InkChemistry

QUESTION WORKBOOK

Enthalpy change, standard conditions and the definitions

Energetics · Unit C04

AQA 3.1.4.1 · OCR A 3.2.1

17 questions · 57 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 ECSC-Q8 Explain why the standard enthalpy of formation of oxygen, $O_2(g)$, is zero. [2]

A2 ECSC-Q9 Explain why the enthalpy change for burning a mole of methane would be less exothermic than $\Delta cH^\circ(CH_4)$ if the water formed remained as steam. [2]

A3 ECSC-Q20 Suggest why the equation for the standard enthalpy of combustion of butane is written with $6\frac{1}{2}O_2(g)$ rather than doubled to $13O_2(g)$. [2]

SECTION B · Standard, 3 to 5 marks

B1 ECSC-Q2 Give the definition of the standard enthalpy of formation of a compound, and write the equation that represents the standard enthalpy of formation of propan-1-ol, $C_3H_7OH(l)$, with every state symbol. [5]

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B2 ECSC-Q1 State the conditions of pressure and temperature to which a standard enthalpy change refers, and state the standard state of carbon, of bromine and of water. [4]

B3 ECSC-Q10 Describe the enthalpy profile diagram for an exothermic reaction, saying how the activation energy and ΔH are shown. [4]

B4 ECSC-Q14 Suggest why the standard enthalpy of formation of glucose, $C_6H_{12}O_6(s)$, cannot be measured directly, and outline how its value can be found from enthalpies of combustion. [4]

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B5 ECSC-Q15 Identify which one of these equations represents a standard enthalpy of formation, and give the reason each of the other three does not. A: $2C(s) + 2H_2(g) \rightarrow C_2H_4(g)$. B: $C(s, \text{diamond}) + O_2(g) \rightarrow CO_2(g)$. C: $4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s)$. D: $H_2(g) + Br_2(g) \rightarrow 2HBr(g)$. [4]

B6 ECSC-Q3 Give the definition of the standard enthalpy of combustion of a substance. [3]

B7 ECSC-Q6 Explain, in terms of the enthalpy of the reactants and the products, why the temperature of the surroundings rises during an exothermic reaction and why ΔH is negative. [3]

B8 ECSC-Q7 Explain why the equation $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$, $\Delta H = -572\ kJ\ mol^{-1}$, does not show the standard enthalpy of formation of water, and give the value that it does have. [3]

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B9 ECSC-Q13 Suggest the sign of ΔH when ammonium nitrate dissolves in the water of a sports cold pack, and explain why the pack feels cold. [3]

B10 ECSC-Q16 Compare the enthalpy profile diagrams of an exothermic reaction and an endothermic reaction. [3]

B11 ECSC-Q18 Calculate the enthalpy change when 85.0 g of ammonia is formed from its elements. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$, $\Delta_rH^\circ = -92$ kJ mol^{-1}; Mr of NH_3 = 17.0. [3]

B12 ECSC-Q19 Explain why the standard enthalpy of combustion of methanol, −726 kJ mol^{-1}, is less exothermic than that of methane, −890 kJ mol^{-1}, although each molecule contains one carbon atom. [3]

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B13 ECSC-Q21 Give the definition of the standard enthalpy of neutralisation, and explain why its value for sulfuric acid with sodium hydroxide is about the same as for hydrochloric acid with sodium hydroxide. [3]

SECTION C · Long, 6 marks or more

C1 ECSC-Q17 Evaluate the claim that a reaction with a large negative ΔH must happen quickly when its reactants are mixed at room temperature. Refer in your answer to an enthalpy profile diagram and to one example. [6]

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