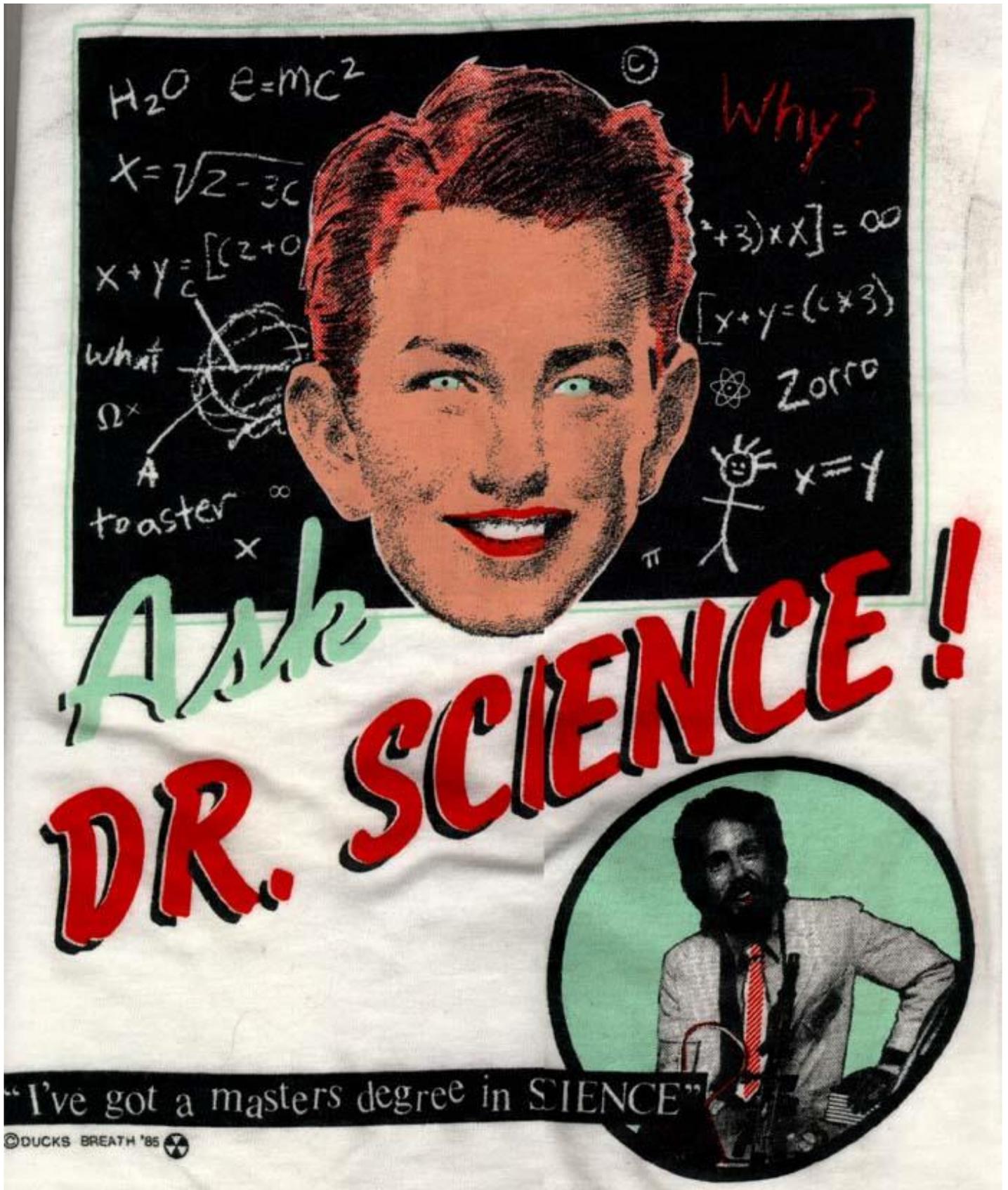


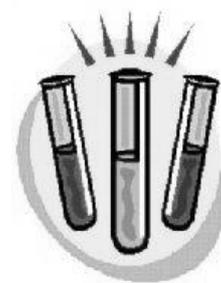
# Science 202 (Level 2) 2016



# Science 202, 2016

## Student information

The Science 202 Course contributes 24 Level 2 credits towards the Level 2 National Certificate in Educational Achievement (NCEA) and is covered in 7 units of work. These are Level 2 Achievement Standards in Science (Biology, Chemistry and Physics)



It **does not** lead to any level 3 course but can lead to a specialist Science (Physics, Biology, Chemistry) at level 2.

