CHEMISTRY ONLINE
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CHEMISTRY

ORGANIC CHEMISTRY

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

Organic Analysis – 1

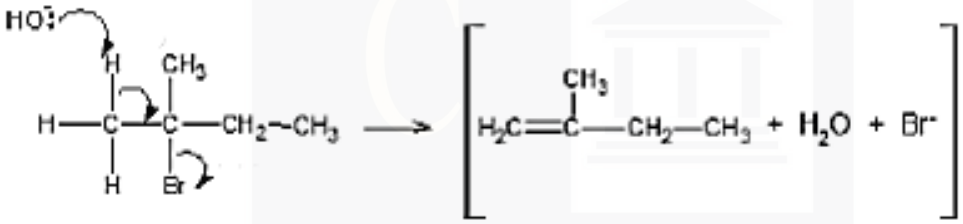
1.

Reaction

$(CH_3)_2CBrCH_2CH_3 + KOH \rightarrow H_2C = C(CH_3)CH_2CH_3 + KBr + H_2O$

Name of the mechanism: Elimination

Mechanism:



(5)

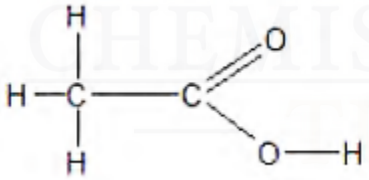
2. D

(1)

3.

(a)

Displayed formula for CH_3COOH



(1)

(b)

Half-equation:

$O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$

(1)

(c)

Half-equation for the oxidation of ethanol:

$CH_3CH_2OH + H_2O \rightarrow CH_3COOH + 4H^+ + 4e^-$

(1)

(d)

Reagents:

Potassium dichromate ($K_2Cr_2O_7$) / Sulfuric acid (H_2SO_4)

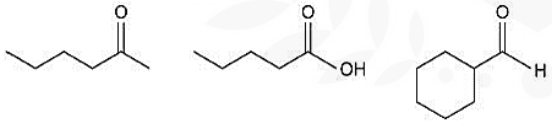
The color change associated with this reaction involves the reduction of the **orange dichromate ($Cr_2O_7^{2-}$) ion to the green chromium (Cr^{3+}) ion.**

Initially, the orange color of the dichromate solution will change to green, indicating the reduction of chromium during the oxidation process.

The overall color change from orange to green serves as a qualitative indicator of the completion of the oxidation reaction.

(2)

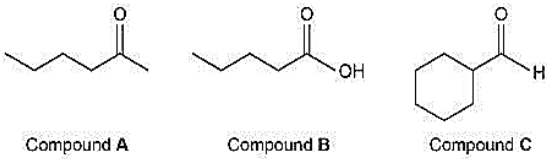
4. The structures of three organic compounds A, B and C are shown.



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)



Compound A Compound B Compound C

Reagent:

sodium bicarbonate ($NaHCO_3$) (test)

Observation with A :

No change/effect

Observation with B:

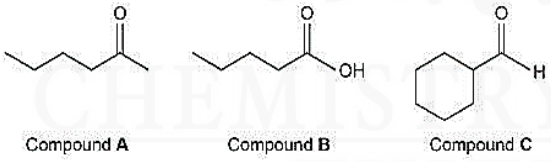
Bubbling or fizzing will be observed as gas is released.

Reaction:

Carboxylic acids react with sodium bicarbonate to produce effervescence (bubbling) due to the evolution of carbon dioxide gas.

(3)

(b)



Compound A Compound B Compound C

Reagent :

Tollens' (reagent) / OR ammoniacal silver nitrate

Observation with A:

No change / stays colourless

Observation with C:

Silver mirror / black solid (precipitate)

(3)

5. A

(1)

6.

Class of Alcohols:
Butan-1-ol belongs to the class of primary alcohols.
Displayed Formula for Organic Products:

- Butanal (Butyraldehyde):

  $CH_3\ CH_2\ CH_2\ CHO$

- Butanoic Acid (Butyric Acid):

  $CH_3\ CH_2\ CH_2\ COOH$

Type of Reaction:

The reaction is an oxidation reaction.

Change in Color of Potassium Dichromate(VI) Solution:

The orange color of the potassium dichromate(VI) solution changes to green during the oxidation process.

(5)

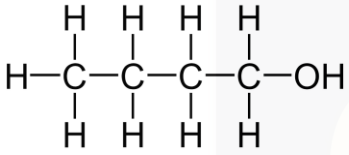
7.

(a)

Following are possible structures for a primary, a secondary and a tertiary alcohol which have the molecular formula C_4H_8O:

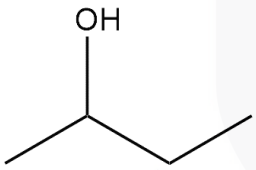
Primary alcohol (1°):

$CH_3CH_2CH_2CH_2OH$



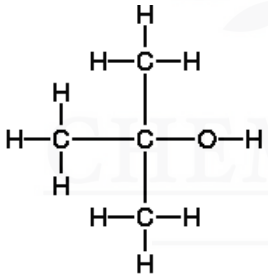
Secondary alcohol (2°):

$CH_3CH_2CH(OH)CH_3$



Tertiary alcohol (3°):

$(CH_3)_3COH$



Tertiary alcohol cannot be oxidised by potassium dichromate in acid solution

(4)

(b)

The 1500–400 cm^{-1} region in an infrared spectrum is the "fingerprint region." An exact match in this zone confirms the identity of organic compounds like C_4H_8O alcohols. It provides unique patterns for comparison between unknown and known spectra.

(2)

8.

Balanced Equation for Fermentation:

$C_6H_{12}O_6 \rightarrow CH_3CH_2CH_2CH_2OH + 2CO_2 + H_2O$

Condition for Complete Combustion :

A good supply of oxygen is necessary for complete combustion.

Equation for Complete Combustion:

$CH_3CH_2CH_2CH_2OH + 6O_2 \rightarrow 4CO_2 + 5H_2O$

Biofuel:

A biofuel is a fuel produced from renewable biological resources.
As 1-butanol is produced by fermentation of glucose so it is a biofuel.

(4)

9.

Reagent for Conversion:

Cyclohexanol can be converted into cyclohexanone using an oxidizing agent such acidified potassium or sodium dichromate ($K_2 Cr_2 O_7 / H_2 SO_4$).

Type of Reaction:

The conversion of cyclohexanol to cyclohexanone is an oxidation reaction or redox reaction.

Class of Alcohol:

Cyclohexanol belongs to the class of secondary alcohols.

(3)

10. **B**

(1)

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