

Internal Assessment Resource

Chemistry Level 2

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| This resource supports assessment against:Achievement Standard 91163 version 2Demonstrate understanding of the chemistry used in the development of a current technology |
| Resource title: What's New Polythene? |
| 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 2015 Version 2To support internal assessment from 2015 |
| Quality assurance status | These materials have been quality assured by NZQA.NZQA Approved number: A-A-02-2015-91163-02-5420 |
| 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 91163: Demonstrate understanding of the chemistry used in the development of a current technology

Resource reference: Chemistry 2.3A v2

Resource title: What's New Polythene?

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 91163. 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 task requires students to demonstrate their understanding of the chemistry involved in a recent (within the last twenty years) development of a polymer, including the history of its development. Students will research secondary information on a polymer development, record notes, process these notes, and prepare a report in a designated format.

This task is not ready to be used without modification. It provides a clearly structured *framework* for assessing whether a student’s skills and understanding meet the specified standard, using the *context* of this task and an *assessment schedule*.

Before using this task, choose one example of a recent polymer or provide a range of examples from which students should select. Ensure that available information about the polymer, and the technological advances required in its development, are appropriate for Level 2 students. Modify the student pages as necessary, and ensure that the assessment schedule aligns with the activity in its final form.

A recent development of a polymer could include, but is not limited to, one of dissolving polymers, conducting polymers or light emitting polymers.

Conditions

This assessment will require multiple sessions, over an extended period (approximately four weeks). Students should work individually on this assessment, in and out of class. Provide 2 to 3 hours of class time for research. Additional research, processing of the research data, and preparation of the report should occur independently outside of class.

Students should maintain a record of their research process. The format could be, but is not limited to, a student workbook, a logbook, or a computer spreadsheet. Confirm an appropriate notes format with your students.

Confirm the format of the report with your students. The format could be, but is not limited to, a poster, a computer presentation, or a wiki.

Additional information

This task requires students to have an understanding of addition polymers; this is described in Achievement Standard Chemistry 2.5. Ensure that teaching and learning about the chemistry of polymers has occurred within the school programme before beginning this assessment.

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| Achievement | Achievement with Merit | Achievement with Excellence |
| Demonstrate understanding of chemistry used in the development of a current technology. | Demonstrate in-depth understanding of the chemistry used in the development of a current technology. | Demonstrate comprehensive understanding of the chemistry used in the development of a current technology. |

Student instructions

Introduction

In this assessment, you will research a polymer development made in the last twenty years and prepare a report demonstrating understanding of the chemistry of that development. Your teacher will [modify as appropriate] provide you with an example of a recent polymer / a range of examples of recent polymers from which you will choose one to research. You will independently perform secondary research, record notes, and prepare a report in an agreed format, for example, a poster or a computer presentation.

You will have [insert time] to complete this assessment; your teacher will provide you with a limited amount of time to perform research in class, however, you are expected to work on your own, outside of class time, to complete your report.

You will be assessed on both your report and the notes you used to produce your report.

Task

The addition polymer polythene was discovered and first used in the 1920s and 30s. Polythene has since reinvented itself several times. Recent developments include the discovery of a range of polymers, such as a dissolving polymer, conducting polymer, and a light emitting polymer.

Working independently, research the chemistry involved in the development of your selected polymer – find out what experimentation, events and/or discoveries led to the development of this polymer. Before you begin, confirm the format for your report and how you should record your notes with your teacher. For example, your report may be an A3 poster based on notes recorded in a logbook.

Your recorded notes should include enough information to allow you to comprehensively describe:

* the historical developments in chemistry that led to the discovery of the chosen polymer since polythene was discovered in the 1920s and 30s
* the recent discovery itself
* the chemistry of the polymer
* the chemistry of the process by which the polymer was developed
* the usefulness of the chosen polymer to society
* the research references you consulted, including web sites.

Using only your own notes, prepare your report. Your report should clearly show your understanding of the chemistry in the development of the chosen polymer. Use appropriate chemistry vocabulary, symbols and conventions. Discuss how the development of the polymer relates to chemistry ideas, and how it is useful to society. Provide evidence for your conclusions, for example, quotes from your research. Hand in your notes with your report.

Assessment schedule: Chemistry 91163 What's New Polythene?

