WORK SAMPLE PORTFOLIOS

These work sample portfolios have been designed to illustrate satisfactory achievement in the relevant aspects of the achievement standard.

The December 2011 work sample portfolios are a resource to support planning and implementation of the Foundation to Year 10 Australian Curriculum in English, Mathematics, Science and History during 2012. They comprise collections of different students’ work annotated to highlight evidence of student learning of different aspects of the achievement standard.

The work samples vary in terms of how much time was available to complete the task or the degree of scaffolding provided by the teacher.

There is no pre-determined number of samples required in a portfolio nor are the work samples sequenced in any particular order. These initial work sample portfolios do not constitute a complete set of work samples - they provide evidence of most (but not necessarily all) aspects of the achievement standard.

As the Australian Curriculum in English, Mathematics, Science and History is implemented by schools in 2012, the work sample portfolios will be reviewed and enhanced by drawing on classroom practice and will reflect a more systematic collection of evidence from teaching and learning programs.

THIS PORTFOLIO – YEAR 9 SCIENCE

This portfolio comprises a number of work samples drawn from a range of assessment tasks, namely:

Sample 1 Investigation report – Reaction time
Sample 2 Leaflet - Carbon
Sample 3 Investigation report – The chemistry of cleaning
Sample 4 Venn diagram – Control and regulation
Sample 5 Slide show presentation – Plate tectonics
Sample 6 Investigation report – Sound waves
Sample 7 Discussion report – WiFi
Sample 8 Report – Bionic eye

In this portfolio, the student explains chemical processes and natural radioactivity with reference to atoms (WS2) and describes examples of neutralisation and combustion as important chemical reactions (WS2, WS3). The student describes the wave model of energy transfer and applies it to explain phenomena (WS6). The student explains some global features in terms of geological processes and timescales (WS5) and provides a simple analysis of how biological systems function and respond to external changes with reference to interdependencies (WS1, WS4). The student describes the development of WiFi and bionic eye technologies and predicts how future applications of these technologies might affect people’s lives (WS7, WS8).
The student demonstrates the capacity to design questions that could be investigated using a range of inquiry skills and methods, including the control and accurate measurement of variables and systematic collection of data (WS1). The student analyses trends in data (WS1, WS5), identifies relationships between variables and reveals inconsistencies in results, suggesting specific improvements to improve the quality of the evidence (WS1). The student uses appropriate language and representations to communicate findings and ideas (WS1, WS2, WS3, WS4, WS5, WS6, WS7, WS8) and designs text to communicate to specific audiences (WS5).

The following aspects of the achievement standard are not evident in this portfolio:

- **analyse how biological systems function and respond to external changes with reference to energy transfers and flows of matter**
- **describe how they considered ethics and safety (in design of methods)**
- **evaluate others’ methods and explanations from a scientific perspective.**
Work sample 1:
Investigation report – Reaction time

Relevant parts of the achievement standard

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.

Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety. They analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others’ methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences.

Summary of task

Students have been studying response and control systems, particularly with regard to the human body.

Students were asked to conduct an investigation to compare reaction times to visual and auditory stimuli. They were provided with the method and the basic equipment required.

In their report, they were asked to include the following:

- an aim and hypothesis
- an identification of the independent, dependent and controlled variables (these were not identified as such in the method provided)
- an appropriate representation and description of their results
- a conclusion
- an evaluation of their methods and the quality of the data.

The investigation was completed in pairs in class time. Students completed the report independently out of class time.
Investigation: Reflexes

Aim:
To evenly test how fast and individuals auditory and sight reflexes are.

Hypothesis:
I believe that an individual’s sight reflexes will be faster than their auditory reflexes because we use sight more.

Method:
Independent variable:
• reaction time of your sight and audition

Dependent variable:
• time it takes to grab the ruler

Control variables:
• meter ruler is the same, same weather conditions, same person dropping the ruler, same blind fold used

Results:

<table>
<thead>
<tr>
<th></th>
<th>Visual response</th>
<th>Auditory response</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Distance ruler dropped (cm)</td>
<td>Distance ruler dropped (cm)</td>
</tr>
<tr>
<td>Trial 1</td>
<td>11cm</td>
<td>18cm</td>
</tr>
<tr>
<td>Trial 2</td>
<td>6cm</td>
<td>12 cm</td>
</tr>
<tr>
<td>Trial 3</td>
<td>6cm</td>
<td>8 cm</td>
</tr>
<tr>
<td>Average</td>
<td>7cm</td>
<td>12 cm</td>
</tr>
</tbody>
</table>

Annotations

Designs a question that can be investigated.