It is not possible to gain an endorsement in this subject as all assessments are internally assessed (i.e. there is no end of year examination)

Each standard is assessed by test or assignment. Before each test or assignment you will be given a study guide to tell you what you need to know.

Refer to the Kāpiti College NCEA Policy and Procedures handbook for assessment procedures, including authenticity, missed assessments and appeals.

## Standards that contribute to Level 1 Literacy and Numeracy

The Biology 2.3 (Adaptations) and Physics 2.5 (Atomic) standards each contribute 3 credits to Level 1 Literacy. The Biology 2.1 (Biology practical) standard contributes 4 credits towards Level 1 Numeracy. The Physics 2.1 (Physics practical) contributes 4 credits towards Level 1 Numeracy and Level 1 Literacy.

Science 202 Record of Achievement

Standard number (version) and Topic	Grade	Credits	Teacher initials	Parent/Guardian Signature
AS 91168 (v2) Physics Investigation		4		
AS 91162 (v2) Identification of Ions		3		
AS 91190 (v2) Humans in an extreme environment		4		
AS 91155 (v2) Adaptations to way of life		3		
AS 91160 (v2) Microscopes		3		
AS 91153 (v2) Biology Investigation		4		
AS 91172 (v2) Atomic and nuclear physics		3		
Total		24		

## Further Assessment Opportunities

Further assessment opportunities will be offered where practicable. Generally this means that **ONE** further assessment opportunity only will be made available for the class test parts of all assessments, although some practical components will not be reassessed.

There is an Assessment schedule on the next page of this booklet. Every effort will be made to keep to this schedule. However, due to the dynamic nature of teaching and learning, assessment dates may change slightly.

You will be informed of any changes well in advance.

**KAPITI COLLEGE ASSESSMENT STATEMENT 2016**

**Subject:**

# Science 202

One week before each assessment you will be told  
 \* what learning outcomes will be assessed  
 \* how they will be assessed  
 \* how the assessment contributes towards your report.

Student to enter Achieved (A), Merit (M), Excellence (E) or Not Achieved (N)



Term	Week	Date	ASSESSMENT TASK	Int/Ext	Credits	NA, A, M, E
1	1	1-Feb-2016				
	2	9-Feb-2016				
	3	15-Feb-2016				
	4	22-Feb-2016				
	5	29-Feb-2016				
	6	7-Mar-2016	<b>AS 91168 (v2) Physics Investigation</b>	int	4	
	7	14-Mar-2016				
	8	21-Mar-2016				
	9	29-Mar-2016				
	10	4-Apr-2016	<b>AS 91162 (v2) Identification of Ions</b>	int	3	
	11	11-Apr-2016				
2	1	2-May-2016				
	2	9-May-2016				
	3	16-May-2016				
	4	23-May-2016	<b>AS 91190 (v2) Humans in an extreme environment</b>	int	4	
	5	30-May-2016				
	6	7-Jun-2016				
	7	13-Jun-2016				
	8	20-Jun-2016				
	9	27-Jun-2016	<b>AS 91155 (v2) Adaptations to way of life</b>	int	3	
	10	4-Jul-2016				
3	1	25-Jul-2016				
	2	1-Aug-2016				
	3	8-Aug-2016				
	4	15-Aug-2016	<b>Senior Exams: AS 91160 (v2) Microscopes</b>	int	3	
	5	23-Aug-2016				
	6	29-Aug-2016	Tournament week			
	7	5-Sep-2016				
	8	12-Sep-2016	<b>AS 91153 (v2) Biology Investigation</b>	int	4	
	9	19-Sep-2016				
4	1	10-Oct-2016				
	2	17-Oct-2016				
	3	25-Oct-2016	<b>AS 91172 (v2) Atomic and Nuclear Physics</b>	int	3	
	4	31-Oct-2016	Seniors finish			

# Science Achievement Standards - 2016

Conditions of Assessment and other resources related to any of the internal achievement standards can be found at <http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards>.

