain how the sustainable use of resources reflects deep knowledge of the environment
Evaluate the environmental impact of extracting and using a named resource and document findings in a written scientific report Data Science outcome: Use available large datasets to develop and test a question	Investigating the Impact of Resource Extraction	Modern industries extract and use natural resources at a scale that can impact the environment in both short- and long-term ways. In this lesson, you will evaluate these impacts and learn how to communicate your findings in a scientific report.	- Identify a specific resource and outline how it is extracted and used - Evaluate the environmental impacts associated with the extraction and use of this resource - Construct a scientific report that clearly presents your findings using appropriate structure and language
Describe the causes of environmental pollution and discuss its implications	Understanding Environmental Pollution	Pollution is a significant environmental issue with widespread implications. In this lesson, we will describe the causes of environmental pollution and discuss how it affects ecosystems, human health, and the planet.	- Identify different types of environmental pollution - Describe the causes of pollution and their sources - Discuss the implications of pollution for ecosystems, human health, and the environment

Research how Aboriginal and Torres Strait Islander Peoples have developed sustainable harvesting practices and Cultural protocols based on deep ecological understandings	Sustainable Harvesting Practices and Cultural Protocols of Aboriginal and Torres Strait Islander Peoples	Aboriginal and Torres Strait Islander Peoples have developed sustainable harvesting practices and cultural protocols rooted in deep ecological understandings. In this lesson, we will explore these practices and their importance for sustainable living.	- Describe examples of sustainable harvesting practices developed by Aboriginal and Torres Strait Islander Peoples - Investigate how cultural protocols guide the use of resources - Explain the role of ecological understanding in ensuring sustainability - Compare how these practices can inform contemporary environmental management
Discuss alternatives to the current resource use, including how to reduce, reuse and recycle	Sustainable Alternatives to Resource Use	Current resource use practices often lead to environmental degradation. In this lesson, we will discuss alternatives to current resource use, focusing on reducing, reusing, and recycling, and how these strategies can support sustainability.	- Describe the environmental impacts of current resource use - Identify alternatives to reduce, reuse and recycle resources - Explain how these alternatives contribute to sustainability
Describe current processes for recycling materials Investigate how scientists have developed innovative ways to recycle materials	Recycling Materials: Current Processes and Innovations	Recycling is essential for reducing waste and conserving resources. In this lesson, we will describe current recycling processes and investigate innovative ways scientists are improving recycling methods.	- Identify materials commonly recycled and their current recycling processes - Describe how materials are separated and processed during recycling - Investigate innovative methods developed by scientists to recycle materials - Evaluate the benefits and challenges of these innovations
Bonding			
Use valency to describe the number of electrons an atom needs to gain, lose or share to achieve a stable electron configuration	Understanding Valency and Electron Configuration	Atoms interact to achieve a stable electron configuration. In this lesson, we will explore how valency describes the number of electrons an atom needs to gain, lose, or share to become stable.	- Identify the number of valence electrons in an atom using the periodic table - Describe how valency relates to the gain, loss, or sharing of electrons for stability - Use valency to determine the electron behaviour of elements during bonding
Explain noble gas configuration and identify that it occurs during chemical bonding	Noble Gas Configuration	Noble gas configuration represents the most stable arrangement of electrons. In this lesson, we will explore how atoms achieve noble gas configuration through chemical bonding.	- Define noble gas configuration and explain its stability - Identify how atoms achieve noble gas configuration during chemical bonding - Describe examples of ionic and covalent bonding that result in noble gas configuration - Explain the relationship between noble gas configuration and the reactivity of elements

Describe types of chemical bonds, including ionic, covalent and metallic bonds	Types of Chemical Bonds	Atoms combine in different ways to form compounds. In this lesson, we will explore and describe the types of chemical bonds: ionic, covalent, and metallic.	- Define ionic, covalent, and metallic bonds - Describe how each type of bond forms, including the role of electrons - Compare the properties of ionic, covalent, and metallic compounds - Classify examples of compounds based on the type of bonding present
Use models to describe the formation of cations and anions	The Formation of Cations and Anions	Atoms form charged particles, called cations and anions, by gaining or losing electrons. In this lesson, we will use models to describe how cations and anions form and why they are important in chemical bonding.	- Define cations and anions and explain how they form - Model the process of gaining or losing electrons to create cations and anions - Describe examples of elements that form cations or anions - Explain the role of cations and anions in forming ionic compounds
Recognise that some elements exist as diatomic molecules	Elements that Bond with Themselves	Some elements exist naturally as diatomic molecules, meaning two atoms of the same element bond together. In this lesson, we will explore what diatomic molecules are, why they form, and identify examples of these elements.	- Define diatomic molecules and explain why they form - Identify elements that exist as diatomic molecules - Recognise the role of diatomic molecules in chemical processes
Construct chemical formulas of some common ionic compounds and covalent molecules	Constructing Chemical Formulas for Ionic and Covalent Compounds	Chemical formulas represent the composition of compounds. In this lesson, we will construct formulas for common ionic compounds and covalent molecules, understanding the rules that govern their formation.	- Identify the charges of ions to construct formulas for ionic compounds - Use prefixes and rules to construct formulas for covalent molecules - Construct accurate chemical formulas for common compounds - Explain the difference in formula construction between ionic and covalent compounds
Conduct an investigation to observe and compare the physical and chemical properties of ionic, covalent and metallic substances, and explain how these relate to their uses	Investigation: Properties of Ionic, Covalent, and Metallic Substances	Substances have different physical and chemical properties based on their bonding. In this lesson, we will investigate and compare the properties of ionic, covalent, and metallic substances and explain how these properties influence their uses.	- Conduct a practical investigation to observe the physical and chemical properties of ionic, covalent, and metallic substances - Compare the properties of substances, including conductivity, melting point, and solubility - Relate these properties to the bonding type and practical applications of the substances - Explain how the properties of substances influence their uses in everyday life

Chemistry of organic compounds			
Distinguish between organic and inorganic compounds Use International Union of Pure and Applied Chemistry (IUPAC) nomenclature to name simple organic compounds	Introduction to Organic Chemistry	Organic compounds are the basis of life and modern chemistry. In this lesson, we will distinguish between organic and inorganic compounds and learn to use IUPAC rules to name simple organic compounds.	- Define organic and inorganic compounds and explain the key differences between them - Identify examples of organic and inorganic compounds - Apply IUPAC nomenclature to name simple organic compounds, including alkanes and alkenes - Explain why consistent naming conventions are important in chemistry
Identify and reproduce the structure of simple alkanes C1–C8	Alkanes	Alkanes are the simplest hydrocarbons consisting only of single bonds between carbon atoms. In this lesson, we will identify the structures of simple alkanes (C_1–C_8) and reproduce their molecular and structural formulas.	- Identify the general formula for alkanes and apply it to calculate the number of hydrogen atoms in a given alkane - Reproduce the molecular and structural formulas for simple alkanes (C_1–C_8) - Model and draw the structures of alkanes
Describe how hydrocarbons can be separated from crude oil and identify the uses of these products	Separating Hydrocarbons: Fractional Distillation and Their Uses	Crude oil contains a mixture of hydrocarbons that can be separated into useful products. In this lesson, we will describe how hydrocarbons are separated using fractional distillation and identify the uses of these products in everyday life.	- Describe the process of fractional distillation and explain how it separates hydrocarbons based on boiling points - Identify the key products obtained from crude oil and their uses - Explain the relationship between the size of hydrocarbon molecules and their properties - Evaluate the importance of crude oil products in daily life and industry
Describe the differences between complete and incomplete combustion reactions of hydrocarbons, and use examples from everyday applications to compare the products of the chemical reaction and amount of energy released	Complete and Incomplete Combustion of Hydrocarbons	Combustion reactions of hydrocarbons can occur as complete or incomplete processes, producing different products and releasing varying amounts of energy. In this lesson, we will explore these differences and relate them to everyday applications.	- Define complete and incomplete combustion and describe the conditions required for each - Identify the products of complete and incomplete combustion - Compare the energy released and environmental impacts of complete and incomplete combustion - Explain examples of complete and incomplete combustion in everyday life
Research the uses of hydrocarbon compounds and how this has changed over time	The Changing Uses of Hydrocarbons	Hydrocarbons are versatile compounds with uses that have evolved over time. In this lesson, we will research how hydrocarbons are used in various industries and explore how advancements in technology and environmental considerations have influenced their applications.	- Describe the traditional and modern uses of hydrocarbon compounds - Research and identify changes in the uses of hydrocarbons over time - Explain how technological advancements and environmental concerns have influenced the use of hydrocarbons

