

NZQA Approved

Internal Assessment Resource

Chemistry Level 3

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| This resource supports assessment against:  Achievement Standard 91389  Demonstrate understanding of chemical processes in the world around us |
| Resource title: Which fuel source? |
| 3 credits |
| This resource:   * Clarifies the requirements of the standard * Supports good assessment practice * Should be subjected to the school’s usual assessment quality assurance process * Should be modified to make the context relevant to students in their school environment and ensure that submitted evidence is authentic |

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| Date version published by  Ministry of Education | December 2012  To support internal assessment from 2013 |
| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number A-A-12-2012-91389-01-6039 |
| Authenticity of evidence | Teachers must manage authenticity for any assessment from a public source, because students may have access to the assessment schedule or student exemplar material.  Using this assessment resource without modification may mean that students’ work is not authentic. The teacher 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. |

**Internal Assessment Resource**

Achievement Standard Chemistry 91389: Demonstrate understanding of chemical processes in the world around us

Resource reference: Chemistry 3.3B

Resource title: Which fuel source?

Credits: 3

Teacher guidelines

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

Teachers need to be very familiar with the outcome being assessed by Achievement Standard Chemistry 91389. The achievement criteria and the explanatory notes contain information, definitions, and requirements that are crucial when interpreting the Standard and assessing students against it.

Context/setting

This activity requires students to process and interpret information to write a report that demonstrates an understanding of the processes involved in using hydrogen fuel cells and fossil fuels to produce energy, and the consequences of the chemical processes for the environment or people involved with these processes. They will recommend which of the two methods of energy production should be promoted in the future.

Conditions

The students must be given sufficient time to show their understanding.

Students will need approximately five hours of in-class and out-of-class time to process the information and write their report.

This is an individual assessment.

Resource requirements

Internet access is needed for the links provided in Resource A. Additional web links or printed information can also be given to the students.

If Internet access is not available, provide printed copies of resource material.

Additional information

None.

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Resource reference: Chemistry 3.3B

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| Achievement | Achievement with Merit | Achievement with Excellence |
| Demonstrate understanding of chemical processes in the world around us. | Demonstrate in-depth understanding of chemical processes in the world around us. | Demonstrate comprehensive understanding of chemical processes in the world around us. |

Student instructions

Introduction

You are an advisor to an investor for a new energy supply company. You have been asked to prepare a report that outlines the chemical processes involved in the use of hydrogen fuel cells and fossil fuels and the effect on the environment or people of these chemical processes. You need to recommend which method of energy production should be promoted.

Teacher note: The context of energy production using hydrogen fuel cells and fossil fuels could be substituted by other contexts involving chemical processes as suggested in the Standard.

You will be assessed on the comprehensiveness of your report and on your evaluation of the impact of, and issues that have arisen from, chemical processes.

You have <<teacher to insert time and conditions here>> of in-class and out-of-class time to individually complete this task.

Task

Write a report that demonstrates your understanding of the chemical processes involved in the production of energy using hydrogen fuel cells and fossil fuels and the consequences of the chemical processes for the environment or people associated with these processes. Recommend which of the two methods of energy production should be promoted.

See Resource A for links to information that you will need to process and interpret.

Teacher note: A selection of links/resources is provided in Resource A. You may need to provide additional resources for your students as appropriate.

In your report:

* describe the chemical processes involved, including appropriate chemistry vocabulary, symbols, conventions and equations
* elaborate on the steps involved in the chemical processes
* make and explain links between chemical processes and the consequences of the chemical processes for the environment or people
* compare and contrast the links between chemical processes and their consequences
* recommend and justify which of the two methods should be promoted.

Resource A

Links to information about the use of hydrogen fuel cells and fossil fuels to produce energy:

The chemistry behind fuel cells

<http://library.thinkquest.org/04apr/00215/energy/fuel_cells/fuel_cells.htm#Chemistry>

How fuel cells work

<http://auto.howstuffworks.com/fuel-efficiency/alternative-fuels/fuel-cell2.htm>

Burning of fossil fuels is polluting oceans with carbon dioxide, says research  
<http://www.naturalnews.com/001398.html>

Environmental chemistry.com

<http://environmentalchemistry.com/yogi/environmental/200608hydrogenfuelcells.html>

Introduction to atmospheric chemistry

<http://www.rolf-sander.net/chem-intro.html>

Urine turned into hydrogen fuel

<http://www.rsc.org/chemistryworld/news/2009/july/02070902.asp>

Reducing acid rain

<http://www.epa.gov/acidrain/reducing>

Acid rain

<http://www.chemistry.wustl.edu/~edudev/LabTutorials/Water/FreshWater/acidrain.html>

Assessment schedule: Chemistry 91389 Which fuel source?

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The student demonstrated understanding of chemical processes in the world around us. They have done this by:   * writing a report that describes the chemical processes involved in using hydrogen fuel cells and fossil fuels to produce energy and the environmental effects of these processes   In their report the student:   * identifies, describes, and gives an account of the chemical processes involved in the use of hydrogen fuel cells and fossil fuels * gives chemical equations for the reactions occurring in the use of hydrogen fuel cells and fossil fuels * identifies relevant advantages and/or disadvantages of the use of hydrogen fuel cells and fossil fuels.   The student’s account is supported by the use of chemistry vocabulary, symbols, conventions, and equations.  *The examples above relate to only part of what is required, and are just indicative.* | The student has demonstrated in-depth understanding of chemical processes in the world around us. They have done this by:   * writing a report that explains links between the chemical processes involved in the use of hydrogen fuel cells and fossil fuels to produce energy and the environmental effects of these processes   In their report the student:   * explains how the chemical properties of hydrogen and fossil fuels allow them to be used to produce energy * makes and explains the links between the chemical processes and effects on the environment or people   for example, burning fossil fuels produces nitrogen oxides (NO) that react to produce O3, which is destructive and toxic to humans   * links their explanations to chemical equations for the processes occurring.   The student’s explanations integrate chemistry vocabulary, symbols, conventions, and equations.  *The examples above relate to only part of what is required, and are just indicative.* | The student has demonstrated comprehensive understanding of chemical processes in the world around us. They have done this by:   * writing a report that shows a comprehensive understanding of the chemical processes involved in the use of hydrogen fuel cells and fossil fuels to produce energy and the environmental effects of these processes   In their report the student:   * demonstrates consistent use of chemical equations and vocabulary to analyse the chemical processes involved in energy production using hydrogen fuel cells and fossil fuels * elaborates on the key consequences on the environment or people of the chemical processes involved   for example, burning fossil fuels produces NO and other organic gases that react to create O3. NO molecules react with oxygen rapidly to form NO2, which then starts a series of reactions that produces O3.  *NO + ½ O2 🡪 ½ NO2*  *UV*  *½ NO 🡪NO + O*  *O + O2 🡪 O3*  The O3 forms near the ground and is destructive and highly toxic to humans.   * evaluates the overall significance of the use of hydrogen fuel cells and fossil fuel cells in terms of energy production and the effect on the environment or people and justifies which process should be promoted in the future.   The student has consistently integrated chemistry vocabulary, symbols, conventions, and equations.  *The examples above relate to only part of what is required, and are just indicative.* |

Final grades will be decided using professional judgement based on a holistic examination of the evidence provided against the criteria in the Achievement Standard.