Field **Sciences**

Review of *Science* Level 1 achievement and unit standards and AMAP for NZQA Astronomy [Ref: 0184]

Unit standards

Subfield	Domain	ID
Science	Astronomy	20621-20623
	Biology	6294-6304, 8923, 8924, 18969-18971, 18978
	Chemistry	6323-6325, 6329-6331, 8935-8938, 18974, 18979
	Earth Science	6356-6358, 18981, 18982, 18989
	Physics	6366-6370, 6372, 6374-6377, 8767, 18972, 18975, 18977, 18980
	Science - Core	6349, 18973, 18976, 18983, 18986, 18988, 21611, 21612

Achievement standards

Domain	ID	Subject reference
Biology	90161-90168	1.1-1.8
Chemistry	90169-90173, 90640, 90648	1.1-1.7
Physics	90180-90185	1.1-1.6
Science - Core	90186-90192	1.1-1.7

The Ministry of Education and NZQA National Qualifications Services (NQS) have completed the review of the achievement standards, unit standards and AMAP listed above.

New Registration date **30 November 2010**

Date new versions published **30 November 2010**

Planned review date **31 December 2014**

Summary of review and consultation process

In 2008 the Ministry of Education (MoE) and NZQA began to review achievement and unit standards in light of the revised New Zealand Curriculum (NZC). This Alignment of Standards (AoS) review also addressed duplication of outcomes, credit parity, fairness, consistency, and coherence. The AoS review was guided by the revised NZC itself and the Standards Review Guidelines. A copy of the NZC is available at http://nzcurriculum.tki.org.nz/Curriculum-documents/The-New-Zealand-Curriculum.

Teacher subject associations were involved in the review and draft achievement standards were the focus of wide consultation, especially with secondary schools and teachers. Extensive resources, including student exemplars, were also developed to support these standards, and are available on the MoE and/or the NZQA websites.

The review of unit standards included consultation with tertiary providers to assess continued relevance and likely future use of the standards. Unit standards that duplicate achievement standard outcomes and those without the likelihood of future use were recommended for expiry.

National consultation was undertaken in 2009, with the results analysed by Research New Zealand. The responses were generally positive.

The review of unit and achievement standards at level 1 was completed in time for implementation in schools in 2011. Standards at levels 2 and 3 will be implemented in 2012 and 2013 respectively.

The NZQA Astronomy AMAP was reviewed at the same time as the unit standards within its coverage.

Main changes resulting from the review

- All NZC level 6 (NQF level 1) outcomes derived from the NZC are now assessed using achievement standards, and any unit standards are no longer linked to NZC.
- Existing achievement standards were reviewed and new achievement standards were developed to align with the NZC. See list below.
- Grading criteria for the achievement standards were reviewed in accordance with the Standards Review Guidelines.
- Unit standards that recognised similar outcomes as achievement standards were recommended for expiry. See list below.
- The NZQA Astronomy AMAP was designated expiring.

Further detail on the outcomes of the review of the Science achievement standards and unit standards is included in Appendix 1.

Impact on existing accreditations

Current Accreditation for			**Accreditation extended to**		
Nature of accreditation	**ID**	**Level**	**Nature of accreditation**	**ID**	**Level**
Standard	6372	1	Standard	90941, 90942, 90943	1

Impact on Accreditation and Moderation Action Plan (AMAP)

AMAP 0184, which covers the standards in the *Astronomy* domain, was designated expiring, and will expire at the end of December 2011.

All new achievement standards have been registered on AMAP 0233.

Impact on existing qualifications

Qualifications that contain the reviewed standards or classifications are tabled below.

Affected	The qualification lists a reviewed classification (domain or subfield) in an elective set The qualification lists a standard that has changes to level or credits The qualification lists a C or D category standard
Not materially affected	The qualification lists a standard that has a new title The qualification lists a standard that has a new classification

The following qualifications are affected by the outcome of this review. The standard setting bodies (SSBs) have been advised that they require revision.

Qualification title	Classification or standard in the qualification	SSB Name
National Certificate in Design (Draughting) (Level 2) [Ref: 0640]	6331, 6366, 6368, 6376, 8767	InfraTrain New Zealand
National Certificate in Conservation (Trainee Ranger) (Level 3) [Ref: 0642]	6294	Learning State
National Certificate in Pharmaceutical and Allied Products Manufacturing (Level 1) [Ref: 1233]	18978	Plastics and Materials Processing Industry Training Organisation Incorporated

Impact of changes on NCEA Exclusions List

For transition purposes, the following exclusions will apply for new achievement standards. This transition will apply until December 2011 only, when the existing standards will expire.

