IGCSE Chemistry: **w25 21**

Question 33 (Answer: **B**)

- An alcohol contains the –OH group, with the oxygen bonded to one carbon and one hydrogen.
- So look for a structure ending in C–O–H.
- A C–O–C arrangement is an ether and a –COOH is a carboxylic acid.

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Question 37 (Answer: **D**)

- Fermentation uses a renewable feedstock at low temperature, but is slow, batch-wise and gives impure ethanol.
- The ethene route is fast, continuous and gives pure ethanol, but its feedstock is finite crude oil.
- Each process has one clear advantage and one clear disadvantage – match them the right way round.

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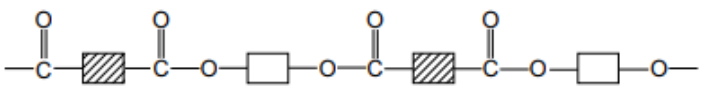
<table>
<tr><td>5(a)(i)</td><td>$C_nH_{2n+1}OH$</td></tr>
<tr><td>5(a)(ii)</td><td>(same) functional group</td></tr>
<tr><td>5(b)(i)</td><td>
<table>
<tr><td>M1 25–35</td><td>M2 300</td></tr>
<tr><td>M3 yeast</td><td>M4 acid</td></tr>
<tr><td>M5 absence of oxygen</td><td>M6 60 atm</td></tr>
</table>
</td></tr>
<tr><td>5(b)(ii)</td><td>$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$
M1 $C_6H_{12}O_6$ as the only reactant on left
M2 correct equation</td></tr>
<tr><td>5(b)(iii)</td><td>$C_2H_4 + H_2O \rightarrow C_2H_5OH$
M1 both $C_2H_4 + H_2O$ only on left
M2 correct equation</td></tr>
<tr><td>5(c)(i)</td><td>$C_4H_{10}O_2$</td></tr>
<tr><td>5(c)(ii)</td><td>2</td></tr>
<tr><td>5(d)(i)</td><td>$C_2H_3O_2$</td></tr>
<tr><td>5(d)(ii)</td><td>hydrogen</td></tr>
<tr><td>5(e)(i)</td><td> 
M1 any one correct fully displayed ester link between any two blocks
M2 three fully displayed inter-block ester links with correct orientation
M3 fully correct diagram showing two complete repeat units of polyester including continuation bonds</td></tr>
<tr><td>5(e)(ii)</td><td>condensation (polymerisation)</td></tr>
</table>

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Question 17 (Answer: **B**)

- Acidified manganate(VII) is an oxidising agent, so the ethanol is oxidised to ethanoic acid.
- The manganate(VII) is itself reduced to Mn^{2+}.
- So the purple colour fades to colourless.

Question 35 (Answer: **C**)

- Fermentation uses yeast at about 30 °C on a renewable sugar feedstock, as a batch process.
- Hydrating ethene uses a catalyst at about 300 °C and high pressure, continuously, from crude oil.
- So the low temperature and the enzyme belong to fermentation, the high temperature to the ethene route.

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Question 32 (Answer: **D**)

- Butan-2-ol has four carbons in a chain, so the skeleton is $CH_3CH_2CH_2CH_3$.
- The "2" means the –OH is on the second carbon.
- That gives $CH_3CH_2CH(OH)CH_3$.

Question 36 (Answer: **B**)

- Hydrating ethene is a continuous process, so it runs without stopping to re-charge a vessel.
- It is also much faster, and gives pure ethanol directly rather than a dilute aqueous mixture.
- Fermentation's advantage is its renewable feedstock, which is not what this question asks for.

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Question 37 (Answer: **D**)

- Using a renewable resource is an advantage, not a disadvantage.
- Fermentation is slow and gives dilute, impure ethanol that must then be distilled – real disadvantages.
- It runs at only about 30 °C, so the high-temperature claim is wrong.