

90698



NEW ZEALAND QUALIFICATIONS AUTHORITY
 MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

Level 3 Chemistry, 2011

90698 Describe aspects of organic chemistry

9.30 am Monday 21 November 2011

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 room for any answer, use the extra space provided at the back of this booklet.

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.

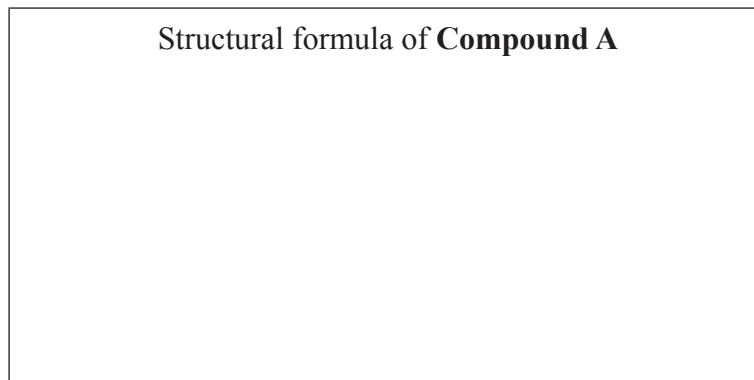
ASSESSOR'S USE ONLY		Achievement Criteria	
Achievement		Achievement with Merit	Achievement with Excellence
Describe aspects of organic chemistry.	<input type="checkbox"/>	Explain and apply aspects of organic chemistry.	<input type="checkbox"/>
		Discuss aspects of organic chemistry.	<input type="checkbox"/>
Overall level of performance			<input type="checkbox"/>

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

QUESTION ONE

- (a) Draw the structural formula of a carboxylic acid (**Compound A**) with the molecular formula $C_4H_8O_2$.

Structural formula of **Compound A**



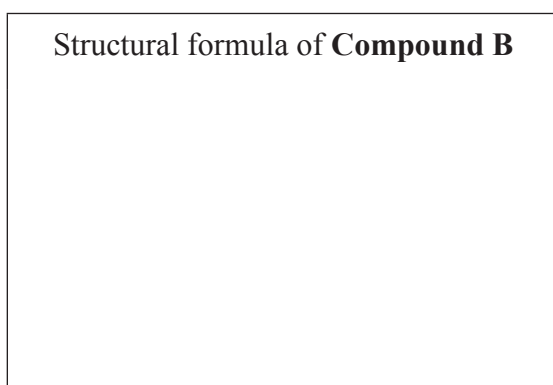
- (b) **Compound A** forms a number of structural isomers that have **different** functional groups.

These isomers are involved in the following reactions:

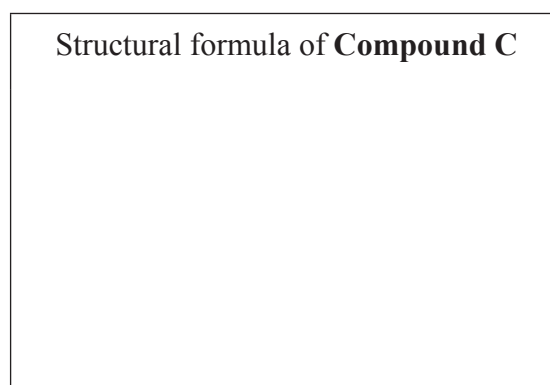
- **Compound B** rapidly decolourises bromine water.
- **Compound C** will react with acidified potassium dichromate solution, and will also react with Fehling's solution.
- **Compound D** can be hydrolysed to form methanol as one of its products.

- (i) Draw the structural formula for the isomers of **Compound A** in the boxes.

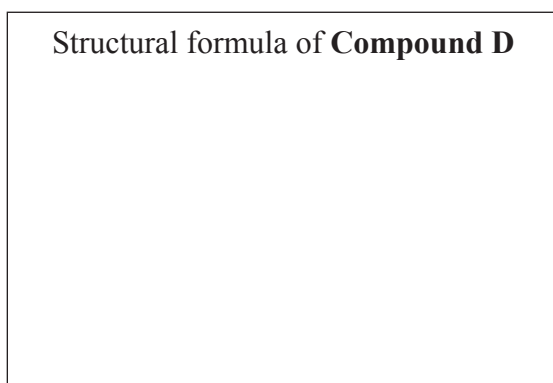
Structural formula of **Compound B**



Structural formula of **Compound C**



Structural formula of **Compound D**



Use the reactions described on the opposite page to justify your choice.

Justification for **Compound B**: _____

Justification for **Compound C**: _____

Justification for **Compound D**: _____

- (ii) Identify an isomer of **Compound A** that can exist as a pair of enantiomers (optical isomers).

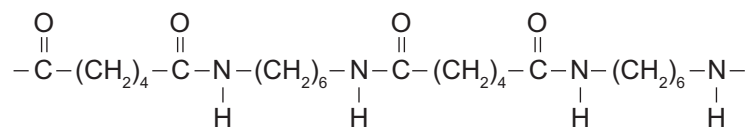
Draw the structural formulae, and state why the isomers are considered enantiomers.

