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MANA TOHU MĀTAURANGA O AOTEAROA

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Level 2 Chemistry, 2014

91165 Demonstrate understanding of the properties of selected organic compounds

2.00 pm Tuesday 11 November 2014
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 is provided on the Resource Sheet L2–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 2–11 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.

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QUESTION ONE

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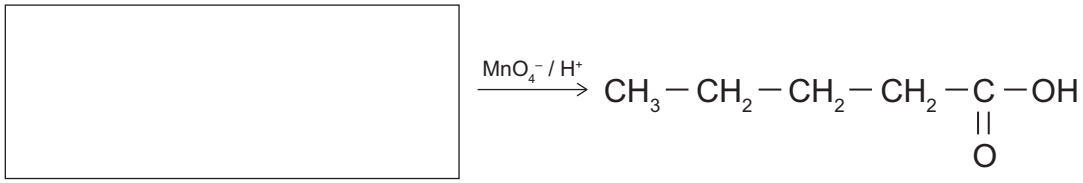
(a) In the boxes below, draw a primary, a secondary, and a tertiary alcohol for the molecule $C_5H_{11}OH$.

Primary	Secondary	Tertiary

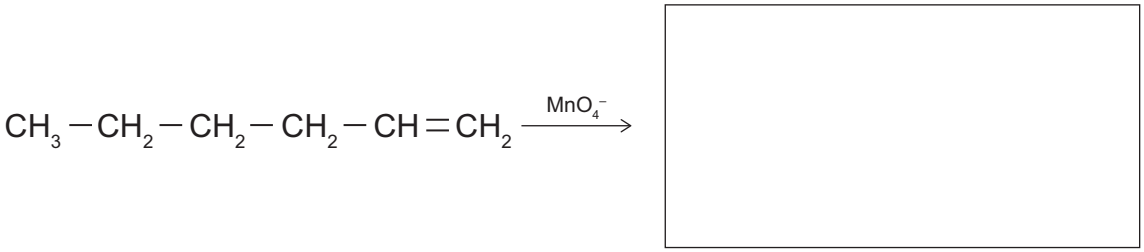
(b) (i) When primary alcohols are oxidised by acidified permanganate, MnO_4^-/H^+, they form carboxylic acids.

In the box below, draw the primary alcohol that was oxidised to form the carboxylic acid shown.



(ii) Permanganate ion, MnO_4^-, can be used to oxidise alkenes.

Draw the product of the following reaction:



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(c) The reactions shown below are all classified as being the same type of reaction.

Reaction One	hexane, $CH_3CH_2CH_2CH_2CH_2CH_3$, reacts with bromine water, $Br_2(aq)$
Reaction Two	hexan-1-ol, $CH_3CH_2CH_2CH_2CH_2CH_2OH$, reacts with PCl_3
Reaction Three	1-chlorohexane, $CH_3CH_2CH_2CH_2CH_2CH_2Cl$, reacts with conc NH_3 (alc)

Compare and contrast these reactions.

In your answer you should:

- state whether any conditions are required
- describe the type of reaction occurring and explain why all three reactions are classified as this type of reaction
- explain why two layers form in **Reaction One**.

QUESTION TWO

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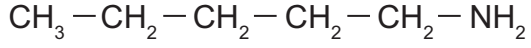
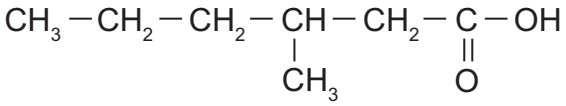
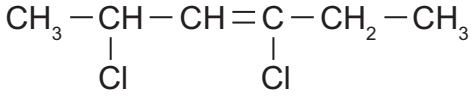
(a) Complete the following table to show the structural formula and IUPAC (systematic) name for each compound.

Structural formula	IUPAC (systematic) name
	But-1-yne
	2,2-dichloropentan-1-ol
	
	
	

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(b) The structures of three organic compounds are shown below.