Following is an outline of what is required in each of the available Standards

<b>Subject Reference</b>		<b>Physics Investigation</b>			
<b>Title</b>		<b>Carry out a practical physics investigation that leads to a non-linear mathematical relationship</b>			
<b>Number: AS 91168</b>		<b>Domain: Physics</b>		<b>Version 2</b>	
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>4</b>	<b>Assessment</b>	<b>Internal</b>
<b>Assessment Type</b>		<b>Practical Investigation</b>		<b>Further Assessment Opportunity</b>	
				<b>Yes (after seniors leave)</b>	

This achievement standard involves carrying out a practical physics investigation that leads to a non-linear mathematical relationship.

## Achievement Criteria

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<ul style="list-style-type: none"> <li>Carry out a practical physics investigation that leads to a non-linear mathematical relationship.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out an in-depth practical physics investigation that leads to a non-linear mathematical relationship.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out a comprehensive practical physics investigation that leads to a non-linear mathematical relationship.</li> </ul>

## Explanatory Notes

- Carry out a practical physics investigation* involves:

  - collecting data relevant to the aim based on the manipulation of the independent variable over a reasonable range and number of values
  - drawing a graph that shows the relationship between the independent and dependent variables
  - writing a conclusion which describes the type of mathematical relationship that exists between the variables.

*Carry out an in-depth practical physics investigation* involves:

  - controlling the variable(s) that could have a significant effect on the results
  - using technique(s) that increase the accuracy of the measured values of the dependent (and independent, if appropriate) variable
  - writing a conclusion that describes the mathematical relationship obtained from the experimental data.

*Carry out a comprehensive practical physics investigation* involves writing a discussion that addresses critical issues such as:

  - a reason why there is a limit to either end of the value chosen for the independent variable
  - a justification for why a variable needs to be controlled
  - a description of any difficulties encountered when making measurements and how these difficulties were overcome
  - the relationship between the findings and physics ideas
  - a description of any unexpected results and a suggestion of how they could have been caused and/or the effect they had on the validity of the conclusion.
- A practical physics investigation* is an activity that includes gathering, processing and interpreting data.

<b>Subject Reference</b>		<b>Identification of Ions</b>			
<b>Title</b>		<b>Carry out procedures to identify ions present in solution</b>			
<b>Number: AS 91162</b>		<b>Domain: Chemistry</b>		<b>Version 2</b>	
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>3</b>	<b>Assessment</b>	<b>Internal</b>
<b>Assessment Type</b>		<b>Class test involving practical</b>		<b>Further Assessment Opportunity</b>	
				<b>Yes</b>	

This achievement standard involves carrying out procedures to identify ions present in solution.

#### Achievement Criteria

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<ul style="list-style-type: none"> <li>Carry out procedures to identify ions present in solution.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out procedures to justify the identification of ions present in solution.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out procedures to comprehensively justify the identification of ions present in solution.</li> </ul>

#### Explanatory Notes

- Carry out procedures to identify ions* involves collecting primary data and using these observations to identify ions in solution using a procedure provided.

*Carry out procedures to justify the identification of ions* involves writing balanced equations for all the reactions where precipitates are formed.

*Carry out procedures to comprehensively justify the identification of ions* involves interpreting observations by recognising the formation of complex ions and writing balanced equations for these reactions.
- Identification of ions must be supported by experimental observations and identification of all precipitates formed.
- Ions to be identified will be limited to:  $\text{Ag}^+$ ,  $\text{Al}^{3+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Cu}^{2+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Na}^+$ ,  $\text{Zn}^{2+}$ ,  $\text{Cl}^-$ ,  $\text{CO}_3^{2-}$ ,  $\text{I}^-$ ,  $\text{NO}_3^-$ ,  $\text{OH}^-$ ,  $\text{SO}_4^{2-}$ .  $\text{Na}^+$  and  $\text{NO}_3^-$  are identified by a process of elimination.
- Complex ions are limited to  $[\text{FeSCN}]^{2+}$  and those formed when  $\text{OH}^-(\text{aq})$  or  $\text{NH}_3(\text{aq})$  react with cations listed in EN 5 above, ie  $[\text{Ag}(\text{NH}_3)_2]^+$ ,  $[\text{Al}(\text{OH})_4]^-$ ,  $[\text{Pb}(\text{OH})_4]^{2-}$ ,  $[\text{Zn}(\text{OH})_4]^{2-}$ ,  $[\text{Zn}(\text{NH}_3)_4]^{2+}$ ,  $[\text{Cu}(\text{NH}_3)_4]^{2+}$ .

