Government of Western Australia
School Curriculum and Standards Authority

Year levels: 3, 4 and 5 | Learning area: Science – Chemical sciences

Plan for the primary years

Prior knowledge	Phases of schooling	Context
Diagnostic assessment (if required): Y-chart identifying examples of gases, solids and liquids and any properties they know. Display a picture of a familiar object (such as a window) and students describe the materials used and where they came from. Students have engaged in the teaching and learning of properties and changes to materials in Pre-primary to Year 2 Science. Students are familiar with the investigative process and have been using the same template planner across all years via a gradual release of responsibility.	In the middle to late childhood phase of schooling, students develop a sense of self, their world expands, and they begin to see themselves as members of larger communities. Learning experiences emphasise and lead to an appreciation of both the commonality and diversity of human experience and concerns. Science provides opportunities for students to explore their physical, social, cultural and technological surroundings. As students develop the ability to work collaboratively, they work with others to plan and make decisions in constructing knowledge.	Three year levels get Science instruction in a general classroom. The students present with a range of abilities, varying from those requiring support to some requiring extension. Skills from the Science inquiry sub-strand are integrated into all Science learning experiences.

Year 3 content	← Year 3 – Year 4 conceptual links →	Year 4 content	← Year 4 – Year 5 conceptual links →	Year 5 content

Science understanding
• Chemical sciences
  ▪ The observable properties of solids and liquids and how adding or removing heat leads to a change of state
Science inquiry
• Entire strand covered through investigations and practicals
	• Properties
	• Materials can be changed by processing or change of state
	• The role of heat in changing materials
	• Science inquiry
		Science understanding
		• Chemical sciences
		  ▪ Processed materials, including fibres, metals, glass and plastics, are made from raw materials, such as wool, ores, sand and oil, and have a range of physical properties that influence their use
		Science inquiry
		• Entire strand covered through investigations and practicals
			• Properties
			• States of matter changing properties of materials
			• Change of properties or state of matter changing the use of a material
			• Science inquiry
				Science understanding
				• Chemical sciences
				  ▪ The observable properties of solids, liquids and gases can be explained by the motion and arrangement of atoms and molecules (particles)
				Science inquiry
				• Entire strand covered through investigations and practicals

Teach

Common understandings

Some suggested common understandings that could be applied across year groups for teaching

Common vocabulary:	Common skills:	Common concepts:
• properties, physical, observable, changes, heat, solid, liquid, gas, molecules, atoms, particles, states of matter, processing, melting, freezing, evaporating • questioning, predicting, conducting, safety risks, fair test, data, results	• Questioning and predicting: Making reasonable questions and predictions, identifying variables in an investigation • Planning and conducting: Follows a set of steps to complete an investigation safely (Year 5 students will start developing methods independently) • Processing, modelling and analysing: records data in tables, tables provided to Year 3 students and some students in Years 4 and 5 to begin developing on their own. Column graphs for all • Evaluating: evaluate the fairness of their investigation, compare results to prediction, identify ways to improve • Communicating: using appropriate scientific vocabulary and a variety of texts	• Changes to materials and substances by changing the state of matter, processing from a raw material.

Suggested learning experiences

Learning experiences that provide a cumulative progression of knowledge and skills

beginning activities → **extension activities**

• Sort objects into solid/liquid/gas. • Match raw to processed materials. • Identify raw and processed materials in the school environment.	• Investigation: How adding or removing heat changes common substances (e.g. chocolate, ice, water, juice). • Research the role of states of matter in the processing of familiar objects such as glass. • Modelling (using concrete materials or diagrams) the layout of molecules in solids, liquids and gases. • Create a flow chart on the process of recycling aluminium cans, identifying where heat is used in the process and a change of state occurs. • Investigation: Combining differing amounts of bicarbonate soda with vinegar to measure the amount of carbon dioxide gas produced. • Practical: Research the combination of liquids and solids to make waterproof materials and make their own using beeswax and fabric. • My outfit: Students design, draw and label the perfect outfit for different situations such as going to the beach, walking in the rain or going to space. Students add a detailed explanation of material choices including any raw and processed materials, and the properties of the material that makes it fit for purpose. • Explore how Aboriginal and Torres Strait Islander peoples use changing states of matter to process materials for use, such as for tools, decoration and transport.	• Investigate and make bioplastic, comparing different methods to identify the best result. • Research and produce a timeline of the introduction of plastic in the production of fabrics. Include an explanation of the process of a plastic fabric production (e.g. nylon) and identification of changes in states of matter. • Research and explain the use of local flora and fauna by Aboriginal and Torres Strait Islander peoples to suit a purpose. Create a flow chart to detail the changes the material went through to be fit for purpose, for example, melting resin and letting it solidify to act as a glue. • Identify changes to the way Aboriginal and Torres Strait Islander peoples process materials for their use. For example, use of a camp fire to heat and melt solids, as opposed to a portable stovetop in modern times.

