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90309

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

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

Level 2 Chemistry, 2003

90309 Describe the structural formulae and reactions of compounds containing selected organic functional groups

Credits: Four
2.00 pm Monday 24 November 2003

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 provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–8 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.

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Achievement Criteria		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Describe structures and reactions of organic compounds.	Apply principles of structure and reactivity to organic compounds.	Interpret and explain information about the reactivity and structure of organic compounds.
Overall Level of Performance		

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

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QUESTION ONE

Refer to the following compounds to answer questions (a)–(g) below.

$CH_3CH_2CH_2CH_2OH$	$CH_3CH=CHCH_3$	$HCOCH_2CH_2CH_3$ (O double-bonded to C)
A	**B**	**C**
$CH_3CH_2CH_2CH_3$	$CH_3CH_2CH_2COH$ (O double-bonded to C)	$CH_3C(CH_3)=CH_2$
D	**E**	**F**

(a) What type of alcohol is compound **A**?

(b) State the type of reaction that will change compound **A** to compound **E**.

(c) Describe what would be observed if compound **E** is added to sodium carbonate.

(d) Contrast the reactions of compound **B** and compound **D** with bromine. Include relevant observations and equations, and identify the type of reaction that occurs in EACH case.

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(e) Explain what is meant by the term **structural isomer**.
Use examples from the table on page 2 to illustrate your answer.

(f) Compound **B** has two geometric isomers (*cis* and *trans*).

Draw the TWO isomers in the boxes below.

cis isomer

trans isomer

(g) Compounds **A**, **C** and **E** are all colourless liquids.

Describe tests that would identify EACH of these compounds if the labels were left off the bottles.
Use the physical **and** chemical properties of these compounds to select suitable tests.
Include any observations that would be made when carrying out these tests.

(h) Complete the table below by writing:
(i) the name of EACH functional group circled
(ii) the systematic name for EACH compound.

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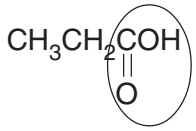
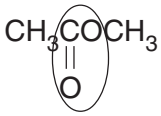
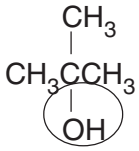
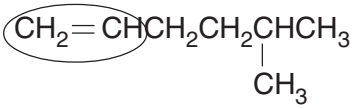
Compound	Name of functional group	Systematic name of the compound
		
		
		
		

QUESTION TWO

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(a) Polypropylene is the common name for a polymer used widely in clothing designed for warmth. It is an addition polymer made from propene ($CH_3CH=CH_2$).

Draw a section of the polymer showing at least TWO repeating units.

(b) Propene can undergo other addition reactions, as given below.

Complete the following equations, showing the structural formulae of the organic products. For (ii), it is necessary to give BOTH of the possible organic products.

(i) $CH_3CH=CH_2 \xrightarrow{H_2/Pt}$ [ ]

(ii) $CH_3CH=CH_2 \xrightarrow{H_2O/H^+}$ [ ] and [ ]

(iii) Write an asterisk (*) below the product in (ii) above that is produced in the larger amount.

QUESTION THREE

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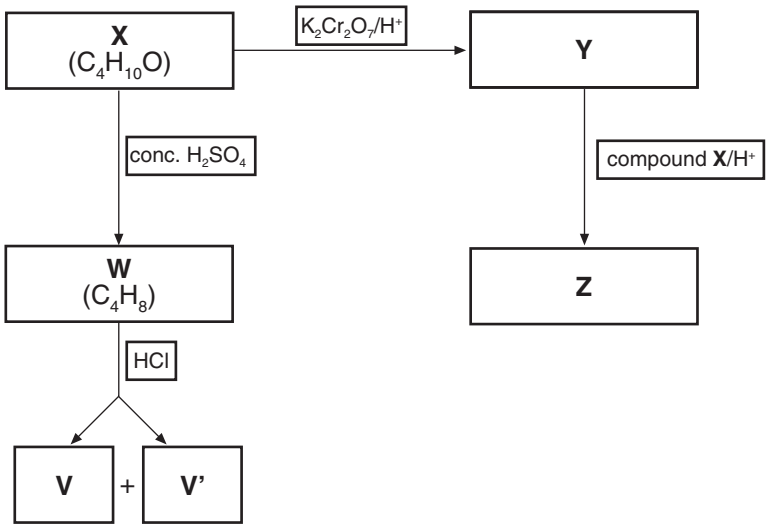
Compounds **X**, **Y**, **Z**, **W**, **V** and **V'** are involved in a series of reactions as shown by the scheme below. In this scheme only the organic reaction products are indicated. Molecular formulae for compounds **X** and **W** are given. Additional information about the compounds is listed in the box at right.

Complete the table below by writing the structural formula and name for EACH compound.
(Hint: Begin with compound **X**, which is a straight chain molecule.)



Additional Information

Compound **Y** turns blue litmus red.

Compound **Z** has a characteristic smell. It is formed by the reaction between compounds **X** and **Y** in the presence of sulfuric acid.

Compound **W** is unsaturated.

Compounds **V** and **V'** are structural isomers.

Compound	Structural formula	Name
X		
Y		
Z		
W		
V		
V'		

QUESTION FOUR

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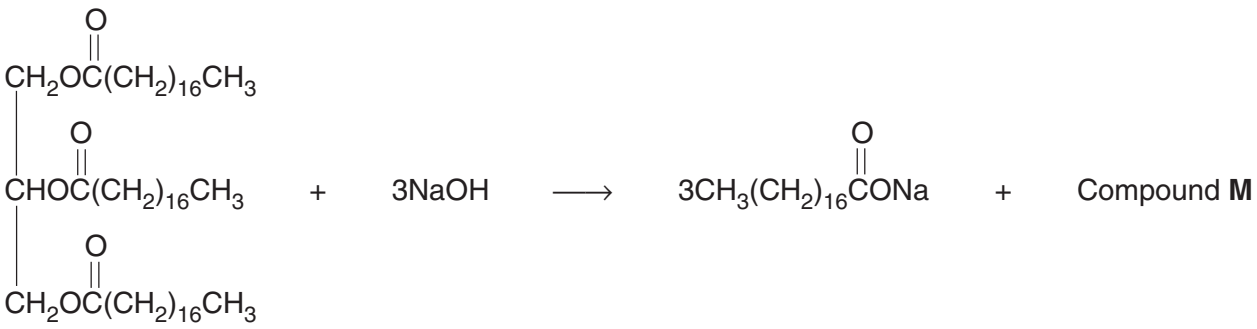
Fats and oils are **triester** molecules. Hydrolysis of a fat can be represented by the equation below.



(a) Circle ONE of the ester groups in the fat.

(b) Write the name of the functional group that would be present in compound **M**.

Unsaturated fats are usually considered to be healthier than saturated fats.

(c) What is meant by the term **unsaturated**?

(d) Describe a test, using a solution of bromine in a non-polar solvent, that could be carried out in the laboratory to compare the degree of unsaturation of two fats.

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

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Question Number