

91165



Draw a cross through the box (☒)  
if you have NOT written in this booklet

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**Mana Tohu Mātauranga o Aotearoa**  
New Zealand Qualifications Authority

## Level 2 Chemistry 2023

### 91165 Demonstrate understanding of the properties of selected organic compounds

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of the properties of selected organic compounds.	Demonstrate in-depth understanding of the properties of selected organic compounds.	Demonstrate comprehensive understanding of the properties of selected 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 and other reference material are provided in the Resource Booklet L2–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 2–12 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE). This area will be cut off when the booklet is marked.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.**

## QUESTION ONE

- (a) An assortment of organic compounds is listed in the table below.
- (i) Complete the table below by drawing the structure or giving the IUPAC (systematic) name.

Compound	Structure	IUPAC (systematic) name
A	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\overset{\text{Cl}}{\underset{ }{\text{CH}_2}}$	
B		methanoic acid
C	$\text{H}_3\text{C}-\text{CH}_2-\overset{\text{NH}_2}{\underset{ }{\text{CH}}}-\text{CH}_3$	
D		propan-1-ol

- (ii) **Compounds A–D** are all liquids at room temperature.

Devise a procedure to distinguish between **Compounds A–D** using only red litmus paper and aqueous acidified potassium permanganate,  $\text{KMnO}_4/\text{H}^+$  (aq).

In your answer you should:

- state any observations
- link your observations to the chemical or physical properties of the organic molecule
- give the structural formula of the organic product of any chemical reaction(s) that occur.

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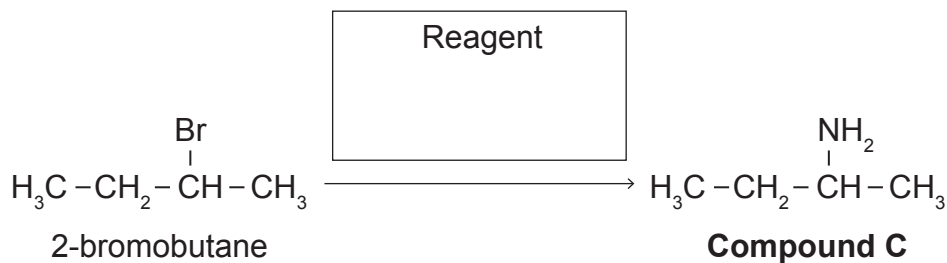
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(b) **Compound C**, from the table opposite, can be formed by reacting 2-bromobutane with a reagent.

- (i) Write the name or chemical formula of the reagent required for this conversion, in the box below.



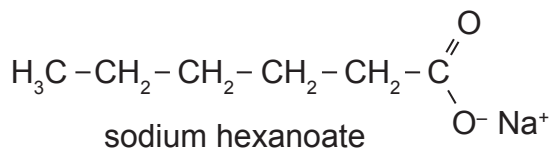
- (ii) Identify the type of reaction that is occurring in the conversion of 2-bromobutane to **Compound C**, and justify your choice.



