FIELD SCIENCES

Review of *Science – Core* Level 3 achievement standards

Subfield Science

Domain	Id	Subject reference
Science – Core	90727-90733	Science 3.1-3.7

The Ministry of Education and the Secondary Education Group Assessment business unit of NZQA have completed a review of the achievement standards listed above that were registered in November 2003.

New Registration date **November 2005**

Date new versions published **November 2005**

Planned review date **March 2008**

Summary of review and consultation process

This review is part of the planned cycle of review that takes place after the first year of use of the achievement standards.

- Initial feedback and comments were collated from teachers/schools, moderators, examiners, markers, material developers, and other stakeholders.
- This information was reviewed by a subject expert panel and recommendations were made in March 2005.
- The recommendations were sent out for full consultation to secondary schools, tertiary institutions, and others in the education sector, in April/May 2005.
- Feedback from this full consultation has informed the changes described below.

Main changes resulting from the review

AS90727 (Science 3.1)

Title

- The title has been changed to 'Carry out a practical scientific investigation with guidance'. The word 'extended' has been deleted to emphasise that the key difference between Level 2 and Level 3 is that an investigation for Level 3 is with guidance rather than with supervision.

Introductory Statement

- The introductory statement has been changed to emphasise that the investigation is to be carried out individually, with guidance.

Achievement Criteria

- These have been simplified and have been made consistent with the changes made to the Level 2 Science 2.1 achievement standard.

Explanatory Notes

- The Explanatory Notes have been changed to be consistent with Science 1.1 and Science 2.1.
- Safety procedures have been specifically included in Explanatory Note 2.

- The requirement for the investigation to be carried out individually has been specified in Explanatory Note 4.
- An important additional discriminator between Level 2 and Level 3 is the discussion of scientific ideas relevant to the investigation. For achievement, the Level 3 achievement standard requires 'an identification of at least one of the science ideas relevant to the investigation'. For achievement with merit, and for achievement with excellence, 'explanation of science ideas relevant to the investigation' is expected.
- Achievement with merit, and achievement with excellence also require a 'quality' investigation for which the expectations are listed. For example, the treatment of extremes is fundamental to a quality report, as is precision in data.
- The discriminator between achievement with merit and achievement with excellence is in the evaluation, for which the definition has been made more explicit than for the Level 2 achievement standard to give clearer guidance.
- In regard to wording, some terms (eg workable) have been removed. Also, the phrase 'statistical techniques' has been removed to avoid the overuse of sophisticated statistical techniques at the expense of science. The word 'appropriate' is used often, as the Explanatory Notes have to cover both fair testing and pattern seeking.

AS90728 (Science 3.2)

Introductory Statement

- This has been modified so that the research involves selecting rather than collecting information, to emphasise that this aspect of the research is skilled rather than mechanical.

Achievement Criteria

- These have been reduced from two bullet points to one, and their format has been made consistent with the Level 2 Science 2.1 achievement standard. At Level 3, the research must involve a 'scientific controversy' with the consequent need to present two or more views.

Explanatory Notes

- The requirement for a log book (in Version 1, Explanatory Note 4) has been removed as unnecessary because the evidence required for achievement, particularly that listed in Explanatory Note 5, is sufficiently specific for this purpose, without additional evidence being required from the student.
- Explanatory Note 2 has been reworded. One purpose of this Explanatory Note is to state that the primary focus of the research and reporting is on scientific aspects. Secondary aspects include social, ethical, and cultural issues.
- Explanatory Note 4 has been reworded to make it clear that the research is student driven.
- The explicit requirement for comment on the bias or validity of the researched information (in Version 1, Explanatory Note 4) has been removed.
- The requirement for a range of sources of information (in Version 1, Explanatory Note 4), with the evidence of this being stepped up across the achievement grades, has been simplified. The new Explanatory Note 4 requires the student to 'Select a range of scientific information on more than one side of the controversy', and this applies equally to all grades of achievement.

- Explanatory Notes 5, 6, and 7, which indicate the report evidence required for the three grades of achievement, have been reworded in the style of the Level 2 achievement standard.
- The previous requirement for the student's point of view has been removed from the achievement, and achievement with merit grades. It has been retained as a requirement for achievement with excellence as a 'justified position on the controversy' (Explanatory Note 8).