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QUESTION TWO

Nylon 6,6 is a polymer with the following structure:



- (a) Circle an amide linkage in the structure above.
- (b) Draw TWO monomers that could have formed this polymer.

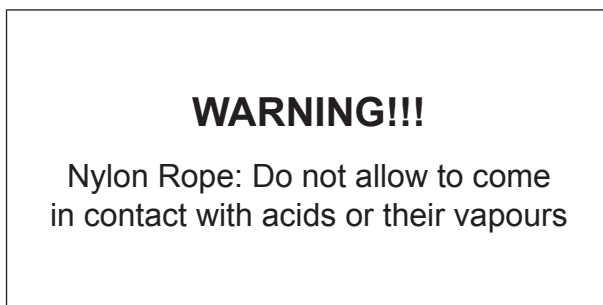
Structural formula	+	Structural formula
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(c) Nylon 6 is formed from the monomer $\text{H}_2\text{N} - (\text{CH}_2)_5 - \text{CO}_2\text{H}$.

- (i) Name this monomer.

- (ii) Draw THREE repeating units of the Nylon 6 polymer chain in the box below.

- (d) Nylon is used for making ropes for climbing and abseiling. The ropes come with a warning label attached, such as that shown below.



Discuss why this warning label is attached to nylon rope when purchased.

Include in your answer:

- the type of reaction that would occur
- relevant organic structural formulae
- any changes to the properties of the nylon rope.

QUESTION THREE

(a) Write the IUPAC systematic names for the four compounds in the table below.

<p>A</p> $\text{FH}_2\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$ <p>Name: _____</p>	<p>B</p> $\text{H}_3\text{C}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl}$ <p>Name: _____</p>
<p>C</p> $\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{Br}$ <p>Name: _____</p>	<p>D</p> $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$ <p>Name: _____</p>

(b) (i) Using a compound from part (a), write an equation to show the formation of an **amide**.

Amide equation

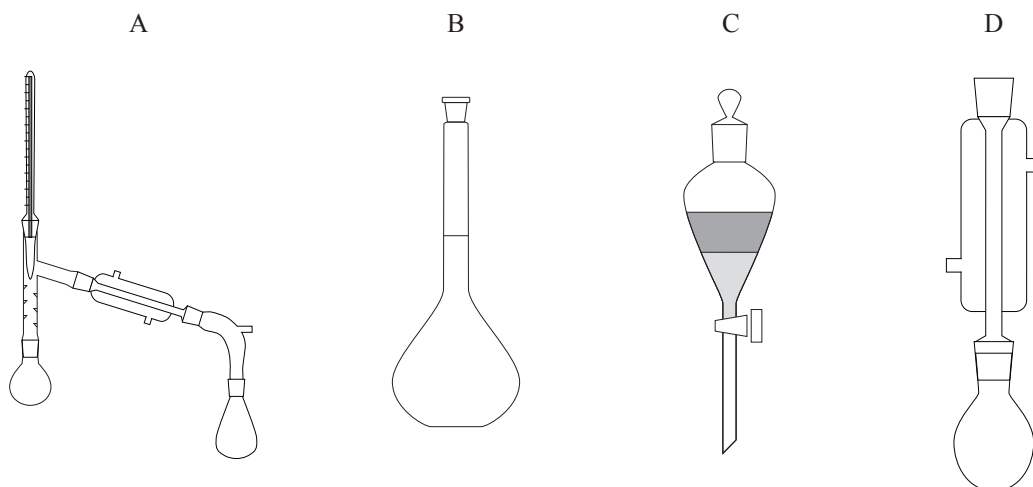
(ii) Using another compound from part (a), write an equation to show the formation of an **amine**.

Amine equation

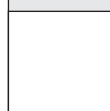
(iii) Describe a test that could distinguish between the two organic products produced in reactions (i) and (ii).

- (c) (i) Refluxing is often required in reactions involving organic substances.

Circle the letter of the apparatus below that would be used in this procedure.



- (ii) Discuss why refluxing is sometimes used.



QUESTION FOUR

Complete the following reaction scheme by naming and drawing the structural formula of each of the compounds A to F.

Identify the reagents **1** to **4**, including any necessary conditions, needed to bring about each transformation.

Diagram illustrating a reaction scheme for the synthesis of 1-chloropropane from compound A.

Compound A: [Empty box for structural formula]
Name: _____

Reaction 1: A $\xrightarrow{\text{1}}$ B and C

Compound B: $\text{CH}_3\text{-CH}_2\text{-C}(=\text{O})\text{ONa}$
Name: _____

Reaction 2: D $\xrightarrow{\text{2}}$ B

Compound D: [Empty box for structural formula]
Name: _____

Reaction 3: C $\xrightarrow{\text{3}}$ E

Reaction 4: E $\xrightarrow{\text{4}}$ D

Reaction 5: C $\xrightarrow{\text{Cr}_2\text{O}_7^{2-} / \text{H}^+}$ E

Reaction 6: E $\xrightarrow{\text{3}}$ F

Compound F: [Empty box for structural formula]
Name: **1-chloropropane**

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