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NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Chemistry 2026

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 2–16 in the correct order and that none of these pages is blank.

Do not write in the margins (▨). 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.

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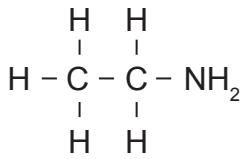
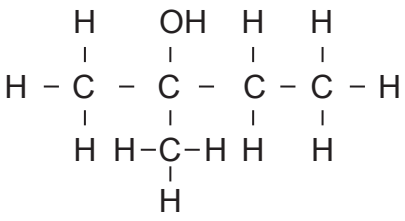
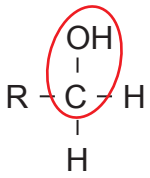
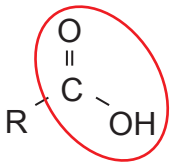
QUESTION ONE

(a) The name or structural formulae of four organic compounds are given in the table.

Complete the table below to show the structural formula or the IUPAC (systematic) name for each compound.

Structural formula	IUPAC (systematic) name
	3-methylpentanoic acid
	
	hex-3-yne
	

(b) The functional groups contained in two compounds, A and B, are shown circled below.

Compound A	Compound B
	

(i) Name the functional groups circled in Compounds A and B.

A: _____ B: _____

(ii) Compounds A and B are colourless liquids at room temperature.

Outline a procedure to positively identify the functional groups found in compounds A and B, using **only** blue litmus paper and aqueous acidified potassium permanganate, $KMnO_4 / H^+(aq)$.

In your answer:

- identify the type of reaction occurring
- state the conditions required for the reaction to occur
- describe relevant observations.

There is more room for your answer on the following page.

(c) Bromine water, $Br_2(aq)$, is reacted with pentane, $C_5H_{12}(\ell)$ and pent-1-ene, $C_5H_{10}(\ell)$.

Compare and contrast the types of reactions the two different compounds will undergo with bromine water, $Br_2(aq)$.

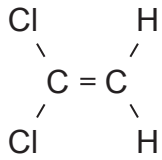
In your answer:

- identify and **justify** the type of reactions taking place
- state the condition(s) required for the reactions to occur
- describe relevant observations
- name any organic products formed.

Working space if required

QUESTION TWO

(a) Cling-wrap is a polymer called polyvinylidene chloride (PVDC) that can be made from the monomer 1,1-dichloroethene, shown below.



1,1-dichloroethene

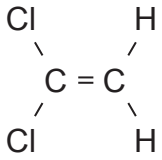
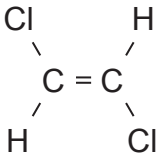
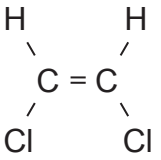
(i) In the box below, draw THREE repeating units for the addition polymer produced using 1,1-dichloroethene.

(ii) Discuss how addition polymerisation of the monomer 1,1-dichloroethene produces a stable polymer.

In your answer:

- link the structure of the monomer to its reactivity
- explain how addition polymerisation forms the polymer
- link the structure of the polymer to its reactivity.

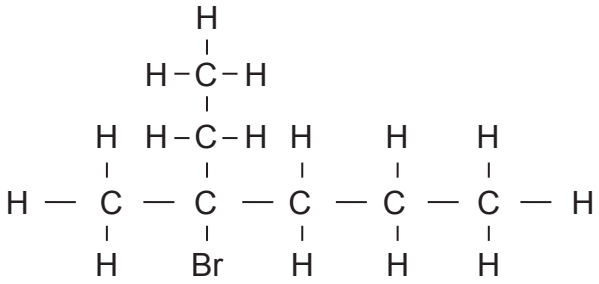
(b) All three structural formulae shown below are isomers of $C_2H_2Cl_2$.

1,1-dichloroethene	1,2-dichloroethene	1,2-dichloroethene
		
Circle:	**cis** or **trans**	**cis** or **trans**

(i) Identify the geometric isomers above as cis or trans by circling the correct answer.