<b>Subject Reference</b>		<b>Humans in an extreme environment</b>			
<b>Title</b>		<b>Investigate how organisms survive in an extreme environment</b>			
<b>Number: AS 91190</b>		<b>Domain: Science</b>		<b>Version 2</b>	
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>4</b>	<b>Assessment</b>	<b>Internal</b>
<b>Assessment Type</b>		<b>Class test</b>		<b>Further Assessment Opportunity</b>	<b>Yes</b>

This achievement standard involves investigating how organisms survive in an extreme environment.

### Achievement Criteria

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<ul style="list-style-type: none"> <li>Investigate how organisms survive in an extreme environment.</li> </ul>	<ul style="list-style-type: none"> <li>Investigate in depth how organisms survive in an extreme environment.</li> </ul>	<ul style="list-style-type: none"> <li>Investigate comprehensively how organisms survive in an extreme environment.</li> </ul>

### Explanatory Notes

1 Investigate involves:

- selecting and processing information
- using the processed information:
  - describing why the conditions of the extreme environment require special biological adaptations or technological modifications for survival
  - describing how the biological adaptations or technological modifications allow the organism(s) to survive in the extreme environment
- recording sources of information used in a traceable format.

Investigate in depth is further developed by:

- selecting and processing information that provides links between conditions of the extreme environment and biological adaptations or technological modifications
- explaining, using the processed information, how the biological adaptations or technological modifications allow the organism(s) to survive the conditions of the extreme environment.

Investigate comprehensively *is further developed by:*

- selecting and processing information that provides integrated links between conditions of the extreme environment and biological adaptations or technological modifications
- justifying, using the processed information, how the biological adaptations or technological modifications allow the organism(s) to survive the conditions of the extreme environment.

2 Organisms can be the same or different species including humans.

3 An extreme environment can be selected from, but is not restricted to: outer space, deep oceans, deep sea trenches, extremes of temperature or salinity, anaerobic conditions, excess exposure to radiation or toxic chemicals, geothermal vents.

<b>Subject Reference</b>		<b>Adaptations to way of life</b>			
<b>Title</b>		<b>Demonstrate understanding of adaptation of plants or animals to their way of life</b>			
<b>Number: AS 91155</b>		<b>Domain: Biology</b>		<b>Version 2</b>	
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>3</b>	<b>Assessment</b>	<b>Internal</b>
<b>Assessment Type</b>		<b>Class test</b>		<b>Further Assessment Opportunity</b>	<b>No</b>

This achievement standard involves demonstrating understanding of adaptation of plants or animals to their way of life.

#### Achievement Criteria

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<ul style="list-style-type: none"> <li>• Demonstrate understanding of adaptation of plants or animals to their way of life.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate in-depth understanding of adaptation of plants or animals to their way of life.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate comprehensive understanding of adaptation of plants or animals to their way of life.</li> </ul>

#### Explanatory Notes

1 *Demonstrate understanding* involves describing the adaptations and identifying the aspects of the adaptations that enable each organism to carry out its life process(es) in order to survive in its habitat.

*Demonstrate in-depth understanding* involves providing a biological reason that explains how or why the adaptations enable each organism to carry out its life process(es) in order to survive in its habitat.

*Demonstrate comprehensive understanding* involves showing understanding by linking several biological ideas. The linking of ideas may involve justifying, evaluating, comparing and contrasting, or analysing, and must include consideration of the two points from below appropriate to the chosen context.

In the context of *understanding of adaptation* related to one life process over three taxonomic or functional groups of multi-cellular plants or animals:

- comparing diversity of adaptation in response to the same demand across different taxonomic or functional groups
- limitations and advantages involved in each feature within each organism

In the context of *understanding of adaptation* across two related life processes within one taxonomic or functional group:

- connections between two life processes within each organism which enhance the effectiveness of both processes
- limitations and advantages involved in each feature within each organism.

