Field **Sciences**

Review of *Biology* Level 3 achievement and unit standards

Unit standards

Subfield	Domain	ID
Science	Biology	6317-6321, 8931-8934

Achievement standards

Domain	ID	Subject reference
Biology	90713	3.1
	90714	3.2
	90715	3.3
	90716	3.4
	90717	3.5
	90718	3.6
	90719	3.7

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

New Registration date **December 2012**

Date new versions published **December 2012**

Planned review date **December 2016**

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 tertiary use were recommended for expiry. Unit standards 6314 and 6315 were not included in this review because of continuing tertiary usage, and were identified for separate review which took place in 2012.

National consultation was undertaken in 2011, with the results analysed by Research New Zealand. The responses were generally positive.

The review of these Level 3 unit and achievement standards was completed in time for implementation in schools in 2013.

Main changes resulting from the review

- All NZC Level 8 (NZQF Level 3) 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 recommended for expiry. See table below.

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 Consent and Moderation Requirements (CMR)

All new achievement standards have been registered on CMR 0233.

Impact of changes on Exclusions List

For transition purposes, the following exclusions will apply for new achievement standards.

Achievement standard	Excluded against each of these standards
91601	90713
91602	6319, 90714
91603	90716
91605	90717
91606	90719
91607	90718

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 2012**

Internally assessed achievement standards and unit standards categorised as category C or D expire at the end of	**December 2013**

Sciences > Science > Biology

ID	Ref	Title	Level	Credit	Review Category
6317		Explain the process of speciation	3	4	D
6318		Interpret scientific evidence for human evolution	3	4	D
6320		Describe a biological technique used in contemporary molecular biology or biotechnology	3	3	D
6321		Investigate and describe scientific views of human biological evolution	3	3	D
8931		Describe gene expression	3	4	D
8932		Describe gene-gene and gene-environment interaction	3	3	D
8933		Relate aspects of animal behaviour to environmental factors	3	3	D
8934		Relate aspects of plant responses to environmental factors	3	3	D
90713	3.1	Carry out a practical investigation into an aspect of an organism's ecological niche with guidance	3	4	C
91601	**3.1**	**Carry out a practical investigation in a biological context, with guidance**	**3**	**4**	
6319		Make an informed judgement on a contemporary biological issue	3	3	C
90714	3.2	Research a contemporary biological issue	3	3	C
91602	**3.2**	**Integrate biological knowledge to develop an informed response to a socio-scientific issue**	**3**	**3**	
90715	3.3	Describe the role of DNA in relation to gene expression	3	4	D
90716	3.4	Describe animal behaviour and plant responses in relation to environmental factors	3	4	C
91603	**3.3**	**Demonstrate understanding of the responses of plants and animals to their external environment [Externally Assessed]**	**3**	**5**	
90717	3.5	Describe processes and patterns of evolution	3	3	C
91605	**3.5**	**Demonstrate understanding of evolutionary processes leading to speciation [Externally Assessed]**	**3**	**4**	

ID	Ref	Title	Level	Credit	Review Category
90718	3.6	Describe applications of biotechnological techniques	3	3	C
91607	**3.7**	**Demonstrate understanding of human manipulations of genetic transfer and its biological implications**	**3**	**3**	
90719	3.7	Describe trends in human evolution	3	3	C
91606	**3.6**	**Demonstrate understanding of trends in human evolution [Externally Assessed]**	**3**	**4**	
91604	**3.4**	**Demonstrate understanding of how an animal maintains a stable internal environment**	**3**	**3**	**New**

Appendix

Development of Level 3 Biology Standards

Process of Aligning Standards with the New Zealand Curriculum

The Level 3 Biology achievement standards have been developed to align the outcomes with the Level 8 Living World strand, and with the Nature and Science strand, of the Science Learning Area of the NZC.

Supporting documents have been developed to assist in the interpretation of achievement standards and to assist in the development of teaching and learning programmes.

