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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

For Supervisor's use only

Level 3 Chemistry, 2009

90698 Describe aspects of organic chemistry

Credits: Five
9.30 am Tuesday 17 November 2009

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.

A periodic table is provided on the Resource Sheet L3–CHEMR.

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 aspects of organic chemistry. ☐	Explain and apply aspects of organic chemistry. ☐	Discuss aspects of organic chemistry. ☐
Overall Level of Performance ☐		

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

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QUESTION ONE

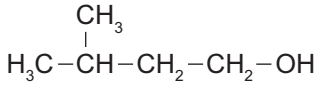
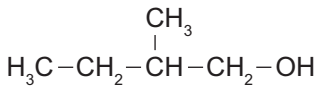
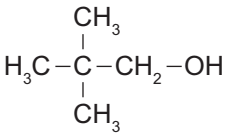
$C_5H_{11}OH$ is an example of an alcohol that can exist as a number of different isomers.

(a) Draw structures of the isomers of $C_5H_{11}OH$ that satisfy the requirements below.

A branched-chain **secondary** alcohol (**A**)	A branched-chain **tertiary** alcohol (**B**)

(b) The structures of the three branched-chain **primary** alcohols with the formula $C_5H_{11}OH$ are given below.

(i) Write systematic names for the three isomers in the spaces provided in the table.

Isomer	Name
C 	
D 	
E 	

(ii) Explain why **D** is the only primary alcohol isomer drawn above that is able to exist as a pair of enantiomers (optical isomers).

(c) A colourless liquid is known to be a branched-chain alcohol with the molecular formula $C_5H_{11}OH$.

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Investigations of this liquid show the following features:

- It does not rotate the plane of polarised light.
- It reacts with acidified potassium dichromate solution.
- It reacts with concentrated sulfuric acid. The product of this reaction decolourises bromine water.

Use the features listed to determine which of the alcohols **A** to **E** is the colourless liquid. Justify your answer.

QUESTION TWO

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(a) Draw the structural formula for each of the organic compounds below.

propanoyl chloride	2-amino-3-methylbutane

pentanal	4-chlorobutanoic acid

(b) Identify the compound from those given in part (a) that will react as described below, and draw the structural formula for each organic product formed.

(i) Elimination with alcoholic KOH

Compound: _____

Product:

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(ii) Oxidation with Fehling's or Benedict's solution

Compound: _____

Product:

(iii) Substitution with aqueous KOH

Compound: _____

Product:

(c) Devise a method for distinguishing between the four compounds, all liquids, given in part (a). Each test should use either **moist red litmus paper** or an **acidified solution of potassium permanganate**.

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QUESTION THREE

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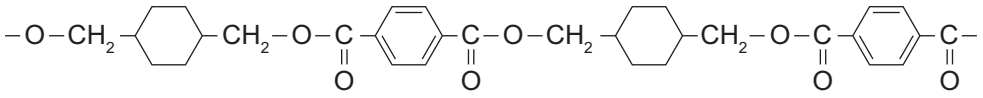
(a) Kodel is a polymer with the following structure:



(i) Identify TWO monomers for this structure.

(ii) Explain why this type of polymer is known as a **condensation polymer**.

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(b) Compound **X** is a polymer which can be hydrolysed to give a single monomer, Compound **Y**, which has the molecular formula $C_3H_6O_3$.

Compound **Y** will turn blue litmus red, and can exist as enantiomers (optical isomers). It will react with acidified potassium dichromate to form Compound **Z**, which has the molecular formula $C_3H_4O_3$.

Compound **Z** does not react with Tollens' reagent.

(i) Draw the structures of Compounds **Y** and **Z**.

Compound **Y**	Compound **Z**

(ii) Draw a section of the polymer, Compound **X**, showing at least two repeating units.