AS90729 (Science 3.3)

Explanatory Notes

- Explanatory Note 3 has been reworded to relate to the role of genetic expression in gene technology, with more emphasis on the key principles. The 'stability of DNA and the effect of point mutations on gene expression' has been added to this Explanatory Note. The details of genetic processes have been retained as consultation feedback requested guidance on the depth of knowledge expected.
- In Explanatory Note 4 (bullet point 1), the selection of applications has been increased to include ligation.
- In Explanatory Note 4 (bullet point 2), 'associated ethical issues' has been replaced by 'associated issues', to recognise that there is a breadth of issues (economic, cultural, social, environmental, and ethical) associated with gene technology.

AS90730 (Science 3.4)

Title

- 'Chemical substances' has been replaced by 'organic compounds' to more accurately describe the nature of the chemical substances, and this has been followed through in the achievement standard.

Explanatory Notes

- In Explanatory Note 2, the selected organic compounds are 'alkanes, alkenes, alcohols, carboxylic acids, fats and oils', which has replaced 'alcohols, carboxylic acids, esters, fats and oils, and soaps and detergents'. Alkanes and alkenes have been added to allow for a brief introduction to polymers (Explanatory Note 4).
- In Explanatory Note 4, 'health' has been added as a possible context for uses and effects.
- Knowledge of esters is now limited to that which applies to the esterification process (Explanatory Notes 5 and 6). Hydrolysis of esters has been removed.
- Saponification has been removed.
- Knowledge of soaps and detergents is limited to uses based on the action of their anions on triglycerides and hydrocarbons (Explanatory Note 7).
- Requirements in relation to alcohols and carboxylic acids have been separated rather than being combined in one Explanatory Note as in Version 1 (Explanatory Notes 5 and 6).
- The effect of cis and trans structures on human health has been added (Explanatory Note 7).

AS90731 (Science 3.5)

Explanatory Notes

- Explanatory Notes 3 and 4 have been swapped, for consistency with other achievement standards.

AS90732 (Science 3.6)

Title

- The title has been changed to 'Describe selected properties and applications of EMR, radioactive decay, sound and ultrasound' and this has been followed through in the introductory statement and the achievement criteria. This is to clarify that it is the properties that are selected.

Explanatory Notes

- The Explanatory Notes have been changed to provide a more complete list of the physical properties (Explanatory Note 2).
- The scope of 'applications' (Explanatory Note 3) has been clarified to make it clear that aspects relating to the properties can be considered, but that detailed knowledge of the application is not required. Examples of applications, but not an exhaustive list, have been included for guidance.
- The requirements for sound and ultrasound are combined and Explanatory Note 2 has been changed to reflect this.
- 'Production methods' and 'detection methods' have been removed from Explanatory Note 2 as these do not fit with the achievement criteria. However, they are relevant to 'applications' in Explanatory Note 3.
- In relation to the use of formulae (in Version 1, Explanatory Note 4), a specific requirement for each grade of achievement was considered restrictive and so these have been removed. The formula f = 1/T has been added. Version 2, Explanatory Note 5 now applies.

AS90733 (Science 3.7)

Achievement Criteria

- For achievement with merit, a 'thorough report' has been replaced by a 'detailed report'.
- For achievement with excellence, a 'comprehensive report' has been replaced by a 'detailed and analytical report' because 'comprehensive' implied a greater evidence requirement than would be reasonable in relation to the credits allocated.

Explanatory Notes

- A 'detailed report' and a 'detailed and analytical report' have been defined.
- Examples of recent astronomical events or discoveries now include solar flares, moons of Saturn, and rings of Saturn.

Impact on Accreditation and Moderation Action Plan (AMAP)

None.

Impact on existing qualifications

None.

Impact of changes on NCEA Exclusions List

None.

Summary of main changes to achievement standards' Ids, classification, titles, levels, and credits

The following summary shows the changes made to the achievement standards as a result of the review. All changes are in **bold**.

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

Subfield Science
Domain Science – Core

Id	Title	Level	Credit	Review Category
90727	Carry out an extended practical scientific investigation with guidance **Carry out a practical scientific investigation with guidance**	3	4	B
90728	Research a current scientific controversy	3	4	B
90729	Describe genetic processes	3	4	B
90730	Describe selected chemical substances and their uses **Describe selected organic compounds and their uses**	3	4	B
90731	Describe geological processes affecting New Zealand	3	2	B
90732	Describe properties and applications selected from EMR, radioactive decay, sound and ultrasound **Describe selected properties and applications of EMR, radioactive decay, sound and ultrasound**	3	4	B
90737	Report on a recent astronomical event or discovery	3	2	B