New achievement standard	Existing achievement or unit standard(s)
90925	90161
90927 [External assessment]	6298
90930	90169
90931	90170
90935	6375, 90180
90936	90181
90941	6370
90947	6324, 6325, 8938
90950	6298
90952	6358
90954	90192

For transition purposes, where there is impact on qualifications, the following exclusion will apply for the new achievement standard. This transition will apply until December 2012 only, when the existing unit standard will expire.

New achievement standard	Existing unit standard
90943	8767

The following exclusions will apply permanently for the new achievement standards.

Achievement standard	Achievement standard
90941	90937 [External assessment]
90942	90938 [External assessment]
90943	90939 [External assessment]

90945	90932 [External assessment]
90946	90933 [External assessment]
90947	90934 [External assessment]
90950	90927 [External assessment]

Review Categories and changes to classification, title, level, and credits

The following summary shows the changes made to the standards as a result of the review. All changes are in **bold**. Where a new or a new version of an externally assessed achievement standard is registered, the following designation appears after the title [Externally Assessed].

Key to review category

A Dates changed, but no other changes are made - the new version of the standard carries the same Id and a new version number

B Changes made, but the overall outcome remains the same - the new version of the standard carries the same Id and a new version number

C Major changes that necessitate the registration of a replacement achievement standard with a new Id

D Achievement standard will expire and not be replaced

Externally assessed achievement standards categorised as category C or D expire at the end of	**December 2010**

Internally assessed achievement standards categorised as category C or D expire at the end of	**December 2011**

Unit standards categorised as category C or D which do not impact on qualifications expire at the end of	**December 2011**

Unit standards categorised as category C or D which impact on qualifications (see table above) expire at the end of	**December 2012**

Subfield Science
Domain Astronomy

ID	Title	Level	Credit	Review Category
20621	Demonstrate knowledge of space exploration	1	4	D
20622	Demonstrate knowledge of our solar system	1	4	D
20623	Demonstrate knowledge of the Milky Way, our galaxy	1	4	D

Subfield Science
Domain Biology

ID	Title	Level	Credit	Review Category
6294	Compare the diversity and organisation of different biological communities	1	4	D
6295	Describe the structure and function of a selected human organ system	1	5	D
6296	Investigate plant processes	1	5	D
6297	Describe methods for the management of introduced species	1	4	D

ID	Title	Level	Credit	Review Category
6298	Describe interactions between humans and microorganisms	1	5	C
90927	**Demonstrate understanding of biological ideas relating to micro-organisms [Externally assessed]**	**1**	**4**	
90950	**Investigate biological ideas relating to interactions between humans and micro-organisms**	**1**	**4**	
6299	Describe how people apply biological principles to plant or animal management	1	3	D
6300	Describe homeostatic control mechanisms of the human body	1	4	D
6301	Describe links between human organ systems	1	4	D
6302	Discuss the biological effects of food and other activity choices on the human body	1	4	D
6303	Describe and discuss human reproduction	1	4	D
6304	Describe natural and artificial human defence mechanisms against pathogenic diseases	1	4	D
8923	Describe mechanisms for the transfer of genetic information	1	3	D
8924	Describe the structure and replication of deoxyribonucleic acid (DNA)	1	2	D
18969	Demonstrate knowledge of the characteristics of living things, organs and organ systems	1	2	D
18970	Demonstrate knowledge of adaptations and relationships in a biological community	1	2	D
18971	Demonstrate knowledge of cells, reproduction, and inheritance	1	2	D
18978	Demonstrate knowledge of biotechnology	1	2	D
90161	Carry out a practical biology investigation with direction	1	4	C
90925	**Carry out a practical investigation in a biological context, with direction**	**1**	**4**	
90162	Process information to describe a use of biology knowledge with direction	1	2	D
90163	Describe the transfer of genetic information	1	3	D
90164	Describe ecological characteristics found in two biological communities	1	3	D
90165	Describe the control of an introduced species that affects native species	1	2	D
90166	Describe the functioning of human digestive and skeletomuscular systems	1	4	D
90167	Describe plant processes	1	4	D
90168	Describe biological ideas relating to how humans use and are affected by micro-organisms	1	2	D
90926	**Report a biological issue**	**1**	**3**	**New**
90928	**Demonstrate understanding of biological ideas relating to the life cycle of flowering plants [Externally assessed]**	**1**	**4**	**New**

