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| Previous level’s achievement standard as a starting point of comparison Previous level’s achievement standard as a starting point of comparison **CURRICULUM AREA - SCIENCE**  |
| **VCAA EXAMPLE – How can sound become music?** **Context:**Students self-select to construct a wind, percussion or string instrument from household materials. They work in a ‘wind’, ‘percussion’ or ‘string’ group to test materials and the sounds they produce, share ideas, and provide comments about each other’s findings. Stimulus questions may be used to prompt student inquiry: How is sound produced? How can sound be described? What factors affect the quality or characteristics of sound? How does the way that you hit/pluck/blow on an object change the sound that is produced? How can senses other than hearing be used to consider the quality or characteristics of sound? Students may be further supported to develop skills in formulating questions by being provided with question stems such as, ‘What will happen if…?’ and ‘Is there another way to…?” The teaching and learning plan focuses primarily on students using their senses to explore the world around them and the development of collaboration and communication skills.**Content Descriptions:****Science Understanding*** People use science in their daily lives [(VCSSU041)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU041)
* Objects are made of materials that have observable properties [(VCSSU044)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU044)
* Everyday materials can be physically changed or combined with other materials in a variety of ways for particular purposes [(VCSSU045)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU045)
* Light and sound are produced by a range of sources and can be sensed [(VCSSU049)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU049)

**Science Inquiry Skills*** Respond to and pose questions, and make predictions about familiar objects and events [(VCSIS050)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS050)
* Participate in guided investigations, including making observations using the senses, to explore and answer questions [(VCSIS051)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS051)
* Use a range of methods, including drawings and provided tables, to sort information [(VCSIS053)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS053)
* Represent and communicate observations and ideas about changes in objects and events in a variety of ways [(VCSIS055)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS055)
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|  | **Example of Indicative Progress toward Level 2 Achievement Standard** | **Science Level 2 Achievement Standard** |
| In **Science**, indicative progression towards the Level 2 achievement standard may be when students:* give examples of how music can be produced in different ways, but are not yet able to explain how science is involved in improving the quality or characteristics of sound.
* trial and use different materials to construct a musical instrument, but are not yet able to make reasoned decisions about the most suitable material that will produce a specific quality or characteristic of sound.
* list some ways in which sound can be produced, but are not yet able to identify how senses other than hearing can be utilised to explore the quality or characteristics of sound.
* respond to provided questions about their selection of materials for the construction of their musical instrument, but are not yet able to pose their own questions that explore the relationship between material properties and the production of sound.
* classify tested materials as being ‘useful’ or ‘non-useful’ when considering materials for the construction of their musical instruments, but are not yet able to justify their classifications of tested materials or to respond to questions from their peers about their classification criteria.
 | By the end of Level 2:Students describe examples of how people use science in their daily lives. They identify and describe examples of the external features and basic needs of living things. They describe how different places meet the needs of living things. They describe the properties, behaviour, uses and the effects of interacting with familiar materials and objects. They discuss how light and sound can be produced and sensed. They identify and describe the changes to objects, materials, resources, living things and things in their local environment. They suggest how the environment affects them and other living things. Students pose and respond to questions about familiar objects and events and predict outcomes of investigations. They use their senses to explore the world around them and record informal measurements to make and compare observations. They record, sort and represent their observations and communicate their ideas to others.  |

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| Previous level’s achievement standard as a starting point of comparison Previous level’s achievement standard as a starting point of comparison **CURRICULUM AREA - SCIENCE** |
