**NZQA**

**Approved**

Achievement standard: 90931 Version 3

Standard title: Demonstrate understanding of the chemistry in a technological application

Level: 1

Credits: 2

Resource title: Shiny, hardy Al

Resource reference: Chemistry VP-1.2 v2

Vocational pathway: Manufacturing and Technology

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| Date version published | February 2015 Version 2  To support internal assessment from 2015 |
| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number A-A-02-2015-90931-02-7200 |
| Authenticity of evidence | Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material.  Using this assessment resource without modification may mean that learners’ work is not authentic. Assessors/ educators may need to change figures, measurements or data sources or set a different context or topic to be investigated or a different text to read or perform. |

Vocational Pathway Assessment Resource

Achievement standard: 90931

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Learner instructions

# Introduction

This assessment activity requires you to demonstrate understanding of the chemistry related to the use of aluminium alloys.

You are going to be assessed on how comprehensively you demonstrate understanding of the chemistry in a technological application. You need to show that you can link the chemistry applicable with the use of aluminium alloys.

The following instructions provide you with a way to structure your work so you can demonstrate what you have learnt and achieve success in this standard.

Assessor/educator note: It is expected that the assessor/educator will read the learner instructions and modify them if necessary to suit their learners.

# Task

The Tiwai Point Aluminium smelter was set up to purify the metal aluminium from ore mined in Australia and produce aluminium alloys. The manufacturing plant is New Zealand’s largest user of electricity and is the largest producer of the aluminium alloys in the world.

Produce a report for fabrication engineers that demonstrates comprehensive understanding of the chemistry related to the use of aluminium alloys by:

* describing the chemistry related to the use of aluminium alloys
* explaining how or why the chemistry applies to the use of aluminium alloys
* linking the chemistry applicable to aluminium alloys with its use
* giving balanced chemical equations where appropriate.

# Resources

The following websites may be useful:

<http://www.asminternational.org/portal/site/www/SubjectGuideItem/?vgnextoid=f50045d3f365d210VgnVCM100000621e010aRCRD>

<http://www.keytometals.com/page.aspx?ID=CheckArticle&site=ktn&NM=191>

<http://www.mlevel3.com/BCIT/heat%20treat.htm>

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Assessor/Educator guidelines

# Introduction

The following guidelines are supplied to enable assessors/educators to carry out valid and consistent assessment using this internal assessment resource.

As with all assessment resources, education providers will need to follow their own quality control processes. Assessors/educators must manage authenticity for any assessment from a public source, because learners may have access to the assessment schedule or exemplar material. Using this assessment resource without modification may mean that learners' work is not authentic. The assessor/educator may need to change figures, measurements or data sources or set a different context or topic. Assessors/educators need to consider the local context in which learning is taking place and its relevance for learners.

Assessors/educators need to be very familiar with the outcome being assessed by the achievement standard. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the standard and assessing learners against it.

# Context/setting

This activity requires learners to produce a report for fabrication engineers to demonstrate their comprehensive understanding of the chemistry in a technological application. In the report the learners will explain the chemistry related to the use of aluminium alloys. The report will link all the chemistry applicable with its use and include balanced equations where applicable.

# Conditions

This is an individual activity.

# Resource requirements

Learners require access to relevant resource materials such as the internet, library resources and specific chemistry texts.

# Additional information

None.

# Assessment schedule: Chemistry 90931 – Shiny, hardy Al

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The learner demonstrates understanding of the chemistry in a technological application by:  • describing or giving an account of the chemistry related to the use of aluminium alloys  For example:  *Other elements are added to aluminium to improve its properties. Some aluminium alloys are manufactured for their strength. The addition of iron, sand, silicon or manganese forms an alloy of aluminium that is strong. This alloy is used in the production of cars and buildings.*  *The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates in-depth understanding of the chemistry in a technological application by:  *•* describing or giving an account of the chemistry related to the use of aluminium alloys   * explaining how or why the chemistry applies to the use of aluminium alloys   For example:  *Aluminium alloys are used in buildings and cars because of their strength. Iron and sand are added directly to reduction cells because the temperature is relatively high (approximately 960°C) and this facilitates solution. When elements are added to aluminium, solute rich clusters of atoms are formed – called precipitates. The precipitates have a high degree of dispersion and therefore contribute to the strength of the alloy.*  *The above expected learner responses are indicative only and relate to just part of what is required.* | The learner demonstrates comprehensive understanding of the chemistry in a technological application by:   * describing or giving an account of the chemistry related to the use of aluminium alloys * explaining how or why the chemistry applies to the use of aluminium alloys * linking the chemistry to the use of aluminium alloys. Linking may include elaborating, justifying, evaluating, comparing and contrasting or analysing   For example:  *Aluminium alloys are used in buildings and cars because of their strength. The reason that these alloys have a high degree of strength lies in the process of strengthening. The process of age hardening requires a decrease in solid solubility of the alloying elements with decreasing temperature. Heat treatment usually involves:*   * + *Solution treatment at relatively high temperature to dissolve the alloying elements.*   + *Rapid cooling or quenching usually to room temperature to obtain supersaturated solid solution (SSSS) of these elements in aluminium.*   + *Controlled decomposition of the SSSS to form finely dispersed precipitates, normally accompanied with ageing at appropriate temperatures.*   *The above expected learner responses are indicative only and relate to just part of what is required.* |

Final grades will be decided using professional judgement based on an examination of the evidence provided against the criteria in the Achievement Standard. Judgements should be holistic, rather than based on a checklist approach.