QUESTION FOUR

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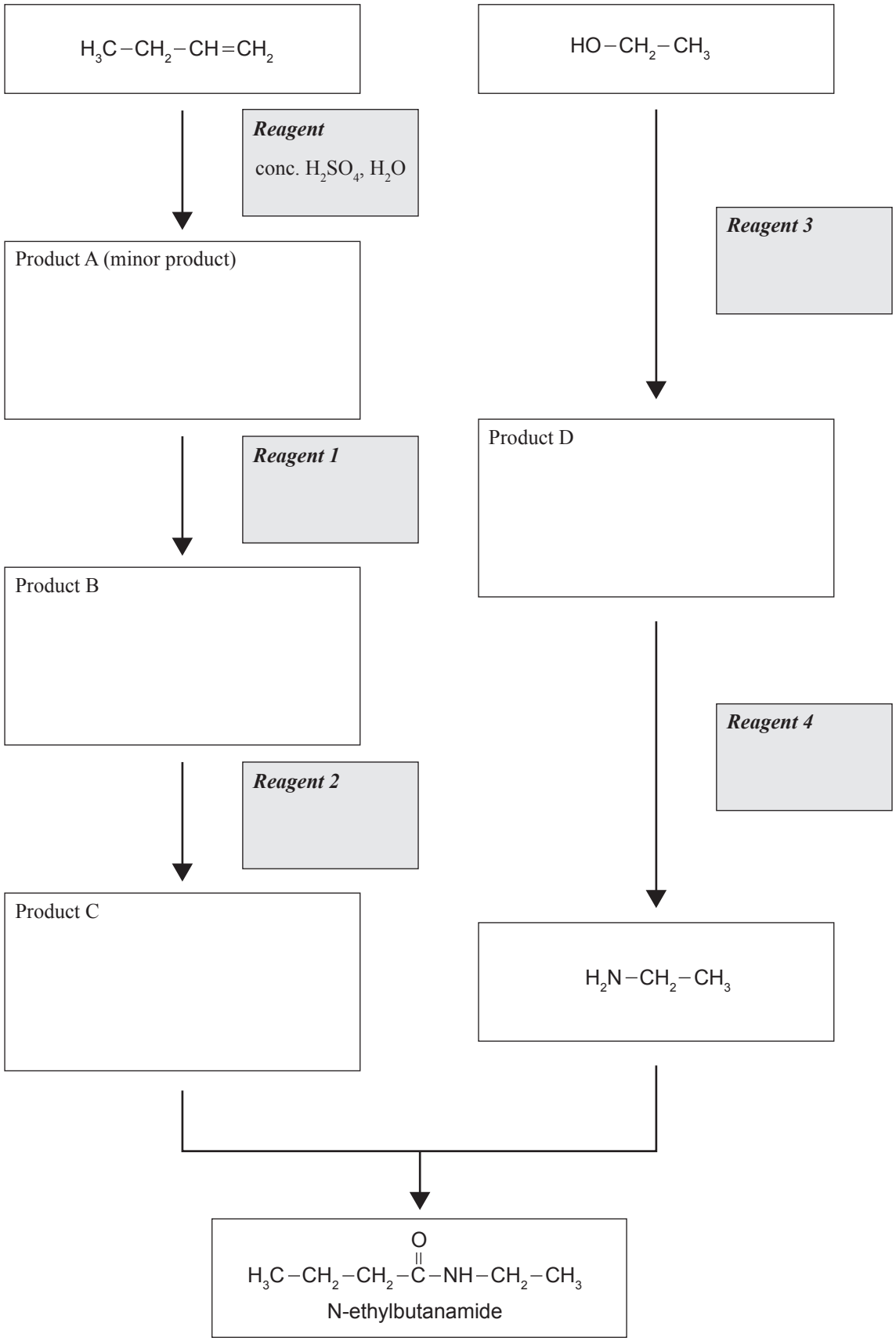
Complete the reaction scheme by giving the formulae for reagents 1 to 4 and the **structural formulae** for the organic products A to D.



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

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Question number	