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CHEMISTRY

ORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	ORGANIC ANALYSIS
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	10
TOTAL MARKS	37

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Organic Analysis - 1

1. Name and outline a mechanism for the following reaction.

State the role of the hydroxide ion in this reaction.



(5)

2. Which one of the following statements about but-2-enal, $\text{CH}_3\text{CH}=\text{CHCHO}$, is not true?

- A. It has stereoisomers.
- B. It shows a strong absorption in the infra-red at about 1700 cm^{-1} .
- C. It will turn an acidified solution of potassium dichromate(VI) green.
- D. It can be dehydrated by concentrated sulphuric acid.

(1)

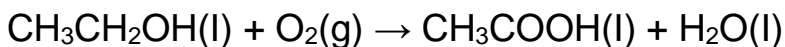
3. Any ethanol present in the breath of a drinker can be detected by using a breathalyser.

The ethanol is converted into ethanoic acid.

The breathalyser has negative and positive electrodes.

A current is measured and displayed in terms of alcohol content.

The overall redox equation is as follows



(a) Draw the displayed formula for ethanoic acid.

(1)

(b) Deduce a half-equation for the reduction of atmospheric oxygen to water in acidic solution at one electrode of the breathalyser.

(1)

(c) Deduce a half-equation for the oxidation of ethanol in water to ethanoic acid at the other electrode of the breathalyser.

(1)

(d) The earliest breathalysers used laboratory chemicals to oxidise the ethanol to ethanoic acid.

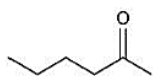
Detection was by a colour change.

Identify a reagent or combination of reagents that you would use in the laboratory to oxidise ethanol to ethanoic acid.

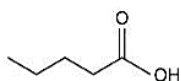
State the colour change that you would expect to see.

(2)

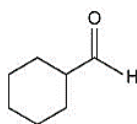
4. The structures of three organic compounds A, B and C are shown.



Compound A



Compound B



Compound C

These compounds can be distinguished by simple test-tube reactions.

For each pair of compounds in questions (a) and (b), give a reagent (or combination of reagents) that could be added separately to each compound to distinguish between them.

State what is observed in each case.

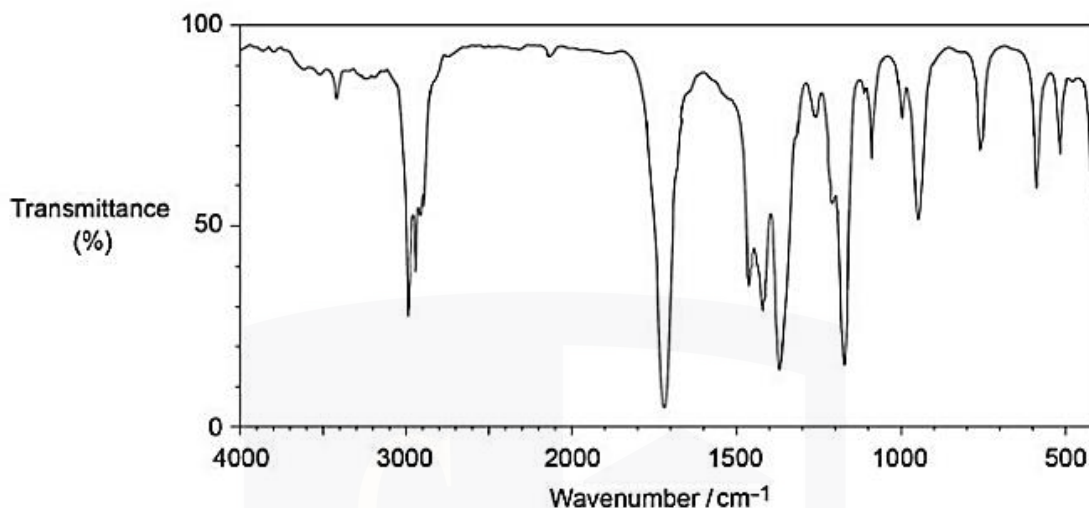
(a) Compounds A and B

(3)

(b) Compounds A and C

(3)

5. The infrared spectrum of an organic compound is shown. Which compound produces this spectrum?



- A. butanone
- B. ethanol
- C. pent-2-ene
- D. propanoic acid

(1)

6. Butan-1-ol reacts with acidified potassium dichromate(VI) solution to produce two organic compounds.

State the class of alcohols to which butan-1-ol belongs.

Draw the displayed formula for both of the organic products.

State the type of reaction that occurs and the change in colour of the potassium dichromate(VI) solution.

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(5)

7. Alcohols can be classed as primary, secondary or tertiary.

(a) Draw possible structures for a primary, a secondary and a tertiary alcohol which have the molecular formula C_4H_8O .

Which of the structures you have drawn cannot be oxidised by potassium dichromate in acid solution?

(4)

(b) Explain what is meant by the fingerprint region of an infra-red spectrum.

State how it is used to confirm the identity of organic molecules such as the primary, secondary and tertiary alcohols of molecular formula C_4H_8O .

(2)

8. British scientists have used bacteria to ferment glucose and produce the biofuel butan-1-ol.

Write an equation for the fermentation of glucose ($C_6H_{12}O_6$) to form butan-1-ol, carbon dioxide and water only.

State one condition necessary to ensure the complete combustion of a fuel in air.

Write an equation for the complete combustion of butan-1-ol and state why it can be described as a biofuel.

(4)

9. Cyclohexanol can be converted into cyclohexanone.

Give a reagent or combination of reagents that can be used for this reaction and state the type of reaction.

State the class of alcohols to which cyclohexanol belongs.

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(3)

10. Which can be used to distinguish between these two compounds?



- A. Acidified potassium dichromate(VI)
- B. Fingerprint region of infrared spectrum
- C. Mr value in high resolution mass spectrometry
- D. Tollens' reagent

(1)



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