ANSWERS: Hess’s Law

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| **2019** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| (a)(b) |   | Recognises need to multiplyvalues.Attempts correct process. | Valid method with oneminor error.Correct answer with units. | Valid method and answerwith negative sign and unit.Answer to 3 s.f. |

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| **2018** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| (a)(b) | Δc*H*° = [(3 × –394) + (4 × –286)] – (–255) = –2071 kJ mol–1The enthalpy change would be less negative / less exothermic. Energy is absorbed/required to break the intermolecular attractions when changing liquid water into gaseous water / less bonds are formed when gaseous water is produced.As a result, less heat energy will be released in the reaction. | • Correct process with minor error, e.g. incorrect sign, incorrect unit.• ONE correct statement• Correct process. | • Correct enthalpy change,including unit.• Correctly identifies effect on enthalpy change with fullexplanation.• Correct numerical answer. | • Correct answer withcorrect unit, sign andsignificant figures. |

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| **2017** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| (a)(b) | 10C + 11H2 → C10H22 –301 kJ mol–1C + O2 → CO2 –393 × 10 kJ mol–1H2 + ½O2 → H2O –286 × 11 kJ mol–1Δ*H* = +301 + (10 × –393) + (11 × –286)= –6775 kJ mol–1 | • Correct method with errors in calculation. | • Correct answer. May have poor rounding / incorrect units / sign / minor error causing incorrect answer. | • Correct calculation with sign and unit. |
| **2016** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
|  | Δc*H*° = –394 + (2 × –286) – (–240) Δc*H*° = –966 + 240 Δc*H*° = –726 kJ mol–1 | * Uses a recognised process but errors made in the calculation.
 | * Correct answer. May have poor rounding / incorrect units / sign / minor error causing incorrect answer.
 | * Calculation correct with correct units, sign, and an appropriate number of sig. figs.
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| **2015** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
|  | Δc*H°* = ΣΔf*H°* (products) *–* ΣΔf*H*° (reactants) = [(5 × –394) + (6 × –286)] – [–295] = –3686 + 295 = −3391 kJ mol–1 | * Correct process
 | * Correct answer with units
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| **2014** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
|  | Δr*H°* = ΣΔf*H°* products *–* ΣΔf*H*° reactants = (–314) – (–46 + –92) = –176 kJ mol–1 | * Correct process.
 | * Correct with units.
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| **2013** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
|  | Δc*H*° = ∑Δf*H*(products) – ∑Δf*H*(reactants)=[(10 × –393) + (11 × –286)] – (–250)= –6 826 kJ mol–1  or (–6 830 kJ mol–1)  | * Correct process (evidence of 10 × –393, 11 × –286 and 1 × –250)
 | * Correct calculation, with correct units and sign.
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