**ANSWERS: Enthalpy change calculations**

**2022**

**(a)**



**(b)**



**2021**

**(a)**



**(b)**



**2020**

**(a)**



**(b)**



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| **2019** | **Evidence** | **Achievement** | **Merit**  | **Excellence** |
| **(a) (i)****(ii)****(b)** |  | • ONE step of calculation correct.• ONE step of calculation correct. | • Correct answer.• Correct answer.• ONE step of process correct. | BOTH correct answers with units.• Process correct with minor error. |

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| **2018** | **Evidence** | **Achievement** | **Merit**  | **Excellence** |
|  |  | • One step of calculation correct. | • Two steps of calculation are correct. | • Correct answer with unit. |

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| **2017** | **Evidence** | **Achievement** | **Merit**  | **Excellence** |
|  | **Reaction 1:** If 1 mole of Fe2O3 releases 852 kJ energy 0.313 mol × 852 kJ mol–1 = 266 kJ energy released**Reaction 2:** If 3 mole of CuO releases 1520 kJ energy. Then 1 mole of CuO releases 507 kJ energy 0.628 mol × 507 kJ mol–1 = 318 kJ energy releasedSo 50.0 g CuO releases more energy than 50.0 g Fe2O3OR CuO releases more energy (52 kJ) than Fe2O3 OR**Reaction 2** releases more energy. | Amount (moles) of both Fe2O3 and CuO correct. | Correctly calculates energyreleased for either Reaction 1 or Reaction 2. | Both Fe2O3 and CuO calculations with units (kJ) are correct with appropriate significant figures,and a statement identifying CuO /Reaction 2 as releasing moreenergy. |
| **2016** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | *n* (pentane) = 125 g / 72.0 g mol–1 = 1.74 mol*n* (hexane) = 125 g / 86.0 g mol–1 = 1.45 molIf 1 mole of pentane releases 3509 kJ energy, then 1.74 mol of pentane1.74 × 3509 = 6106 kJ energy released.If 2 moles of hexane release 8316 kJ energy,then 1 mole of hexane releases 4158 kJ energy. So 1.45 mol of hexane1.45 × 4158 = 6029 kJ energy releases.So pentane releases more energy (77.0 kJ) than hexane, per 125 g of fuel. | Amount (moles) of pentane or hexane correct. | Pentane or hexane calculation correct. | Both pentane and hexane calculations with units are correct, and identifies pentane as releasing more energy (link back to question) per 125 g of fuel. |

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| **2015** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  |  Since 6 moles of CO2 reacting requires 2803 kJ of energythen 1 mole of CO2 reacting requires  = 467.2 kJ of energyand 0.450 moles of CO2 requires 467.2 × 0.450 = 210 kJ of energy absorbed. | * One step of calculation is correct.

OR  Correct answer with no working. | Two steps of the calculation are correct. | Calculation is correct with correct sign and units. |

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| **2014** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | n(CH3OH) = m / M = 345 / 32 = 10.78 moln(C2H5OH) = m / M = 345 / 46 = 7.50 mol2 mol CH3OH release 1 450 kJ of energy1 mol CH3OH releases 725 kJ of energy10.78 mol CH3OH releases 725 kJ × 10.78 = 7 816 kJ of energy1 mol C2H5OH releases 1 370 kJ of energy7.5 mol C2H5OH releases 1 370 kJ × 7.5 = 10 275 kJ of energyTherefore C2H5OH releases more energy when 345 g of fuel are combusted. | * Amount of CH3OH or C2H5OH correct.

Energy released for one mol CH3OH or C2H5OH correct. | * TWO steps of calculation correct for both CH3OH and C2H5OH, with conclusion.
 | * Justifies choice of fuel with correct calculations and unit.
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| **2013** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| **1.** **2.** **3.** | 9800 kJ / 2820 kJ mol–1 = 3.48 moln(C4H10) = 100 g / 58.1 g mol–1 = 1.7212 mol–4960 kJ / 1.7212 mol = –2882 kJ mol–1n(Fe) = 2000 g / 55.9 g mol–1 = 35.78 molFe3O4:3348 kJ / 9 = 372 kJ mol–1372 kJ mol–1 × 35.78 mol = 13 310.16 kJ= (–)1.33 × 104 kJ Fe2O3:851 kJ / 2 = 425.5 kJ mol–1425.5 kJ mol–1 × 35.78 mol = 15 224.4 kJ= (–)1.52 × 104 kJTherefore Fe2O3 produces more heat energy when 2 kg iron is formed. | calculation is correctone step correct in the calculation.one step correct. | calculation is correct.two steps correct | calculations correct with units and statement made about which iron oxide produces more heat energy. |

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