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CHEMISTRY

ORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	ORGANIC ANALYSIS
PAPER TYPE:	QUESTION PAPER - 4
TOTAL QUESTIONS	10
TOTAL MARKS	36

Organic Analysis - 4

1. Write an equation for the hydration of propene to form isopropyl alcohol. Give the IUPAC name for isopropyl alcohol.

(2)

2. Samples of 1-chloropropane and ethanoyl chloride can be distinguished by the addition of an aqueous solution of silver nitrate.
State what you would observe with each sample.

(2)

3. The following pairs of compounds can be distinguished by simple test-tube reactions.
For each pair, give a suitable reagent that could be added separately to each compound to distinguish between them.
Describe what you would observe in each case.

(a) AgBr(s) and AgI(s)

(3)

(b) HCl(aq) and HNO_3(aq)

(3)

4. Explain how infrared spectroscopy can be used to show that an aldehyde is definitely pentanal.

(2)

5. Ethanoic acid, propyl ethanoate and propan-1-ol are all colourless liquids. Esters do not give a positive result with any of the usual tests for functional groups.
State how you could use chemical tests to show the presence of ethanoic acid and propan-1-ol in a mixture of the acid, the alcohol and the ester.

(4)

6. Pure hydrogen peroxide is a colourless liquid with a boiling point of 150 °C.
Hydrogen peroxide was originally produced commercially in a two-stage process.

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In the first stage barium was heated in air to form barium peroxide. In the second stage barium peroxide was added to aqueous nitric acid.
The equations for the reactions are shown below.

Stage 1 $Ba(s) + O_2(g) \rightarrow BaO_2(s)$
Stage 2 $BaO_2(s) + 2HNO_3(aq) \rightarrow H_2O_2(aq) + Ba(NO_3)_2(aq)$

(a) Suggest one method of separating hydrogen peroxide from the reaction mixture in Stage 2.

(1)

(b) Apart from cost, suggest one reason why nitric acid was eventually replaced by sulfuric acid in Stage 2.

(1)

(c) Suggest one reason why infrared spectroscopy could not be used to indicate the presence of a small amount of water in hydrogen peroxide.

(1)

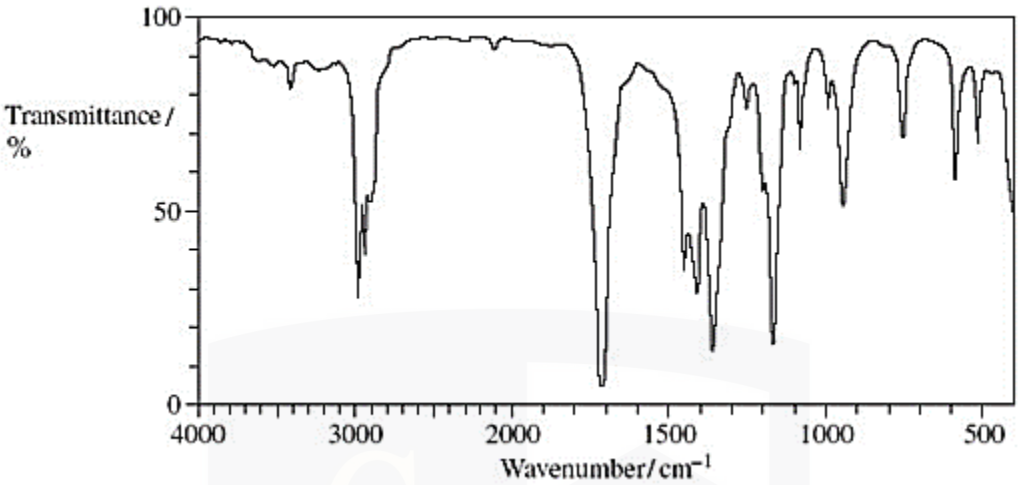
7. Butan-2-ol can be oxidised by acidified potassium dichromate(VI) to form butanone as shown by the following equation.

$CH_3CH_2CH(OH)CH_3 + [O] \rightarrow CH_3CH_2COCH_3 + H_2O$

(a) State the class of alcohol to which butan-2-ol belongs.

(1)

(b) The infrared spectrum shown below is either that of butan-2-ol or that of butanone.



Identify the compound to which this infrared spectrum refers.
Explain your answer.

(3)

(c) Draw the displayed formula of the alcohol C_4H_9OH which is resistant to oxidation by acidified potassium dichromate(VI).

(1)

8. Haloalkanes also undergo elimination reactions to produce alkenes.
Outline a mechanism for the elimination reaction in which 2-bromopropane reacts with potassium hydroxide to form propene.

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(3)

9. 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.

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

$(CH_3)_2CHCHBrCH_3 + KOH \rightarrow (CH_3)_2C=CHCH_3 + KBr + H_2O$

(4)

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

(1)

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

(1)

10. State the class of alcohols to which the diol butane-1,4-diol belongs.

Identify a suitable reagent or combination of reagents for the conversion of butane-1,4-diol into butanedioic acid ($HOOCCH_2CH_2COOH$).

Write an equation for this oxidation reaction using [O] to represent the oxidising agent.

(3)

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