ID	Title	Level	Credit	Review Category
90929	**Demonstrate understanding of biological ideas relating to a mammal as a consumer [Externally assessed]**	**1**	**3**	**New**

Subfield Science
Domain Chemistry

ID	Title	Level	Credit	Review Category
6323	Describe the production and importance to society of chemical substances	1	3	D
6329	Relate similarities and differences within the periodic table to atomic structure	1	3	D
6330	Undertake a chemical investigation of the use of a group of substances in the home and the community	1	2	D
6331	Investigate a chemical process	1	2	D
8935	Investigate characteristic properties and reactions of metals	1	3	D
8936	Investigate the characteristic behaviour of acids and bases	1	3	D
8937	Describe the nature and use of organic fuels	1	3	D
18974	Demonstrate knowledge of chemical change	1	2	D
18979	Demonstrate knowledge of chemical processes in the context of the environment	1	2	D
90169 **90930**	Carry out a practical chemistry investigation with direction **Carry out a practical chemistry investigation, with direction**	1 **1**	4 **4**	C
90170 **90931**	Process information to describe a use of chemistry knowledge with direction **Demonstrate understanding of the chemistry in a technological application, with direction**	1 **1**	2 **2**	C
90171	Describe chemical reactions	1	4	D
90172	Describe atomic structure and bonding	1	3	D
90173	Describe selected non-metals and their compounds	1	4	D
90640	Describe characteristic properties and reactions of metals, acids and bases	1	4	D
90648	Describe properties and reactions of carbon and its compounds	1	3	D
90932	**Demonstrate understanding of aspects of carbon chemistry [Externally assessed]**	**1**	**4**	**New**
90933	**Demonstrate understanding of aspects of selected elements [Externally assessed]**	**1**	**4**	**New**
90934	**Demonstrate understanding of aspects of chemical reactions [Externally assessed]**	**1**	**4**	**New**

Subfield Science
Domain Earth Science

ID	Title	Level	Credit	Review Category
6356	Report on a geological resource in New Zealand	1	3	D
6357	Identify common minerals and rocks	1	3	D
18981	Demonstrate basic knowledge of weather	1	2	D
18982	Demonstrate knowledge of Earth science	1	2	D
18989	Demonstrate knowledge of Earth and space	1	2	D

Subfield Science
Domain Physics

ID	Title	Level	Credit	Review Category
6366	Demonstrate knowledge of linear motion	1	2	D
6367	Explain the results of forces acting on an object	1	2	D
6368	Demonstrate knowledge of energy transformations	1	2	D
6369	Apply formulae and graphical methods to find unknowns for a physical system	1	3	D
6372	Investigate and describe the influences physics-based applications have on people's lives	1	2	D
6374	Carry out a practical investigation of a physics-based application with direction	1	3	D
6375	Use graphical analysis to recognise a directly proportional physical relationship	1	2	C
90180	Carry out a practical physics investigation with direction	1	4	C
90935	**Carry out a practical physics investigation that leads to a linear mathematical relationship, with direction**	**1**	**4**	
6376	Demonstrate knowledge of atomic structure and fission reactions	1	2	D
6377	Observe and explain the movement of objects in the solar system	1	3	D
18972	Demonstrate knowledge of sources, transference, and uses of energy	1	2	D
18975	Demonstrate knowledge of science in sport	1	2	D
18977	Demonstrate knowledge of the generation and use of electricity	1	2	D
18980	Demonstrate basic knowledge of waves	1	2	D
90181	Process information to describe a use of physics knowledge with direction	1	2	C
90936	**Demonstrate understanding of the physics of an application**	**1**	**2**	
90183	Demonstrate understanding of mechanics in one dimension	1	5	D
90184	Demonstrate understanding of heat transfer and nuclear physics	1	3	D
90185	Demonstrate understanding of electricity and magnetism	1	5	D

ID	Title	Level	Credit	Review Category
90937	**Demonstrate understanding of aspects of electricity and magnetism [Externally assessed]**	**1**	**4**	**New**
90938	**Demonstrate understanding of aspects of wave behaviour [Externally assessed]**	**1**	**4**	**New**
90939	**Demonstrate understanding of aspects of heat [Externally assessed]**	**1**	**4**	**New**