			- Evaluate the benefits and challenges of using hydrocarbons in the past and present
Assess the environmental impacts of materials that are used as alternatives to those derived from crude oil	Assessing the Environmental Impacts of Alternative Materials	Materials derived from crude oil, such as plastics and fuels, have significant environmental impacts. In this lesson, we will assess the environmental impacts of alternative materials and compare them to traditional crude oil-derived products.	- Identify alternative materials to crude oil-derived products, such as bioplastics and biofuels - Describe the environmental impacts of both crude oil-derived materials and their alternatives - Compare the benefits and drawbacks of alternative materials - Assess whether alternative materials are truly sustainable solutions to reduce environmental impacts
Polymers			
Identify the raw materials used to make polymers	Where Do Polymers Come From?	Polymers are versatile materials used in everyday life. In this lesson, we will identify the raw materials used to make polymers and explore their origins.	- Define polymers and describe their basic structure - Identify the raw materials used to make natural and synthetic polymers - Explain the sources of raw materials for polymers, including crude oil, natural gas, and biological materials
Investigate and describe the properties of a range of polymers	Exploring the Properties of Polymers	Polymers have a wide range of properties that make them suitable for different applications. In this lesson, we will investigate and describe the properties of various polymers and relate these properties to their uses.	- Identify a range of polymers and their common uses - Investigate the physical and chemical properties of selected polymers - Describe how the properties of polymers relate to their applications - Compare the properties of natural and synthetic polymers
Determine the quantity and types of polymers found in the environment by undertaking a physical survey of the local area	Investigation: Surveying Polymers in the Environment	Polymers are widely used in everyday life, but their environmental presence can raise sustainability concerns. In this lesson, we will conduct a physical survey of the local area to determine the types and quantities of polymers found in the environment.	- Conduct a physical survey to collect data on the quantity and types of polymers in the local environment - Categorise polymers found based on their type, use, and condition - Evaluate the environmental impact of the polymers identified
Conduct an investigation to determine the biodegradability of different packaging materials	Investigation: Testing Biodegradability of Packaging Materials	Packaging materials vary in their ability to biodegrade. In this lesson, we will conduct an investigation to compare the biodegradability of different materials and evaluate their environmental impact.	- Define biodegradability and explain its importance in reducing environmental waste - Conduct an investigation to determine the biodegradability of various packaging materials - Compare the rate of degradation among materials - Evaluate the environmental implications of using biodegradable and non-biodegradable materials

Investigate case studies to explain the effect of bioaccumulation of microplastics in the environment	Understanding Bioaccumulation of Microplastics	Microplastics are an emerging environmental issue due to their bioaccumulation in organisms and ecosystems. In this lesson, we will investigate case studies to understand the effects of bioaccumulation of microplastics in the environment.	- Define bioaccumulation and explain how it relates to microplastics - Investigate case studies that illustrate the impact of microplastic bioaccumulation - Describe the effects of microplastic bioaccumulation on organisms and ecosystems - Evaluate potential strategies to reduce microplastic pollution and bioaccumulation
Environmental sustainability			
SC5-ENV-01 - analyses the impact of human activity on the natural world			
Identify the principles and goals of sustainability Apply scientific understanding to propose valid solutions to identified problems relating to sustainability	Understanding and Applying Sustainability Principles	Sustainability ensures the long-term health of our planet. In this lesson, we will identify the principles and goals of sustainability and apply scientific understanding to propose solutions for sustainability-related problems.	- Define the principles and goals of sustainability - Identify real-world examples of sustainability issues - Suggest realistic and effective solutions to these issues - Evaluate the feasibility and potential impact of proposed solutions
Distinguish between climate and weather Investigate data to determine what trends are evident in the world's climate Data Science outcome: Identify and outline the benefits of using descriptive statistical analysis techniques to assist in recognising or communicating patterns	Climate vs. Weather: Using Data to See the Bigger Picture	While weather changes daily, climate reveals long-term patterns. In this lesson, we will distinguish between climate and weather, use descriptive statistical analysis to investigate climate data, and explore how these techniques help recognise and communicate global climate trends.	- Distinguish between weather and climate, using examples - Identify descriptive statistical techniques used to analyse climate data - Conduct a descriptive analysis of climate data to recognise long-term trends - Explain the benefits of using descriptive statistics to communicate climate patterns
Explain how the natural greenhouse effect influences global climate	The Natural Greenhouse Effect and Its Influence on Global Climate	The natural greenhouse effect is essential for life on Earth, but changes to this system can have profound impacts. In this lesson, we will explain how the natural greenhouse effect influences global climate and why it is vital for maintaining temperatures that support	- Define the natural greenhouse effect - Describe the process of the natural greenhouse effect, including key greenhouse gases and their functions - Explain how the natural greenhouse effect influences global climate

		life.	- Explain the importance of the balance between the natural and enhanced greenhouse effects
Analyse data on global emissions and atmospheric temperatures to explain the enhanced greenhouse effect and its impact on climate and ecosystems	The Enhanced Greenhouse Effect	The enhanced greenhouse effect is a major driver of modern climate change. In this lesson, we will analyse data on global emissions and atmospheric temperatures to explain how the enhanced greenhouse effect impacts global climate and ecosystems.	- Interpret data on global greenhouse gas emissions and atmospheric temperatures - Explain the link between increased emissions, the enhanced greenhouse effect, and rising temperatures - Describe the impacts of the enhanced greenhouse effect on climate and ecosystems - Evaluate possible solutions to reduce emissions and mitigate climate impacts
Identify the advantages and limitations of methods used to reduce greenhouse gas emissions Data Science outcome: Use data to make evidence-based decisions about a familiar issue and assess the implications of these decisions	Data-Driven Decisions: Tackling Greenhouse Gas Emissions	Making informed decisions about climate change requires reliable data. In this lesson, we will use data to make evidence-based decisions about reducing greenhouse gas emissions and assess the implications, advantages, and limitations of different strategies.	- Use data to evaluate methods for reducing greenhouse gas emissions - Identify the advantages and limitations of different emission reduction strategies - Make an evidence-based decision on the most effective approach to lowering emissions - Assess the social, economic, and environmental implications of the chosen strategy
Identify the advantages and limitations of methods used to reduce greenhouse gas emissions Data Science outcomes: Large datasets and scientific argumentation Outline the features, collection, uses and applications of large datasets	Big Data, Big Impact: Linking Industrialisation to Climate Change	Large datasets help scientists uncover critical trends in climate science. In this lesson, we will explore how large datasets are collected and used, and how they help build scientific arguments about the link between industrialisation and rising global temperatures.	- Outline the features and methods of collecting large datasets - Explain how large datasets are used to identify patterns and trends in climate science - Analyse data showing the relationship between industrialisation and global temperatures - Construct a scientific argument using data to support the claim that industrialisation has contributed to global warming
Identify the characteristics of climate change	Understanding the Characteristics of Climate Change	Climate change is a significant global issue with distinct characteristics. In this lesson, we will identify and understand the key characteristics of climate change and how they impact the environment and	- Define climate change and distinguish it from natural climate variability - Identify the key characteristics of climate change - Explain how these characteristics impact the environment,