Identifies variables to be controlled, changed and measured.

Collects data systematically and represents data in a table, including summary statistics (averages).
Work sample 1: Investigation report – Reaction time

The results that I have collected show that an individuals sight reflexes are quicker than the auditory reflexes when you do your first attempt it always seems to be slower than their 2nd and 3rd because they are not used to using that reflex.

Conclusion: The results that I have collected support my hypothesis that an individuals sight reflexes are quicker than their auditory reflexes in this test.

Evaluation: When doing this experiment one of the problems we faced was dropping the ruler from the same place and saying go at the exact same time. Most of the variables were easy to control except for the weather conditions because the wind blew the ruler from side to side. I think this method was a good way to test reflexes but it could have been improved if it had been done somewhere more the weather couldn’t affect it.

I do not think that our results are accurate or reliable because we didn’t always drop the ruler from the same place and we didn’t always say go at the same time. I do not think a valid conclusion could come from these results because not every test was the same as the last.

Annotations

Represents data in a column graph and follows some graphing conventions (title, axes labels, key).

Identifies trends in data and inconsistencies, for example first attempt always has a longer reaction time.

Compares results with hypothesis.

Evaluates method, identifying issues with reliability and validity of data.

Suggests specific improvements.

Annotations (Overview)

The student communicates science ideas and findings using appropriate language and representations.
Work sample 2: Leaflet – Carbon

Relevant parts of the achievement standard

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.

Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety. They analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others’ methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences.

Summary of task

Students were investigating elements and compounds as part of a chemistry unit. They had previously learnt about common chemical reactions, including combustion. They had also looked at the structure of atoms in terms of protons, neutrons and electrons. They had been introduced to the periodic table at a basic level, for example by looking at the place of metals and non-metals in the table.

Students were given a choice of four elements (oxygen, hydrogen, nitrogen or carbon) and were asked to produce a text that showed the special properties of their chosen element. They were told to refer to the behaviour of the atoms of the element as much as possible in their responses. The work could be presented in the form of a slide show presentation, a poster, or a leaflet. Students researched and drafted their text over two class lessons, submitting the final draft at the end of the second lesson.
Work sample 2: Leaflet – Carbon

Annotations

Describes the atomic structure of carbon.

Identifies that forms of carbon with different properties have different arrangement of atoms.

Shows that carbon compounds contain carbon atoms that are joined with other atoms to form molecules.
Work sample 2:
Leaflet – Carbon

Annotations

Shows, with simple diagrams, that atoms are re-arranged to form new substances in chemical reactions.

Describes radioactive decay in terms of what happens to the carbon atoms.

Uses a consistent way of representing atoms and sub atomic particles, and in most cases labels diagrams effectively.

Annotations (Overview)

In this work sample, the student uses appropriate language and representations when communicating their findings.
Work sample 3: 
Investigation – The chemistry of cleaning

Relevant part of the achievement standard

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.

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Summary of task

Students had begun a unit on chemical reactions and had been introduced to word and symbolic equations as ways of representing chemical reactions. They had explored the properties of acids and bases and neutralisation reactions in class.

Students were asked to:

a. survey the cleaning agents in their household and to classify them according to their chemical composition, their method of action and their storage in the house
b. consider the toxicity of the chemical cleaning agents and the safety aspects of handling, storage and disposal in terms of the safety advice (risk) provided on the labels of the products and/or Material Safety Data Sheets (MSDS)
c. select one kind of chemical cleaning product and summarise its chemical action both as a word equation and as a chemical equation.

