

Internal Assessment Resource

Chemistry Level 2

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| This resource supports assessment against:  Achievement Standard 91167 version 2  Demonstrate understanding of oxidation-reduction |
| Resource title: Oxidants at work |
| 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 | February 2017 Version 3  To support internal assessment from 2017 |
| Quality assurance status | These materials have been quality assured by NZQA.  NZQA Approved number: A-A-02-2017-91167-03-5802 |
| 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 91167: Demonstrate understanding of oxidation-reduction

Resource reference: Chemistry 2.7B v3

Resource title: Oxidants at work

Credits: 3

Teacher guidelines

The following guidelines are designed to ensure that teachers can carry out valid and consistent assessment using this internal assessment resource.

Teachers need to be very familiar with the outcome being assessed by the Achievement Standard Chemistry 91167. 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 investigate the oxidation-reduction reactions of three common oxidants then choose one reductant to produce a report comparing and contrasting its reactions with the three oxidants.

You can adapt this activity by using other oxidants or reductants. Update the student instructions and assessment schedule accordingly.

Conditions

In Part 1, students will work in groups to gather data. The teacher provides three oxidants and at least five reductants. You may provide a recording sheet for the students to use.

Students gather information by investigating the reactions of each oxidant with the provided reductants to determine which reactions occur and what is observed.

Once this group work is completed each student uses their Part 1 results to complete Part 2, which is an individual task.

Resource requirements

Teachers need to provide acidified solutions of hydrogen peroxide, potassium permanganate, potassium dichromate, plus five reductants as described in Explanatory Note 4 of the standard.

It is recommended that teachers trial the practical experiments before the students to check all solutions and reactions.

Additional information

Prior learning required includes an understanding of oxidation numbers, electron transfer in reactions, oxidants and reductants, balancing oxidation-reduction equations, and the ability to relate these to experimental observations.

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| Achievement | Achievement with Merit | Achievement with Excellence |
| Demonstrate understanding of oxidation-reduction. | Demonstrate in-depth understanding of oxidation-reduction. | Demonstrate comprehensive understanding of oxidation-reduction. |

Student instructions

Introduction

In this assessment activity you will work in a group to investigate the reactions of three common oxidants with a selection of reductants. Then you will work individually to produce a written report comparing and contrasting the reactions of one chosen reductant with the three oxidants.

This assessment task will take place over three to four lessons.

You will be assessed on your understanding of oxidation numbers, electron transfer in reactions, oxidants and reductants, and balancing oxidation-reduction equations. You will also be assessed on your ability to relate this understanding to experimental observations.

Task

Three common oxidants are hydrogen peroxide, potassium permanganate and potassium dichromate.

* Hydrogen peroxide is used as a bleach, in glow sticks, hydroponics, disinfectants and laundry detergents.
* Potassium permanganate is used as a disinfectant for hands and feet, to kill fungal infections, in water treatment and to make props in film and television look old.
* Potassium dichromate is used as an ingredient in cement, for cleaning glassware, tanning leather, wood treatment and analysing alcohol in the “breathalyser test”.

Part 1: Group activity

Work in your group to carry out test tube reactions by adding each oxidant to each reductant provided by your teacher. Record your observations (your teacher may provide you with a recording sheet).

Part 2: Individual activity

Choose **one reductant** and compare and contrast its reactions with each of the three oxidants. Write a report that includes:

* Balanced half and overall equations for each reaction.
* The observation for each reaction and how these relate to the species involved.
* An explanation of why each reaction is classed as an oxidation-reduction reaction in terms of changes in oxidation number or electron transfer.
* A summary of the similarities and differences involved in the three reactions.

Assessment schedule: Chemistry 91167 Oxidants at work

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| Evidence/Judgements for Achievement | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| Shows understanding for two reactions by:   * oxidation and reduction species are correctly identified * oxidation and reduction are identified with reasons in terms of loss/gain of electrons or oxidation number change   *For example:*  *In the first reaction H2O2 is reduction because it gained electrons.* | Shows in-depth understanding for two reactions by:  Half equations are written  *e.g. H2O2 + I- I2 + H2O*  *MnO4- + I- Mn2+ + I2*  *Cr2O72- + I-  Cr3+ + I2.*   * Oxidation and reduction are explained in terms of oxidation number change or loss/gain of electrons   *For example:*  *H2O2 is the oxidant because each oxygen gains one electron or oxidation number goes from -1 to -2 in H2O.*  Observations are linked to species  *For example:*  *H2O2 + I- are both colourless solutions. The reaction turns brown due to the formation of I2. H2O is colourless. MnO4- is purple and I- colourless. When the solutions mix a brown solution forms due to the presence of I2. Mn2+ is colourless. Cr2O72- is orange and I- colourless. When the solutions mix a greenish brown solution forms due to the presence of brown I2 and green Cr3+ .* | Shows comprehensive understanding for two reactions by:  Balanced overall equations are consistently written with no errors  *e.g. H2O2 + 2I- + 2H+ I2 + 2H2O*  *2MnO4- +16H+ +10I- 2Mn2+ +5I2 +8H2O*  *Cr2O72- +14H+ + 6I- 2Cr3+ +3I2 + 7H2O.*   * Oxidation and reduction are explained in terms of oxidation number or electron transfer   Observations are linked to species  *For example:*  *In all three reactions brown I2 is formed. The differences are caused by the colour produced by the oxidant reaction. H2O2 and MnO4- produce colourless products so the final colour is due to the brown I2 but Cr2O72-produces a green product so the final solution is a greenish brown.* |

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