		society.	ecosystems, and human societies
Investigate and report on the consequences of climate change	The Consequences of Climate Change	Climate change has far-reaching consequences for the environment, ecosystems, and human societies. In this lesson, we will investigate and report on the diverse impacts of climate change to understand its global and local implications.	- Identify the key consequences of climate change - Investigate specific examples of climate change impacts on the environment and society - Analyse the data and evidence supporting these impacts - Report findings in a structured and detailed written format
Investigate the effects of climate change on the water cycle and ecosystems	The Effects of Climate Change on the Water Cycle and Ecosystems	Climate change disrupts natural systems, including the water cycle and ecosystems. In this lesson, we will investigate how climate change affects these systems and understand the broader implications for life on Earth.	- Describe the components of the water cycle and their roles in ecosystems - Investigate the effects of climate change on the water cycle - Explain how these changes impact ecosystems and the long-term implications they have for biodiversity and human life
Investigate how satellites collect global data, including data on ocean temperatures, sea levels, and forest and ice cover, and examine how this data is used to evaluate the impact of climate change	Using Satellites to Monitor Climate Change	Satellites provide critical data to understand and address climate change. In this lesson, we will investigate how satellites collect data on ocean temperatures, sea levels, forest and ice cover, and examine how this data helps evaluate the impacts of climate change.	- Describe the role of satellites in collecting global climate data - Explain how satellites measure ocean temperatures, sea levels, and forest and ice cover - Analyse satellite data to evaluate the impacts of climate change - Evaluate the importance of satellite monitoring in climate change research and action
Genetics and evolutionary change			
SC5-GEV-01 - describes the relationship between the diversity of living things and the theory of evolution			
Genetics			
Identify that all organisms have information coded in genetic material Observe and model the arrangement of genetic information in an organism to define and compare the terms DNA, gene, chromosome and genome Relate the structure of the DNA	The DNA Double Helix	In this lesson, we will look at the genetic material, DNA, that determines who we are. We will learn about the scientists who helped us to discover the structure of DNA and we will model the relationship between genes, chromosome and DNA to learn more about how they are related.	- Define genes, chromosomes and DNA - Describe the structure and function of the DNA double helix - Create a diagram to show the relationship between genes, chromosomes and DNA
	Investigation: Extracting DNA	DNA is the blueprint of life, containing the instructions for how organisms grow and function. In this investigation, we will extract DNA from a biological sample and use models and diagrams to represent the relationship between DNA, genes, and an organism's genome.	- Conduct an experiment to extract DNA from a biological sample using a step-by-step laboratory procedure - Describe how DNA is organised into genes, chromosomes, and the genome - Use models and diagrams to represent the relationships between DNA, genes, and chromosomes within an organism's genome

double helix to its functions			
Discuss the nature of scientific discovery by comparing the contributions of scientists involved in the discovery of the double helix structure of DNA	The Scientists Behind the Double Helix	There are a number of scientists who played an influentual role in our understanding of DNA. In this lesson, we will explore the contributions of these key scientists, compare the impact of their work and discuss the nature of scientific discovery.	- Describe the evidence and techniques used to determine DNA's structure. - Compare the contributions of different scientists, including Rosalind Franklin, James Watson, Francis Crick, and Maurice Wilkins - Discuss how scientific discoveries build on previous work and the ethical considerations related to recognition in science
Outline how genetic information is passed on to offspring by sexual and asexual reproduction	Passing on Genetic Information	We get our genes from our parents, but how does that happen? In this lesson, we will look at the process of meiosis (sex cell replication) and fertilisation to explain how genetic information is passed from parents to offspring.	- Outline meiosis - Define fertilisation - Explain how genetic material is passed from parent to offspring via meiosis and fertilisation - Outline how genetic material is passed in asexual reproduction
Outline the connection between genotypes and phenotypes, using Mendelian inheritance for both plants and animals	Autosomal Inheritance & Punnett Squares	In this lesson, we will explore Mendelian inheritance and how it can be used to predict characteristics of offspring. We'll investigate how genetic traits, including superpowers, are inherited and apply Punnett squares to understand genotype and phenotype.	- Define genotype, phenotype, automosal, dominant, recessive - Predict genotype and phenotype using Mendelian inheritance and punnet squares for one autosomal characteristic (monohybrid)
Use pedigrees and Punnett squares to model monogenic gene-trait relationships and make predictions about patterns of inheritance	Pedigrees and Punnett Squares	We know that we can predict offspring having a particular characteristic through Mendelian inheritance, but we can go on an even larger scale and use pedigree diagrams to look for patterns of inheritance within extended families. In this lesson, we will use a combination of Punnett squares and pedigrees to predict modes of inheritance across generations.	- Identify symbols needed to pedigree diagram - Create a pedigree diagram that span multiple generations - Predict dominant and recessive characteristics using punnet squares and pedigree diagrams
Explain how DNA mutation can result in genetic variation with beneficial, harmful or minimal effects on the functioning of an organism	Mutations	In this lesson, we will explore how the environment and other factors can change our DNA. We will learn about DNA mutations that can result in both positive, neutral and negative genetic variations.	- Identify environmental and other factors that can cause mutations in DNA - Explain how DNA mutations can result in genetic variation - Outline an example of genetic variations that are positive, neutral or harmful on the functioning of an organism
	Genetic Disorders	DNA mutations have a range of effects on the functioning of an organism, they can also result in genetic disorders. IN this lesson, we will explore the role of DNA in cancer and genetic disorders including	- Explain the role of DNA in cancer - Explain the role of DNA in genetic disorders - Identify changes in function in genetic disorders (haemochromatosis, sickle cell anaemia, cystic fibrosis and

		haemochromatosis, sickle cell anaemia, cystic fibrosis and Klinefelter syndrome.	Klinefelter syndrome)
Identify examples of current and emerging genetic technologies Discuss applications of genetic technologies in conservation, agriculture, industry and medicine Discuss the applications of genetic testing and its associated social, economic and ethical implications	Genetic Technologies	Genetic technologies are evolving everyday! In this lesson, we will identify exmaple of genetic technologicals and discuss how these technologies are being used across a range of industries. We will also look at the ethical implications of using genetic technologies using examples.	- Identify examples of genetic technologies including genetic testing and technologies used in agriculture, industry and medicine - Discuss social, economic and ethical implications of using genetic testing - Discuss the ethical implications of the HeLa Stem cell line
Extension	Sex-Linked Inheritance	In this lesson, we will explore inheritance and how it can be used to predict sex-linked characteristics of offspring. We'll investigate how sex-linked traits, including superpowers, are inherited and apply Punnett squares to understand genotype and phenotype.	- Define sex-linked characteristics - Predict genotype and phenotype using Mendelian inheritance and punnet squares for one sex-linked characteristic (monohybrid)
	First Nations Australians Knowledges of Heredity	In this lesson, we will investigate First Nation Australians' knowledges of heredity and how this has led to kinship and family structures as well as marriage laws.	- Explain First Nation Australians' knowledge of heredity - Describe how these knowledges have changed kinship and family structures especially marriage laws
Evolution			
Discuss how scientists developed and refined the theory of evolution, and explain why an understanding of the origins of species is important	The Science of Evolution	Over time, scientific discoveries have refined our understanding of how species change and adapt. The theory of evolution explains how natural selection drives changes within and between species, shaping biodiversity. In this lesson, we will explore how scientists developed and refined the theory of evolution and why understanding the origins of species is important for modern science.	- Describe the contributions of key scientists, including Charles Darwin and Alfred Russel Wallace, to the theory of evolution - Explain how the theory of evolution has been refined over time with new scientific evidence - Discuss why understanding evolution is important in fields such as medicine, conservation, and genetics - Evaluate the impact of evolutionary theory on society and scientific research