2 *Understanding of adaptation* is demonstrated in relation to one life process over three taxonomic or functional groups of multi-cellular plants or animals, or across two related life processes within one taxonomic or functional group.

3 *Adaptation* involves the range of ways in which organisms have developed strategies to carry out the life processes. An adaptation refers to a feature and its function as it enables an organism to carry out a life process and thus occupy a specific ecological niche. It may include structural, behavioural, or physiological features of an organism. An adaptation provides an advantage for the organism in its specific habitat and ecological niche.

4 Way of life encompasses the ways in which an organism carries out all its life processes. It includes:

- relationships with other organisms – competition, predation, parasitism, mutualism
- reproductive strategies
- adaptations to the physical habitat.

- 5 Life processes are selected from:
- internal transport
  - gas exchange
  - transpiration
  - nutrition
  - excretion
  - support and movement
  - sensitivity and co-ordination
  - reproduction.

<b>Subject Reference</b>		<b>Microscopes</b>			
<b>Title</b>		<b>Investigate biological material at the microscopic level</b>			
<b>Number: AS 91160</b>		<b>Domain: Biology</b>		<b>Version 2</b>	
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>3</b>	<b>Assessment</b>	<b>Internal</b>
<b>Assessment Type</b>		<b>Practical</b>		<b>Further Assessment Opportunity</b>	<b>Yes</b>

This achievement standard involves investigating biological material at the microscopic level.

#### Achievement Criteria

Achievement	Achievement with Merit
<ul style="list-style-type: none"> <li>• Investigate biological material at the microscopic level.</li> </ul>	<ul style="list-style-type: none"> <li>• Investigate in-depth biological material at the microscopic level.</li> </ul>

#### Explanatory Notes

1 *Carry out an investigation* involves:

- preparing biological material for viewing under a light microscope
- viewing biological material using a light microscope to enable detail of cell structures and components to be determined
- recording observations of biological material in biological drawings
- identifying observed specialised features and relating them to the function of the cells or tissues.

*Investigate in-depth* involves:

- giving reasons for how or why observed specialised features enable the cells to effectively carry out their specific function(s).

2 *Biological material for viewing* includes two different plant tissues and one unicellular organism.

3 To allow an accurate drawing to be produced, preparation of material may include: staining, use of cavity slides, use of cellulose, epidermal tear, cutting sections.

4 A biological drawing follows the accepted conventions to record observations consistent with the biological material being viewed. Consistency of observations with the biological material used must include recognisable shape and proportions and inclusion of typical organelles present in a cell, appropriate to the magnification. At the Achieved grade, the biological drawing may contain some errors in applying conventions or minor inaccuracies in representation. At the Merit grade the biological drawing may contain some minor errors as long as they do not affect the accuracy of the representation of the biological material being viewed.

5 Specialised features may include: arrangement of cells or cell types within a tissue, shape of a cell, presence or absence of a specific organelle, quantity or distribution of organelles within a cell. Notes about the specialised features may accompany the biological drawing (eg a fully annotated diagram).

6 Relating observed specialised features to the function of the cell or tissue must include: identifying the feature or organelle, stating its function, and giving reasons for why or how it contributes to the function of the cell or tissue.

<b>Subject Reference</b>		<b>Biology Investigation</b>			
<b>Title</b>		<b>Carry out a practical investigation in a biology context, with supervision</b>			
<b>Number: AS 91153</b>		<b>Domain: Biology</b>		<b>Version 2</b>	
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>4</b>	<b>Assessment</b>	<b>Internal</b>
<b>Assessment Type</b>		<b>Practical Investigation</b>		<b>Further Assessment Opportunity</b>	<b>No</b>

This achievement standard involves carrying out a practical investigation in a biology context, with supervision.

#### Achievement Criteria

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<ul style="list-style-type: none"> <li>Carry out a practical investigation in a biology context, with supervision.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out an in-depth practical investigation in a biology context, with supervision.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out a comprehensive practical investigation in a biology context, with supervision.</li> </ul>

#### Explanatory Notes

1 *Carry out a practical investigation* involves:

- developing a statement of the purpose written as a hypothesis linked to a scientific concept or idea
- using a method that describes:
  - for a fair test: a range for the independent variable, the measurement of the dependent variable and the control of some other key variables
  - for a pattern seeking or modelling activity: the data that will be collected, range of data/samples, and consideration of some other key factors
- collecting, recording, and processing data relevant to the purpose of the investigation
- interpreting and reporting on the findings
- reaching a conclusion based on the student's processed data which is relevant to the purpose of the investigation
- identifying and including relevant findings from another source.

