**NZQA**

**Approved**

Achievement standard: 90931 Version 3

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

Level: 1

Credits: 2

Resource title: Stainless steel

Resource reference: Chemistry VP-1.2 v2

Vocational pathway: Primary Industries

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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-02-2015-90931-02-7199 |
| 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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Vocational pathway: Primary Industries

Learner instructions

# Introduction

This assessment activity requires you to demonstrate your understanding of the chemistry in the use of a stainless steel railing system in a cowshed.

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 stainless steel.

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

A cowshed requires an upgrade to its railing system. The farm manager has asked you to write a report on the use of stainless steel for this upgrade.

Produce a report for the farm manager that demonstrates comprehensive understanding of the chemistry involved in the use of stainless steel for railings in a cowshed by:

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

# Resources

The following websites may be useful:

<http://chemistry.about.com/cs/metalsandalloys/a/aa071201a.htm>

<http://chemistry.about.com/od/alloys/>

<http://www.ask.com/wiki/Microstructure>

<http://en.wikipedia.org/wiki/Stainless_steel>

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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 demonstrate their comprehensive understanding of the chemistry in the use of stainless steel. They will produce a report for a farm manager that explains the use of stainless steel in a cowshed railing system. 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 – Stainless steel

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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 stainless steel used for a railing system in a cowshed   For example:  *Stainless steel contains chromium which forms an oxide layer on the surface of the metal. This oxide layer prevents rusting and gives it stain resistance.*  *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 stainless steel used for a railing system in a cowshed * explaining how or why the chemistry applies to the use of stainless steel   For example:  *The chromium in stainless steel combines with oxygen from the atmosphere to form an oxide layer. The invisible layer of chrome containing oxide is called the passive film and gives the protective shiny layer. The sizes of chromium atoms and their oxides are similar, so they pack neatly together on the surface of the metal forming a stable layer only a few atoms thick.*  *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 stainless steel used for a railing system in a cowshed * explaining how or why the chemistry applies to the use of stainless steel * linking the chemistry to the use of stainless steel. Linking may include elaborating, justifying, evaluating, comparing and contrasting or analysing   For example:  *Stainless steel is used for railing systems because it does not rust. The chromium used in stainless steel combines with oxygen from the atmosphere to form an oxide layer (4Cr + 3O2 --> 2Cr2O3). This chromium oxide layer prevents rusting. The sizes of chromium atoms and their oxides are similar, so they pack neatly together on the surface of the metal forming a stable layer only a few atoms thick. If the chromium oxide is disrupted it will quickly reform and cover the exposed surface and prevent oxidative corrosion of the iron (3Fe + 2O2 --> Fe3O4) also contained in stainless steel.*  *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.