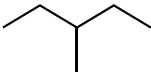
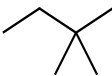
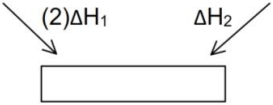


## Multiple Choice Answers

Q9: B

|           |                                                                                                                                                                                                                                                |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3(a)      | <b>M1</b> (family of molecules / compounds / series with) same general formula<br><b>OR</b> (family of molecules where) molecular formula differs (only) by (units of) $\text{CH}_2(n)$ .<br><b>M2</b> similar chemical properties / reactions |
| 3(b)      | <b>M1</b> strong C—H (bonds)<br><b>M2</b> non-polar (C—H / molecule / bonds)                                                                                                                                                                   |
| 3(c)      | cracking                                                                                                                                                                                                                                       |
| 3(d)(i)   | <b>M1</b> <br><b>M2</b>                                                      |
| 3(d)(ii)  | <b>M1</b> B < A < hexane.<br><b>M2</b> hexane / unbranched has stronger / more IMFs<br><b>M3</b> hexane / unbranched requires most / more energy                                                                                               |
| 3(e)(i)   | $\text{H}_2$ ((g)) <b>OR</b> hydrogen (gas)                                                                                                                                                                                                    |
| 3(e)(ii)  | <b>M1</b> $+215 + (-156) - (+48) =$<br><b>M2</b> $+11 \text{ kJ mol}^{-1}$                                                                                                                                                                     |
| 3(e)(iii) | $\text{C}_6\text{H}_{14} + 9\frac{1}{2}\text{O}_2 \rightarrow 6\text{CO}_2 + 7\text{H}_2\text{O}$                                                                                                                                              |

|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1(a)      | <b>I</b> Unambiguous headings <b>AND</b> units for all six recorded readings and calculated values in experiment 1: <ul style="list-style-type: none"> <li>• (mass of) container + <b>FB 2</b> / solid / g</li> <li>• (mass of) container (+ residue) / g</li> <li>• (mass of) <b>FB 2</b> / solid (used / added) / g</li> <li>• initial temperature <b>OR</b> temperature of <b>FB 1</b> / °C</li> <li>• final temperature / °C</li> <li>• temperature change / °C</li> </ul> |
|           | <b>II</b> <ul style="list-style-type: none"> <li>• All four weighings recorded to same decimal places (either 2 or 3).</li> <li>• All four temperatures recorded to .0 or .5°C</li> </ul>                                                                                                                                                                                                                                                                                      |
|           | <b>III</b> Correct subtractions to give all four calculated values: <ul style="list-style-type: none"> <li>• mass of <b>FB 2</b> used and mass of <b>FB 3</b> used</li> <li>• changes in temperature for experiments 1 and 2.</li> </ul>                                                                                                                                                                                                                                       |
|           | <b>Accuracy (Q) marks</b><br>Calculate the candidate's <i>temperature to mass ratio</i> for experiment 1 to 2 d.p.: Ratio = $\Delta T$ (experiment 1) / mass of <b>FB2</b> .<br>Calculate the supervisor's ratio for experiment 1 to 2 d.p.<br>Calculate the difference, $\delta$ , between the candidate's value (rounded to 2 d.p.) and the supervisor's value (rounded to 2 d.p.)                                                                                           |
|           | <b>IV</b> award if $\delta \leq 0.50$                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1(b)(i)   | <b>M1:</b> Correctly calculates both $M_r$ values:<br>$M_r$ of $\text{NaHCO}_3 = 84$ <b>AND</b> $M_r$ of $\text{Na}_2\text{CO}_3 = 106$                                                                                                                                                                                                                                                                                                                                        |
|           | <b>M2:</b> Correctly calculates both amounts using subtractions from (a)<br>$n = \text{mass in (a)} / M_r (\text{mol})$<br><b>AND</b> both answers given to 2–4 sf                                                                                                                                                                                                                                                                                                             |
| 1(b)(ii)  | Correctly calculates both values of energy change<br>energy change = $20 \times 4.18 \times \Delta T$ (J)<br><b>AND</b> both answers given to 2–4 sf                                                                                                                                                                                                                                                                                                                           |
| 1(b)(iii) | <b>M1:</b> Correct display of $\Delta H = (\text{b})(\text{ii}) / (\text{b})(\text{i})$ for experiment 1 or experiment 2.                                                                                                                                                                                                                                                                                                                                                      |
| 1(b)(iv)  | <b>M1:</b> Drawing of enthalpy cycle<br>$(2\text{NaHCO}_3(\text{s}) \rightarrow \text{Na}_2\text{CO}_3(\text{s}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g}))$<br>                                                                                                                                                                                                               |
|           | <b>M2:</b> Correctly calculates $\Delta H_r = 2\Delta H_1 - \Delta H_2$                                                                                                                                                                                                                                                                                                                                                                                                        |