Explain how the processes of natural selection and isolation can lead to changes within and between species	Natural Selection and Isolation	In this lesson, we will explain the process of natural selection and how variation, isolation and selection can lead to changes within and between species.	- Define species - Define natural selection, variation, isolation and selection - Explain the process of natural selection including variation, isolation and selection
	Survival of the Fittest: How Genes Shape Life	Genetic characteristics influence an organism's ability to survive and reproduce in its environment. Traits that provide an advantage can increase in a population over time, while less beneficial traits may disappear. In this lesson, we will explore how genetic characteristics are linked to survival and reproductive success	- Identify examples of genetic characteristics that affect an organism's survival and reproduction - Describe how advantageous traits can increase in frequency over generations - Explain survival and reproductive success by linking to real-world examples, such as antibiotic resistance or camouflage in animals
Investigate, using evidence, how the complexity and diversity of organisms have changed over geological timescales	Evidence for Evolution	We can figure out when species evolved through studying natural records made my scientists. In this lesson, we will analyse evidence such as fossil record, chemical and anatomical similarities and geographical distribution of species to support the theory of evolution.	- Identify evidence for the theory of evolution - Explain using evidence, how the complexity and diversity of organisms can be tracked over time
	Investigation: Evidence for Evolution	Using real life evidence, such as fossils and looking at common anatomy between species, we can see if there was a common ancestor that link the two species. This provides us with evidence that evolution has occurred over time to create biodiversity. In this lesson, we will look at a range of evidence to support the theory of evolution.	- Analyse fossil evidence to determine if species may have come from a common ancestor - Investigate chemical and anatomical similarities in species to identify common lineage
Identify and discuss Aboriginal and/or Torres Strait Islander Peoples' artwork that indicate changes in plants and animals, including megafauna	First Nations Australians and the Environment	Over thousands of years, First Nations Australians have developed structural and physiological adaptations that enable survival in diverse and often extreme Australian environments. In this lesson, we will investigate how these adaptations have supported their way of life and connection to Country.	- Identify structual and physiological adaptations of Aboriginal and/or Torres Strait Islander Peoples - Describe how these adaptations help survival in different Australian environments - Explain how over time, these characteristics would help the Aboriginal and/or Torres Strait Islander Peoples' survive the harsh Australian Environment
	Uncovering the Mystery of Australia's	The extinction of Australia's Pleistocene megafauna remains a topic of scientific debate. Some researchers argue that climate change played a major role, while	- Identify examples of megafauna and describe their key characteristics - Describe Aboriginal and Torres Strait Islander Peoples' artwork that

	Megafauna	others suggest human activity was a key factor. Aboriginal and Torres Strait Islander Peoples' artwork provides important historical records of changes in plant and animal life, including megafauna. In this lesson, we will explore the evidence behind these theories and the cultural significance of Indigenous artwork in understanding Australia's past.	depicts changes in plant and animal life over time - Compare scientific evidence of megafaunal extinction to that of Aboriginal and Torres Strait Islander Peoples' - Discuss how Indigenous knowledge and scientific research contribute to our understanding of Australia's environmental history
Extension	Biodiversity in Action	Natural selection leads to changes within and between species which increases biodiversity. This means there are more varieties of characteristics within one specific habitat or ecosystem. Overtime, this can lead to permanent changes. In this lesson, we will explore how biodiversity can lead to evolution of species over time.	- Define biodiversity - Describe how biodiversity can lead to evolution - Explain why biodiversity is important for the stability and resilience of ecosystems
	Artificial Selection	In recent years, the use of artifical selection, or human created selection pressures, has increased in creating special crops, breeding special meats and even in creating hypoallogenic dogs. In this lesson, we will investigate changes caused by natural selection in a particular population when there is a specific selection pressure introduced into the population, for example, with artifical selection.	- Define artificial selection - Identify two examples of artifical selection in breeding for desired characteristics - Evaluate the use of artifical selection in breeding for desired characteristics
Reactions			
SC5-RXN-01 - describes a range of reaction types			
Law of conservation of mass and chemical reactions			
Model simple chemical reactions to show that atoms are rearranged and mass is conserved during a reaction	Reactants and Products in Chemical Reactions	Chemical reactions involve the transformation of reactants into products. In this lesson, we will identify the reactants and products in various chemical reactions and explore their roles.	- Define reactants and products in the context of chemical reactions - Identify the reactants and products in word equations and simple balanced equations - Describe the roles of reactants and products in chemical reactions
Explain the meaning of the law of conservation of mass	Modelling Chemical Reactions: Rearrangement of Atoms and the	Atoms are rearranged during chemical reactions, and the total mass remains constant, as described by the Law of Conservation of Mass. In this lesson, we will use models to visualise and represent the rearrangement of atoms in chemical reactions.	- Define the Law of Conservation of Mass - Model the rearrangement of atoms - Explain how mass is conserved during a chemical reaction

	Law of Conservation of Mass		
Conduct a practical investigation to demonstrate the law of conservation of mass in a chemical reaction	Investigation: Demonstrating the Law of Conservation of Mass	The Law of Conservation of Mass states that mass is conserved during chemical reactions. In this lesson, we will conduct a practical investigation to observe and verify this principle.	- Conduct a chemical reaction while accurately measuring the mass of reactants and products - Compare the mass before and after the reaction to confirm the Law of Conservation of Mass - Explain how the results demonstrate the conservation of mass
Investigate and explain how mass is conserved in closed systems	Investigation: Conservation of Mass in Closed and Open Systems	In this lesson, we will investigate how mass is conserved in closed systems and explore why it may appear to change in open systems. By conducting experiments, we will relate our observations to the Law of Conservation of Mass.	- Describe the difference between closed and open systems in chemical reactions - Conduct experiments to investigate the conservation of mass in closed and open systems - Record and analyse data from experiments to demonstrate mass conservation - Explain why mass may appear to change in an open system
Represent chemical reactions, by predicting products and writing word and balanced chemical equations with states, as they are encountered	Balancing Chemical Equations and the Law of Conservation of Mass	Chemical equations represent the rearrangement of atoms during reactions. In this lesson, we will learn to write and balance chemical equations, explain why balancing is necessary, and connect it to the Law of Conservation of Mass.	- Write word and symbolic equations to represent chemical reactions - Predict products of simple chemical reactions - Balance chemical equations to satisfy the Law of Conservation of Mass - Explain the rationale for balancing equations with reference to atom conservation
Determine the features of reactions by conducting synthesis, decomposition, displacement and neutralisation reactions	Investigation: Features of Chemical Reactions	Chemical reactions can be classified into different types, including synthesis, decomposition, displacement, and neutralisation. In this lesson, we will conduct experiments to investigate the features of these reaction types and understand their characteristics.	- Define synthesis, decomposition, displacement, and neutralisation reactions - Conduct experiments to observe the features of each reaction type - Record and analyse observations from the experiments - Identify the products of each reaction and classify them accordingly
Identify pH as the measure of acidity and compare the pH of a range of common substances to the pH of pure water	Understanding pH	pH is a measure of how acidic or basic a substance is. In this lesson, we will learn to identify pH as a scale of acidity and alkalinity, and compare the pH of common substances to the neutral pH of pure water.	- Define pH as a measure of acidity or alkalinity - Identify pure water as having a neutral pH of 7 - Compare the pH of a range of common substances - Classify substances as acidic, basic, or neutral based on their pH

