Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Halogenoalkanes

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Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

Haloalkanes are used in the synthesis of other organic compounds.

(a) Hot concentrated ethanolic potassium hydroxide reacts with 2-bromo-3-methylbutane to form two alkenes that are structural isomers of each other. The major product is 2-methylbut-2-ene.

(i) Name and outline a mechanism for the conversion of 2-bromo-3-methylbutane into 2-methylbut-2-ene according to the equation.

$(CH_3)_2CHCHBrCH_3 + KOH \longrightarrow (CH_3)_2C{=}CHCH_3 + KBr + H_2O$

Name of mechanism _____

Mechanism

(4)

(ii) Draw the **displayed formula** for the other isomer that is formed.

(1)

(iii) State the type of structural isomerism shown by these two alkenes.

_____

(1)

(b) A small amount of another organic compound, **X**, can be detected in the reaction mixture formed when hot concentrated ethanolic potassium hydroxide reacts with 2-bromo-3-methylbutane.
Compound **X** has the molecular formula $C_5H_{12}O$ and is a secondary alcohol.

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(i) Draw the **displayed formula** for **X**.

(1)

(ii) Suggest **one** change to the reaction conditions that would increase the yield of **X**.

_____

_____

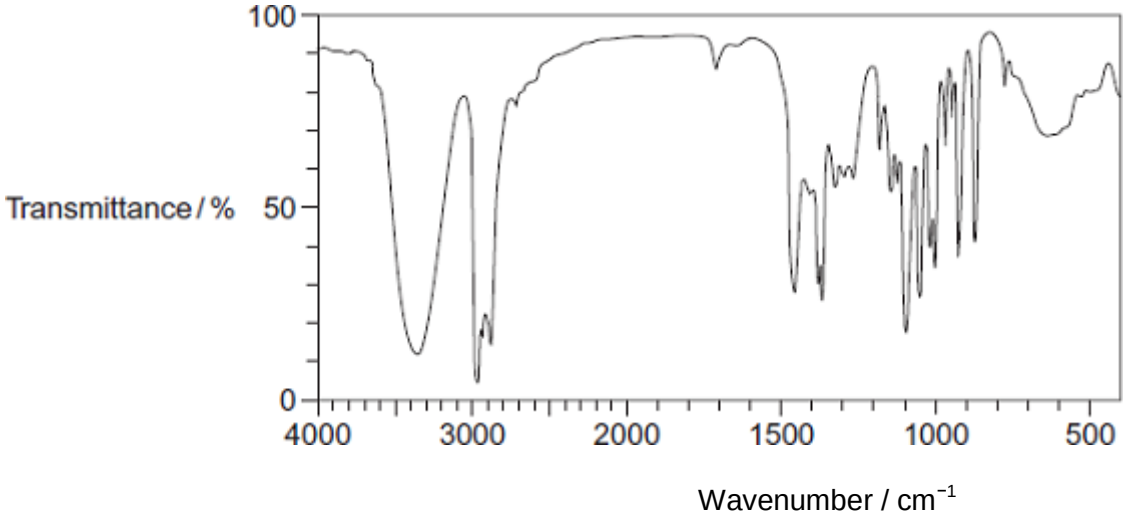
(1)

(iii) State the type of mechanism for the conversion of 2-bromo-3-methylbutane into **X**.

_____

(1)

(iv) Identify **one** feature of this infrared spectrum of a pure sample of **X** that may be used to confirm that **X** is an alcohol.
You may find it helpful to refer to **Table 1** on the Data Sheet.



Feature _____

_____

(1)

(Total 10 marks)

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Q2.

In each of the following questions, you should draw the structure of the compound in the space provided.

(a) Draw the structure of the alkene that would form 1,2-dibromo-3-methylbutane when reacted with bromine.

(1)

(b) Draw the structure of the alcohol with molecular formula $C_4H_{10}O$ that is resistant to oxidation by acidified potassium dichromate(VI).

(1)

(c) Draw the structure of the alkene that has a peak, due to its molecular ion, at $m/z = 42$ in its mass spectrum.

(1)

(d) Draw the structure of the organic product with $M_r = 73$, made from the reaction between 2-bromobutane and ammonia.

(1)

(Total 4 marks)

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Q3.

Chlorine can be used to make chlorinated alkanes such as dichloromethane.

(a) Write an equation for each of the following steps in the mechanism for the reaction of chloromethane (CH_3Cl) with chlorine to form dichloromethane (CH_2Cl_2).

Initiation step

_____

First propagation step

_____

Second propagation step

_____

The termination step that forms a compound with empirical formula CH_2Cl.

_____

(4)

(b) When chlorinated alkanes enter the upper atmosphere, carbon-chlorine bonds are broken. This process produces a reactive intermediate that catalyses the decomposition of ozone. The overall equation for this decomposition is

$$2O_3 \rightleftharpoons 3O_2$$

(i) Name the type of reactive intermediate that acts as a catalyst in this reaction.

_____

(1)

(ii) Write **two** equations to show how this intermediate is involved as a catalyst in them decomposition of ozone.

Equation 1 _____

Equation 2 _____

(2)

(Total 7 marks)

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