Subfield Science
Domain Science – Core

ID	Title	Level	Credit	Review Category
6349	Gather information and report on an item of technology and its related scientific concepts	1	3	D
18973	Demonstrate knowledge of matter	1	2	D
18976	Demonstrate knowledge of science in relation to a vehicle	1	2	D
18983	Apply basic forensic science to a scenario	1	2	D
18986	Select and use basic scientific equipment	1	2	D
18988	Interpret information presented in tables, diagrams, and graphs to answer given questions	1	2	D
21611	Follow instructions to carry out a practical scientific activity, and report on the activity	1	2	D
21612	Follow instructions to process and report on supplied scientific information	1	2	D
90182	Demonstrate understanding of wave and light behaviour	1	5	D
90186	Carry out a practical science investigation with direction	1	4	D
90187	Process information to describe a use of science knowledge with direction	1	2	D
90188	Describe aspects of biology	1	5	D
90189	Describe aspects of chemistry	1	5	D
90190	Describe aspects of geology	1	3	D
90191	Describe aspects of physics	1	5	D
90192 **90954**	Describe aspects of astronomy **Demonstrate understanding of the effects of astronomical cycles on planet Earth**	1 **1**	2 **4**	C
90940	**Demonstrate understanding of aspects of mechanics [Externally assessed]**	**1**	**4**	**New**
90942	**Investigate implications of wave behaviour for everyday life**	**1**	**4**	**New**
90944	**Demonstrate understanding of aspects of acids and bases [Externally assessed]**	**1**	**4**	**New**
90945	**Investigate implications of the use of carbon compounds as fuels**	**1**	**4**	**New**
90946	**Investigate the implications of the properties of metals for their use in society**	**1**	**4**	**New**

ID	Title	Level	Credit	Review Category
90948	**Demonstrate understanding of biological ideas relating to genetic variation [Externally assessed]**	**1**	**4**	**New**
90949	**Investigate life processes and environmental factors that affect them**	**1**	**4**	**New**
90951	**Investigate the biological impact of an event on a New Zealand ecosystem**	**1**	**4**	**New**
90953	**Demonstrate understanding of carbon cycling**	**1**	**4**	**New**
90955	**Investigate an astronomical or Earth science event**	**1**	**4**	**New**

Subfield Science

ID	Domain	Title	Level	Credit	Review Category
6324	Chemistry	Identify simple chemical species in solution	1	3	C
6325	Chemistry	Investigate factors that affect the rate of a chemical reaction	1	3	C
8938	Chemistry	Investigate inorganic reactions	1	5	C
90947	**Science – Core**	**Investigate selected chemical reactions**	**1**	**4**	
6358	Earth Science	Describe the formation of major rock types and describe the rock cycle	1	3	C
90952	**Science – Core**	**Demonstrate understanding of the formation of surface features in New Zealand**	**1**	**4**	
6370	Physics	Describe and construct simple electrical system	1	3	C
90941	**Science - Core**	**Investigate implications of electricity and magnetism for everyday life**	**1**	**4**	
8767	Physics	Demonstrate knowledge of heat and temperature	1	4	C
90943	**Science - Core**	**Investigate implications of heat for everyday life**	**1**	**4**	

Appendix 1 – Development of Level 1 (L1) Science Standards

Science is the only curriculum learning area that is commonly unpacked into both a generic programme (science) **and** subject-specific programmes (biology, chemistry and physics); at curriculum level 6. The proportion of students that study a specific science subject in year 11 is very small compared to students who study through a generic science programme.

Teachers wanted the L1 matrix to contain enough standards for assessing both a generic science programme and the specific biology, chemistry and physics programmes. The L1 matrix therefore contains some standards that overlap in terms of the outcomes being assessed. It indicates which standards will be mutually exclusive for the purpose of contributing credits towards a qualification.

Matrix

The matrix for the L1 Science standards was developed as a single generic matrix with standards listed by strands. Aspects of the Nature of Science strand are integrated into each of these standards, reflecting the intent of the NZC.

There are two parts to this matrix. The first consists of Science standards with three external standards and a suite of internal Science standards. These standards equally cover the four contextual strands from the New Zealand curriculum (NZC).

The second part is a suite of standards covering the three specialist sciences of Physics, Chemistry and Biology. Each specialist science has three external standards. The Science external standards can also be sat by candidates taking specialist sciences. The exclusions are written alongside the matrix – see Appendix 2. The standards that are similar to those in the Science part of the Level 1 matrix were given different titles to reflect a different emphasis.

