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NZQA

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MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 3 Science, 2008

90730 Describe selected organic compounds and their uses

Credits: Four
2.00 pm Thursday 20 November 2008

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					

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

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QUESTION ONE: FATS AND OILS

Fats and oils are naturally occurring esters found in plants and animals. They exist as triglycerides which contain different fatty acids.

The table below shows a selection of fatty acids, their notation, and their melting points.

Fatty Acid	Notation	Melting Point (°C)
Stearic	18:0	71.5
Oleic	18:1	16
Linoleic	18:2	–5
Linolenic	18:3	–11

(a) With reference to the **C=C bonds**, explain the relationship between the notation and melting point information in the table above.

(b) Bromine water was added to separate solutions of stearic acid and oleic acid, and observations recorded.

Describe the observations made of the bromine water **and** explain their significance.

(c) A brand of cooking oil claims the following: "This oil is high in 'good' **mono-unsaturated** fatty acids".

With respect to **both** the shape of the fatty acid molecules and the consequences to human health, discuss what this claim means. Labelled diagrams may assist your answer.

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QUESTION TWO: DETERGENTS

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Fuel oil is made up of different long-chain hydrocarbons, which are insoluble in water.

(a) Explain why fuel oil is insoluble in water.

(b) A sample of fuel oil was added to a test tube containing distilled water and a few drops of detergent.

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The mixture was shaken. It was observed that:

- the water turned cloudy and
- the fuel oil apparently disappeared.

Discuss the chemical reasons for BOTH of these observations. Labelled diagrams may assist your answer.

QUESTION THREE: ESTERS

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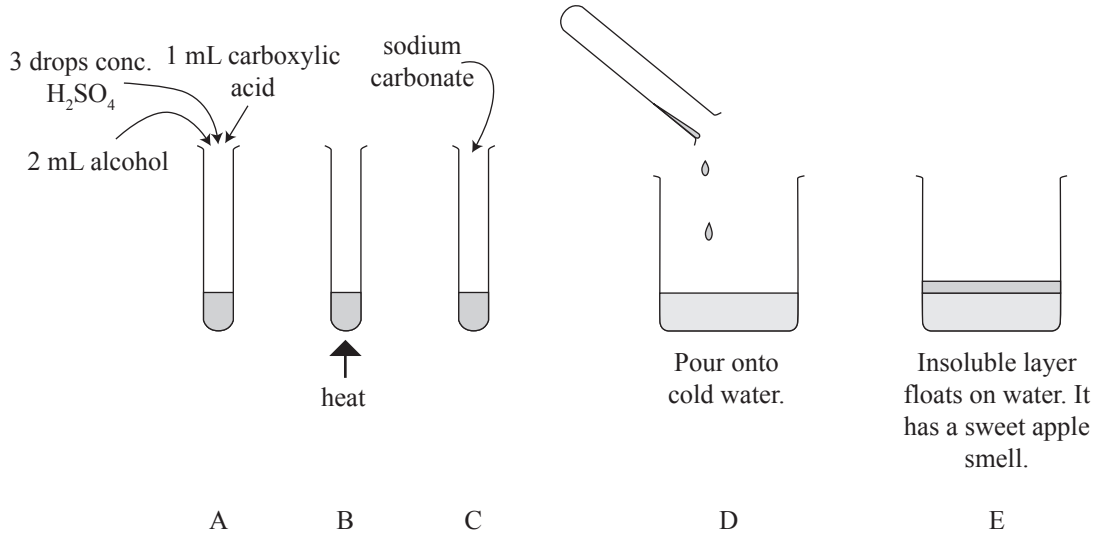
Apple flavouring is produced from the ester methyl butanoate.
An ester is produced when an alcohol reacts with a carboxylic acid. Concentrated sulfuric acid (conc. H_2SO_4) is added to the reaction.

(a) (i) Name and draw the structural formula of the **alcohol** that is used to make the ester methyl butanoate.

Name: _____

(ii) Circle the alcohol functional group on the structural formula drawn in (a)(i) above.

A simple method of making the ester methyl butanoate is shown in the diagram below.



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(b) With respect to the functions of concentrated sulfuric acid, explain why it is needed to produce the **maximum amount** of the ester methyl butanoate.

(c) In the space below draw the structural formula of the ester methyl butanoate.

QUESTION FOUR: FUELS AND SOLVENTS

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Alcohol is a major component of perfumes and aftershaves.

(a) Explain why alcohol is used as a solvent in perfumes and aftershaves.

Hexanol has the molecular formula: $CH_3(CH_2)_5OH$.

Alcohols, including hexanol, can undergo complete oxidation if an oxidising agent like acidified potassium dichromate is present.

(b) Name and draw the formula of the organic compound produced by the **complete oxidation** of hexanol.

Name: _____

(c) Describe the colour change that would be observed if acidified potassium dichromate was used as the oxidising agent in the reaction above.

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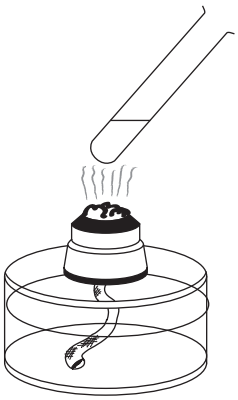
(d) A spirit burner can be used to show the differences in the combustion of liquid **butene** and liquid **butanol**.



Explain the differences in combustion between the two fuels. Use symbol chemical equations to support your answer.

(e) Alkanes, such as butane, can also be used as a fuel. Often the combustion of alkanes, under certain conditions, will produce soot deposits.

Write a balanced symbol equation in the box below to show the formation of soot from the combustion of **butane**.

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

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Question number