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NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 3 Chemistry, 2012

90698 Describe aspects of organic chemistry

2.00 pm Tuesday 20 November 2012
Credits: Five

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 attempt 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 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.

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

An alcohol **A** with the molecular formula $C_4H_{10}O$ can exist as enantiomers (optical isomers).

(a) (i) State the structural requirement for a molecule to be able to exist as enantiomers.

(ii) Describe a property of enantiomers that would enable them to be distinguished from each other.

(iii) Draw the structural formulae of the enantiomers of alcohol **A**.

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(b) Alcohol **A**, ($C_4H_{10}O$) can react with $Cr_2O_7^{2-}/H^+$ to give compound **B** which does **not** react with Tollens' reagent. Compound **A** also reacts with $SOCl_2$ to give a haloalkane **C**, which when reacted with alcoholic KOH, gives two products, **D** and **E**, which are not geometric isomers. When **E** reacts with H^+/H_2O, **A** is the product. When **D** reacts with H^+/H_2O, two products are formed, **A** and **F**. **F** can be oxidised to form butanoic acid.

Give the structural formulae AND names for each of the compounds **A** to **F**.

A	**B**
Name:	Name:

C	**D**
Name:	Name:

E	**F**
Name:	Name:

QUESTION TWO

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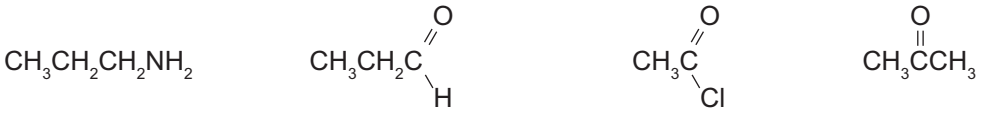
Outline how you would distinguish between the following substances using only litmus paper, water and Tollens' reagent.

In your answer you should include:

- the name of each molecule
- the test(s) that you would carry out to identify each molecule
- any equations, if applicable, to identify the organic products formed.



QUESTION THREE

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(a) Give equations for the reactions of ethanamide when hydrolysed under acidic and basic conditions.

Acidic conditions:

Basic conditions:

(b) The haloalkane 1-chlorobutane can be used to make butanamide. One of the intermediate products is a carboxylic acid.

Show, using structural formulae, how this might be achieved in a number of reaction steps.

Include all reagents.

QUESTION FOUR

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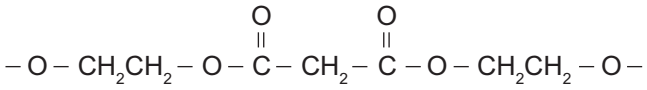
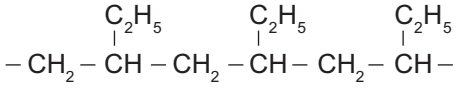
The structures of Polymer A and Polymer B are given below.

Polymer A



Polymer B



(a) In the boxes below, identify the monomers from which these polymers are made.

Polymer A

Polymer B

(b) One of the polymers from above can be hydrolysed using NaOH(*aq*).
Identify the polymer and draw structures for the organic products of the hydrolysis.

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(c) Nylon 6,10 can be made from the monomers below.

(1,6-diaminohexane – a diamine)	sebacoyl chloride (decanedioyl dichloride – an acid chloride)
$H_2N-(CH_2)_6-NH_2$	$Cl-\overset{\overset{O}{\|}}{C}-(CH_2)_8-\overset{\overset{O}{\|}}{C}-Cl$

Steps for the formation of Nylon 6,10 are given below:

1. 2 g of the diamine is dissolved in 25 mL of water.
2. 2.5 mL of sebacoyl chloride is dissolved in 25 mL of a non-polar organic solvent.
3. The dissolved sebacoyl chloride is poured into the diamine solution.
4. 5 g of $NaHCO_3$ is added.
5. The nylon is extracted from the interface between the diamine and sebacoyl chloride layers.

- Identify the repeating unit of the polymer formed.
- Explain why the diamine is water soluble.
- Explain why the sebacoyl chloride is dissolved in a non-polar organic solvent.
- Explain why $NaHCO_3$ is added.

Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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