Compound **A**	$CH_3-CH_2-CH=CH-CH_3$
Compound **B**	$CH_3-CH_2-CH_2-CH=CH_2$
Compound **C**	$CH_3-CH_2-CH_2-CH_2-CH_3$

Explain why compound **A** can exist as geometric (*cis* and *trans*) isomers, but compounds **B** and **C** cannot.

In your answer you should:

- draw the geometric (*cis* and *trans*) isomers of compound **A** in the boxes below
- explain the requirements for geometric (*cis* and *trans*) isomers by referring to compounds **A**, **B**, and **C**.

cis isomer

trans isomer

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(c) Sodium carbonate, hydrochloric acid, and sulfuric acid are each added to separate samples of three organic compounds.

The structures of the compounds and the products of any reactions are given in the table below.

Reagent	**Organic compound**		
	$CH_3-CH_2-\underset{\underset{O}{\|}}{C}-OH$	$CH_3-CH_2-CH_2-NH_2$	$CH_3-CH_2-CH_2-OH$
Na_2CO_3	**(i)**	no reaction	no reaction
HCl	no reaction	**(ii)**	$CH_3-CH_2-CH_2-Cl$
H_2SO_4	no reaction	$CH_3-CH_2-CH_2-NH_3^+$	$CH_3-CH=CH_2$

Compare and contrast the reactions that **do** occur between these organic compounds, and the reagents in the table above.

In your answer you should:

- give the structure of the organic products **(i)** and **(ii)**
- describe the different types of reactions occurring, and give reasons why they are classified as that type
- identify any specific conditions that are required for the reactions to occur.

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QUESTION THREE

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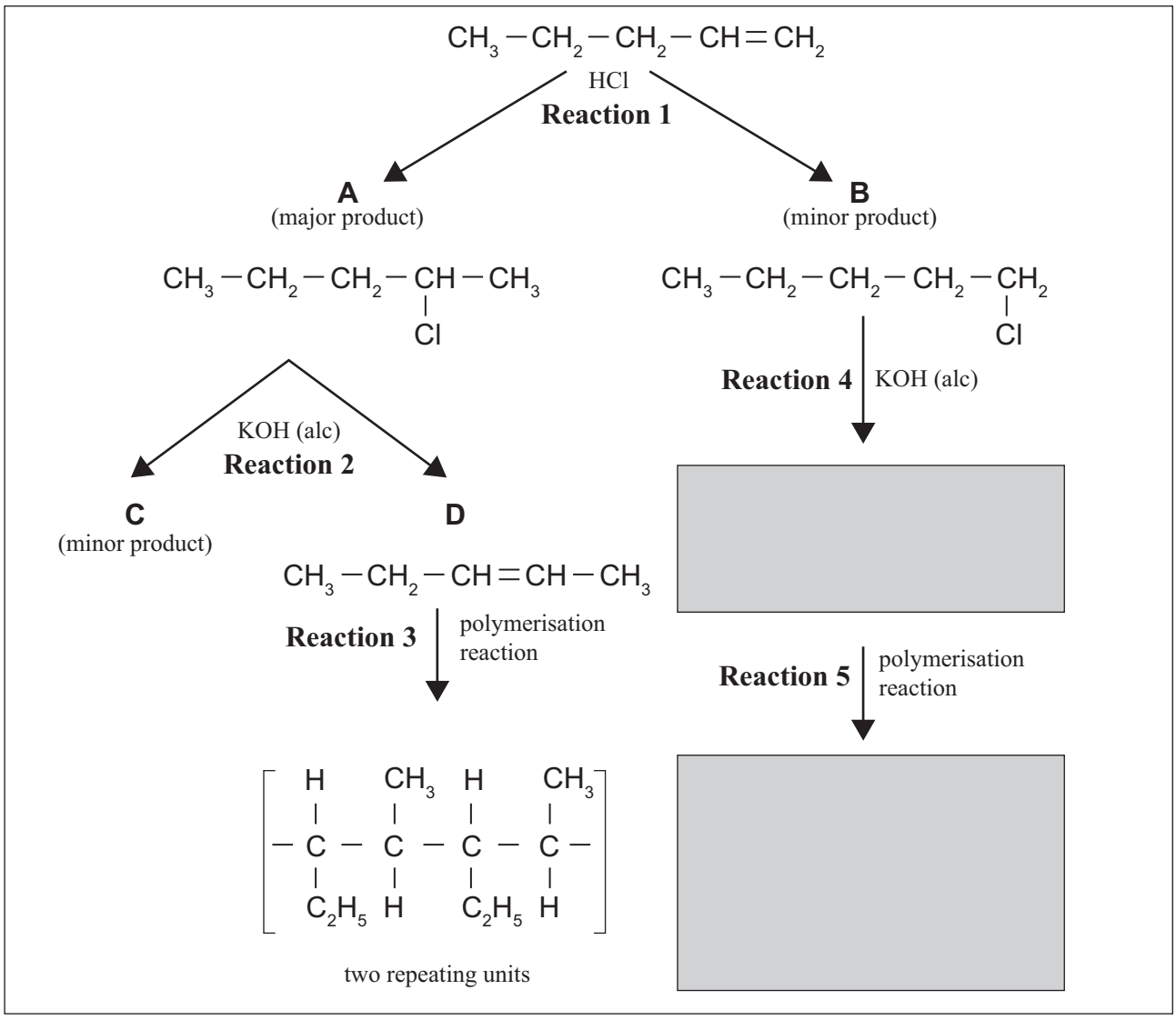
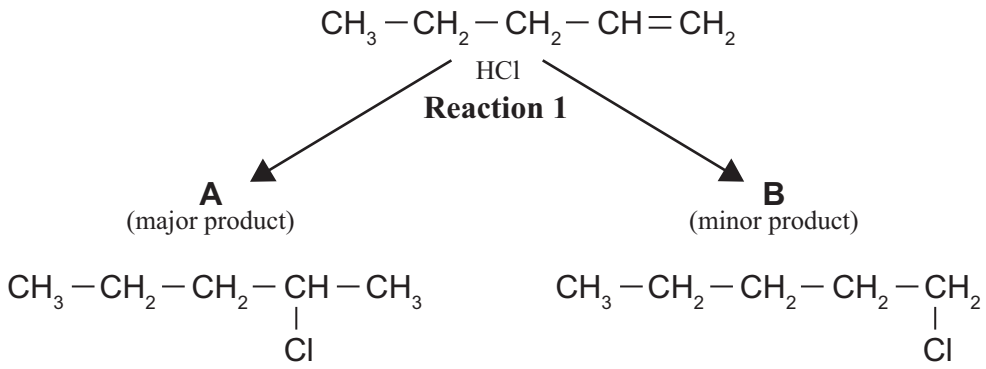
A reaction scheme is shown below.