| **VCAA EXAMPLE – How are magnets affected by heat?** **Context:** Students investigate the effect of heat on magnets. They use a range of magnets (temporary, permanent, electromagnets) to determine which materials are magnetic, including using bar magnets to show attraction and repulsion and using electromagnets to illustrate magnetic effects associated with electric circuits. Stimulus questions may be used to prompt student inquiry: What is a ‘fair test’? How will you make your test ‘fair’? Why was an experiment with the magnets conducted at room temperature first? Students may be further supported to develop skills in scientific investigation by being introduced to scientific hypothesis frameworks such as, ‘If (something is done), then (something else will happen).’ The teaching and learning plan focuses primarily on an understanding of what constitutes a ‘fair test’ in science and the development of science inquiry skills. **Content Descriptions:****Science Understanding*** Science knowledge helps people to understand the effects of their actions ([VCSSU056](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU056))
* A change of state between solid and liquid can be caused by adding or removing heat [(VCSSU059)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU059)
* Natural and processed materials have a range of physical properties; these properties can influence their use [(VCSSU060)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU060)

**Science Inquiry Skills*** With guidance, identify questions in familiar contexts that can be investigated scientifically and predict what might happen based on prior knowledge [(VCSIS065)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS065)
* Suggest ways to plan and conduct investigations to find answers to questions including consideration of the elements of fair tests [(VCSIS066)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS066)
* Use a range of methods including tables and column graphs to represent data and to identify patterns and trends [(VCSIS069)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS069)
* Reflect on an investigation, including whether a test was fair or not [(VCSIS071)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS071)
* Represent and communicate observations, ideas and findings to show patterns and relationships using formal and informal scientific language [(VCSIS072)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS072)
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| **Science Level 2 Achievement Standard**  | **Example of Indicative Progress toward Level 4 Achievement Standard** | **Science Level 4 Achievement Standard** |
| By the end of Level 2:Students describe examples of how people use science in their daily lives. They identify and describe examples of the external features and basic needs of living things. They describe how different places meet the needs of living things. They describe the properties, behaviour, uses and the effects of interacting with familiar materials and objects. They discuss how light and sound can be produced and sensed. They identify and describe the changes to objects, materials, resources, living things and things in their local environment. They suggest how the environment affects them and other living things. Students pose and respond to questions about familiar objects and events and predict outcomes of investigations. They use their senses to explore the world around them and record informal measurements to make and compare observations. They record, sort and represent their observations and communicate their ideas to others. | In **Science**, indicative progression towards the Level 4 achievement standard may be when students:* provide examples of different types of magnets that are used in the home (for example, fridge magnets are permanent magnets and electronic devices contain electromagnets) but are not yet able to identify situations in which permanent magnets may be an advantage over electromagnets.
* recognise that magnets are able to attract some materials and not others, but are not yet able to identify that magnets can attract and repel through mediums other than air.
* recognise that the counting of paper clips is related to the strength of a magnet, but are not yet able to use the results of their investigation to answer the question ‘How does heat affect magnets?’.
* outline alternative ways to conduct an investigation, but are not yet able to determine which alternative may be ‘fairer’.
* complete provided tables to record the numbers of paper clips than can be picked up by magnets at different temperatures, but are not yet able to describe general trends in data that summarise how magnets behave at different temperatures.
* use formal language when describing their investigations (for example, referring to ‘permanent magnets’, ‘temporary magnets’ and electromagnets’, but are not yet able to describe interactions in terms of the strength of magnetic forces.
