| Question | Answers | Extra information | Mark | AO /  Spec ref. |
| --- | --- | --- | --- | --- |
| **01** | propene ─ turns bromine water colourless  ethanoic acid ─ turns universal indicator orange  methanol ─ has the formula CH3OH |  | 1  1  1 | 2 × AO1  1 × AO2  C7.2.2  C7.2.3  C7.2.4  WS1.2, 4.1 |
| **02.1** | C4H8 | allow H8C4 | 1 | AO2  C7.2.1 |
| **02.2** | bar to 117 °C | ± 1 °C | 1 | AO3  C7.2.1  MS2c |
| **02.3** | Independent variable is discrete/ names/non-continuous/not numerical. |  | 1 | AO3  C7.2.1 |
| **02.4** | propene |  | 1 | AO2  C7.2.1 |
| **02.5** | The higher the melting point, the higher the boiling point. |  | 1 | AO2  C7.2.1 |
| **03.1** | Ethene is an unsaturated compound;  ethene’s series has the general formula CnH2n. |  | 1  1 | AO1  C7.2.1 |
| **03.2** | addition |  | 1 | AO1  C7.2.2 |
| **03.3** | C2H4  Cl2 → C2H4Cl2 |  | 1 | AO2  C7.2.2 |
| **04.1** | = 16.05  = 16.1 (°C) | Accept 16.1 for 2 marks.  Accept 16.5 for 1 mark. | 1  1 | AO2  C7.2.3  MS2b |
| **04.2** | Accept any number in range  17.5–18.2 |  | 1 | AO3  C7.2.3 |
| **04.3** | Add a lid/add insulation/move flame closer to beaker. | Allow add draft shields or less water in the beaker. | 1 | AO3  C7.2.3  AT1, 5 |
| **04.4** | carbon dioxide |  | 1 | AO1  C7.2.3 |
| **05** | **Level 3:** There is a reasonably detailed description of both methods giving reactants, products and conditions showing how ethanol is produced from sugar **and** by hydration with steam. This could be achieved by including chemical equations. | | 5–6 | AO1×4  AO2×2  C7.2.2  C7.2.3  WS1.2 |
| **Level 2:** There is a basic description of both methods. There is an attempt to give reactants and some conditions showing ethanol production from sugar and by hydration with steam. | | 3–4 |
| **Level 1:** There is a brief description of one method, including reactants**.** Little or no mention of conditions of the two methods of producing ethanol. | | 1–2 |
| **Level 0:** No relevant content. | | 0 |
| **Indicative content:**  Hydration:   * ethene named * water/steam named * high temperature/300 °C * high pressure/60–70 atmospheres * catalyst * word equation * only ethanol produced.   Sugar:   * sugar or glucose named * aqueous solution/water * yeast * warm/25–50 °C * anaerobic/fermentation * word equation * carbon dioxide also produced.   This indicative content is not exhaustive, other creditworthy responses should be awarded marks as appropriate. | | |
| **06.1** | butanoic acid |  | 1 | AO1  C7.2.4 |
| **06.2** |  |  | 1 | AO1  C7.2.4 |
| **06.3** | covalent bonds | Accept shared pair of electrons. | 1 | AO2  C2.1.4 |
| **06.4** | sodium carbonate |  | 1 | AO2  C7.2.4 |
| **06.5** | H2O + CO2 | Either order;  both required for **1** mark. | 1 | AO2  C7.2.4 |
| **06.6** | Bubbles of gas/carbon dioxide are given off. |  | 1 | AO2  C1.1.1 |
| **06.7** | ester |  | 1 | AO3  C7.2.4 |