Field Sciences

Review of *Biology* Level 2 achievement and unit standards

Unit standards

Subfield	Domain	ID
Science	Biology	6308-6312, 8925-8930

Achievement standards

Domain	ID	Subject reference
Biology	90457	Biology 2.1
	90459	Biology 2.3
	90460	Biology 2.4
	90461	Biology 2.5
	90462	Biology 2.6
	90463	Biology 2.7
	90464	Biology 2.8
	90769	Biology 2.2

The Ministry of Education and NZQA National Qualifications Services have completed the review of the achievement and unit standards listed above.

New Registration date **November 2011**

Date new versions published **November 2011**

Planned review date **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 Principles for Standards Review. 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 tertiary use were recommended for expiry.

National consultation was undertaken in 2010, with the results analysed by Research New Zealand. The responses were generally positive.

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

Main changes resulting from the review

- All NZC Level 7 (NZQF Level 2) outcomes derived from the NZC are now assessed using achievement standards, and there are no longer any unit standards linked to the NZC.
- Existing achievement standards were reviewed and new achievement standards were developed to align with the NZC. See table below.
- Grading criteria for achievement standards were reviewed in accordance with the Standards Review Guidelines.
- Unit standards that recognised similar outcomes as achievement standards were replaced or recommended for expiry. See table below.
- While unit standard 6309 is recommended for expiry, tertiary users are referred to Environmental Sustainability achievement standard 90811 as a possible replacement – see summary of changes table.

For a detailed description of the review of, and the changes to, the Biology standards see the appendix at the end of this report.

Impact on existing organisations with consent to assess

Current consent for			**Consent extended to**		
Nature of consent	**ID**	**Level**	**Nature of consent**	**ID**	**Level**
Domain	Biology	2	Standard	90811	2
Standard	6309	2	Standard	90811	2
Standard	6311	2	Standard	91155	2

Impact on Consent and Moderation Requirements (CMR)
(Formerly known as AMAP)

All new achievement standards were registered on CMR 0233.

Impact on registered qualifications

Key to type of impact	
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 table identifies a qualification developed by another SSB that is *Affected* by the outcomes of this review. The SSB has been advised that the qualification requires revision.

Ref	Qualification Title	ID
0642	National Certificate in Conservation (Trainee Ranger) (Level 3)	Learning State Limited (trading name of the Public Sector Training Organisation)

Impact of changes on NCEA Exclusions List

For transition purposes, the following new exclusions will apply.

Achievement standard	Excluded against these standards
91153	90457
91155	6311
91157	6308, 90459
91158	8929, 90460
91158	8930
91160	8928

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]**. Standards that appear in *italics* are recommended alternatives, rather than replacements.

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 2011**

Internally assessed achievement standards and unit standards categorised as category C or D expire at the end of	**December 2012**

Sciences > Science > Biology

ID	Title	Level	Credit	Review Category
6308	Explain how genetic change occurs within populations	2	5	C
90459	Describe genetic variation and change	2	3	C
91157	**Demonstrate understanding of genetic variation and change [Externally Assessed]**	**2**	**4**	
6309	Evaluate practices used for managing a resource to ensure ecological sustainability	2	4	D
90811	*Describe the consequences of human activity within a biophysical environment in relation to a sustainable future*	*2*	*4*	
6310	Investigate an example of applied biology	2	3	D
6311	Explain reasons for the special characteristics of New Zealand's flora and fauna	2	3	C
91155	**Demonstrate understanding of adaptation of plants or animals to their way of life**	**2**	**3**	
6312	Investigate factors that affect a living process	2	3	D
8925	Investigate diversity in animals	2	3	D
8926	Investigate diversity in plants	2	3	D
8927	Investigate structure and function in cells	2	3	D
8928	Use a microscope to investigate biological material	2	3	C
91160	**Investigate biological material at the microscopic level**	**2**	**3**	
8929	Identify biological population patterns through investigation	2	3	C
8930	Identify biological community interrelationships and patterns through investigation	2	3	C
90460	Investigate an interrelationship or pattern in an ecological population or community	2	3	C
91158	**Investigate a pattern in an ecological community, with supervision**	**2**	**4**	
90457	Carry out a practical biological investigation with supervision	2	3	C
91153	**Carry out a practical investigation in a biology context, with supervision**	**2**	**4**	
90461	Describe concepts and processes relating to ecology	2	3	D
90462	Describe diversity in the structure and function of animals	2	3	D
90463	Describe diversity in the structure and function of plants	2	3	D
90464	Describe cell structure and function	2	3	D
90769	Research the interaction between humans and an aspect of biology	2	3	D
91154	**Analyse the biological validity of information presented to the public**	**2**	**3**	**New**
91156	**Demonstrate understanding of life processes at the cellular level [Externally Assessed]**	**2**	**4**	**New**