 | By the end of Level 4:Students describe situations where science understanding can influence their own and others’ actions. They explain the effects of Earth’s rotation on its axis. They distinguish between temperature and heat and use examples to illustrate how heat is produced and transferred. They explain how heat is involved in changes of state between solid and liquid. They link the physical properties of materials to their use. They discuss how natural and human processes cause changes to Earth’s surface.They use contact and non-contact forces to describe interactions between objects. They group living things based on observable features and distinguish them from non-living things. They describe relationships that assist the survival of living things. They compare the key stages in the life cycle of a plant and an animal and relate life cycles to growth and survival. Students describe how they use science investigations to identify patterns and relationships and to respond to questions. They follow instructions to identify questions that they can investigate about familiar contexts and make predictions based on prior knowledge. They discuss ways to conduct investigations and suggest why a test was fair or not. They safely use equipment to make and record formal measurements and observations. They use provided tables and column graphs to organise and identify patterns and trends in data. Students suggest explanations for observations and compare their findings with their predictions. They use formal and informal scientific language to communicate their observations, methods and findings. |

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| Previous level’s achievement standard as a starting point of comparison Previous level’s achievement standard as a starting point of comparison **CURRICULUM AREA - SCIENCE** |
| **VCAA EXAMPLE – What adaptations would humans need to survive on another planet?** **Context:**Students explore the possibilities of human life on other planets. They undertake research from a variety of sources to collect, summarise and compare secondary data related to the physical conditions on Earth and a selected planet in the Solar System. Stimulus questions may be used to prompt student inquiry: What structural features help humans to survive on Earth? Which behaviours help humans survive on Earth in different weather conditions? How do the conditions on Earth differ from those on your selected planet? In what ways could our structural features and behaviours be an advantage/disadvantage when considering adjusting to conditions on your selected planet? Are two legs and two arms the ideal number of limbs when designing for life on another planet? The teaching and learning plan focuses primarily on generating and justifying creative solutions in an interdisciplinary problem-solving context related to astrobiology.**Content Descriptions:****Science Understanding*** Scientific understandings, discoveries and inventions are used to inform personal and community decisions and to solve problems that directly affect people’s lives [(VCSSU073)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU073)
* The growth and survival of living things are affected by the physical conditions of their environment [(VCSSU075)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU075)
* Earth is part of a system of planets orbiting around a star (the Sun) [(VCSSU078)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU078)

**Science Inquiry Skills*** With guidance, pose questions to clarify practical problems or inform a scientific investigation, and predict what the findings of an investigation might be based on previous experiences or general rules [(VCSIS082)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS082)
* With guidance, plan appropriate investigation types to answer questions or solve problems and use equipment, technologies and materials safely, identifying potential risks [(VCSIS083)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS083)
* Construct and use a range of representations, including tables and graphs, to record, represent and describe observations, patterns or relationships in data [(VCSIS085)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS085)
* Compare data with predictions and use as evidence in developing explanations [(VCSIS086)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS086)
* Suggest improvements to the methods used to investigate a question or solve a problem [(VCSIS087)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS087)
* Communicate ideas and processes using evidence to develop explanations of events and phenomena and to identify simple cause-and-effect relationships [(VCSIS088)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS088)
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| **Science Level 4 Achievement Standard**  | **Example of Indicative Progress toward Level 6 Achievement Standard** | **Science Level 6 Achievement Standard** |
| By the end of Level 4:Students describe situations where science understanding can influence their own and others’ actions. They explain the effects of Earth’s rotation on its axis. They distinguish between temperature and heat and use examples to illustrate how heat is produced and transferred. They explain how heat is involved in changes of state between solid and liquid. They link the physical properties of materials to their use. They discuss how natural and human processes cause changes to Earth’s surface. They use contact and non-contact forces to describe interactions between objects. They group living things based on observable features and distinguish them from non-living things. They describe relationships that assist the survival of living things. They compare the key stages in the life cycle of a plant and an animal and relate life cycles to growth and survival. Students describe how they use science investigations to identify patterns and relationships and to respond to questions. They follow instructions to identify questions that they can investigate about familiar contexts and make predictions based on prior knowledge. They discuss ways to conduct investigations and suggest why a test was fair or not. They safely use equipment to make and record formal measurements and observations. They use provided tables and column graphs to organise and identify patterns and trends in data.Students suggest explanations for observations and compare their findings with their predictions. They use formal and informal scientific language to communicate their observations, methods and findings. | In **Science**, indicative progression towards the Level 6 achievement standard may be when students:* describe how astronaut suits enable humans to survive in space stations and on the Moon, but are not yet able to explain the limitations of these suits for planned travel to planets in the Solar System.
* list some key physical and atmospheric features of a selected planet in the Solar System, but are not yet able to represent their findings as a model.