Use pH indicators or meters to measure the pH change of neutralisation reactions	Investigation: Measuring the pH of Substances	pH is a measure of how acidic or basic a substance is. In this lesson, we will learn to identify pH as a scale of acidity and alkalinity, and compare the pH of common substances to the neutral pH of pure water.	- Define pH as a measure of acidity or alkalinity - Identify pure water as having a neutral pH of 7 - Compare the pH of a range of common substances - Classify substances as acidic, basic, or neutral based on their pH
Extension	Why Are Most Elements Not Found in Their Elemental State?	Most elements are not found in their pure elemental state in nature due to their chemical properties. In this lesson, we will explore why this is the case and investigate the processes used to obtain pure elements from compounds.	- Identify common elements and their natural forms in the environment - Explain why most elements are found as compounds rather than in their elemental state - Describe processes used to extract elements from compounds, such as electrolysis or smelting - Evaluate the challenges and importance of extracting elements for practical use
	Green Chemistry: Reducing Environmental Impact	Green chemistry focuses on minimising waste, reducing energy use, and implementing environmentally friendly processes. In this lesson, we will explore the principles of green chemistry and predict how their implementation can positively affect the environment.	- Define the principles of green chemistry - Explain how reducing waste and energy use benefits the environment - Predict the environmental impacts of using green chemistry principles - Evaluate the importance of green chemistry in sustainable practices
Types and Rates of Reactions			
Determine the features of reactions by conducting synthesis, decomposition, displacement and neutralisation reactions Determine the features of reactions by conducting synthesis, decomposition, displacement and neutralisation reactions	Types of Chemical Reactions: Synthesis, Decomposition, and Displacement	Chemical reactions can be classified into synthesis, decomposition, and displacement reactions. In this lesson, we will define these reaction types and represent them using molecular models, diagrams, and chemical equations.	- Define synthesis, decomposition, and displacement reactions - Represent synthesis, decomposition, and displacement reactions using molecular models, diagrams, and word equations - Write balanced chemical equations for synthesis, decomposition, and displacement reactions
	Classifying Reactions and Predicting Products	Chemical reactions can be classified into different types, each with predictable products. In this lesson, we will identify reaction types and use patterns to predict the products of various reactions.	- Identify the type of chemical reaction from a given equation or description - Predict the products of chemical reactions based on the reaction type - Classify reactions into based on a written chemical equation
	Investigation: Synthesis	Synthesis reactions involve combining reactants to form a single product. In this investigation, we will	- Conduct experiments to observe synthesis reactions - Record evidence of chemical changes during synthesis reactions

	Reactions	conduct experiments to observe and understand synthesis reactions.	- Explain the features of synthesis reactions using chemical equations
	Investigation: Decomposition Reactions	Decomposition reactions involve breaking a single reactant into two or more products. In this investigation, we will observe examples of decomposition reactions and analyse their products.	- Conduct experiments to observe decomposition reactions - Identify products of decomposition reactions using observations - Write word and balanced chemical equations for decomposition reactions
	Investigation: Displacement Reactions	Displacement reactions occur when a more reactive element replaces a less reactive one in a compound. In this investigation, we will explore displacement and neutralisation reactions.	- Conduct experiments to observe displacement and neutralisation reactions - Classify reactions as displacement or neutralisation based on their features - Predict the products of displacement reactions
	Investigation: Exothermic and Endothermic Reactions	Chemical reactions can release or absorb energy. In this investigation, we will explore how exothermic and endothermic reactions are applied in hot and cold packs.	- Define exothermic and endothermic reactions with examples - Conduct experiments to observe exothermic and endothermic reactions - Explain how hot and cold packs work based on the energy changes in these reactions - Evaluate the effectiveness of these reactions for real-worl applications
Investigate and explain how concentration, surface area, temperature and catalysts affect the rate of reactions	Investigation: Factors That Affect the Rate of Chemical Reactions	The rate of a chemical reaction can be affected by factors such as temperature, concentration, surface area, and catalysts. In this lesson, we will conduct experiments to observe and explain how these factors influence reaction rates.	- Identify the factors that affect the rate of chemical reactions. - Explain the relationship between each factor and the reaction rate based on experimental evidence - Create a graph to demonstrate the relationship between factors and rate of reaction
Conduct a practical investigation to test a measurable hypothesis, with a cause-and-effect relationship, that predicts changes to the rate of a chemical reaction, and graph data that communicates the investigation findings in a scientific report	Investigating Reaction Rates: Testing a Hypothesis	The rate of a chemical reaction can be influenced by factors such as temperature, concentration, surface area, or catalysts. In this investigation, we will design and conduct an experiment to test a hypothesis about how one factor affects reaction rates.	- Design a hypothesis to investigate the effect of a factor on the rate of a chemical reaction - Conduct an experiment to test the hypothesis using proper scientific methods - Create a graph to analyse the relationship between the factor and the reaction rate - Write a scientific report to communicate findings clearly
Extension	Chemical Reactions in First Nations	First Nations Australians have used chemical reactions to produce useful substances for thousands of years. In this lesson, we will investigate how reactions such	- Describe chemical reactions used by First Nations Australians. - Explain the processes and products of these reactions with reference to their practical uses.

	Australian Practices	as fermentation, pyrolysis, and calcination are employed to create materials like ethanol, charcoal, plaster, and pigments.	- Investigate examples of how these substances are made and applied in traditional practices. - Evaluate the scientific principles underlying these chemical reactions.
	Chemical Reactions and Indigenous Knowledge: Detoxifying Toxic Plants	For thousands of years, Aboriginal and Torres Strait Islander Peoples have used chemical reactions and innovative techniques to detoxify plants and make them safe to eat. In this lesson, we will explore the chemical processes and methods employed, such as increasing temperature and surface area, to convert toxic plants like cycad seeds into edible food products.	- Describe the chemical reactions and methods used by Aboriginal and Torres Strait Islander Peoples to detoxify plants. - Investigate the detoxification process of toxic plants through research or modelling. - Evaluate the scientific and cultural significance of these methods.
	Chemical Reactions for Useful Products	Chemical reactions are used to produce a wide range of products that benefit society. In this lesson, we will examine how these reactions create useful products, such as fuels, pharmaceuticals, and construction materials.	- Describe examples of chemical reactions that are used to produce useful products. - Explain the role of specific reactions in producing fuels, pharmaceuticals, and materials. - Outline the benefits and limitations of the chemical reactions used to produce them. - Discuss the importance of these reactions for industry and everyday life.
Nuclear Reactions			
Outline how the first elements were formed after the Big Bang	The Birth of Atoms and the Discovery of Subatomic Particles	In this lesson, we will be looking at the smallest particles on earth, the atom. We will learn about how they came about and also identify similarities and differences in the subatomic particles that make up elements.	- Outline how the first elements were formed after the Big Bang - Explain how electrons, protons and neutrons were discovered via experimental evidence - Compare the mass and charge of protons, neutrons and electons
Describe the conditions that cause a nucleus to be unstable	Understanding Isotopes and Nuclear Stability	Naturally occurring elements, under some ideal conditions can change their number of neutrons. These are called Isotopes and in this lesson, we will learn about what isotopes are and how they are formed.	- Define an isotope - Explain that differences in number of neutrons in atoms of the same element results in isotopes - Describe the conditions that cause a nucleus to be unstable. - Identify examples of stable and unstable isotopes
Represent alpha and beta reactions as nuclear reactions	Understanding Radioactive Decay and Nuclear	There are ways unstable isotopes can become stable, but in doing so, they release radiation. In this lesson, we will learn about three specific examples of isotopes and how as they decay they release radiation in order	- Define alpha, beta and gamma radiation - Describe the processes of alpha, beta, and gamma decay in simple terms - Describe how different unstable isotopes decay, specifically using

