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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, 2005

90730 Describe selected chemical substances and their uses

Credits: Four
9.30 am Friday 18 November 2005

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 2–9 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 chemical substances and their uses.		Explain selected chemical substances and their uses.		Discuss selected chemical substances and their uses.	
Overall Level of Performance					

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

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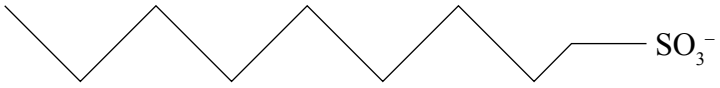
QUESTION ONE: DETERGENTS

(a) The following diagram represents one type of detergent molecule.



(i) On the diagram above, label the TWO key parts of the detergent molecule.

(ii) There are three main types of detergents: cationic, anionic and non-ionic. Which type of detergent does the molecule above represent?

_____

(b) The detergent shown in 1(a) is the type commonly used to wash glassware. Glass has a slight negative charge.

Discuss how the detergent shown in the above diagram is able to clean glassware. A labelled diagram in the box below may help your answer.

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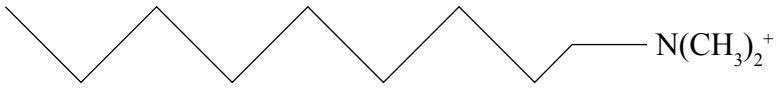
(c) Fabric softener, which reduces static on fabric, contains another type of detergent. This detergent has a positively-charged head as shown in the diagram below.



Fabric softener is added to a final rinse and remains on fabric after drying. Fabrics can have a slight negative charge.

How do fabric softener molecules remain attached to the surface of a fabric? Explain how this would reduce static. A labelled diagram in the box below may help your answer.

QUESTION TWO: ACIDS, ALCOHOLS AND ESTERS

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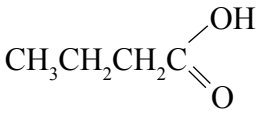
The smell of apricot flavouring is due to the ester **pentyl butanoate**. The following formulae represent the alcohol and the carboxylic acid that are used to produce the ester **pentyl butanoate**.

The alcohol $CH_3CH_2CH_2CH_2CH_2OH$

The carboxylic acid 

(a) (i) Circle the functional group of each molecule shown in the formulae above.

(ii) Name BOTH of these molecules:

(1) The alcohol _____

(2) The carboxylic acid _____

(iii) Draw the structural formula of the ester **pentyl butanoate** in the box below.

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(b) Name ONE additional substance that is needed for the preparation of the ester pentyl butanoate from the alcohol and acid.

Explain why this substance is needed.

Substance _____

Explanation _____

_____

_____

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Water is the other molecule that is produced in the making of the ester.

(c) Using the formulae for the alcohol and the carboxylic acid, explain which parts of these molecules form the water molecule. A labelled diagram may help your answer.

_____

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QUESTION THREE: FATS AND OILS

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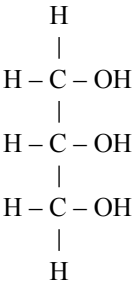
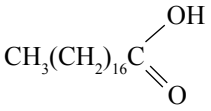
Fats and oils are triglycerides, made from glycerol and long chain fatty acids. The structural formulae of glycerol and one fatty acid called stearic acid are:



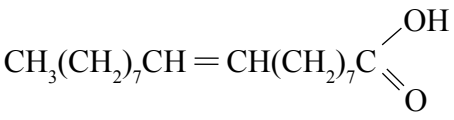
Glycerol



Stearic Acid

(a) In the box below draw the structural formula of the fat made using three stearic acid molecules and glycerol.

(b) Beef fat contains stearic acid. Olive oil, a plant oil, contains the fatty acid called oleic acid. The formula of oleic acid is:



Describe the main **structural** difference between the two fatty acids, oleic acid and stearic acid.

(c) Discuss why a fat made with stearic acid is solid at room temperature, whereas an oil made with oleic acid is liquid at the same temperature. A labelled diagram may help your answer.

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(d) Fats and oils are an important food source for humans.

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Explain why a triglyceride made from oleic acid is healthier for the human body than a triglyceride made from stearic acid.

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

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Question number	