SUPERVISOR'S USE ONLY

1

90932

909320

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

+

NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Chemistry 2023

90932 Demonstrate understanding of aspects of carbon chemistry

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of carbon chemistry.	Demonstrate in-depth understanding of aspects of carbon chemistry.	Demonstrate comprehensive understanding of aspects of carbon chemistry.

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 L1–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.

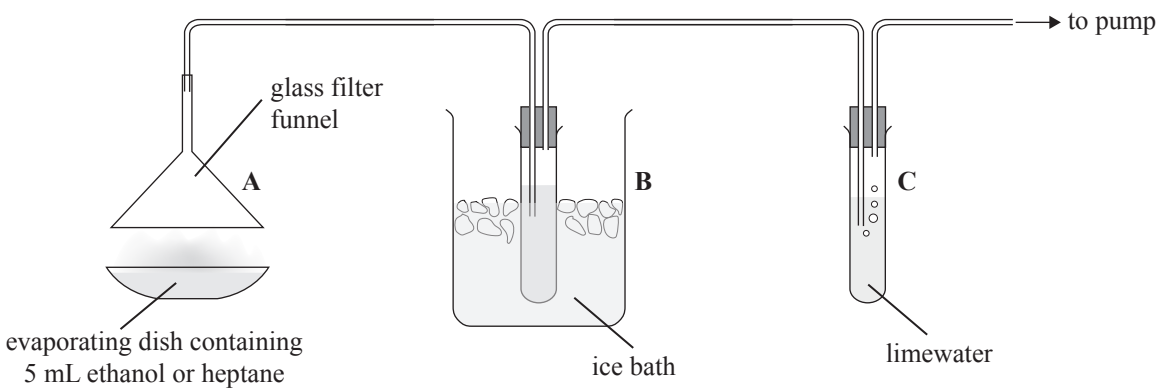
Do not write in any cross-hatched area (DO NOT WRITE IN THIS AREA DO NOT WRITE). This area will be cut off when the booklet is marked.

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

QUESTION ONE

The apparatus below was set up for a student to observe the combustion of ethanol.

The experiment was repeated using heptane.



(a) Draw the structural formulae of ethanol and heptane in the table below.

Ethanol	
Heptane	

(b) Analyse the **complete** combustion of **ethanol** in the above experiment.

In your answer:

- describe the appearance of the flame, and make links to the conditions required for combustion
- include whether any products will be deposited on the funnel at A, or observed at points B and C
- explain the purpose of the ice bath at point B and limewater at point C
- include a balanced symbol equation for the complete combustion of ethanol.

Balanced symbol equation:

(c) The ethanol in the evaporating dish was replaced with heptane.