(ii) Explain why 1,2-dichloroethene can exist as geometric isomers, whereas 1,1-dichloroethene cannot.

(c) Compound G, drawn below, has been incorrectly labelled as 2-bromo-2-ethylpentane.



Compound G

(i) Give the correct IUPAC name for the structure, and reasons for your answer.

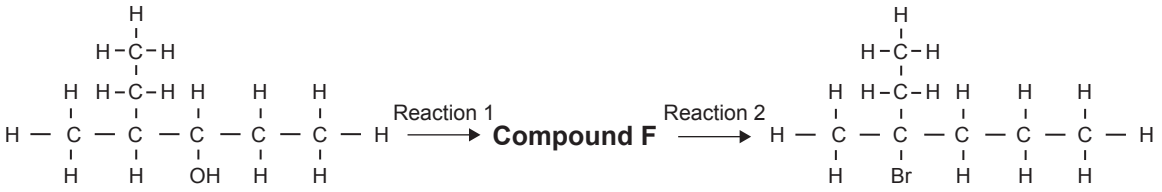
Correct name (IUPAC): _____

Reasons: _____

(ii) Propose a 2-step method for synthesising the incorrectly named Compound G ("2-bromo-2-ethylpentane") from Compound E below.

In your answer:

- give the reagents used for each step in the chemical synthesis, along with any necessary conditions
- state the type of reaction occurring in each step
- give the structure and name of the intermediate organic product formed (Compound F).



