

# 5. Chemical energetics

## 5.2 Hess's law

### **Paper 2**

Marking Scheme

## Q1.

(d)(ii)	Correct use of enthalpy values / correct direction / use of arrows (with or without an energy cycle) <b>M1</b> $((-58.2) + (-40.6))$ OR $(-98.8)$ <b>M2</b> $[(-58.2 + 4(-40.6) = 8\Delta H_f)]$ Correct calculation and correct stoichiometry $\Delta H_f = -27.6$ (kJ mol <sup>-1</sup> )	<b>2</b>
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## Q2.

(b)	<b>M1</b> <u>use of correct stoichiometry in calculation</u> $3x\Delta H_f \text{ NO}_2$ $1x-\Delta H_f \text{ H}_2\text{O}$ $2x\Delta H_f \text{ HNO}_3$ $1x\Delta H_f \text{ NO}$ <b>M2</b> correct signs associated with the appropriate $\Delta H_f$ values/terms used for the calculation of $\Delta H_{\text{reaction}}$ <b>M3</b> $\Delta H_{\text{reaction}} = -(102 - 286) + (-346 + 91.1) = -70.9$ kJ mol <sup>-1</sup>	<b>3</b>
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## Q3.

(c)(ii)	<b>M1:</b> $\Delta H_f = -1434 - (-635 + -297)$	<b>2</b>
	<b>M2:</b> $= -502$ (kJ mol <sup>-1</sup> )	