



**CHEMISTRY ONLINE**  
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# CHEMISTRY

## ORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	ALCOHOLS
PAPER TYPE:	SOLUTION - 3
TOTAL QUESTIONS	10
TOTAL MARKS	26

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## Alcohols - 3

1.

(a)

**Carbon-neutral:**

*Carbon-neutral means that there is no change in the total amount of carbon dioxide, carbon, or greenhouse gas present in the atmosphere or air.*

(1)

(b)

*The main advantage of using glucose from crops as the raw material for the production of ethanol is that it is renewable or sustainable.*

*This is because the crops, such as sugarcane or corn, can be grown and harvested repeatedly, providing a continuous and sustainable source of glucose for ethanol production.*

(1)

(c)

*One disadvantage of using crops for ethanol production is the slow process, which involves the time-consuming growth of crops before they can be harvested and processed.*

(1)

2. B

(1)

3.

$$\begin{aligned} \text{Percentage of oxygen by mass} &= 100 - 40.9 - 4.5 \\ &= 54.6 \end{aligned}$$

**Determine the ratio of elements:**

- Carbon:  $\frac{40.9}{12.01} = 3.41$
- Hydrogen:  $\frac{4.5}{1.01} = 4.5$
- Oxygen:  $\frac{54.6}{16.0} = 3.41$

**Divide by the smallest ratio:**

$$\text{Carbon:Hydrogen:Oxygen} = \frac{3.41}{3.41}, \frac{4.5}{3.41}, \frac{3.41}{3.41}$$

**Round to the nearest whole number ratio:**

Nearest whole number ratio

$$1 \times 3 : 1.32 \times 3 : 1 \times 3$$

**Empirical formula:**

$$\text{Empirical formula} = \text{C}_3\text{H}_4\text{O}_3$$

**Check if the empirical formula mass equals the given molecular formula mass (88.0):**

- Empirical formula mass

$$\begin{aligned} &= 3(12.01) + 4(1.01) + 3(16.00) \\ &= 88.15 \end{aligned}$$

Since the empirical formula mass is approximately equal to the given molecular formula mass, the molecular formula is the same as the empirical formula:

$$\text{Molecular formula: } \text{C}_3\text{H}_4\text{O}_3$$

(4)

4. A

(1)

5.

**Test with Bromine Water:**

**Reagent:**

Bromine Water ( $\text{Br}_2$ )

**Observation:**

Decolourised / becomes colourless

Oleic acid, being an unsaturated compound, can react with bromine water. In the presence of unsaturation, bromine water decolorizes from its characteristic brown color to colorless or a much lighter color.

This change in color indicates the addition reaction between bromine and the double bond in oleic acid.

(5)

6. A

(1)

7.

(a)

Reagent: Hydrogen gas ( $H_2$ )  
 Conditions: Nickel (Ni) catalyst  
 Temperature: 100–200 °C or heat

(2)

(b)

**Difference in Structure:**

- **Soft Margarine:**

*This margarine is less hydrogenated, meaning that not all of the double bonds (C=C bonds) in the unsaturated fatty acids of the vegetable oil have been saturated with hydrogen. As a result, the molecular structure of soft margarine contains more C=C bonds or unsaturated fatty acids, leading to a more open and flexible structure.*

- **Hard Margarine:**

*In contrast, hard margarine undergoes further hydrogenation, where more of the C=C bonds are saturated with hydrogen. This process results in a more saturated molecular structure, with fewer C=C bonds and a tighter packing of fatty acid chains.*

**Difference in Melting Point:**

- **Soft Margarine:**

*The higher proportion of unsaturated fats in soft margarine contributes to a lower melting point. The presence of C=C bonds introduces kinks and bends in the fatty acid chains, making it easier for the molecules to move and transition from a solid to a liquid state at a lower temperature.*

- **Hard Margarine:**

*The increased saturation in hard margarine raises its melting point. The saturated fats have a more linear and tightly packed structure, requiring*

*higher temperatures for the margarine to transition from a solid to a liquid state*

(5)

8. D

(1)

9.

*An unsaturated compound contains at least one double bond between its carbon atoms.*

*Example:  $H_2C=CH_2$*

*Examples of unsaturated compounds include alkenes, where the presence of the double bond (C=C) influences the compound's properties and behavior in chemical reactions.*

(2)

10. A

(1)

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I am Sorry !!!!!



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- Founder & CEO of Chemistry Online Tuition Ltd.
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