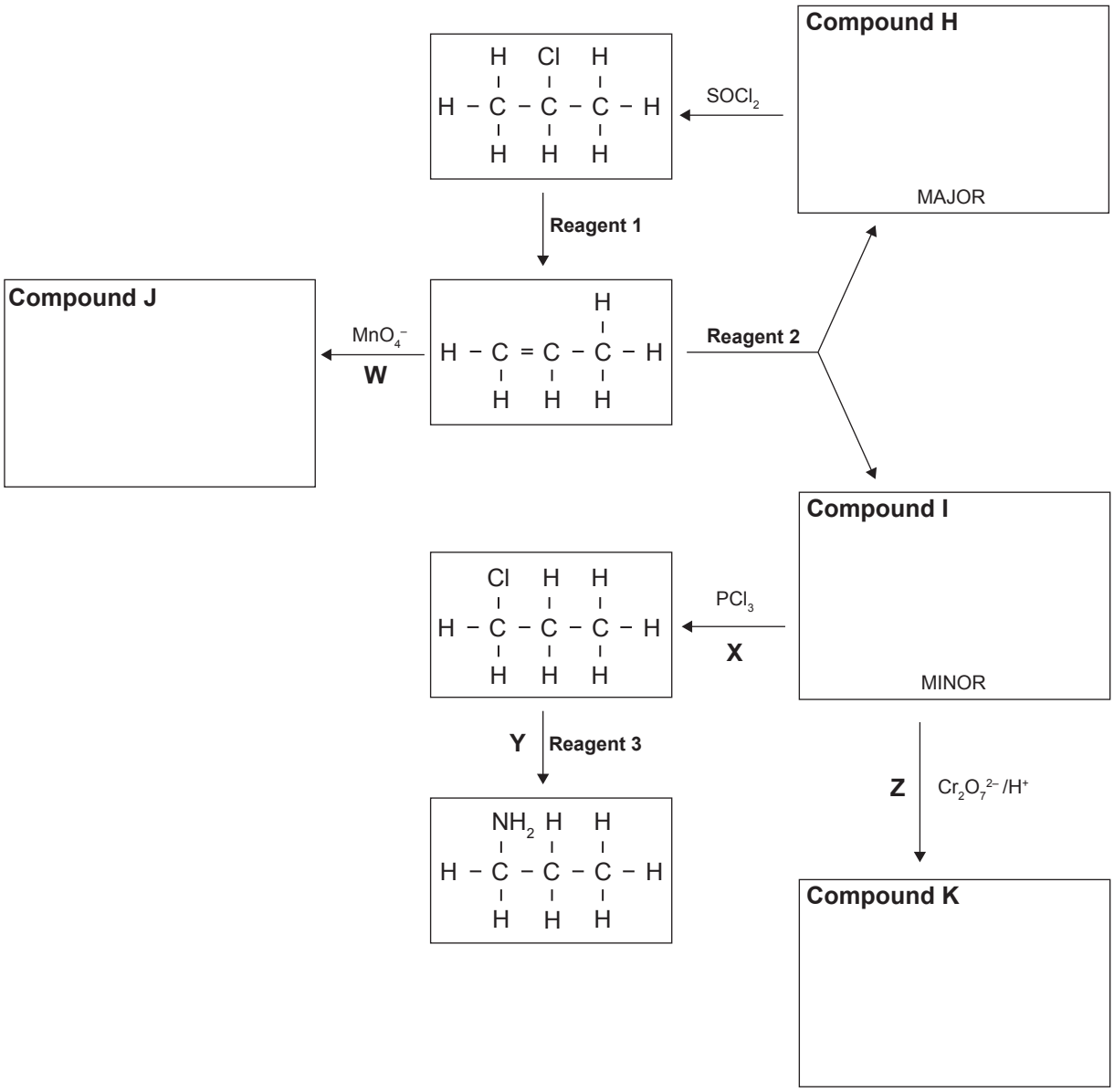
Compound E

Compound G

Compound F

QUESTION THREE

(a) An incomplete reaction scheme starting with 2-chloropropane is shown.



(i) Draw the structural formula of Compound H, I, J, and K in the reaction scheme above.

(ii) Complete the reagents 1, 2, and 3 in the labelled boxes below.

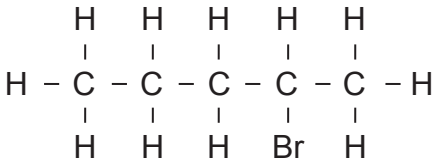
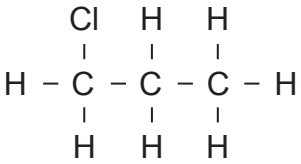
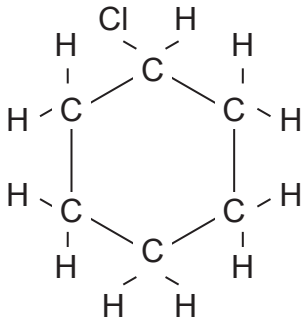
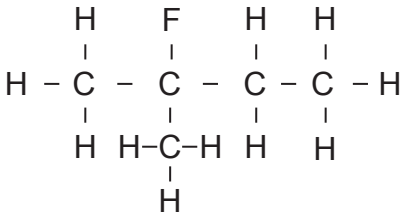
Reagent 1	
Reagent 2	
Reagent 3	

(iii) Identify the reaction types W, X, Y, and Z in the table below.

Reaction type W	
Reaction type X	
Reaction type Y	
Reaction type Z	

Question Three continues on the following page.

(b) (i) Complete the table below by classifying each haloalkane as primary, secondary, or tertiary.

	Haloalkane	**Classification (primary, secondary, or tertiary)**
1		
2		
3		
4		

(ii) Provide reasons for your classification of **haloalkane 3**.

(c) The haloalkane 2-bromopentane forms a major and minor product when reacted with alcoholic potassium hydroxide, KOH(*alc*) and heat.

Give an account of the chemical process of the reaction.

In your answer:

- identify and explain this type of reaction
- draw the structural formulae of both products in the major / minor boxes below
- justify your choice of major and minor products.

	Major product	**Minor product**
Structural formula		

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

QUESTION NUMBER

Extra space if required.
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QUESTION NUMBER

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