ANSWERS: Hess’s Law

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| **2019** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| (a)  (b) |  | Recognises need to multiply  values.  Attempts correct process. | Valid method with one  minor error.  Correct answer with units. | Valid method and answer  with 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–1  The 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 full  explanation.  • Correct numerical answer. | • Correct answer with  correct unit, sign and  significant figures. |

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| **2017** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| (a)  (b) | 10C + 11H2 → C10H22 –301 kJ mol–1  C + O2 → CO2 –393 × 10 kJ mol–1  H2 + ½O2 → H2O –286 × 11 kJ mol–1  Δ*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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