

Multiple Choice Answers

Q7: D

Q8: B

Multiple Choice Answers

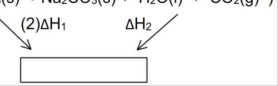
Q9: C

Q10: D

Multiple Choice Answers

Q10: C

2(a)	I 6 correct unambiguous headings shown, with units, in list / table • (mass of) container + FA 3 / solid / $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ • (mass of) container (empty OR with residual FA 3) • (mass of) FA 3 / solid / $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ OR mass used OR mass added • initial temperature / thermometer reading • lowest / minimum / final temperature / thermometer reading • temperature change / decrease Mass units: /g OR in g OR (g) OR g by every reading Temperature units: / °C OR in °C OR (°C) OR °C by every reading II All readings shown to appropriate precision • all four balance / thermometer readings shown • both thermometer readings to .0 OR .5 • both weighings consistently to either 2 d.p. OR to 3 d.p. III Subtractions correctly calculated • mass of solid correct AND temperature change correct IV ΔT is within 1.0 °C of expected temperature change for the mass used
2(b)(i)	Correctly calculates amount of FA 3 = mass FA 3 in 2(a) / 248.2 mol AND answer given to 2–4 s.f.
2(b)(ii)	Correctly calculates energy change = $30 \times 4.18 \times \Delta T$ J AND answer given to 2 – 4 sf
2(b)(iii)	Correctly uses $(b)(ii) / (b)(i) \times 1000$ AND plus sign shown AND answer given to 2 – 4 sf
2(c)	M1 repeating experiment with $\text{Na}_2\text{S}_2\text{O}_3$ OR adding $\text{Na}_2\text{S}_2\text{O}_3$ in water M2 any two from: • known volume of water • known mass of solid • measuring the temperature change. M3 indicating that use of Hess's law is needed M4 $\Delta H_f = \Delta H$ from their additional experiment – (b)(iii)

1(a)	I Unambiguous headings AND units for all six recorded readings and calculated values in experiment 1: • (mass of) container + FB 2 / solid / g • (mass of) container (+ residue) / g • (mass of) FB 2 / solid (used / added) / g • initial temperature OR temperature of FB 1 / °C • final temperature / °C • temperature change / °C II • All four weighings recorded to same decimal places (either 2 or 3). • All four temperatures recorded to .0 or .5 °C III Correct subtractions to give all four calculated values: • mass of FB 2 used and mass of FB 3 used • changes in temperature for experiments 1 and 2. Accuracy (Q) marks Calculate the candidate's <i>temperature to mass ratio</i> for experiment 1 to 2 d.p.: Ratio = ΔT (experiment 1) / mass of FB2. Calculate the supervisor's ratio for experiment 1 to 2 d.p. Calculate the difference, δ, between the candidate's value (rounded to 2 d.p.) and the supervisor's value (rounded to 2 d.p.) IV award if $\delta \leq 0.50$
1(b)(i)	M1: Correctly calculates both M_r values: M_r of $\text{NaHCO}_3 = 84$ AND M_r of $\text{Na}_2\text{CO}_3 = 106$ M2: Correctly calculates both amounts using subtractions from (a) $n = \text{mass in (a)} / M_r$ (mol) AND both answers given to 2–4 sf
1(b)(ii)	Correctly calculates both values of energy change energy change = $20 \times 4.18 \times \Delta T$ (J) AND both answers given to 2–4 sf
1(b)(iii)	M1: Correct display of $\Delta H = (b)(ii) / (b)(i)$ for experiment 1 or experiment 2.
1(b)(iv)	M1: Drawing of enthalpy cycle ($2\text{NaHCO}_3(\text{s}) \rightarrow \text{Na}_2\text{CO}_3(\text{s}) + \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$)  M2: Correctly calculates $\Delta H_f = 2\Delta H_1 - \Delta H_2$