	Reactions	to become stable.	examples of radon-222; iodine-131 and cobalt-60 - Explain how alpha and beta reactions are nuclear reactions
Identify that the half-life of a radioactive isotope is the time taken for half of the atoms in a sample to undergo radioactive decay	Investigation: Modelling Half-Life	A half-life is the time taken for half of the atoms in a sample to undergo radioactive decay. In this lesson, we will investigate the half-lifes of carbon-14 and uranium-238 to gather data and find the half-life of these radioactive isotopes.	- Define the term "half-life" and describe its significance in radioactive decay - Describe the timescales of decay for isotopes like carbon-14 and uranium-238 - Model the concept of half-life through a first-hand investigation - Analyse the results of the investigation to understand radioactive decay patterns
Evaluate the societal benefits and considerations of using radioisotopes in medicine, industry and environmental monitoring	Applications of Radioactivity in Medicine and Industry	Although there are dangers in using radioisotopes, there are also benefits. In this lesson, we will learn about the societal benefits and considerations in using radioisotopes in medicine, industry and envrionmental monitoring.	- Identify uses of radioisotopes in medicine, industry and environment monitoring - Evaluate the benefits and disadvantages of using radioisotopes in society - Explain how radioactivity is monitored to ensure safety in its applications
Describe nuclear fission and nuclear fusion	Mass, Energy, and Nuclear Processes	Some countries use only nuclear energy! In this lesson, we will learn about how nuclear reactions work, including nuclear fission and fusion and outline potential impacts of using nuclear reactions.	- Describe nuclear fission and nuclear fusion - Discuss how mass and energy are connected in terms of atomic nuclei - Compare the energy released in fission and fusion reactions
Outline the impacts on the environment of nuclear reactions, including the raw materials used, the various stages of production and nuclear waste	Environmental Impacts of Nuclear Reactions	Nuclear reactions have significant impacts on the environment. In this lesson, we will explore how the raw materials, stages of production, and disposal of nuclear waste affect ecosystems and the broader environment.	- Identify the raw materials used in nuclear reactions and their environmental impacts - Describe the environmental effects of the various stages of nuclear production - Explain the challenges associated with nuclear waste management - Evaluate the overall environmental impact of nuclear reactions compared to other energy sources
Investigate a chemical or nuclear reaction used in industry to produce an important product	Industrial Reactions: Investigating Chemical and Nuclear Processes	Industrial processes often rely on chemical or nuclear reactions to produce essential products. In this lesson, we will investigate the role of these reactions in producing key materials and energy sources.	- Identify a chemical or nuclear reaction used in industry - Explain the process and its role in producing an important product - Investigate the benefits and challenges of the reaction in terms of efficiency, safety, and environmental impact

Extension	Exploring Dating Methods to Establish Australia's Ancient History	In this lesson, we will investigate how radicarbon and other dating methods have been used to establish that Aboriginal and Torres Strait Islander Peoples' have been on the Australian continent for more than 60,000 years.	- Describe radiocarbon and other dating methods - Outline evidence from dating methods that show Aborginal and/or Torres Strait Islander Peoples' have been on Australian continent for over 60,000 years - Discuss the importance of these dating methods in understanding human history - Explain how dating methods contribute to recognising and preserving cultural heritage
Waves and Motion			
SC5-WAM-01 - describes the features and applications of different forms of waves			
Common properties of waves, sound waves and light waves			
Use models to compare and describe the features of transverse and longitudinal waves	Comparing Transverse and Longitudinal Waves	Waves transfer energy in different ways. In this lesson, we'll use models to compare the features of transverse waves and longitudinal waves, and describe how each type of wave behaves in different scenarios.	- Identify the key components of transverse and longitudinal waves, such as crests, troughs, compressions, and rarefactions - Compare the similarities and differences between transverse and longitudinal waves - Describe real-world examples of each type of wave
Investigate the features of waves, including amplitude, frequency, speed and wavelength by exploring a range of wave types Use the formula wavelength = velocity / frequency to explain the relationship between a wave's frequency, speed and wavelength	Exploring the Features of Waves	Waves have unique properties such as amplitude, frequency, speed, and wavelength. In this lesson, we will explore these features using different wave types and learn how to calculate a wave's wavelength using the formula: Wavelength = Velocity / Frequency	- Identify the key features of waves, including amplitude, frequency, speed, and wavelength - Create a model of different types of waves to observe their properties - Use the formula Wavelength = Velocity / Frequency to calculate wavelength - Explain the relationship between a wave's frequency, speed, and wavelength using data and observations
Model the transfer of sound energy as compressions and rarefactions in waves	Investigation: How Does Sound Travel as Waves?	Sound energy travels in waves through a medium, such as air, liquids, or solids. In this lesson, we'll use slinky springs to model how sound travels as compressions and rarefactions, and explore the role of the medium in transferring sound.	- Identify sound as a form of energy that travels in longitudinal waves - Model the transfer of sound energy as compressions and rarefactions using a slinky spring - Describe how sound waves travel through different media (solids, liquids, gases) - Explain why sound requires a medium to transfer energy
Investigate and describe how	Investigation:	Sound waves have properties like amplitude and	- Identify that amplitude determines the volume (loudness) of

amplitude and frequency affect the pitch and volume of sound	How Do Amplitude and Frequency Affect the Pitch and Volume of Sound?	frequency that determine how loud or high-pitched a sound is. In this lesson, we'll investigate how the amplitude of a wave affects the volume of sound and how the frequency of a wave changes its pitch or tone.	sound, and frequency determines the pitch (high or low) - Model how amplitude and frequency affect sound waves using practical investigations - Describe the relationships between wave amplitude, frequency, pitch, and volume - Analyse data to explain changes in pitch and volume
Investigate and outline the impact of material selection on the transfer of sound energy in Aboriginal and/or Torres Strait Islander Peoples' traditional musical and communication instruments	How Does Material Selection Affect Sound in Aboriginal and Torres Strait Islander Instruments?	Aboriginal and Torres Strait Islander Peoples have used their knowledge of materials to create musical, hunting, and communication instruments that effectively transfer sound energy. In this lesson, we'll investigate how the choice of materials impacts the quality, volume, and type of sound produced by traditional instruments.	- Identify traditional musical, hunting, and communication instruments used by Aboriginal and Torres Strait Islander Peoples - Describe how materials influence the transfer of sound energy in these instruments - Compare the sound properties of different materials used in traditional instruments - Analyse the cultural significance of material selection for traditional practices
Describe how the ear responds to sound waves	How Does the Ear Respond to Sound Waves?	The human ear detects sound waves and converts them into electrical signals that the brain can interpret. In this lesson, we'll explore the structure of the ear, describe the process of hearing, and understand how sound waves are transformed into meaningful sounds.	- Identify the main structures of the ear and their functions - Describe the process of how the ear detects and responds to sound waves - Explain how sound waves are transformed into electrical signals - Create a model of the journey of sound through the ear using diagrams
Describe how sound waves are used in medical diagnosis	Using Sound Waves in Medical Diagnosis	Sound waves are a powerful tool in medical diagnosis. In this lesson, we'll explore how ultrasound technology uses sound waves to create images of the body and how these images are used by healthcare professionals to diagnose medical conditions.	- Describe how sound waves are used in medical imaging - Identify real-world applications of ultrasound in medical diagnosis - Explain how the properties of sound waves allow them to create images of internal structures
Investigate the Doppler effect of waves	Investigation: Doppler Effect	The Doppler Effect explains how the frequency and pitch of waves change when the source of the waves is moving relative to an observer. In this lesson, we'll investigate the Doppler Effect in sound and light waves and explore real-world applications like ambulance sirens and astronomy.	- Describe the Doppler Effect and how it affects sound and light waves - Explain how the frequency and pitch of waves change due to the motion of the source or observer - Apply the concept of the Doppler Effect to real-world examples, such as sirens or redshift in astronomy
Investigate the properties of light, including absorption, reflection, refraction and scattering	Wave and Particle Models	Light and other forms of electromagnetic radiation can be described using wave and particle models. In this lesson, we'll explore how these models explain the	- Describe the wave and particle models of energy transfer - Explain how the concept of photons is used to describe light as a particle