*Carry out an in-depth practical investigation* involves:

- using a method that describes:
  - for a fair test: a valid range for the independent variable, the valid measurement of the dependent variable and the control of other key variables with consideration of factors such as sampling bias and sources of errors
  - for a pattern seeking or modelling activity: a valid collection of data with consideration of factors such as sampling bias and sources of errors
- collecting, recording, and processing data which enables a trend or pattern (or the absence of a trend or pattern) to be determined
- reaching a valid conclusion based on the student's processed data which is relevant to the purpose of the investigation
- a discussion of the biological ideas relating to the investigation that is based on the student's findings and those from other source(s).

*Carry out a comprehensive practical investigation* involves justification of the choices made during the sound investigation, ie evaluating the validity of the method or reliability of the data and explaining the conclusion in terms of the biology ideas relevant to the investigation.

- 2 *A practical investigation* is an activity covering the complete investigation process: planning and carrying out the investigation, collecting primary data, processing and interpreting data, and reporting on the investigation. Students may make changes to their initial method as they work through the investigation.
- 3 Assessment against this standard may be based on a stand-alone or an individual investigation that can contribute findings to a larger group or class investigation. In a group or class investigation, individual findings may be discussed and individual students may interpret their own findings in the light of other students' investigations and findings. Findings from outside the group or class such as published information or historical findings relevant to the investigation may also be used.
- 4 The nature of the investigation could be the manipulation of variables (fair test), the investigation of a pattern or relationship or the use of models.
- 5 It is intended that this investigation be carried out with supervision. This means that the teacher provides guidelines for the investigation such as the context for the investigation, instructions that specify the requirements for a comprehensive investigation, and broad experimental conditions such as the availability of equipment or chemicals. Students then develop and complete the investigation from the initial guidelines given by the teacher. Supervision may involve discussion between teachers and individual students in order to clarify the students' ideas and may also involve teachers managing the process of sharing findings.

<b>Subject Reference</b>		<b>Atomic and nuclear physics</b>			
<b>Title</b>		<b>Demonstrate understanding of atomic and nuclear physics</b>			
<b>Number: AS 91172</b>		<b>Domain: Physics</b>		<b>Version 2</b>	
<b>Level</b>	<b>2</b>	<b>Credits</b>	<b>3</b>	<b>Assessment</b>	<b>Internal</b>
<b>Assessment Type</b>		<b>Class test</b>		<b>Further Assessment Opportunity</b>	
				<b>Yes (after seniors leave)</b>	

This achievement standard involves demonstrating understanding of atomic and nuclear physics.

### Achievement Criteria

<b>Achievement</b>	<b>Achievement with Merit</b>	<b>Achievement with Excellence</b>
<ul style="list-style-type: none"> <li>• Demonstrate understanding of atomic and nuclear physics.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate in-depth understanding of atomic and nuclear physics.</li> </ul>	<ul style="list-style-type: none"> <li>• Demonstrate comprehensive understanding of atomic and nuclear physics.</li> </ul>

### Explanatory Notes

- 1 *Demonstrate understanding* involves writing statements that show an awareness of how simple facets of phenomena, concepts or principles relate to a described situation.

*Demonstrate in-depth understanding* involves writing statements that give reasons why phenomena, concepts or principles relate to a described situation. For mathematical solutions, the information may not be directly usable or immediately obvious.

*Demonstrate comprehensive understanding* involves writing statements that demonstrate understanding of connections between concepts.

- 2 Written statements include mathematical solutions and/or descriptions. Descriptions may include graphs or diagrams.
- 3 Assessment typically includes:
- models of the atom (Thomson and Rutherford), gold foil experiment
  - nuclear transformations: radioactive decay (half life), fission and fusion reactions
  - conservation of atomic and mass number
  - products of nuclear transformation: power generation,  $E = mc^2$ ,  $P = E/t$ , properties of nuclear emissions (ionising ability, penetration ability).