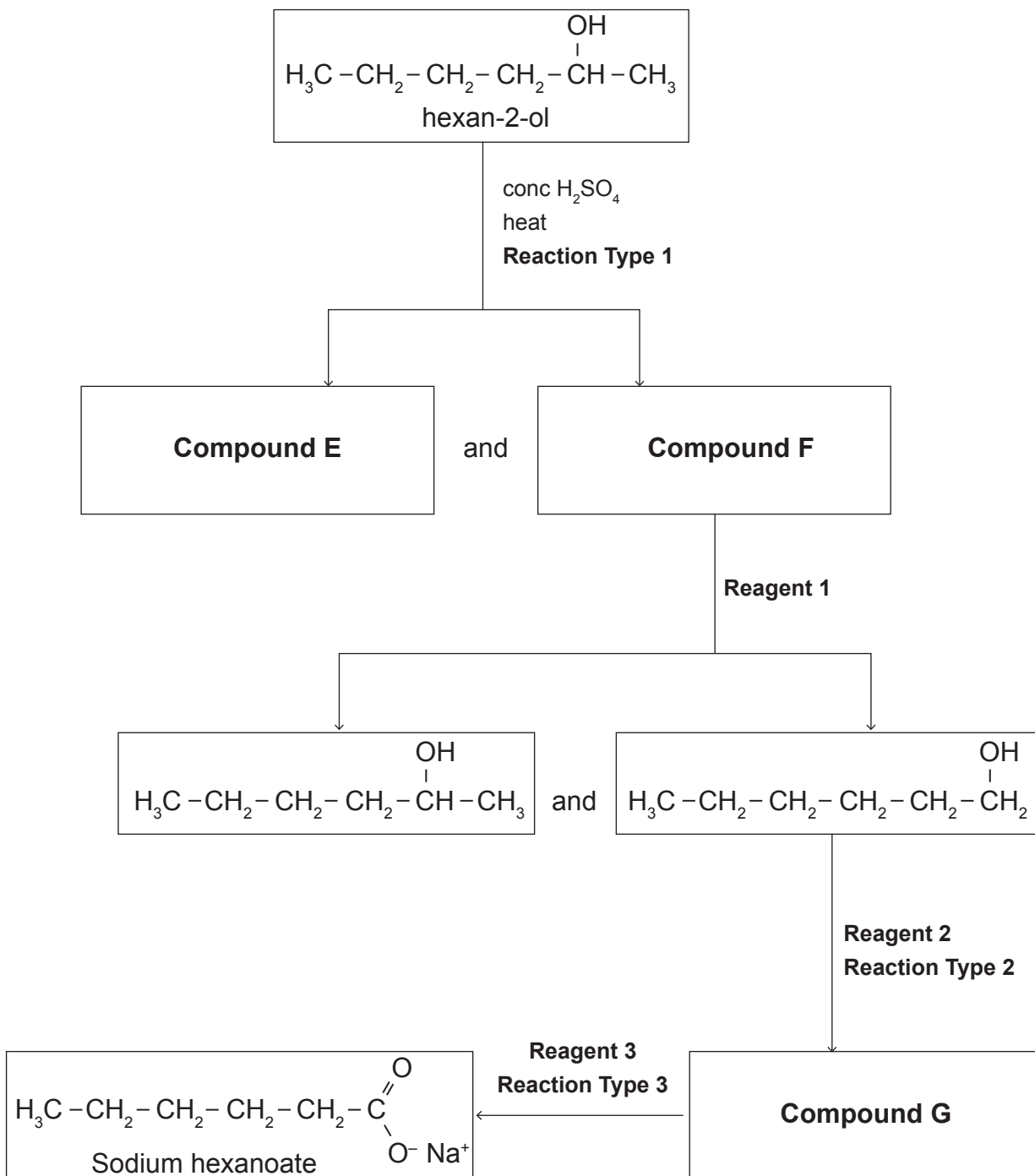


## QUESTION TWO

Sodium hexanoate (shown below) is used as a preservative in foods, cosmetics, and medicines.



- (a) An incomplete reaction scheme for the production of sodium hexanoate from hexan-2-ol is shown below.



- (i) Complete the reaction scheme by giving the structures of **Compounds E–G**, **Reagents 1–3**, and **Reaction Types 1–3** in the tables below.

Give conditions where necessary.

<b>Compound E</b>	<b>Compound F</b>	
<b>Compound G</b>		

<b>Reagent 1</b>	
<b>Reagent 2</b>	
<b>Reagent 3</b>	

<b>Reaction Type 1</b>	
<b>Reaction Type 2</b>	
<b>Reaction Type 3</b>	

- (ii) Explain whether the starting material, hexan-2-ol, in the scheme opposite, is a primary, secondary, or tertiary alcohol.

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- (iv) Give the structural (constitutional) isomer of hexan-2-ol that would form only ONE product when reacted with concentrated sulfuric acid, conc.  $\text{H}_2\text{SO}_4$ .

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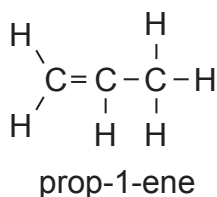
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### QUESTION THREE

Polypropene is the polymer used to make the web-like filters in most N95 and loose-fitting surgical face masks. While filtering out most microbes, air can still pass through.

Polypropene is made through the addition polymerisation of the prop-1-ene monomer, shown below.



- (a) (i) In the box below, **draw three repeating units** of the polypropene polymer.

- (ii) Explain why this is classified as addition polymerisation.

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- (iii) Polypropene is a relatively chemically inert (unreactive) substance.

Compare the reactivity of polypropene with its monomer.

In your answer you should:

- link the structure of the monomer to its reactivity
- outline why polypropene's lower reactivity makes it appropriate for use in face masks.

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*There is more space for your answer on the next page.*





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

QUESTION  
NUMBER

91165