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NZQA

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# Level 2 Chemistry, 2015

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

9.30 a.m. Monday 23 November 2015
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 room for any answer, use the extra space 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.**

**Not Achieved**

TOTAL 5

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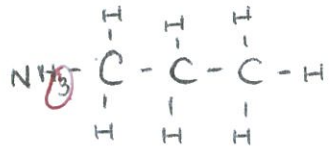
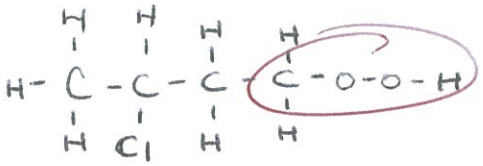
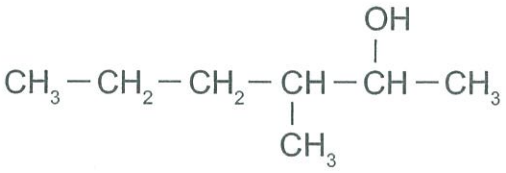
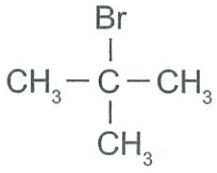
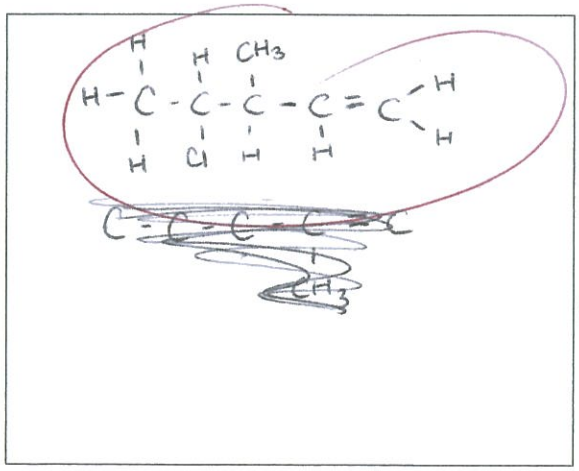
## QUESTION ONE

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

| Structural formula | IUPAC (systematic) name |
|---|---|
|  | propan-1-amine |
|  | 2-chlorobutanoic acid |
|  | 3-methylhexan-2-ol |
|  | 2-methyl-2-bromopropane. |

(ii) The organic compound, 4-chloro-3-methylpent-4-ene has been named incorrectly.

Draw the implied structure and explain why it is named incorrectly.



The double bond should be 'pent-2-ene' because it is the functional group on this molecule. (4-Chloro-3-methylpent-2-ene)

The correct IUPAC name for this structure is:

4-chloro-2-methylpent-2-ene

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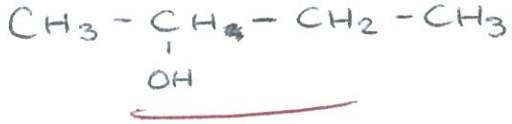
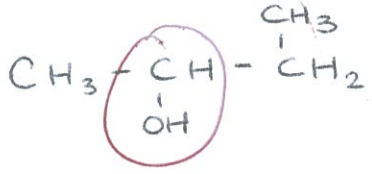
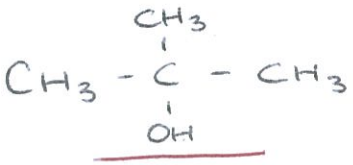
(b) Butan-1-ol has the molecular formula $C_4H_{10}O$. Its structural formula is:

$$CH_3-CH_2-CH_2-CH_2-OH$$

(i) Define the term constitutional (structural) isomer.

The same atoms & same amounts of atoms just in a different place.

(ii) Draw THREE other constitutional (structural) isomers of $C_4H_{10}O$.

| Alcohol | Structural formula |
|---|---|
| A |  |
| B |  |
| C |  |

(iii) Choose a **secondary** alcohol from the structures above and give a reason for your choice.

