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90730

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 3 Science, 2006

90730 Describe selected organic compounds and their uses

Credits: Four
9.30 am Tuesday 28 November 2006

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 answer 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 2–10 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.

For Assessor's use only	**Achievement Criteria**				
Achievement		**Achievement with Merit**		**Achievement with Excellence**	
Describe selected organic compounds and their uses.		Explain selected organic compounds and their uses.		Discuss selected organic compounds and their uses.	
Overall Level of Performance					

You are advised to spend 45 minutes answering the questions in this booklet.

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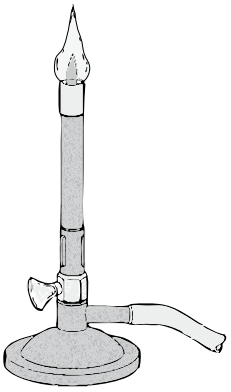
QUESTION ONE: THE BUNSEN BURNER



In New Zealand, some schools have Bunsen burners that use Liquid Petroleum Gas (LPG) as a fuel. LPG is made up of a combination of propane and butane.

Bunsen burners provide a convenient way of looking at the differences between incomplete and complete combustion of fuels.

(a) (i) Draw the structural formula of **butane**.

(ii) Name the products of the **complete** combustion of propane and butane.

(iii) Soot is often produced during **incomplete** combustion.

Write a balanced symbol equation in the box below showing the formation of soot from **propane**.

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(iv) Discuss why school laboratories must be well ventilated when students are using Bunsen burners. Use balanced symbol equations to assist your answer.

(b) Propane and butane are different-sized alkanes.

Explain the relationship between the size of the alkanes and the amount of energy released when combusted.

QUESTION TWO: POLYMERS

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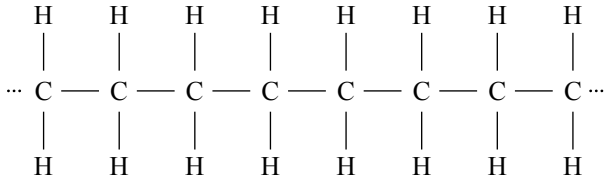
Plastic shopping bags are made from polythene polymers. A polymer is a large chain molecule made up of repeating units called monomers.

The following formula represents part of a **polythene** polymer.



(a) (i) Give the **name** and **draw** the structural formula of the **monomer** that is used to produce the polythene polymer.

Name: _____

(ii) Circle the functional group on the monomer you have drawn in (a)(i).

(b) Explain why plastic bags made with long polythene chains are **stronger** than bags made with short polythene chains. Consider the bonding between the chains in your answer. A labelled diagram may help your answer.

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QUESTION THREE: ALCOHOLS

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(a) The solubilities of alcohols are determined by the size of the alcohol molecule. Smaller alcohols are completely soluble in water, while larger alcohols are insoluble in water.

Discuss the reason for the **difference** in solubility.

(b) Alcohols can be completely oxidised if a suitable oxidising agent is present. One such agent is acidified potassium dichromate ($K_2Cr_2O_7$) solution.

(i) State ONE observation that would be made when $K_2Cr_2O_7$ solution is added to alcohol.

(ii) In the space below, name or give the formula for the product of the complete oxidation of methanol.

$$\underset{\text{methanol}}{CH_3OH} \xrightarrow{Cr_2O_7^{2-}/H^+} \underset{\text{(Product A)}}{\text{\_\_\_\_\_}}$$

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(c) Product A (from (b)(ii)) can then be reacted with another alcohol such as hexanol, in the presence of concentrated sulfuric acid.

In the box below, **name** and **draw** the structural formulae of the products from the reaction between product A and hexanol.

In New Zealand, some city councils are trialling the use of methanol as an alternative fuel source for public transport instead of petrol or diesel.

(d) Explain the **scientific** advantages and disadvantages of methanol compared with petrol or diesel.

QUESTION FOUR: FATS AND OILS

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Fats and oils are both triglycerides. However, a fat is solid whereas an oil is liquid at room temperature.

(a) Describe ONE key **chemical** difference between a solid fat and a liquid oil.

Below is a table showing the iodine number of some common fats and oils.

Fat or Oil	**Iodine number**
Peanut	93
Sunflower	125
Mutton fat	40
Beef fat	50
Soybean	130
Corn	124
Coconut	10

(b) Describe which property of fats and oils the iodine number is indicating.

(c) Discuss the significance of the low iodine number for coconut as compared with the iodine numbers of the other fats and oils. Consider implications for human health in your answer.

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Extra paper for continuation of answers if required.
Clearly number the question.

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Question number	