Investigate applications of absorption, reflection and refraction in everyday life		transfer of energy and how the concept of photons helps us understand the dual nature of light.	- Compare the usefulness of wave and particle models for understanding electromagnetic radiation
	Investigation: Reflection and Refraction	Light interacts with materials in various ways. In this lesson, we'll investigate the properties of absorption, reflection, refraction, and scattering, and understand how these properties explain the behaviour of light in different situations.	- Identify and describe the properties of light: absorption, reflection, refraction, and scattering - Investigate how light interacts with different materials through experiments - Explain real-world examples of light behaviour using these properties
	Investigation: Absorption and Scattering	Light behaves differently when it interacts with materials. In this lesson, we will conduct hands-on experiments to explore how absorption, reflection, and refraction are applied in everyday life, from sunglasses and mirrors to lenses and solar panels.	- Investigate how light behaves in absorption, reflection, and refraction experiments - Relate the results of the experiments to real-world applications of light behaviour - Describe how everyday objects use absorption, reflection, and refraction to function effectively - Analyse the advantages of these properties in practical applications
Describe how the eye responds to light	How Does the Eye Respond to Light?	The human eye detects light and converts it into signals that the brain can interpret as images. In this lesson, we will explore the structure of the eye, how it responds to light, and how the brain processes visual information.	- Identify the main parts of the eye and their functions - Describe how light enters the eye and is focused on the retina - Explain how light is converted into electrical signals and sent to the brain - Create a model of the process of vision
Demonstrate that a mechanical wave requires a medium to travel through, while an electromagnetic (EM) wave does not Use the wave model to explain how energy is transferred without the net transfer of particles	Comparing Mechanical and Electromagnetic Waves	Mechanical waves and electromagnetic (EM) waves transfer energy in different ways. In this lesson, we'll demonstrate how mechanical waves require a medium to travel, while electromagnetic waves do not, and use the wave model to explain how energy moves without transferring particles.	- Demonstrate how mechanical waves require a medium to travel - Explain why electromagnetic waves can travel through a vacuum - Model the transfer of energy in waves without the net transfer of particles - Compare the properties of mechanical and electromagnetic waves
Compare the different wave forms of the electromagnetic spectrum Analyse data from secondary sources to compare the uses of	Applications of Electromagnetic Radiation	The properties of electromagnetic radiation determine how it is used in various technologies. In this lesson, we'll examine the different waveforms of the electromagnetic spectrum, compare their properties, and explore their applications in modern	- Identify the different types of electromagnetic waves and their properties - Compare how the properties of electromagnetic waves influence their uses - Analyse data to evaluate the advantages and limitations of

different EM waves based on their properties		communication, medicine, and more.	different EM waves in specific applications - Explain how electromagnetic waves are applied in technologies such as radar, medicine, sanitation, and communication
Explain how the electromagnetic spectrum is used to learn about stars	Using the Electromagnetic Spectrum to Learn About Stars	The electromagnetic spectrum helps us understand the composition, temperature, motion, and age of stars. In this lesson, we will explore how astronomers use different types of electromagnetic waves to gather information about stars and their behaviour.	- Identify the different parts of the electromagnetic spectrum and their uses in astronomy - Describe how visible light, infrared, ultraviolet, and other waves reveal information about stars - Explain how spectra are used to determine the composition and movement of stars - Explain how the Doppler effect helps astronomers study the motion of stars
Motion			
SC5-WAM-02 - explains the motion of objects using Newton's laws of motion			
	An Introduction to Motion: Newton's Three Laws	Newton's three laws of motion form the foundation of our understanding of how objects move and interact. In this lesson, we will explore these laws and how they apply to everyday situations to set the stage for our study of motion.	- Describe Newton's three laws of motion and their significance - Identify examples of Newton's laws in real-world scenarios - Explain how Newton's laws apply to simple systems
Use mathematical representations, including graphs and the algebraic formulas , and , to quantitatively relate force, distance, time, speed, displacement, acceleration, velocity and mass	Skills Lesson: Solving Problems with Formulas	Mathematical formulas help us quantify the relationships between force, speed, acceleration, and mass. In this lesson, we will use algebraic equations to calculate motion parameters and understand their interactions.	- Identify the relevant formulas to solve problems involving force, speed, acceleration, and mass - Calculate values for force, speed, acceleration, and mass using mathematical formulas - Interpret the results of calculations to explain physical scenarios - Evaluate solutions for accuracy and reasonableness
	Skills Lesson: Understanding Motion Through Graphs	Graphs visually represent the relationships between motion variables, such as speed, distance, time, and acceleration. In this lesson, we will construct and interpret motion graphs to analyse motion data.	- Construct motion graphs, including displacement-time, velocity-time, and acceleration-time graphs - Interpret motion graphs to describe motion relationships - Calculate motion parameters, such as acceleration, from graphs - Evaluate graphical data to explain real-world motion scenarios
Conduct an investigation to analyse the relationships between distance, time, speed, displacement and velocity	Investigation: Newton's First Law	Objects do not change their motion unless acted upon by an external force. This principle, known as inertia, is the foundation of Newton's First Law. In this investigation, we will explore how an object at rest or	- Investigate inertia using an experiment and record observations - Use model diagrapms to represent the motion of an object before and after an external force is applied - Explain how unbalanced forces are necessary to change the

Conduct investigations to analyse the relationship between distance, time and speed, and draw and analyse a line graph of the results Investigate the motion of objects and represent them using motion diagrams		in motion resists changes in its state. We will analyse and represent our observations using motion diagrams to better understand the forces involved.	motion of an object
	Investigation: Newton's Second Law	An object's acceleration depends on the force applied and its mass. This relationship is described by Newton's Second Law of Motion. In this investigation, we will collect data to analyse how changes in force or mass affect acceleration. We will use mathematical calculations, including algebraic formulas and graphs, to represent these relationships.	- Measure and record time, distance, and speed to calculate acceleration - Use the equation F=ma to determine relationships between force, mass, and acceleration - Construct and interpret line graphs to analyze trends in motion data - Explain how increasing or decreasing force or mass affects acceleration
	Investigation: Newton's Third Law	For every action, there is an equal and opposite reaction. Newton's Third Law explains how forces always act in pairs. In this investigation, we will explore how action-reaction force pairs influence motion. We will analyse data on displacement, velocity, and force interactions to understand how these principles apply to real-world scenarios like rockets and propulsion.	- Identify action-reaction force pairs and describe their effects on motion - Conduct an experiment to observe action-reaction forces in a controlled setup - Analyse and compare displacement and velocity across different trials - Apply Newton's Third Law to real-world examples, such as rockets and propulsion systems
Determine, using vector analysis, the net force on an object in one dimension	Vector Analysis: Calculating Net Force in One Dimension	Understanding the net force acting on an object is key to predicting its motion. In this lesson, we will use vector analysis to determine the net force on an object moving in one dimension.	- Define force as a vector quantity with both magnitude and direction - Illustrate forces acting on an object using vector diagrams - Calculate the net force on an object moving in one dimension using vector addition - Apply the concept of net force to predict the object's motion
Investigate applications of Newton's laws of motion	The Physics of Vehicle Safety Features	Vehicle safety features are designed to reduce the effects of forces during collisions. In this lesson, we will learn how seatbelts, airbags, and crumple zones use physics principles, including Newton's laws of motion, to protect passengers.	- Describe how seatbelts, airbags, and crumple zones work to minimise injury - Explain the connection between safety features and Newton's laws of motion - Identify the role of force, acceleration, and energy absorption in collision safety
	Investigation: Modelling Safety Features in	Safety features like seatbelts, airbags, and crumple zones are crucial for passenger safety. In this lesson, we will model and test these features to observe how	- Construct models of seatbelts, airbags, and crumple zones - Test how these safety features reduce impact forces during a simulated crash

