

91391



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA

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# Level 3 Chemistry, 2014

## 91391 Demonstrate understanding of the properties of organic compounds

2.00 pm Tuesday 11 November 2014  
Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the properties of organic compounds.	Demonstrate in-depth understanding of the properties of organic compounds.	Demonstrate comprehensive understanding of the properties of organic compounds.

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

Check that this booklet has pages 2–15 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.**

TOTAL

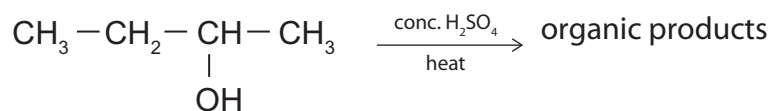
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## QUESTION ONE

- (a) Complete the table below giving the IUPAC systematic name or the structural formula for each compound.

Structural formula	IUPAC systematic name
$\begin{array}{c} \text{Cl} \quad \text{O} \\   \quad    \\ \text{CH}_3 - \text{CH} - \text{C} - \text{CH}_3 \end{array}$	
	propanamide
$\begin{array}{c} \text{CH}_3 - \text{O} - \text{C} - \text{CH}_2 - \text{CH}_2 - \text{CH}_3 \\    \\ \text{O} \end{array}$	

- (b) When butan-2-ol undergoes a reaction with concentrated  $\text{H}_2\text{SO}_4$ , three possible organic products form, which are isomers of each other.



- (i) In the boxes below, draw the three isomers formed during this reaction.

1	2	3
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- (ii) Which of the three isomers from part (i) will be formed in the smallest amount?  
Explain your answer.

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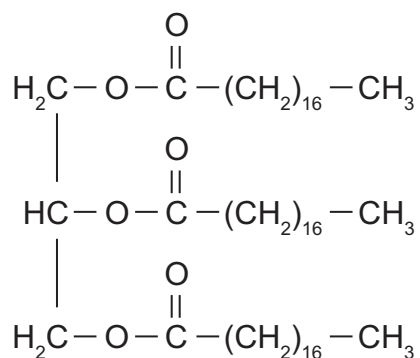
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(c) The triglyceride below is shown in condensed form.



(i) Circle a functional group on the diagram above and give its name.

Functional group name: \_\_\_\_\_

(ii) Compare and contrast the reaction of the above triglyceride when it undergoes both acidic and basic hydrolysis.

In your answer you should include:

- drawings of condensed structures of the organic products
- any reagents and conditions required for the reaction to proceed.

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**QUESTION TWO**

(a) Identify the reagents, conditions required, and observations linked to species, to enable the following pairs of chemicals to be distinguished from each other.

(i) Aqueous solutions of propanamine and propanamide.

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(ii) Propanone and propanal.

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(iii) Propanoyl chloride and propyl propanoate.

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(b) Instructions for the preparation of 2-chloro-2-methylpropane are given below.

Read the instructions carefully and answer the questions that follow.

1. Shake 10 mL of 2-methylpropan-2-ol with 30 mL of concentrated hydrochloric acid in a separating funnel for 10 minutes.
2. Run off the bottom acid layer and discard it. Add saturated sodium hydrogen carbonate to the organic product. Shake, releasing the tap every few seconds to relieve the pressure.
3. Run off the bottom aqueous layer and discard it. Transfer into a conical flask and add some anhydrous sodium sulfate, and stir thoroughly.
4. Transfer the organic product into a round-bottom flask, and collect the fraction boiling within 2°C of the boiling point of 2-chloro-2-methylpropane.

- (i) Explain why the solution of sodium hydrogen carbonate is added in instruction 2.

Name the gas produced in this step.

Name of gas formed: \_\_\_\_\_

Explanation: \_\_\_\_\_

\_\_\_\_\_

- (ii) Explain why anhydrous sodium sulfate is added in instruction 3.