Letter: A **B** C (circle your choice)

Reason:

OH is connected to the Carbon that has two other carbons coming off it, making this a secondary alcohol.

(c) Four separate colourless organic liquids are known to be:

- ethanol
- ethanoic acid
- hex-2-ene
- hexan-1-amine (1-aminohexane).

Write a procedure to identify each of these organic liquids using **only** the reagents listed below.

- acidified dichromate solution, $Cr_2O_7^{2-}/H^+(aq)$
- bromine water, $Br_2(aq)$
- sodium carbonate solution, $Na_2CO_3(aq)$.

In your answer, you should:

- identify the test reagents used
- describe any observations that would be made
- identify the type of reaction that occurs
- identify the organic product of any reaction.

You do not need to include equations in your answer.

hex-2-ene ~~ethanoic~~ [redacted] + acidified dichromate ($Cr_2O_7^{2+}/H^+$) solution would change the colour from green to orange with heat. This goes from an alkene to a carboxylic acid.

hexan-1-amine + bromine water would change the amine to an alkene.

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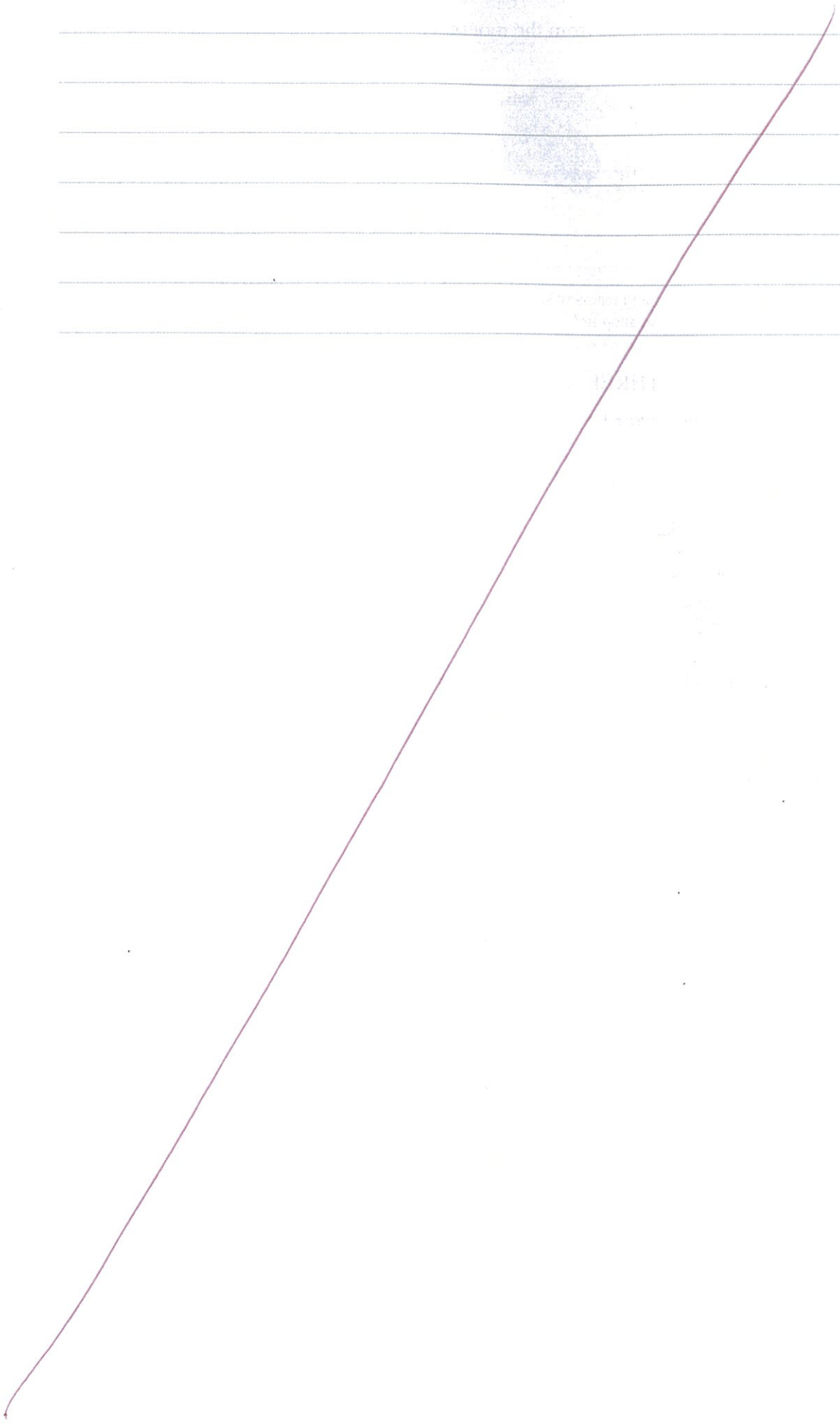
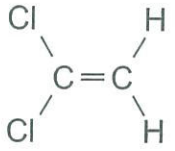