Students were provided with a pro-forma to record their findings and present their conclusions. They completed the task out of class time.
Work sample 3: Investigation – The chemistry of cleaning

The Chemistry of Cleaning

Part A: Modes of Action of Cleaning Products

<table>
<thead>
<tr>
<th>Cleaning Method</th>
<th>Chemical Reaction Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleach</td>
<td>✓</td>
</tr>
<tr>
<td>Detergent</td>
<td>✓</td>
</tr>
<tr>
<td>Soap</td>
<td>✓</td>
</tr>
<tr>
<td>Acids</td>
<td>✓</td>
</tr>
<tr>
<td>Bases</td>
<td>✓</td>
</tr>
<tr>
<td>Salts</td>
<td>X</td>
</tr>
</tbody>
</table>

Part B: Survey of Cleaning Products and Safety Advice

1. Use the table below to survey the cleaners in your home and sort them according to their mode of action. Try to find one cleaner that uses each mode of action.
2. Use the bottle/container to find out its active ingredient (where possible), or go to these websites: [http://www.epa.gov/childhood/index.htm](http://www.epa.gov/childhood/index.htm) or [http://www.doe.gov/](http://www.doe.gov/)
3. Write down where it is stored in the house and any safety advice (use the container again to help you).

<table>
<thead>
<tr>
<th>Name of Cleaning Product</th>
<th>Mode of Action</th>
<th>Active ingredient/Chemical composition</th>
<th>Where are they stored in your house?</th>
<th>Safety Advice relating to handling, storage and disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brake</td>
<td>phosphate</td>
<td>Kitchen</td>
<td>Use rubber gloves to circulate air in room after use. Do not inhale or ingest.</td>
<td></td>
</tr>
<tr>
<td>Bleach</td>
<td>sodium hydroxide</td>
<td>Laundry</td>
<td>Do not inhale or get in eyes.</td>
<td></td>
</tr>
<tr>
<td>Detergent</td>
<td>hydrochloric acid</td>
<td>Under the sink</td>
<td>Store out of reach of children.</td>
<td></td>
</tr>
<tr>
<td>Soap</td>
<td>methanol</td>
<td>Toilet</td>
<td>Store out of reach of children.</td>
<td></td>
</tr>
<tr>
<td>Acids</td>
<td>acetic acid</td>
<td>Kitchen</td>
<td>Non toxic.</td>
<td></td>
</tr>
<tr>
<td>Bases</td>
<td>ethyl alcohol</td>
<td>Bathroom</td>
<td>Do not swallow or get in eyes.</td>
<td></td>
</tr>
</tbody>
</table>

Annotations

Identifies where chemical reactions are involved in the use of cleaning products.

Identifies necessary safety precautions when using specific chemicals.
Work sample 3:
Investigation – The chemistry of cleaning

Annotations

Identifies the reactants and products of a neutralisation reaction.

Represents a neutralisation reaction using words and chemical formulae.

Recognises ammonia as a base and identifies that an acid cleaning agent is required.

Annotations (overview)

Communicates findings and science ideas using appropriate terminology and representations.

Acknowledgment
ACARA acknowledges the contribution of the Victorian Curriculum and Assessment Authority for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.
Work sample 4: Venn diagram – Control and Regulation

Relevant parts of the achievement standard

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.

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Summary of task

Students had studied the human nervous and endocrine systems, particularly the role of central nervous system, the peripheral nervous system and hormones. They had not explored any aspects of plant responses to environmental change.

Students were asked to research how plants used hormones to respond to their environment and to construct a Venn diagram to show the similarities and differences between the plant and animal mechanisms for control and regulation of systems. They completed their research in pairs over one class lesson and constructed the Venn diagram summary as a homework task.
Acknowledgment
ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.
Science

Work sample 5:
Slide show presentation – Plate tectonics

Relevant parts of the achievement standard

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.

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Summary of task

Students had begun a unit of work on plate tectonics. They were involved in a series of activities, which they were asked to compile in a presentation to show how their understanding developed. They were asked to develop the presentation for an audience of their peers.

Students were asked to:

a. map recent earthquakes and volcanic eruptions and describe the patterns they observed
b. complete a ‘jigsaw’ of tectonic plates and describe how this compared to the pattern observed for (a)
c. develop a hypothesis to explain the observed pattern
d. watch a video on plate tectonic theory and present a summary of main points
e. select their own analogy for the Earth’s structure and explain the limitations of the model
f. describe the formation of a number of geological features
g. reflect on their hypothesis.

They presented their learning as a slideshow presentation, developing the presentation in class over two lessons.
Work sample 5: Slide show presentation – Plate tectonics

Annotations

Maps the location of earthquake and volcanic events.

Describes observed patterns.
Annotations

Analyses data in both slides to connect earthquake and volcanic activity to plate boundaries.

