Achievement Standard

Subject Reference	Chemistry 2.1				
Title	Carry out a practical investigation into a substance present in a consumer product using quantitative analysis				
Level	2	**Credits**	4	**Assessment**	Internal
Subfield	Science				
Domain	Chemistry				
Status	Registered	**Status date**	29 November 2018		
Planned review date	31 December 2020	**Date version published**	29 November 2018		

This achievement standard involves carrying out a practical investigation into a substance present in a consumer product using quantitative analysis.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Carry out a practical investigation into a substance present in a consumer product using quantitative analysis.	• Carry out an in-depth practical investigation into a substance present in a consumer product using quantitative analysis.	• Carry out a comprehensive practical investigation into a substance present in a consumer product using quantitative analysis.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 7. The standard is aligned to the Nature of Science achievement objectives and the Material World achievement objectives:

- Investigating in Science – Develop and carry out investigations that extend their science knowledge, including developing their understanding of the relationship between investigations and scientific theories and models
- Communicating in Science – Use accepted science knowledge, vocabulary, symbols, and conventions when evaluating accounts of the natural world and consider the wider implications of methods of communication and/or representation employed;

and is related to the material in the *Teaching and Learning Guide for Chemistry*, Ministry of Education at http://seniorsecondary.tki.org.nz.

This standard is also derived from *Te Marautanga o Aotearoa*. For details of *Te Marautanga o Aotearoa* outcomes to which this standard relates, see the Papa Whakaako for the relevant learning area.

Safety procedures outlined in *Safety and Science: A Guidance Manual for New Zealand Schools*, Learning Media, Ministry of Education, 2000, should be followed: https://stanz.nzase.org.nz/app/uploads/2015/05/Safety-and-Science.pdf.

2 *Carry out a practical investigation into a substance present in a consumer product using quantitative analysis* involves:

- developing a workable plan to determine if the consumer product sample and/or titration procedure requires modification
- collecting, recording and processing a sufficient quantity of data to enable a conclusion to be reached
- determining the concentration of a substance relevant to the investigation
- describing how significant variables were controlled in the investigation.

Carry out an in-depth practical investigation into a substance present in a consumer product using quantitative analysis involves:

- using results from preliminary trials to develop a valid plan to modify the consumer product sample and/or titration procedure
- collecting, recording and processing quality data that enables a valid conclusion to be reached
- accurately determining the concentration of the standard solution; and the substance present
- explaining how control of variables improved the quality of the investigation.

Carry out a comprehensive practical investigation into a substance present in a consumer product using quantitative analysis involves:

- accurately determining the concentration of the substance in the consumer product, including correct use of significant figures and units
- justifying how modifying the consumer product sample and/or the titration procedure improved the validity and accuracy of the investigation
- evaluating the outcome of the investigation in relation to the consumer product.

3 A *practical investigation* is an activity involving 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.

4 *Quantitative analysis* involves using a titration procedure to determine the concentration of a substance present in a given sample.

5 The titration must be one of:

- acid-base
- complexometric
- precipitation
- oxidation-reduction.

6 Determination of the concentration of a substance must involve the use of stoichiometric principles and both the relationships $n=m/M$ *and* $c=n/V$.

7 Conditions of Assessment related to this achievement standard can be found at http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards.

Replacement Information
This achievement standard replaced AS91161.

Quality Assurance

1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233