IGCSE Chemistry: **w25 21**

Question 14 (Answer: **B**)

- An endothermic reaction takes energy in, so the mixture gets colder.
- An exothermic reaction gives energy out, so the mixture gets hotter.
- So the neutralisation cools down and the displacement warms up.

Question 15 (Answer: **A**)

- Activation energy is measured from the reactant level up to the peak.
- The enthalpy change is measured from the reactant level to the *product* level.
- So they start from the same place but end at different ones – do not confuse the two arrows.

IGCSE Chemistry: **w25 22**

Question 14 (Answer: **A**)

- Bonds broken: the four N–H bonds and the N–N bond of the hydrazine, plus the O=O of the oxygen.
- Bonds formed: the N≡N triple bond of nitrogen and four O–H bonds in the two waters.
- ΔH = energy in − energy out; the very strong N≡N is what makes this so exothermic.

Question 15 (Answer: **A**)

- Endothermic means the change takes energy *in* from its surroundings.
- The surroundings here are the water and the beaker.
- So they lose energy and the temperature of the mixture falls.

IGCSE Chemistry: **w25 63**

2(a)	**M1** all initial temperatures correct (21.0, 21.5, 21.5, 22.0, 22.0) **M2** all readings for temperature after one minute correct (29.0, 36.5, 33.5, 38.5, 46.0) **M3** temperature changes correct (8.0, 15.0, 12.0, 16.5, 24.0) **M4** all temperatures and temperature changes recorded to 1 decimal place
2(b)	**M1** *y*-axis scale is linear, and points extend above halfway up the scale **M2 and M3** all points plotted correctly **M4** best fit curve correctly drawn
2(c)	**M1** the larger the volume of acid, the lower the temperature (increase/change) **M2** same amount of heat energy given out (as same length of magnesium and acid is in excess)
2(d)	**M1** extrapolation shown on graph, this must be a smooth continuation of line **M2** correct reading from their working shown on graph **M3** °C
2(e)	sketched line is below plotted line for all volumes of acid and does not drop to or below zero
2(f)(i)	(burette is more) accurate (than a measuring cylinder)
2(f)(ii)	to mix them / to evenly distribute acid/heat energy
2(g)	**M1** change: insulate the boiling tube **M2** explanation: reduce/no heat loss

IGCSE Chemistry: **s25 21**

Question 13 (Answer: **C**)

- The mixture gets hot, so energy is released – the reaction is exothermic.
- On a reaction pathway diagram the products must therefore sit *below* the reactants.
- ΔH is negative.

IGCSE Chemistry: **s25 22**

Question 14 (Answer: **A**)

- Forming a bond *releases* energy, so the enthalpy change must be negative.
- Methane contains four C–H bonds.
- $4 \times 413 = 1652$, so $\Delta H = -1652$ kJ.

IGCSE Chemistry: **s25 23**

Question 13 (Answer: **D**)

- Exothermic means energy is given out to the surroundings.
- So the surroundings get warmer.
- Energy leaving the reacting system makes ΔH negative.

IGCSE Chemistry: **m25 22**

Question 17 (Answer: **B**)

- Bonds broken: $4\times$ C–H $+2\times$ O=O $= 1640 + 992 = 2632$ kJ.
- Bonds formed: $2\times$ C=O $+4\times$ O–H $= 1610 + 1840 = 3450$ kJ.
- $\Delta H = 2632 - 3450 = -818$ kJ/mol – negative, because more is released than absorbed.