

90932



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA

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## Level 1 Chemistry, 2012

### 90932 Demonstrate understanding of aspects of carbon chemistry

9.30 am Thursday 22 November 2012

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of carbon chemistry.	Demonstrate in-depth understanding of aspects of carbon chemistry.	Demonstrate comprehensive understanding of aspects of carbon chemistry.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

**You should attempt ALL the questions in this booklet.**

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–11 in the correct order and that none of these pages is blank.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.**

TOTAL

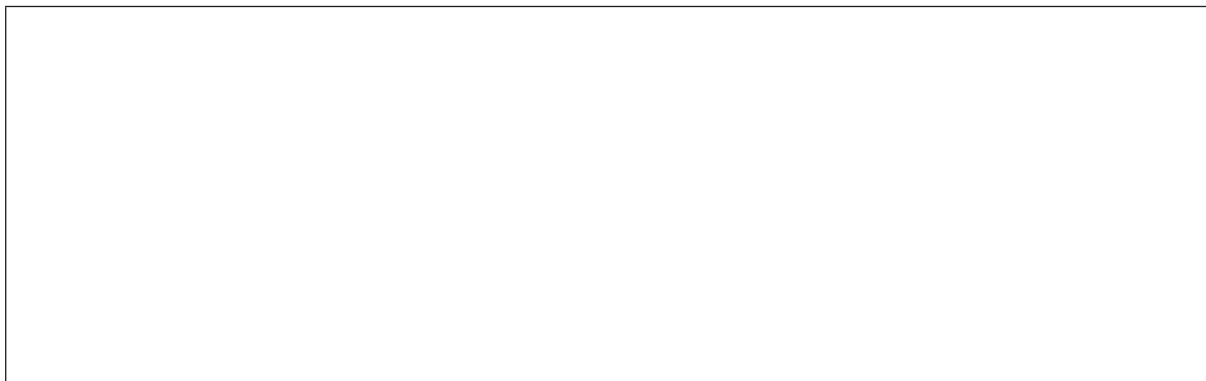
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You are advised to spend 60 minutes answering the questions in this booklet.

### QUESTION ONE: ETHANOL

Ethanol can be produced by the fermentation of glucose.

- (a) Draw the structural formula of ethanol.



- (b) Outline the fermentation process that produces ethanol from glucose ( $C_6H_{12}O_6$ ).  
Include the conditions required for this process to occur, and a balanced symbol equation.

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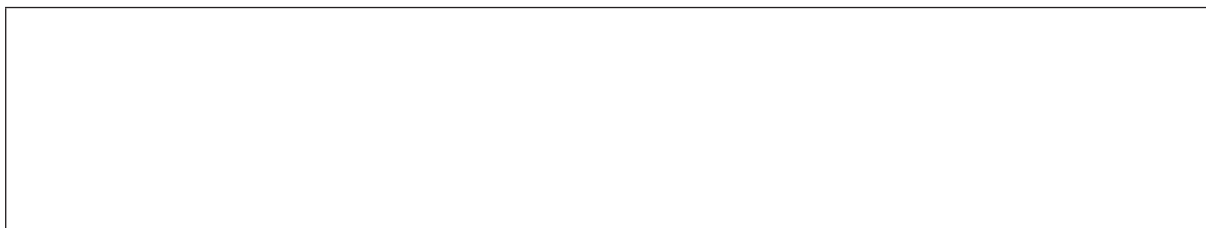
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- (c) Ethanol burns in air with an almost invisible flame.

State the type of combustion reaction ethanol undergoes and name the products formed.

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Write a balanced symbol equation for the reaction of ethanol burning in air.

- (d) Identify and evaluate ONE effect that a product of the complete combustion reaction for ethanol would have on the **environment**.

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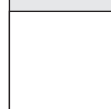
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**QUESTION TWO: CRACKING**

Crude oil is made up of different fractions. Some of these fractions contain large chain hydrocarbons that may not be useful as fuels.