ID	Title	Level	Credit	Review Category
91159	**Demonstrate understanding of gene expression [Externally Assessed]**	**2**	**4**	**New**

Appendix

Development of L2 Biology standards

This range of standards was developed to assess outcomes derived from the NZC Level 7 achievement objectives of the Living World and the Nature of Science strands.

What has changed from the initial matrix?

Feedback from consultation on the Level 2 matrix was considered and as a result the following changes were made to the proposed standards:

- The titles of the standards have been altered to better reflect the intent of the standards.
- Biology 2.9 has been deleted from the matrix as it was apparent that there was significant overlap with an achievement standard for Educational Sustainability, AS90811, *Describe the consequences of human activity within a biophysical environment in relation to a sustainable future*.
- Feedback from the sector consultation that Biology 2.6 would require more than 30 hours work (3 credits) has resulted in the credit value increasing to 4 credits.
- An increase in credit value from 2 to 3 for Biology 2.8 is to recognise the extra learning time needed for students to develop the biological knowledge as well as microscope skills.

Biology 2.1: *Carry out a practical investigation in a biology context, with supervision*

This standard has been changed slightly so that the scope of the investigation allows students to work more collaboratively as an alternative to working totally independently.

This standard has been developed to include the Nature of Science achievement objectives on understanding about science and investigating science. The investigation still involves the student carrying out a complete practical investigation. However it is flexible enough to allow students to work more collaboratively as an alternative to working totally independently.

This means that students may carry out a stand alone investigation or an individual investigation that can contribute findings to a larger group or class investigation. They can interpret their own findings in light of findings from investigations carried out by other students, previous investigations, or from existing scientific knowledge. This could also involve students presenting their findings to others.

The term ‘sound’ investigation has been deliberately chosen for the criteria for Merit to indicate there are no major gaps or inconsistencies in the reasoning processes throughout the design and interpretation. ‘In-depth’ may apply to a thorough method or interpretation, but does not necessary imply the holistic quality expected in a ‘comprehensive’ investigation. Justifying why an investigation is sound is one way a student may demonstrate excellence.

The change in this standard’s credit value from 3 to 4 is in recognition of the extra teaching time required to incorporate the Nature of Science achievement objectives.

Biology 2.2: *Analyse the biological validity of information presented to the public*

This standard is derived from the Communicating in Science achievement objective from the Nature of Science strand.

Students are expected to be able to identify both accurate and inaccurate biological information in the way information is presented to the public.

Students are expected to evaluate a range of different sources. It is suggested that these sources involve three different genres (which may include historical information).

It is anticipated that students collect evidence of their analysis in a portfolio or as a single assessment report. This evidence will be provided in response to a range of pieces of communication, selected across at least three different genres, which may include: advertisements, documentary, newspaper articles, historical accounts, videos.

Articles for analysis may be provided by the teacher or selected by the student. If the latter applies the selection must be approved by the teacher. In either case, the processing of information and preparation of the report is to be completed individually.

The assessor can determine the time taken by the assessment as this is dependent on the situation involved in the issue.

Biology 2.3: *Demonstrate understanding of adaptation of plants or animals to their way of life*

Two possible approaches can be used for this standard – either the study of two connected life processes in one group of organisms, or the study of one life process over three taxonomic or functional groups of animals or plants.

Students may study either the adaptation of plants or animals; and the standard therefore avoids the duplication of the assessment of the same curriculum outcome, as was the case previously.

The life processes to be used are limited to the selection provided in the standard.

An explanatory note is included to define the term adaptation. It has been included as the term adaptation can be used in different ways.

Biology 2.4: *Demonstrate understanding of life processes at the cellular level*

Title has been changed to '…life process at the cellular level' with a focus on the three processes of photosynthesis, respiration and cell division.