There is scope for considerable flexibility so that schools can select the set of standards that match the learning programme(s) that they have designed for their students.

All four Planet Earth and Beyond standards, at Level 1, are to be internally assessed. This means that the Science external standards can all be included in one exam slot, for consistency with the principles and parameters of the alignment process.

Addressing Credit Parity

The writing group for these standards gave careful consideration to the requirement that, in general, one credit should represent 10 hours of notional learning, including timetabled and out-of-class learning, and assessment, for an average student.

External and Internal Assessment

The writing group carefully considered the content of the individual standards, the most appropriate means of assessing each outcome and the requirement that only three external standards should be assessed against during one three-hour exam when deciding which standards should be assessed against externally or internally.

Planet Earth and Beyond (PEB)

All four Planet Earth and Beyond standards are to be internally assessed so that the Science external standards can all be included in one exam slot. Internally- assessed PEB standards also allow for a greater flexibility in course design.

Science 1.13
Demonstrate understanding of the formation of surface features in New Zealand
This standard covers the relationships between the processes of plate tectonics, and erosion and weathering, and the surface features of the land. This standard can be assessed in either a local or national context within Aotearoa/New Zealand. Assessment related to the rock cycle has been moved to Level 2 because the level of understanding required is more appropriate to this level.

Science 1.14
Demonstrate understanding of carbon cycling
This standard covers the carbon cycle in terms of a global process which includes both land and oceans.

Science 1.15
Demonstrate understanding of the effect on planet Earth of astronomical cycles
This standard has added “the effect on planet Earth” to what was previously assessed in achievement standards. The linking of the astronomical cycles with these effects on Earth will support the use of relevant contexts in teaching programmes.

Science 1.16
Investigate an astronomical or Earth science event
This standard includes reporting on an investigation. An investigation has been defined in its broadest sense to allow flexibility and to reflect the intent of the Nature of Science strand.

Living World

Science 1.9
Demonstrate understanding of biological ideas relating to genetic variation
This standard covers the continuity of life based on the inheritable nature of DNA, and links the concepts of DNA, phenotypic variation, and adaptation to the environment. The rationale for establishing this standard as the common external standard is its focus on the key role of DNA in linking all aspects of biology – ecology is connected to life processes via DNA and gene expression. There is a shift in focus in the new standard away from procedural aspects such as using punnet squares towards understanding the significance of DNA and its role in organisms ie to ensure continuity and to generate variation.

Science 1.10-1.12
Investigate life processes and environmental factors that affect them
Investigate biological ideas relating to interactions between humans and micro-organisms
Investigate the biological impact of an event on a New Zealand ecosystem
The term "investigate" in the titles signals the expectation that students are involved in a wide range of rich learning activities that includes practicals, field work, modelling, research, and interpretation of secondary materials. They will then use their findings to demonstrate their understanding of key biological ideas. While investigation skills do not form part of the achievement criteria for these standards, the ability to make meaning of primary and secondary data within the various contexts does. This rationale reflects the way in which NZC Level 6 Nature of Science strand recognises the diverse ways in which scientists construct knowledge.

The range of Living World internal standards provides opportunities for teachers to develop a variety of courses which incorporate both the Nature of Science and Living World achievement objectives into a range of contexts that will be meaningful for students.

Biology 1.1 and 1.2
Carry out a practical investigation in a biological context, with direction
Report on a biological issue
These standards cover skills and knowledge related to investigating, researching and communicating, which are significant to the field of Biology.

B1.1 was developed to allow flexibility in the modes and contexts of assessment. Evidence for this standard may be collected in a variety of ways which are specified in the assessment conditions that accompany the standards. The option of using a portfolio approach is provided to recognise that students at NZC Level 6 develop investigation skills progressively and may better develop and demonstrate those skills in a range of assessment situations. This allows teachers to use more than one investigation as an opportunity for assessment. The aim is to move away from the current practice of assessing investigation in an isolated, contrived event, resulting in greater assessment validity. The allocation of four credits for B1.1 recognises that greater teaching, learning and assessment time will be involved.

B1.2 reflects the Participating and Contributing, and Communicating in Science, achievement objectives in the Nature of Science strand. It involves students exploring a socio-scientific issue and developing a point of view on an issue based on their understanding of biology. Details of the scope and parameters of the resource information involved are provided in the assessment conditions accompanying the standard.