	Vehicles	they reduce forces during collisions.	- Analyse the effectiveness of each feature in protecting a passenger - Explain the results using Newton's laws of motion
	Supporting Lower Speed Limits	Speed affects the forces involved in vehicle collisions, particularly near schools and in urban environments. In this lesson, we will analyse data on speed, force, and stopping distances to construct an argument supporting lower speed limits for vehicles in these areas.	- Interpret data on speed, stopping distances, and collision forces - Explain the relationship between speed, force, and stopping distance using Newton's laws of motion - Construct a persuasive argument, supported by data, for implementing lower speed limits near schools or for trucks in urban environments
	Newton's Laws and Driverless Vehicles	Driverless vehicles rely on Newton's laws of motion to ensure safe and timely braking. In this lesson, we will investigate how these laws are applied in the design and function of autonomous braking systems.	- Describe how Newton's laws of motion are used to understand braking in vehicles - Explain the role of force, mass, and acceleration in calculating stopping distances - Investigate how driverless vehicles use sensors and algorithms to apply these principles for timely braking - Evaluate the effectiveness of autonomous braking systems in enhancing road safety
	Newton's Laws in Sport: Improving Performance and Safety	Newton's laws of motion play a crucial role in sports by improving athletic performance and safety. In this lesson, we will investigate how these laws are applied in various sports and examine their impact on athletes' techniques and equipment.	- Describe how Newton's laws of motion are demonstrated in different sports - Analyse the role of force, mass, and acceleration in athletic performance - Investigate how athletes and equipment use Newton's laws to enhance safety and performance - Explain how scientific understanding improves sports strategies and technology
	The Physics of Spearthrowers and Bows	Newton's laws of motion explain how force, mass, and acceleration influence motion. In this lesson, we will investigate how Aboriginal and Torres Strait Islander Peoples used spearthrowers and bows to increase speed and impact force, demonstrating these physical principles.	- Describe how spearthrowers and bows increase speed and impact force using Newton's laws of motion - Investigate how changes in force and mass affect acceleration and velocity - Evaluate the scientific ingenuity of Aboriginal and Torres Strait Islander Peoples in designing these tools

Data Science 2			
SC5-DA2-01 - assesses the use of scientific knowledge and data in evidence-based decisions and when verifying the legitimacy of claims			
Discuss the features of investigable and non-investigable questions, including considerations of available resources	Questioning Science: What Can We Investigate?	Asking the right questions is the first step in any scientific investigation. In this lesson, we will explore the features of investigable and non-investigable questions and consider how available resources impact what can be tested in science.	- Define investigable and non-investigable questions - Identify features that make a question investigable - Evaluate scientific questions based on available resources - Construct your own investigable questions from non-investigable ones
Investigate how scientific knowledge is verified and refined by scientists through hypothesis testing and peer review	Proof or Puff? How Science Tests Itself	Scientific knowledge isn't accepted until it's been tested and critiqued. In this lesson, we will investigate how scientists verify and refine their ideas through hypothesis testing and peer review, ensuring research is accurate and reliable.	- Define hypothesis testing and peer review in scientific research - Describe how scientists use these methods to verify and refine knowledge - Explain the importance of peer review in maintaining scientific integrity - Evaluate examples of how hypothesis testing and peer review have shaped scientific understanding
Investigate how scientific knowledge is verified and refined by scientists through hypothesis testing and peer review	Peer Review in Action: The Science Behind Vaccines	Peer review is essential in ensuring scientific research is accurate, reliable, and safe—especially in fields like medicine. In this lesson, we will explore how peer review has played a critical role in the development and approval of vaccines, ensuring they are safe and effective before reaching the public.	- Describe the peer review process used in vaccine development - Explain how peer review ensures the safety and effectiveness of vaccines - Evaluate the impact of peer review on public trust in vaccines
Develop criteria and use them to evaluate whether online content is valid and reliable	Fact or Fiction? Evaluating Online Science Content	Not everything you read online is true, especially when it comes to science. In this lesson, we will develop criteria to evaluate whether online content is valid and reliable, helping you separate trustworthy information from misinformation.	- Identify key features of valid and reliable online science content - Describe criteria used to evaluate the credibility of sources - Apply evaluation criteria to assess examples of online science content - Justify decisions about whether specific content is valid and reliable

Explain the distinction between science and pseudoscience using examples Investigate incidences of pseudoscience in popular media Determine if an assertion of a claim or theory is pseudoscientific	Science or Pseudoscience? Spotting the Difference	Not all claims that sound scientific are based on real science. In this lesson, we will explore the difference between science and pseudoscience, investigate examples in popular media, and learn how to identify pseudoscientific claims.	- Define science and pseudoscience, highlighting their key differences - Identify examples of pseudoscience in popular media. - Explain why certain claims are considered pseudoscientific - Evaluate whether a claim or theory is pseudoscientific using clear criteria
Conduct a written scientific argument showing how a range of evidence supports a claim	Making Your Case: Writing Scientific Arguments	In science, it's not enough to have evidence—you need to build a convincing argument. In this lesson, we will learn how to construct a written scientific argument that uses a range of evidence to support a claim clearly and logically.	- Identify key components of a strong scientific argument - Select relevant evidence to support a scientific claim - Construct a written scientific argument using evidence and logical reasoning - Evaluate the strength of an argument based on the quality of evidence and reasoning
Conduct a univariate analysis and a bivariate analysis using large datasets	Data Detectives: Analysing Non-Infectious Diseases in Australia	Data plays a crucial role in understanding health trends. In this lesson, we will conduct univariate and bivariate analyses of large datasets to explore patterns and relationships related to non-infectious diseases in Australia.	- Define univariate and bivariate analysis and explain their purposes - Conduct a univariate analysis on a large dataset related to non-infectious diseases - Perform a bivariate analysis to explore relationships between variables - Interpret findings to draw conclusions about non-infectious disease trends in Australia
Conduct a descriptive analysis of a large dataset Explore the role of large datasets and statistical analysis in validating scientific	The Power of Numbers: Using Data to Validate Science	Large datasets are essential for revealing trends and supporting scientific discoveries. In this lesson, we will conduct a descriptive analysis of a large dataset and explore how statistical analysis helps validate scientific findings.	- Conduct a descriptive analysis of a large dataset to identify key patterns and trends - Summarise data using statistical measures such as mean, median, mode, and range - Explain how large datasets and statistical analysis support and validate scientific research

findings			- Evaluate the reliability of scientific findings based on data analysis
Investigate how data, or its analysis and interpretation, can be distorted to manipulate findings that support specific viewpoints	Data Deception: How Numbers Can Lie	Data should help us understand the world, but it can be manipulated to mislead. In this lesson, we will investigate how data, or its analysis and interpretation, can be distorted to support specific viewpoints and explore strategies for identifying misleading data.	- Identify common ways data can be distorted or misrepresented - Analyse examples of misleading data presentations in graphs, statistics, or reports - Explain how data manipulation can influence public opinion and decision-making - Evaluate data sources to determine their reliability and integrity
Recognise the difference between causal and correlational relationships	Cause or Coincidence? Understanding Causation and Correlation	Not all connections between events mean one caused the other. In this lesson, we will explore the difference between causal and correlational relationships and learn how to identify when data shows a true cause-and-effect link or just a coincidence.	- Define causal and correlational relationships with examples - Identify examples of correlation that do not imply causation - Explain how to determine if a relationship is causal or correlational - Evaluate real-world examples to decide whether a causal link exists