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| Evidence/Judgements for Achievement  | Evidence/Judgements for Achievement with Merit | Evidence/Judgements for Achievement with Excellence |
| The student:* gathers, processes and interprets teacher provided and/or other secondary source information about a polymer and records notes appropriately
* describes the development of a dissolving, conducting, or light emitting polymer
* gives an overview of the history of the polymer's development
* uses chemistry vocabulary to describe the development and composition of the polymer, for example, the chemical equation that describes the polymerisation process
* provides some related chemistry information about the polymer.

For example:*Initially the polymer polythene was produced from ethene in an uncontrolled way and often produced an unstable product. By using a cooler temperature and adding oxygen to the reaction mixture the reaction was controlled. This resulted in low density polythene that had limited uses. Use of organometallic compounds in the 1950s produced high density polythene. Experimentation with these organometallic compounds with propene rather than ethene resulted in polymers in which the structure of the polymer was controlled. Using these organometallic compounds with ethanol (produced in situ) produced a polymer with OH groups. These polymers dissolve in water.* ONE OF: *Low density polythene has branched chains and molecules with differing chain lengths* OR *High density polythene has few branched chains and longer chain length* OR *branching is controlled to either one side of the polymer or alternating sides of the polyme*r OR *These polymers hydrogen bond to adjacent molecules.* | The student:* gathers, processes and interprets teacher provided and/or other secondary source information about a polymer in depth and records notes appropriately
* describes the development of a dissolving, conducting, or light emitting polymer in depth
* gives a detailed description of the history of the polymer's development
* links the development of the polymer to related current or historical chemistry knowledge
* uses chemistry vocabulary to describe the development and composition of the polymer, for example, the chemical equation that describes the polymerisation process.

For example:*Initially the polymer polythene was produced from ethene in an uncontrolled way and often produced an unstable product. By using a cooler temperature and adding oxygen to the reaction mixture the reaction was controlled. This resulted in low density polythene. Low density polythene has branched chains and molecules with differing chain lengths. The intermolecular forces of attraction between the polymer chains are weak, limiting its uses. Use of organometallic compounds in the 1950s produced high density polythene. Experimentation with these organometallic compounds with propene rather than ethene resulted in polymers with a crystalline structure. High density polythene has few branched chains and longer chain length. This results in strong forces of attraction between polymer chains. These polymers were crystalline where the branching is controlled to either one side of the polymer or alternating sides of the polymer. Using these organometallic compounds with ethanol (produced in situ) produced a polymer with OH groups. These polymers dissolve in water, because these polymers hydrogen bond to adjacent molecules. When the polymer is put into water, these hydrogen bonds break dissolving the polymer.* | The student:* gathers, processes and interprets teacher provided and/or other secondary source information about a polymer and records notes appropriately
* describes the development of a dissolving, conducting, or light emitting polymer in depth
* gives a comprehensive description of the history of the polymer's development, including reasons why a particular development path was pursued
* links the development of the polymer to related current or historical chemistry knowledge
* uses chemistry vocabulary extensively to describe the development and composition of the polymer, for example, the chemical equation that describes the polymerisation process
* evaluates the discovery or development with respect to its use by society, for example, the needs met by the polymer and the new challenges it presents.

For example:*Polythene was invented by accident, in a high temperature gas experiment. Initially the polymer polythene was produced from ethene in an uncontrolled way and often produced an unstable product. By using a cooler temperature and adding oxygen to the reaction mixture the reaction was controlled. This resulted in low density polythene. Low density polythene has branched chains and molecules with differing chain lengths. The intermolecular forces of attraction between the polymer chains are weak, limiting its uses to low strength products like toys or bags. Chemists therefore looked for ways of making higher density polythene. Use of organometallic compounds in the 1950s produced high density polythene. Experimentation with these organometallic compounds with propene rather than ethene resulted in polymers with a crystalline structure. This diagram shows how the structure of propene is different from ethene…High density polythene has few branched chains and longer chain length. This results in strong forces of attraction between polymer chains. These polymers were crystalline where the branching is controlled to either one side of the polymer or alternating sides of the polymer. Because the process has been controlled, the properties of the polymer are controlled. Modern chemists now develop polymers to meet a specific need. For example, a dissolving plastic around dishwasher tablets allows us to avoid touching the caustic substance contained by the polymer. OH groups hydrogen bond to adjacent molecules, which means that substances with OH groups tend to dissolve. Chemists looked to produce a polymer with OH groups. Using organometallic compounds with ethanol (produced in situ) produced a polymer with OH groups. These polymers dissolve in water - when the polymer is put into water, these hydrogen bonds break dissolving the polymer. These polymers are useful because they enhance consumer safety and they eliminate the environmental impact caused by non-degrading polymers.* |

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