Biology 1.3-1.5
Demonstrate understanding of biological ideas relating to micro-organisms
Demonstrate understanding of biological ideas relating to the life cycle of flowering plants
Demonstrate understanding of biological ideas relating to a mammal as a consumer
These are externally-assessed standards which are derived from the NZC Level 6 Life Processes achievement objective that recognises that structural features are related to function in the life processes of all organisms. The requirement for a common external examination means that the scope and context of each standard has been specified. These standards allow external assessment to move away from an emphasis on recall of

broad content to an understanding of the key biological ideas better reflecting the step up from Level 5 of the curriculum.

There is no specific ecology external standard in the L1 matrix since the Ecology achievement objective, which focuses on investigation, is better suited to being assessed internally, particularly at curriculum Level 6.

The external Biology and internal Living World standards cover the same level of curriculum achievement (Level 6). The exclusion between B1.3 and S1.1 is required due to the degree of overlap of content involved despite their different emphases.

Physical World

Science 1.1
Demonstrate understanding of aspects of mechanics
This standard was chosen to be externally-assessed because the study of mechanics has more well-defined boundaries than other areas of study at this level.

Science 1.2-1.4
Investigate implications of electricity and magnetism for everyday life
Investigate implications of wave behaviour in everyday life
Investigate implications of heat for everyday life
In the Science standards for Physics, students should acquire sufficient understanding of the concepts of the topic to be able to relate what they have learned to a situation that might be encountered in their everyday lives. It is hoped that this requirement will mean that students will appreciate the relevance of what they are learning and hence gain more enjoyment from the learning process.

Some examples of possible questions that students might address that relate to real life situations are:

Electricity and magnetism:
- A power point is loaded to the level that it becomes overloaded. What happens and what causes it to happen?
- Should homes be built under high voltage power lines?

Wave behaviour:
- What causes a red sunset?
- Should frequent cell phone users be concerned about possible cancer?

Heat:
- In what way will the effect of the melting ice at the north pole be different to the effect of the melting ice at the south pole?
- Why does sweating cool you down?

Although many of these questions have a strong social science flavour, these standards require the student to concentrate on the science of the situation; social science discussions will not be considered when student work is judged.

The learning that relates to each standard should be completed in about five weeks. The number of questions the students are required to address will depend on the relative complexity of the situation involved. A maximum of three questions is considered reasonable.

Physics 1.1
Carry out a practical physics investigation that leads to a linear mathematical relationship, with direction
This standard was developed to allow a logical progression of skills and understanding from L1 through to L3. This standard focuses on the use of skills in an investigation rather than an evaluation of the process of an investigation as that is beyond Level 1.

Physics 1.3-1.4
Demonstrate understanding of aspects of electricity and magnetism
Demonstrate understanding of aspects of wave behaviour
The main change to the structure of standards in this area is the move to a single criterion. Two criteria standards can lead to anomalies where a student can achieve very highly in one criterion but very poorly in the other. By combining the grade criteria it is possible to award a grade that more closely reflects the overall ability of the student.

The content of the standards is largely unchanged.

Exclusions exist between the Physics standards and the equivalent Science standards because of the significant overlap of content.

Physics 1.5
Demonstrate understanding of aspects of heat
Heat was chosen as the focus for this standard because there is a major practical aspect as well as theory.

Although the NZC refers to atomic and nuclear physics, it was decided that this was not a key outcome for qualification assessment at this level. It will be included in the L2 suite of achievement standards.

Material World

Science 1.5
Demonstrate understanding of aspects of acids and bases
This standard covers understanding of the properties and uses of some acids and bases. It requires knowledge of the structure and formulae of ions. It retains most aspects of the Chemistry standard with the exception of metal properties that are now covered in Science 1.7.

Science 1.6
Investigate the implications of the use of carbon compounds as fuels
This standard covers the use of carbon compounds as fuels. It requires an understanding of names, formulae, and properties (including combustion reactions) of some simple hydrocarbons and alcohols. The implications of the use of hydrocarbons as fuels for humans and the environment are linked to these properties.

Science 1.7
Investigate the implications of the properties of metals for their use in society
This standard covers the properties of metals and the implications of these properties for the ways that metals are extracted and used.

Science 1.8
Investigate selected chemical reactions
This standard covers a range of chemical reactions and classifies them using experimental observations and equations. It also covers factors which affect the rate of a chemical reaction.