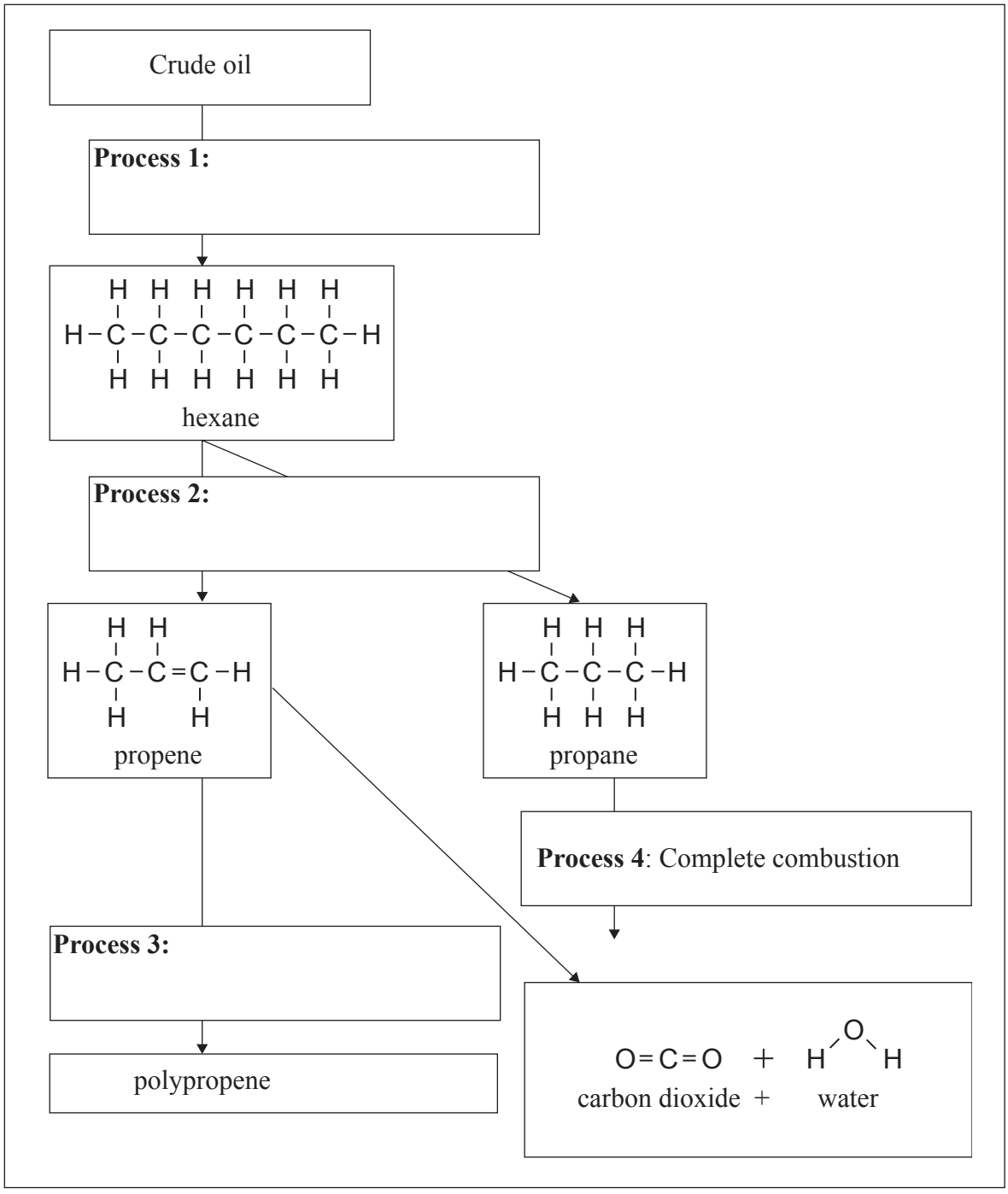
Analyse the effect on **human health** of the complete and incomplete combustion of heptane.

This page has been deliberately left blank.
The assessment continues on the following page.

QUESTION TWO

(a) (i) Crude oil can undergo a number of processes to produce useful hydrocarbons, such as polypropene (polypropylene) and propane.

Complete the flow chart / reaction scheme below by naming the processes (**Processes 1**, **2**, and **3**).



(ii) **Process 3** produces polypropene.

Draw TWO repeating units of polypropene in the box below.

Polypropene (polypropylene):

(iii) **Process 2** produces propene and propane. Propene and propane can undergo complete combustion, while propene is also used as a monomer for producing polypropene, a plastic.

Compare and contrast the reactions of propene and propane.

In your answer:

- explain the bonding and structure of both hydrocarbons
- link the chemical reaction (or lack of) to the structure and bonding of each hydrocarbon, and the conditions required for **Processes 3** and **4**.

(b) A student participating in a beach clean-up discovered many of the rubbish items washed up on the beach were made from the polymers **polypropene** or **polyethene**.

Source: https://environment.govt.nz/what-government-is-doing/areas-of-work/waste/plastic-phase-out/

Discuss why these polymer products can be considered environmental pollutants.

In your answer:

- draw TWO repeating units of polyethene in the box below
- describe the chemical structure and bonding of BOTH polymers
- explain the relevant chemical and physical properties.

Polyethene (polyethylene):

QUESTION THREE

(a) Ethanol can be produced by fermentation.

Discuss the process of fermentation used to form ethanol.

In your answer, you should include:

- a description of the process
- explanations of any conditions required
- a balanced symbol equation for any reaction occurring.

Balanced symbol equation:

Question Three continues on the next page.

(b) The following table shows selected data for the compounds methanol, ethanol, and ethane.

Compound	Molar Mass	Boiling Point	Solubility in Water
Methanol	32 g mol^{-1}	65 °C	Soluble
Ethanol	46 g mol^{-1}	78 °C	Soluble
Ethane	30 g mol^{-1}	–89 °C	Insoluble

Compare and contrast the boiling point and solubility in water of the compounds.

Use your knowledge of the structure and physical properties of the compounds.

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

QUESTION NUMBER	

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

QUESTION NUMBER