My hypothesis:

- Volcanoes and earthquakes occur on the edge of continental plates because the Earth is weak there
Plate tectonics theory

- The Earth's surface is made up of tectonic plates that drift
- Tectonic plates move because of convection currents in the mantle
- They move very slowly – about 10-40 mm per year
- They cause mountains to form, earthquakes and volcanoes, folding and faulting and ocean trenches along the boundaries
- There are three types of plate boundaries:
  - Transform boundaries – plates slide past each other
  - Divergent boundaries – plates slide apart from each other
  - Convergent boundaries – plates slide towards each other and form a subduction zone

Tectonic plates analogy

Cracking the shell of a boiled egg is like the surface of the Earth.
It is like the surface of the Earth because it has plates that fit together like a jigsaw and move up against each other.
It isn't like the Earth because it doesn't have a layer that moves underneath the surface and it doesn't have a hot core. The egg shell doesn't fold and bend so it can't show mountains or trenches.

Annotations

Describes key elements of plate tectonics theory.

Recognises that tectonic plates move very slowly.

Recognises restrictions of analogy – lack of interior layers and relative ‘brittleness’ of crust.
Annotations

- Identifies the geological processes that have led to a range of geological features.
- Identifies the slow rate of geological change.
- Identifies that plate movement is critical to earthquake and volcanic activity.

Annotations (Overview)

In this work sample, the student uses scientific language and appropriate representations to communicate ideas and findings to a peer audience.

Acknowledgment

ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.
Work sample 6:
Investigation report – Sound waves

Relevant parts of the achievement standard

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.

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Summary of task

Students were investigating properties of sound. They had completed experiments to measure the speed of sound and had previously used slinky springs to model transverse waves. They had also used the kinetic theory of matter in other contexts, and had investigated air pressure in a previous chemistry unit.

Students were provided with a slinky and asked to develop a means of modelling compression waves. They were required to develop a model that demonstrated how compression waves move and how echoes occur. They were required to explain the components of their model and the phenomena it represented.

The students worked in groups to complete the investigation, but wrote up their report independently as a homework task.
Work sample 6: 
**Investigation report – Sound waves**

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**Annotations**

Describes the movement of the compression wave along the slinky spring.
Work sample 6: Investigation report – Sound waves

Annotations

Describes observations and identifies the reflection of the wave from the other person’s end of the spring.

Recognises how the slinky spring models the behaviour of sound waves travelling through air.

Describes in simple terms how an echo is formed by the reflection of the sound wave.

Annotations (Overview)

In this work sample, the student uses appropriate language and representations when communicating their findings.

Acknowledgment

ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.
**Work sample 7:**
**Discussion report – WiFi**

### Relevant parts of the achievement standard

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### Summary of task

The class were being taught a unit on energy transfer, and had considered how energy travels in the form of electromagnetic radiation, including light waves and radio waves. This lead to discussions about modes of energy transfer used in communication technology, such as GPS systems, optical fibre networks, WiFi hotspots and mobile phone technology.

Students were asked to write an explanation of how one of these technologies was important in today’s society, and to include where possible how it might impact our lives in the future. Students completed the text in class over one lesson.
Work sample 7: Discussion report – WiFi

Annotations

Explains in basic terms how the technology works and links to previous work on radio waves.

Explains how WiFi technology is important in today’s society by describing applications of the technology.

Suggests future directions for the development of the technology, including describing the impact it may have on people’s lives.

Annotations (Overview)

In this work sample, the student uses appropriate language when communicating their findings.

Acknowledgment

ACARA acknowledges the contribution of trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.
Science

Work sample 8:  
Report – Bionic eye

Relevant parts of the achievement standard

By the end of Year 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.

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Summary of task

Students had been studying energy transfer in the context of sound, light and electricity. They had considered how the structure of the eye enables light waves to be detected and how eyes work, including how information is passed on to our brains.

Students were asked to research how bionic eyes have been developed in Australia, provide a brief description of how bionic eyes work, and how they might impact people’s lives. They were asked to produce a brief report on their findings. They were provided with one 50 minute lesson to begin their research and were required to complete the task at home.
Work sample 8:
Report – Bionic eye

Annotations

Gives a clear description of the function of the bionic eye, including how signals are transferred from one form of energy to another.

Describes some benefits of the bionic eyes.

Describes how access to this new technology may well be limited by cost.

Describes how future developments of this technology may affect people using bionic eyes.

Annotations (Overview)

In this work sample, the student uses appropriate language when communicating their findings.