\_\_\_\_\_

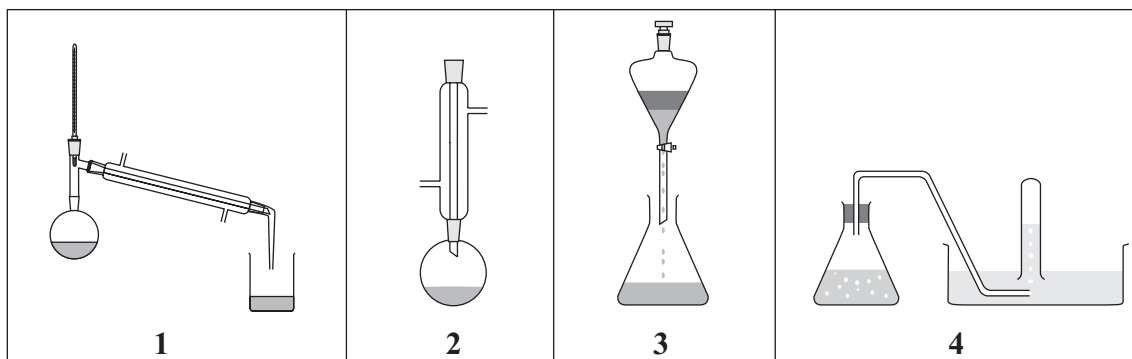
\_\_\_\_\_

- (iii) Name the process used in instruction 4 to purify the organic product.

Process used: \_\_\_\_\_

Write the number of the equipment that a student would use to perform this process from the diagrams below.

Diagram no: \_\_\_\_\_



(iv) Discuss the process carried out in instruction 4 on page 6.

Include in your answer:

- the purpose of this process
- an explanation of how it works.

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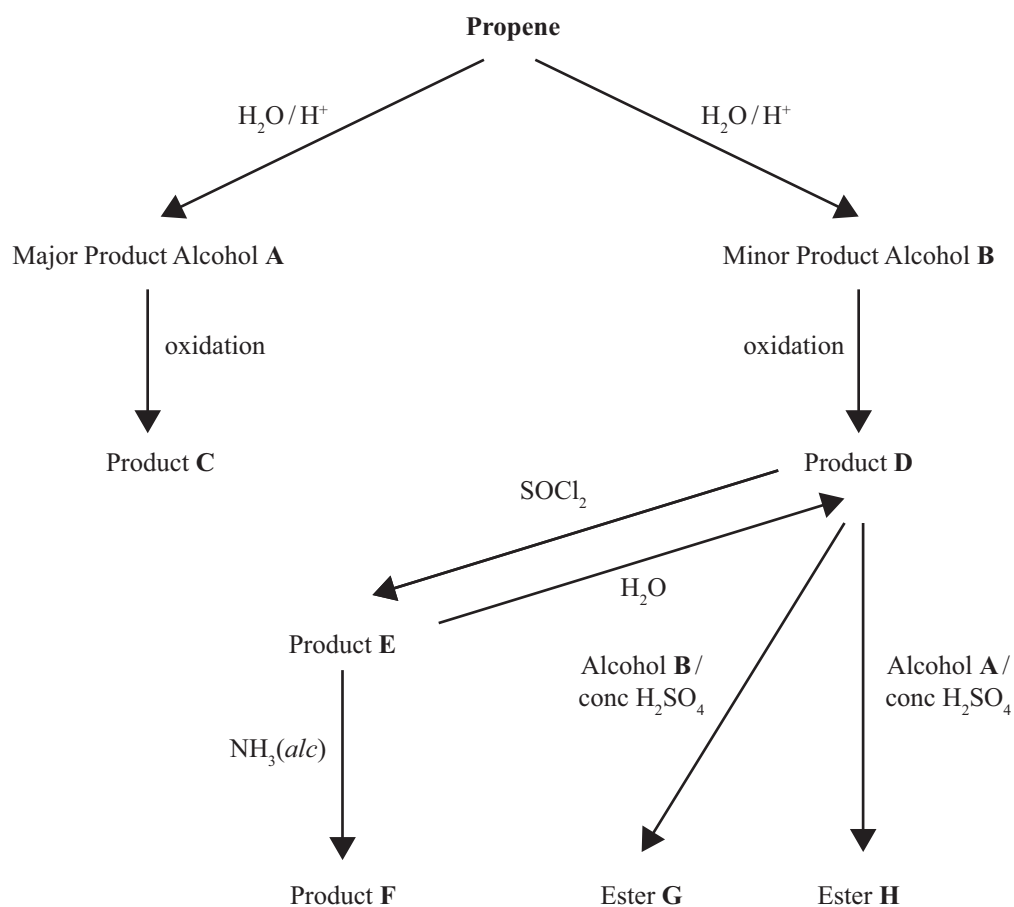


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The examination continues on the following page.**

## QUESTION THREE

(a) Propene can be reacted with water in the presence of acid to form a major product (**A**) and a minor product (**B**).