Assess

Consider the learning experiences and identify the points of assessment for each year level (against the year level Achievement standard)

Assessment ideas for Year 3	Assessment ideas for Year 4	Assessment ideas for Year 5
• Formative: Understandings demonstrated during investigations, can describe how adding or removing heat changes the state of matter in an investigation of familiar substances such as ice or chocolate. • Summative: Given a visual example such as cooking pancake batter, students describe the change of state of matter and the role of heat and how they know a change of state has occurred. • Formative and summative: Inquiry skills, based on investigations.	• Formative: Understandings demonstrated during investigations, makes connections between observable properties of materials and their uses by designing a toy that uses natural materials such as wood, cotton, bamboo. • Summative: Given some raw materials, students identify the appropriate processed material. With some familiar objects, students identify the materials they are composed of, the raw material they came from and the properties of the material that make it fit for purpose. • Formative and summative: Inquiry skills, based on investigations.	• Formative: Understandings demonstrated during investigations, uses scientific vocabulary to describe the behaviour and properties of each state of matter in the bicarbonate of soda, vinegar and carbon dioxide reaction. • Summative: Students produce a model (physical or diagram) of the arrangement of molecules in solids, liquids and gases. Identify the observable properties of each state of matter. • Formative and summative: Inquiry skills, based on investigations.
Relevant statements from the Year 3 Achievement standard	**Relevant statements from the Year 4 Achievement standard**	**Relevant statements from the Year 5 Achievement standard**
Students recall the observable properties of solids and liquids and understand that a change of state in a substance results from adding or removing heat. Students explore science ideas by posing guided questions about the effect on one variable of changing another. They make predictions, with assistance, and test them by planning and conducting safe investigations that account for variables to be kept the same. They make and record observations with some familiar scaled instruments, such as thermometers. They organise data using tables, column graphs or models. With support, they communicate findings using familiar scientific vocabulary. Students use science knowledge to propose explanations for observed phenomena and simple solutions to problems.	Students connect raw materials to the processed materials that are made from them and relate the use of materials to their observable properties. Students explore science ideas by posing questions, with guidance, that include variables to measure and change. They make predictions based on observations and test them by planning and conducting scaffolded investigations. They make and record observations in a variety of ways and using a diversity of scaled instruments. They organise and represent data in tables, column graphs and models to identify patterns. They communicate findings using scientific vocabulary in correct contexts. Students use science knowledge to propose explanations for observed phenomena and solutions to problems.	Students describe and compare the observable properties and behaviour of solids, liquids and gases, and relate this to the arrangement of atoms and molecules (particles). Students pose testable questions that include variables to be changed and measured. They apply science knowledge to make predictions and, with guidance, plan and conduct safe, fair investigations to test them. Students use a variety of equipment to observe, measure and record data that they organise using tables, graphs and models to identify the relationship between variables, including using line graphs to represent continuous data. Students compare their methodology with others to determine whether investigations were fair and identify ways to improve their process. They communicate their investigation procedure, data and results in various ways. Students use science knowledge to develop considered responses to problems, at a local level, through investigation and research.

Make curriculum links to other learning areas

Consider the authentic connections that can be made across learning areas to develop connected programs

English: communicating scientific ideas and understandings verbally, in a written format or using digital technologies. Possible activities: Writing a scientific report, information report, displaying processing of materials in a visual format, investigating layouts of non-fiction texts.

Mathematics: measuring results and collecting numerical data. Possible activities: constructing bar graphs (line graphs if appropriate for Year 5).

Humanities and Social Sciences: the Humanities and Social Sciences skills relate directly to the Science inquiry strand explored in these lessons. Possible activities: exploring processing and manufacturing that occurs within Australia and the economic, societal and environmental impact.

Technologies: Design Technologies – exploring the Food and fibre, and Materials and technologies specialisations strands that have direct connections with the properties of materials, and use of states of matter in processing. The Design thinking skills strands could also be explored through common skills with the Science inquiry skills. Possible activities: identifying a problem in the process of material manufacturing (local to area) and designing a solution. For example, a more efficient way to transport iron ore.

Cross-curriculum Priority: Aboriginal and Torres Strait Islander histories and cultures – activities outlined in the suggested learning experiences to support understanding of Aboriginal and Torres Strait Islander peoples' scientific knowledge and its applications.