* explain how the conditions for human survival (movement, respiration, sensitivity, growth, reproduction, excretion and nutrition) are met on Earth, but are not yet able to identify how all of these conditions may be met on a different planet.
* respond to stimulus questions to guide their investigations, but are not yet able to independently modify provided procedures in response to challenges that arise in developing their models of human adaptations required to survive on another planet.
* make predictions about possible adaptations for life on another planet based on comparisons with adaptations for surviving on the Moon, but are not yet able to suggest new possibilities for another
* summarise their research findings in self-constructed tables for each reference source, but are not yet able to collate information from different sources into a single table.
* use multiple sources to collect secondary data, but are not able to resolve issues related to differences in factual information from different sources or to independently source authoritative information.
* annotate their models of a human being adapted for life on another planet to show relevant physical and behavioural adaptations, but are not yet able to justify their choices for adaptations with reference to their own collected data.
 | By the end of Level 6:Students explain how scientific knowledge is used in decision making and develops from many people’s contributions. They discuss how scientific understandings, discoveries and inventions affect peoples’ lives. They compare the properties and behaviours of solids, liquids and gases. They compare observable changes to materials and classify these changes as reversible or irreversible. They explain everyday phenomena associated with the absorption, reflection and refraction of light. They compare different ways in which energy can be transformed from one form to another to generate electricity and evaluate their suitability for particular purposes. They construct electric circuits and distinguish between open and closed circuits.. They explain how natural events cause rapid change to Earth’s surface and use models to describe the key features of our Solar System. They analyse how structural and behavioural adaptations of living things enhance their survival, and predict and describe the effect of environmental changes on individual living things. Students follow procedures to develop questions that they can investigate and design investigations into simple cause-and-effect relationships. When planning experimental methods, they identify and justify the variables they choose to change and measure in fair tests. They make predictions based on previous experiences or general rules. They identify and manage potential safety risks. They make and record accurate observations as tables, diagrams or descriptions. They organise data into tables and graphs to identify and analyse patterns and relationships. They compare patterns in data with their predictions when explaining their findings. They suggest where improvements to their experimental methods or research could improve the quality of their data. They refer to data when they report findings and use appropriate representations and simple reports to communicate their ideas, methods, findings and explanations. |
| Previous level’s achievement standard as a starting point of comparison Previous level’s achievement standard as a starting point of comparison **CURRICULUM AREA - SCIENCE** |
| **VCAA EXAMPLE – How effective is your ‘separating machine’?** **Context:**Students are provided with a mixture containing specific amounts of sand, salt, iron filings, polystyrene beads, water and oil. They work in pairs to design, test and evaluate a ‘separating machine’ prior to using it to separate the provided mixture. Stimulus questions may be used to prompt student inquiry: What are the strengths and limitations of different separating techniques? Do all mixture components dissolve in water? What are the physical properties of each component of the mixture? In what order should the components of the mixture be separated? The teaching and learning plan focuses primarily on the application of an understanding of the chemical principles associated with separation techniques and critical and creative thinking strategies to design and construct a functioning ‘separating machine’.**Content Descriptions:****Science Understanding*** Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations [(VCSSU090)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU090)
* Mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques  [(VCSSU095)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU103)
* Water is an important resource that cycles through the environment  [(VCSSU101)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSSU104)

**Science Inquiry Skills*** Communicate ideas, findings and solutions to problems including identifying impacts and limitations of conclusions and using appropriate scientific language and representations [(VCSIS113)](http://victoriancurriculum.vcaa.vic.edu.au/Curriculum/ContentDescription/VCSIS113)
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| **Science Level 6 Achievement Standard**  | **Example of Indicative Progress toward Level 8 Achievement Standard** | **Science Level 8 Achievement Standard** |