## QUESTION TWO

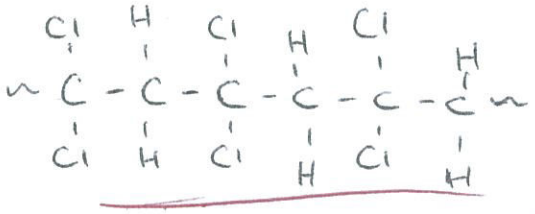
Cling Wrap is a polymer that can be made from the monomer 1,1-dichloroethene.

http://savingcentswithcoupons.com/money-maker-deal-on-glad-cling-wrap-at-shoprite/




1,1-dichloroethene

(a) (i) In the box below, draw THREE repeating units of the polymer formed.

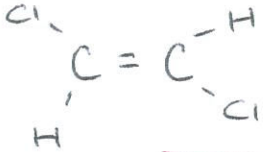
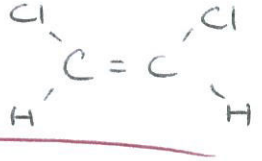


(ii) Explain why 1,1-dichloroethene cannot exist as a *cis-trans* isomer.

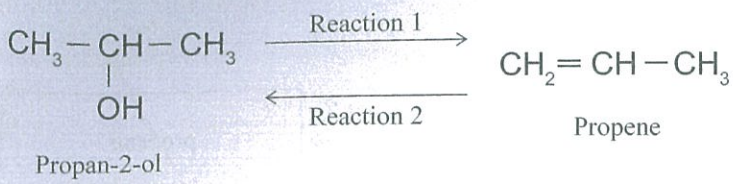
1,1-dichloroethene is an unsymmetrical molecule so it cannot exist as a cis-trans isomer.

(iii) A structural isomer of 1,1-dichloroethene **can** exist as *cis-trans* isomers.

Draw and name the *cis-trans* isomers.

| | | |
|---|---|---|
| **Structure** |  |  |
| **Name** | 1,2-dichloroethene ~~dichloroethene~~ | 1,2-dicholoroethene |

(b)




Propan-2-ol

Propene

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In Reaction 1, propan-2-ol can be converted to propene.

In Reaction 2, propene can be converted back to propan-2-ol.

Analyse BOTH of these reactions by:

- describing the reagents and conditions needed for each reaction to occur
- identifying each type of reaction and explaining your choice
- explaining why Reaction 1 forms only a single organic product, but Reaction 2 forms a mixture of organic products.

Propan-2-ol to propene is reacted using ... heat $

~~This forms~~ Reaction one forms a single organic compound because it is an ~~substitution~~ elimination ~~elimination~~ reaction which ~~substitutes~~ eliminate O ~~for~~ to make a double bond.