(a) (i) Explain why **Reaction 1** from the reaction scheme, shown again below, is classified as an addition reaction.



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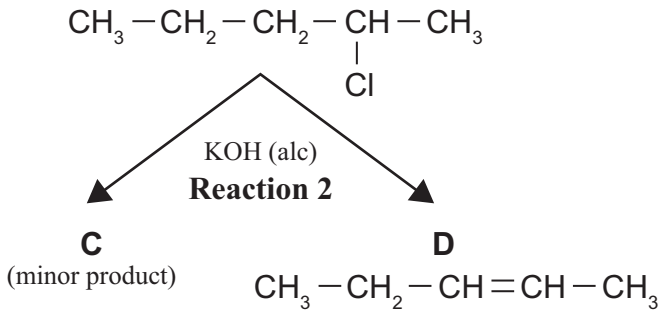
(ii) Explain why compound **A** is the **major** product for **Reaction 1** shown in the reaction scheme on the previous page.

(b) (i) Explain why **Reaction 2** from the reaction scheme, shown again below, is classified as an elimination reaction.



(ii) **Reaction 4** is also an elimination reaction.

Draw the structural formula of the product formed in **Reaction 4**.

(c) (i) Draw TWO repeating units of the polymer formed in **Reaction 5**.

Question Three continues on the following page.

(ii) Compare and contrast the polymer formed in **Reaction 5** to the polymer formed in **Reaction 3**.

In your answer you should explain why the polymers formed in these two reactions are different.

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

QUESTION NUMBER

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