| By the end of Level 6:Students explain how scientific knowledge is used in decision making and develops from many people’s contributions. They discuss how scientific understandings, discoveries and inventions affect peoples’ lives. They compare the properties and behaviours of solids, liquids and gases. They compare observable changes to materials and classify these changes as reversible or irreversible. They explain everyday phenomena associated with the absorption, reflection and refraction of light. They compare different ways in which energy can be transformed from one form to another to generate electricity and evaluate their suitability for particular purposes. They construct electric circuits and distinguish between open and closed circuits. They explain how natural events cause rapid change to Earth’s surface and use models to describe the key features of our Solar System. They analyse how structural and behavioural adaptations of living things enhance their survival, and predict and describe the effect of environmental changes on individual living things. Students follow procedures to develop questions that they can investigate and design investigations into simple cause-and-effect relationships. When planning experimental methods, they identify and justify the variables they choose to change and measure in fair tests. They make predictions based on previous experiences or general rules. They identify and manage potential safety risks. They make and record accurate observations as tables, diagrams or descriptions. They organise data into tables and graphs to identify and analyse patterns and relationships. They compare patterns in data with their predictions when explaining their findings. They suggest where improvements to their experimental methods or research could improve the quality of their data. They refer to data when they report findings and use appropriate representations and simple reports to communicate their ideas, methods, findings and explanations. | In **Science**, indicative progression towards the Level 8 achievement standard may be when students:* identify familiar applications of separation techniques (for example, tea strainer, pool filters, gold panning, sewerage treatment, treatment of oil spills) but are not yet able to extend their understandings to unfamiliar applications (for example, safe disposal by dentists of mercury fillings using filtration and the use of chromatography in blood processing).
* identify and describe different types of separating techniques (for example, filtration, sieving, evaporation, crystallisation, decanting, chromatography, magnetic separation, precipitation, distillation and centrifuging), but are not yet able to sequence multiple separations within a mixture to obtain pure substances.
* identify that water can be extracted from mixtures by processes of evaporation followed by condensation to recover the water with close to 100% efficiency, but are not yet able to connect these processes to the water cycle.
* identify effective separation techniques to separate the components of a mixture, but are not yet able to identify the limitations of each technique.
* calculate the percentage recovery of each mixture component, but are not yet able to modify their experimental methods to achieve greater recovery.
* synthesise different elements of their investigation findings to draw conclusions, but are not yet able to identify gaps in their reasoning or missing elements in information.
* draw flowcharts to represent the sequencing of their separation procedures and include annotations that reflect investigation outcomes, but are not yet able to reconstruct the flowcharts to reflect the changes made in producing their final ‘separating machine’.
 | By the end of Level 8:Students explain how evidence has led to an improved understanding of a scientific idea. They discuss how science knowledge can be applied to generate solutions to contemporary problems and explain how these solutions may impact on society. They investigate different forms of energy and explain how energy transfers and transformations cause change in simple systems. They use examples to illustrate how light forms images. They use a wave model to explain the properties of sound. They use the particle model to predict, compare and explain the physical and chemical properties and behaviours of substances. They describe and apply techniques to separate pure substances from mixtures. They provide evidence for observed chemical changes in terms of colour change, heat change, gas production and precipitate formation. They analyse the relationship between structure and function at cell, organ and body system levels. They identify and classify living things. They explain how living organisms can be classified into major taxonomic groups based on observable similarities and differences. They predict the effect of environmental changes on feeding relationships between organisms in a food web. They distinguish between different types of simple machines and predict, represent and analyse the effects of unbalanced forces, including Earth’s gravity, on motion. They compare processes of rock formation, including the time scales involved, and analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They model how the relative positions of Earth, the Sun and the Moon affect phenomena on Earth.Students identify and construct questions and problems that they can investigate scientifically and make predictions based on scientific knowledge. They plan experiments, identifying variables to be changed, measured and controlled. They consider accuracy and ethics when planning investigations, including designing field or experimental methods. Students summarise data from different sources and construct representations of their data to reveal and analyse patterns and relationships, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate scientific language, representations and simple word equations to communicate science ideas, methods and findings. |