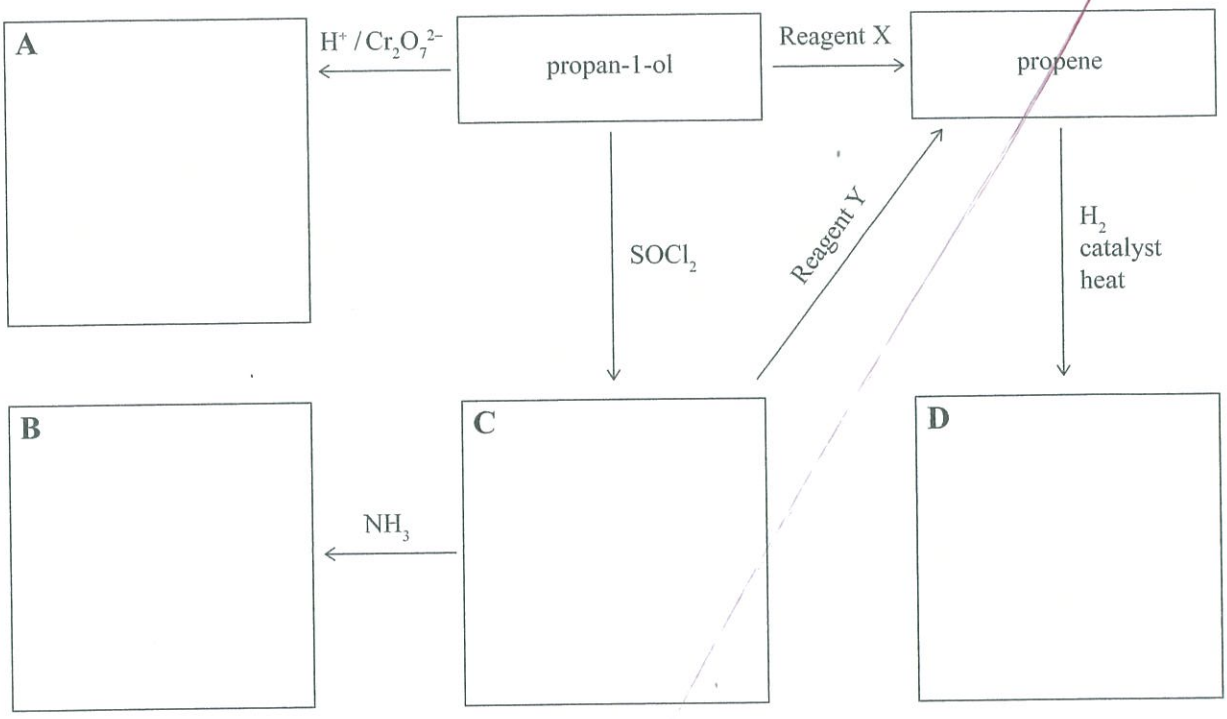
Reaction 2 contains a pt catalyst $ $H^+$ + heat. This is how it convets from an alkene back to an alkane. This forms a mixture of organic compounds because this reaction is an addition reaction which has Oxygen added to form the alcohol. The original ~~reaction~~ product has just been moved around for the double bond to break $ contain the alcohol again.

4

A3

## QUESTION THREE

(a)




(i) Complete the scheme above by drawing the structural formulae of the organic compounds A to D.

(ii) Circle the functional group of each of the organic compounds A, B, and C that you have drawn.

(iii) Identify reagents X and Y.

Reagent X: _____

Reagent Y: _____

(b) Ethene, $C_2H_4(g)$, reacts with aqueous potassium permanganate solution, $KMnO_4(aq)$, dilute acid, $H_2O/H^+$, and hydrogen bromide, HBr.

Compare and contrast the reactions of ethene gas with each of these three reagents.

In your answer, you should:

- describe any observations that can be made
- identify, with reasons, the type of reaction ethene undergoes with each reagent
- describe the functional group of the products formed
- include equations showing the structural formulae for the organic compounds for each reaction.

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

QUESTION NUMBER

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