Chemistry 1.1
Carry out a chemistry practical investigation with direction
This standard covers the carrying out of a procedure to collect primary data and the processing, interpreting of both primary and secondary data.

Chemistry 1.2
Demonstrate understanding of the chemistry in a technological application with direction
This standard covers the links between a technological application of chemistry and the chemistry involved. A technological application is defined as a use of chemistry to meet the needs of society.

Chemistry 1.3
Demonstrate understanding of aspects of carbon chemistry
This standard covers the understanding of the names, formulae, and properties (including combustion reactions) of some simple hydrocarbons. The implications of the use of hydrocarbons as fuels for humans and the environment are linked to these properties.

Chemistry 1.4
Demonstrate understanding of aspects of selected elements
This standard covers the chemical and physical properties and uses of selected metals and non-metals. It also covers the relationships between the atomic structure of the elements and the organisation of and trends in the periodic table.

Chemistry 1.5
Demonstrate understanding of aspects of chemical reactions
This standard covers the classification of a range of chemical reactions based on observations and related equations. It also covers factors which affect the rate of the chemical reaction.

Appendix 2 – Sciences Matrix - Level 1

Physical World	Material World	Living World	Planet Earth & Beyond
Science 1.1 Demonstrate understanding of aspects of mechanics. 4 credits External	**Science 1.5** Demonstrate an understanding of chemical ideas relating to acids and bases. 4 credits External	**Science 1.9** Demonstrate understanding of genetic variation. 4 credits External	**Science 1.13** Demonstrate understanding of the formation of surface features in New Zealand. 4 credits Internal
Science 1.2 Investigate the implication of electricity and magnetism in everyday life. 4 credits Internal	**Science 1.6** Investigate the implications of the use of carbon compounds as fuels. 4 credits Internal	**Science 1.10** Investigate life processes and environmental factors that affect them. 4 credits Internal	**Science 1.14** Demonstrate understanding of carbon cycling. 4 credits Internal
Science 1.3 Investigate the implication of wave behaviour in everyday life. 4 credits Internal	**Science 1.7** Investigate the implications of the properties of metals to their use in society. 4 credits Internal	**Science 1.11** Investigate interactions between humans and micro-organisms. 4 credits Internal	**Science 1.15** Demonstrate understanding of the effect on planet Earth of astronomical cycles. 4 credits Internal
Science 1.4 Investigate the implication of heat in everyday life. 4 credits Internal	**Science 1.8** Investigate selected chemical reactions. 4 credits Internal	**Science 1.12** Investigate the biological impact of an event on a New Zealand ecosystem. 4 credits Internal	**Science 1.16** Investigate an astronomical or Earth science event. 4 credits Internal
Physics 1.1 Carry out a practical investigation, with direction, that leads to a linear mathematical relationship. 4 credits Internal	**Chemistry 1.1** Carry out a practical chemistry investigation, with direction. 4 credits Internal	**Biology 1.1** Carry out a practical investigation in a biology context. 4 credits Internal	
Physics 1.2 Demonstrate understanding of the physics of an application. 2 credits Internal	**Chemistry 1.2** Demonstrate understanding of the chemistry in a technological application, with direction. 2 credits Internal	**Biology 1.2** Report on a biological issue. 3 credits Internal	
Physics 1.3 Demonstrate understanding of aspects of electricity and magnetism. 4 credits External	**Chemistry 1.3** Demonstrate understanding of aspects of carbon chemistry. 4 credits External	**Biology 1.3** Demonstrate understanding of biological ideas relating to micro-organisms. 4 credits External	
Physics 1.4 Demonstrate understanding of aspects of wave behaviour. 4 credits External	**Chemistry 1.4** Demonstrate understanding of aspects of selected elements. 4 credits External	**Biology 1.4** Demonstrate understanding of biological ideas relating to the life cycle of flowering plants. 4 credits External	
Physics 1.5 Demonstrate understanding of aspects of heat. 4 credits External	**Chemistry 1.5** Demonstrate understanding of aspects of chemical reactions. 4 credits External	**Biology 1.5** Demonstrate understanding of biological ideas relating to a mammal as a consumer. 3 credits External	

There will be exclusions between:

- S1.2 and P1.3
- S1.3 and P1.4
- S1.4 and P1.5
- S1.6 and C1.3
- S1.7 and C1.4
- S1.8 and C1.5
- S1.11 and B1.3