Cracking is the process used to produce smaller, more useful hydrocarbons.

Give a detailed account of the process of cracking.

In your answer you should:

- describe the process of cracking, stating the conditions required
- explain why the large chain fractions may **not** be useful as fuels
- by using hexane as an example, identify the products that would form in cracking, and explain why they form by referring to their chemical structures
- give ONE use for each of the products that form.

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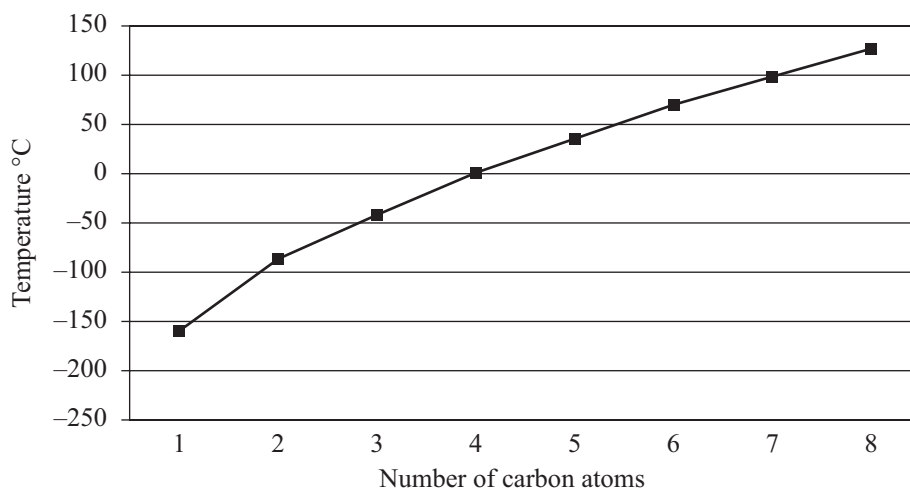
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### QUESTION THREE: PROPERTIES OF HYDROCARBONS

**Boiling points of straight chain alkanes**



adapted from [www.meta-synthesis.com/webbook/06\\_ligands/lig09.jpg](http://www.meta-synthesis.com/webbook/06_ligands/lig09.jpg)

- (a) Name and draw the structural formulae of the alkanes with 3 and 7 carbon atoms.

Name:	Name:

- (b) Identify and explain the trend of boiling points for the alkanes shown in the graph above.

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- (c) In October 2011 a ship, the *Rena*, grounded on a reef near Tauranga Harbour, causing oil to be spilled into the ocean.

It was observed that the oil formed a layer on top of the water, and that it lasted for a long time.

Give an explanation for both observations by referring to the properties of oil.

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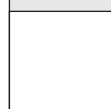
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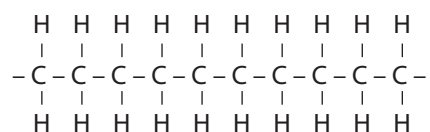
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### QUESTION FOUR: POLYMERS

This is a section of the polymer polyethene (polythene):



- (a) In the box below, name and draw the monomer used to form polyethene.

Name:

- (b) This monomer burns with a smoky flame in a limited oxygen supply.

Identify and explain TWO negative effects on **human health** of the products of this combustion reaction.

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- (c) Polyethene is available in both a low density (LDPE) and high density (HDPE) form. Some properties of LDPE and HDPE are given in the table below.

	<b>Mass</b>	<b>Solubility in water</b>	<b>Chemical resistance</b>	<b>Flexibility</b>	<b>Polymer chain packing</b>
<b>LDPE (low density polyethene)</b>	light	insoluble	high	more flexible	chains packed loosely together
<b>HDPE (high density polyethene)</b>	light	insoluble	high	less flexible	chains packed closely together

Explain why LDPE is used to make plastic food wrap and HDPE is used to make plastic drink bottles, by analysing the properties provided in the table above.

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**Question Four continues  
on the following page.**

(d) Explain why polyethene is a non-biodegradable substance.

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