- Conditions of Assessment provide guidelines on the assessment of the internal standards.
- Assessment Specifications provide guidelines on the assessment of external standards (accessible via relevant subject on NZQA website).

Addressing Duplication

The achievement standards and unit standards were compared in detail to identify duplication issues. Where duplication of outcomes was identified the unit standard was recommended for expiry.

Addressing Credit Parity

The credits allocated to each of the draft standards reflect the time required for the teaching and learning involved.

External and Internal Assessment

The method of assessment for each standard best reflects the teaching and learning involved in the content of the standard.

What Has Changed?

Biology 3.1 *Carry out a practical investigation in a biological context, with guidance* (4 credits, Internal)

This standard replaces AS90713. It reflects the Investigating in science and Understanding about science, and Nature of Science achievement objectives. The scope of investigations assessed by this standard has thus been expanded by the removal of the requirement to focus on responses to the environment and the ecological niche of an organism.

The step-ups from Level 2 to Level 3 involve the shift from curriculum Level 7 to 8 and the reduction in the degree of teacher involvement and in the collaboration with other students.

Use of the term “sound” to describe an investigation at Merit is deliberately chosen to indicate that there are no major gaps or inconsistencies in the reasoning processes throughout the experimental design and interpretation. “In-depth” might apply a very thorough method or interpretation but does not necessarily imply the holistic quality expected in a complete investigation. Justifying why an investigation is sound is one way in which a student can then demonstrate excellence.

While statistical analysis may be carried out, it will not constitute excellence on its own but may form part of the evaluation of reliability of the method and data.

Students working at excellence may make links between their own findings and some biological principle, concept, theory, or model to comprehensively discuss their valid conclusion, eg Gausian competitive exclusion, prey/predator dynamics, osmoregulation/homeostasis, territoriality.

Biology 3.2 *Integrate biological knowledge to develop an informed response to a socio-scientific issue (*3 credits, Internal)

This standard replaces US6319 and AS90714. It is derived from the Participating and contributing objective of the Nature of Science strand – "Use relevant information to develop a coherent understanding of socio-scientific issues that concern them, to identify possible responses at both the personal and societal levels". Hence the thrust is strongly toward the development of a personal response based on accumulated biological information and away from assessing the research process used.

To signal the shift away from a primarily research task, the teacher guidance role is expanded to allow the provision of extra resource material, suggestion of sites for further references etc. Students will still be required to process and evaluate any material in order to identify the most relevant material and will be expected to research independently.

Biology 3.3 *Demonstrate understanding of the responses of plants and animals to their external environment (*5 credits, External)

This standard replaces AS90716. It is derived from Living World achievement objective "Understand the relationship between organisms and their environment".

The increased credit value (compared with AS90716) reflects the increased teaching and learning time required to cover the details of ecological inter-relationships (which used to be incorporated into the Level 2 Ecology standard) and also recognises that to reach merit and excellence a student needs to show appropriate evidence relating to both plants and animals.

"External" environment is specified in the standard title in order to distinguish this standard from Biology 3.4 which involves responses to the internal environment.

Historically the outcome assessed in this standard has been very content-heavy. The intent of the reviewed standard is to take more of a "systems-approach" to considering any response to the environment. The key ideas here are:

- all responses are adaptive and lead to "fitness to niche" (how it optimises the way it fits into its niche)
- an organism's ecological niche involves all its relationships with both biotic and abiotic environmental factors as well as the adaptations which allow it to survive and/or provide it with a competitive advantage.

The 'systems approach' means that students should be able to apply their understanding to a novel situation presented in a resource-based examination question. Hence, the suitability of this standard for external assessment.

Biology 3.4 *Demonstrate understanding of how an animal maintains a stable internal environment (*3 credits, Internal)

This standard is derived from Living World achievement objective "Understand the relationship between organisms and their environment".

This is a new standard that recognises that organisms respond to their external environment at more than one level. Whereas the focus of Biology 3.3 is on outward responses involving orientation and organism interrelationships, this standard focuses on the internal control processes for maintaining a stable internal environment despite external fluctuation (homeostasis). It provides a rich opportunity to further explore systems thinking in a biology context and it also allows for a detailed study of one animal (including humans).

