

91165



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NEW ZEALAND QUALIFICATIONS AUTHORITY
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Level 2 Chemistry, 2012

91165 Demonstrate understanding of the properties of selected organic compounds

9.30 am Tuesday 20 November 2012

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.

TOTAL

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You are advised to spend 60 minutes answering the questions in this booklet.

QUESTION ONE

- (a) Four of the structural isomers of $C_4H_{10}O$ are alcohols. One of these isomers has been drawn and named for you in the table below.

Complete the table to show the structural formulae and IUPAC (systematic) names of the other structural isomers.

| | |
|--|--|
| $ \begin{array}{ccccccc} & H & H & H & H & & \\ & & & & & & \\ H & - C & - C & - C & - C & - OH \\ & & & & & & \\ & H & H & H & H & & \end{array} $ | |
| butan-1-ol | |
| | |
| | |

(b) Butan-1-ol can be oxidised to form a carboxylic acid.

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- (i) Write the name or formula of a suitable reagent that could be used to carry out the reaction.

Include any specific conditions.

- (ii) Describe the colour change that would be observed.

- (iii) One of the other alcohol isomers of $C_4H_{10}O$ can also be oxidised to form a carboxylic acid.

Identify this isomer by name or structural formula: _____

Explain your choice of isomer.

- Two reagents, bromine water, Br_2 , and acidified potassium permanganate, $\text{MnO}_4^- / \text{H}^+$, are available.

In your answer you should include:

- a description of the type of reactions that would occur
- any conditions that would be required
- any observations that would be made
- equations showing the structural formulae of the organic reactant(s) and product(s).

QUESTION TWO

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

| Structural formula | Name |
|---|----------------|
| $ \begin{array}{c} \text{Cl} \\ \\ \text{H}_3\text{C} - \text{C} - \text{CH}_3 \\ \\ \text{Cl} \end{array} $ | |
| | ethanoic acid |
| $ \begin{array}{ccccccc} & \text{H} & \text{H} & \text{H} & \text{H} & & \text{O} \\ & & & & & & // \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - & \text{C} \\ & & & & & & \backslash \\ & \text{Br} & \text{H} & \text{H} & \text{CH}_3 & & \text{OH} \end{array} $ | |
| $ \begin{array}{c} \text{H} \\ \\ \text{N} - \text{CH}_3 \\ \\ \text{H} \end{array} $ | |
| | 2-aminopentane |

- (b) State how you could distinguish between aminobutane, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2$, and butanoic acid, $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$, using damp litmus paper.

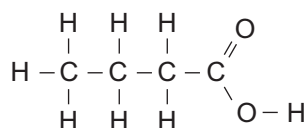
Give a reason for your answer.

- (c) When butanoic acid reacts with sodium hydrogen carbonate, NaHCO_3 , fizzing can be seen during the reaction.

(i) What type of reaction is occurring? _____

(ii) Explain why fizzing is observed during the reaction.

- (iii) Complete the equation below to show the structural formula of the organic product formed.

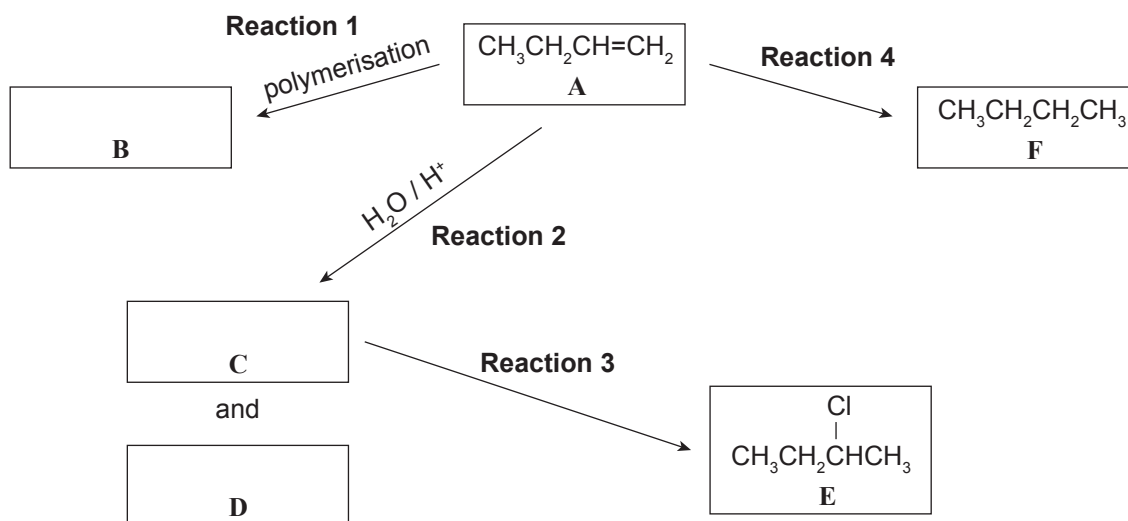


Compare and contrast the reactions of chloroethane with the three reagents.

- the type of reaction occurring and the reason why it is classified as that type
- the type of functional group formed
- equations showing structural formulae for reactions occurring.

QUESTION THREE

But-1-ene is used in the reaction sequence shown below.



- (a) (i) Draw two repeating units of the polymer, **B**, formed in **Reaction 1**.

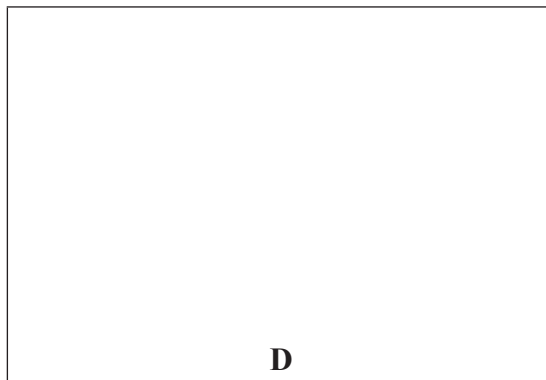


- (ii) Give the name or formula of a suitable reagent in **Reaction 4**; include any specific conditions required.
- _____
- (iii) Give the name or formula of a suitable reagent in **Reaction 3**; include any specific conditions required.
- _____

- (b) Can compound **A** exist as geometric (*cis-trans*) isomers?

Justify your answer, including reference to the requirements for geometric (*cis-trans*) isomers.

- C**



- In your answer you should include:

- identification of the major and minor products
- an explanation of why there are two possible products
- justification of your placement of the different structures in boxes **C** and **D** with reference to the reaction sequence.

There is more space for your answer to Question Three (c)(ii) on the following page.

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

QUESTION
NUMBER

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