- **A** is oxidised to form product **C**.
- **B** is oxidised to form product **D**.
- When **D** is reacted with  $\text{SOCl}_2$ , it forms product **E**.
- When **D** is reacted with alcohol **B**, it forms an **ester G**.
- When **D** is reacted with alcohol **A**, it forms **ester H**, which is an isomer of **G**.
- When **E** is reacted with alcoholic ammonia, it forms product **F**.
- When **E** is reacted with water, it forms product **D**.

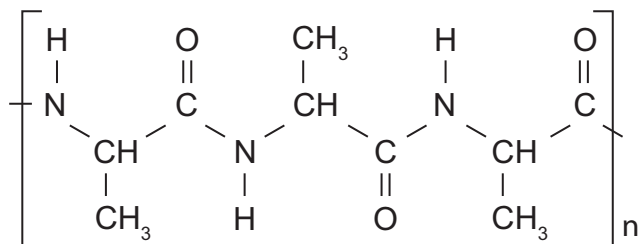


Name compounds **A** to **G**, and draw structural formulae for compounds **A** to **H**.

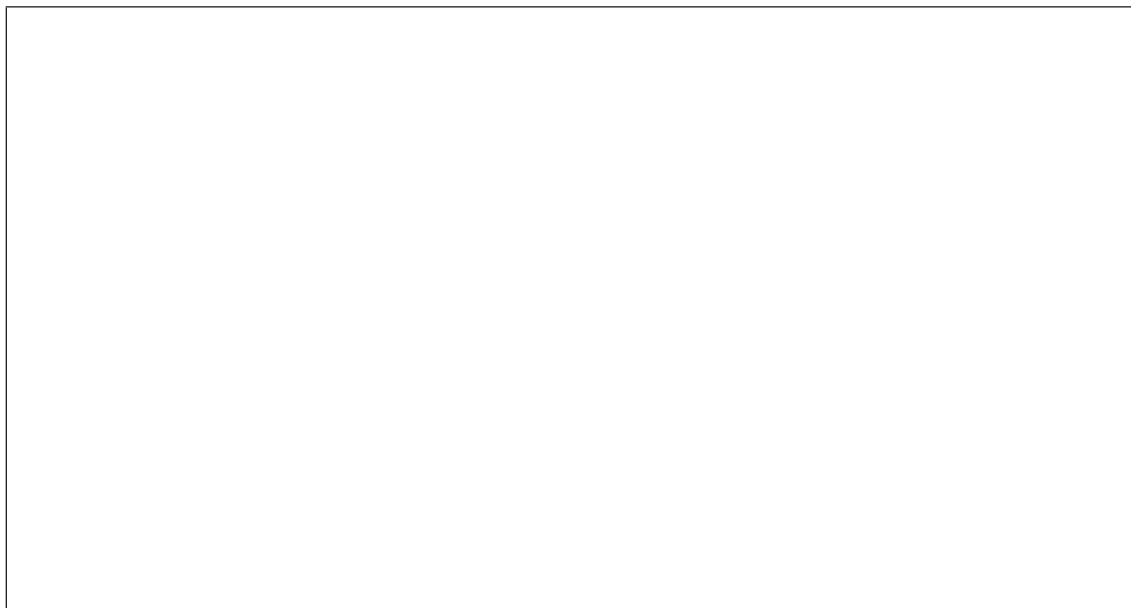
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	Name	Structural Formula
<b>A</b>		
<b>B</b>		
<b>C</b>		
<b>D</b>		
<b>E</b>		
<b>F</b>		
<b>G</b>		
<b>H</b>		

(b) The following polymer will, under the correct conditions, hydrolyse.



(i) Draw the monomer(s) from which this polymer is formed.



(ii) Discuss the hydrolysis of the polymer.

In your answer you should include:

- the conditions under which it can be hydrolysed
- structures of the organic products formed as a result of hydrolysis.

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