This standard builds from the outcomes assessed in the Level 2 standards 91155 and 91156 and is at Level 3 since it requires a higher level of conceptual understanding. It recognises that systems may be complex, yet understood, using a systems approach. By contrast, traditional approaches to biology have involved considering organisms' biology as complicated linear processes. This contrast between complex systems and complicated processes is an important distinction.

Internal assessment is most appropriate to assess this standard since the specific systems studied by students will vary between (and possibly within) schools in response to interest, expertise and opportunity. Because this is a new standard there is added detail provided for teachers in the explanatory notes to clarify the intended scope.

Biology 3.5 *Demonstrate understanding of evolutionary processes leading to speciation (*4 credits, External)

This standard replaces AS90717. Its title aligns with the Living World achievement objective that refers to evolutionary processes that have resulted in the diversity of life on earth, the patterns being incidental. The Nature of Science objective (Understanding about science) is reflected in the inclusion of the biological ideas about how gene pools change (EN3) and the requirement for recognising and using scientific evidence for evolution in students' responses (EN4). It recognises that the nature of scientific evidence changes over time so allows students to see the connection between new ideas and historical scientific knowledge.

The emphasis on New Zealand fauna and flora in the explanatory note reflects the reference in the Science learning area introductory statement (NZC page 28): "The emphasis is on the biology of New Zealand, including the sustainability of New Zealand's unique fauna and flora and distinctive ecosystems".

The role of mutation implies the full range of mutations at all levels, including point and chromosomal mutations that contribute to phenotypic change as well as non-disjunction that results in polyploidy (instant speciation).

Biology 3.6 *Demonstrate understanding of trends in human evolution* (4 credits, External)

This standard replaces AS90719. There was no need for significant change in the content and scope of AS90719. The standard is derived largely from the Nature of Science

objectives Understanding about science and Investigating in science as well as addressing the evolutionary aspects of the Living World Achievement Objective.

The credit value (increased from 3 to 4) recognises the requirement for students (and teachers) to deal with a continually expanding pool of current evidence around human evolution in order to effectively discuss the trends involved.

Biology 3.7 *Demonstrate understanding of human manipulations of genetic transfer and its biological implications* (3 credits, Internal)

This standard replaces AS90718. The title of this new standard better aligns with the Living World achievement objective "Understand how humans manipulate the transfer of genetic information from one generation to the next and make informed judgements about the social, ethical and biological implications relating to this manipulation" and also with "Explore the evolutionary processes that have resulted in the diversity of life on Earth and appreciate the place and impact of humans within these processes".

There is a focus on biological implications in this standard to avoid overlap between this and Biology 3.2 (Integrate biological knowledge to develop an informed response to a socio-scientific issue) where the social and ethical aspects play a greater role.

The big idea here is how humans are potentially impacting on and changing the rate and direction of evolution of populations. The shift in focus recognises that modern genetic modification is simply a continuation of selective breeding activities that humans have been undertaking throughout history. Thus this standard provides an opportunity to explore the Nature of Science objective Understanding about science "Understanding that scientists have an obligation to connect their new ideas to current and historical scientific knowledge and to present their findings for peer review and debate".

Internal assessment is the most appropriate assessment mode since it allows for selection of specific topics and case studies as appropriate to each group of students, depending on local opportunities, expertise and interest.

The word "application" has been deliberately omitted to avoid confusion with the replaced standard. The meaning of "manipulate" has been expanded somewhat so the scope of the standard is wider than AS90718.

While there is less emphasis in the reviewed standard on covering a wide range of techniques, the specific techniques used will still be inherent in whatever context is used (eg recombinant DNA used in transgenesis, genome analysis or DNA profiling used in selective breeding). There is also scope for Mendelian genetics ideas, including recombination of various alleles to maintain diversity of phenotypes, inbreeding and outbreeding, avoiding expression of recessive alleles, use of test crossing, to be used in explanations.