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Level 2 Chemistry, 2018

91165 Demonstrate understanding of the properties of selected organic compounds

9.30 a.m. Monday 26 November 2018
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 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 and clearly number the question.

Check that this booklet has pages 2–12 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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QUESTION ONE

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(a) Complete the following table.

Compound	IUPAC (systematic name)
$CH_2=CH-CH_2-CH_2-CH_3$	
$CH_3-\underset{\displaystyle CH_3}{\underset{\vert}{CH}}-\underset{\displaystyle OH}{\underset{\vert}{CH}}-CH_3$	
	2-hydroxypropanoic acid

(b) Draw structural formulae for primary, secondary, and tertiary chloroalkane molecules that are constitutional (structural) isomers with the molecular formula C_4H_9Cl.

Classification of chloroalkane	Structural formula
Primary	
Secondary	
Tertiary	

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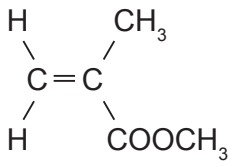
(c) Perspex® is a polymer used as an alternative to glass as it is transparent, lightweight, and shatter resistant. It can be made from the monomer shown below.



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

(ii) Justify whether or not the **monomer** used to produce Perspex® is a geometric (cis-trans) isomer by explaining the features required for this type of isomerism.

(d) When but-1-ene is reacted to form bromobutane, C_4H_9Br, two organic products are formed.

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Analyse this reaction by:

- stating the reagent required
- identifying the type of reaction and justifying your choice
- explaining why there is a mixture of organic products.

Support your answer by drawing structural formulae for but-1-ene and the organic products.

QUESTION TWO

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(a) Two bottles of different colourless organic liquids are unlabelled. They are known to be propan-1-amine, $CH_3CH_2CH_2NH_2$, and ethanoic acid, CH_3COOH.

(i) Explain how you could identify these two liquids using only solid sodium hydrogen carbonate, $NaHCO_3(s)$.

(ii) Give the structural formula and name for the product of the reaction between propan-1-amine, $CH_3CH_2CH_2NH_2$, and ethanoic acid, CH_3COOH to form a salt.

$CH_3CH_2CH_2NH_2(aq) + CH_3COOH(aq) \searrow$

Name: _____

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(b) Three more unlabelled bottles of colourless organic liquids are known to contain hexane, hex-1-ene, and ethanol.

Write a procedure to identify each of these liquids using only bromine water, $Br_2(aq)$, and water, H_2O.

In your answer you should explain any observations that would be made.

You do not need to include equations in your answer.

(c) Many organic reactions take more than one step in order to convert from one organic molecule to another.

Two steps are required to produce pentan-2-amine from an alcohol.

Use the information given to analyse the reactions.

(i) Draw the structural formulae of the compounds, and name the reagents involved in the process, in the boxes on the next page.

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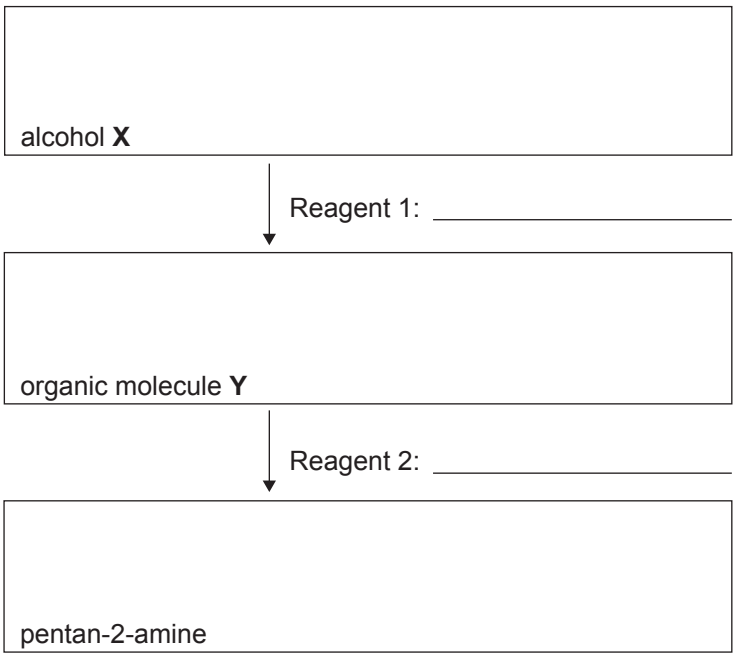

(ii) Elaborate on the reactions in the scheme above.

In your answer you should identify:

- any conditions needed for each step of the conversion
- the names of alcohol **X** and organic molecule **Y**
- the type of reaction that is occurring for each step of the conversion.

QUESTION THREE

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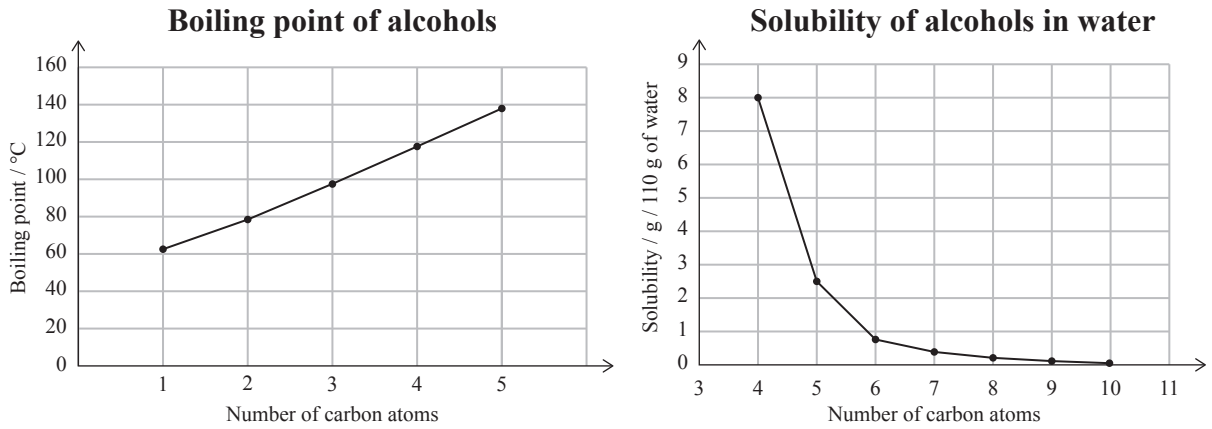
The graphs below show trends in two physical properties of alcohols.



(a) Identify the trends shown on the graphs above.

(b) Reacting 2-chloropropane with potassium hydroxide, KOH, can produce different products due to different reactions occurring.

(i) Elaborate on the reactions of 2-chloropropane with potassium hydroxide, KOH.

In your answer you should:

- identify the conditions of the reagent KOH
- explain the types of reaction that occur with the reagent in each condition
- draw structural formulae of the organic products.

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(ii) Elaborate on chemical tests that could be used to identify the functional groups of the organic products formed in part (i).

In your answer, you should:

- identify chemicals and conditions required
- describe any observations
- state the type of reaction occurring
- explain why potassium permanganate solution, $KMnO_4(aq)$, cannot be used to distinguish between these organic products.

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

QUESTION NUMBER

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