References to unicellular organisms have been removed – only plant and animal cells are required for study to ensure only eukaryote cells are used.

Biological ideas are taught and assessed in the context of the three life processes as specified in EN 2 rather than in isolation. Therefore the ideas are only required in the detail as related to each process eg cell organelles will be those related to photosynthesis, respiration and cell division. However, it would include membrane structures related to transport of materials as it relates to the life processes being studied.

The specific names of enzymes are not required.

In EN 2 reference to the cell cycle is to focus on the role of cell division in cell continuity. An understanding of DNA replication, including complementary base pairing and enzymic control, is needed for demonstrating an understanding cell division as part of the cell cycle. Specific names of enzymes and names of stages of mitosis are not required.

Biology 2.5: *Demonstrate understanding of genetic variation and change*

This standard assesses the 'Explain how the interaction between ecological factors and natural selection leads to genetic changes within populations' achievement objective. This standard has limited changes from the existing Biology 2.3 (90459)

The main changes are specified in EN 4 relating to monohybrid inheritance which specifies the requirement to include the study of the effect of co-dominance, incomplete dominance, lethal and multiple alleles.

Different DNA roles are included in two standards: this standard assesses the role of DNA in inheritance; and Biology 2.7 assesses the role of DNA in gene expression.

Biology 2.6: *Investigate a pattern in an ecological community, with supervision*

This standard is designed to assess the Ecology achievement objective in the Living World strand as well as the 'Investigating in Science' achievement objective in the Nature of Science strand. The standard requires students to study one ecosystem so that the relevant theory can be incorporated into the teaching while still enabling an enriched context for students to explore ecology.

This standard is designed to assess the interpretation of collected data to identify a pattern in reference to environmental factors and the biology of organisms. A pattern would be succession; zonation; stratification; or other distribution pattern in response to an environmental factor.

The practical aspects of planning an investigation, collecting and processing data during the field trip could be included if assessment of Biology 2.1 is used in conjunction with this standard.

This standard provides the opportunity for a richer information-gathering task that is developed with the teacher and involves more observations so that a more holistic set of data is collected recognising the fact that individual species exist within communities and not in isolation.

The standard is about using gathered data to be able to discuss the pattern using a range of organisms to reflect that this is a community study not an ecological niche study. Specification of a minimum of two species of organisms allows for identification of an inter-relationship relevant to the pattern which could allow access to the Excellence grade, and also recognises that organisms do not live in an ecosystem in isolation.

Biology of the organisms will include structural, physiological, and behavioural adaptations of organisms related to the environmental factor(s) **and** their inter-relations with other organisms eg competition, predation, mutualism.

Evidence is likely to be in the form of a written report.

Biology 2.7: *Demonstrate understanding of gene expression*

This standard is derived from the 'Understand that DNA and the environment interact in gene expression' Level 7 achievement objective.
This is a significant change as previously much of this knowledge was assessed by a Level 3 Biology standard which was based on the previous curriculum Level 8.

Consequently, the content has been amended in this draft standard to clearly identify the required knowledge appropriate to Level 7 of the curriculum. EN 4 to 9 have been included to provide the necessary guidance for the appropriate level of knowledge.

Biology 2.8: *Investigate biological material at the microscopic level*

This achievement standard has been developed from unit standard 8928 *Use a microscope to investigate biological material*.

This standard assesses the Communicating in Science achievement objective from the Nature of Science strand and the key competency: Using language, symbols and text.

Recording observations using diagrams is an important communication skill which has specific conventions in Biology. No other standard assesses this skill. By learning how to represent their own observations in this way, students develop the skill needed to interpret the representations of others.

This standard involves a form of investigation used for investigating life processes at the cellular level that is specific to Biology. It allows students to develop an appreciation of how the use and the development of microscopy have contributed to modern biological knowledge. This appreciation is linked to the Nature of Science strand achievement objectives: Understanding about Science and Investigating in Science). The standard includes only two assessment criteria – Achieved and Achieved with Merit as it was not possible to describe a qualitative step-up to Excellence level.

A range of biological material is to be prepared from plant tissues and unicellular organisms. A minimum of two different plant tissues and one unicellular organism is required. The students are required to prepare material and draw their observations of all three materials.

Students are also required to relate the observed features to the function of the cell. The theory of what organelles are present and how they function will need to be taught in the context of the material chosen for preparation and drawing.