Thermochemical Equations and Stoichiometry Worksheet

Purpose: To reinforce your understanding of the stoichiometry of thermochemical equations.

Answer the questions below in the spaces provided.

1. Consider the following thermochemical equation:

$$2ZnS_{(s)} + 3O_{2(g)} \rightarrow 2ZnO_{(s)} + 2SO_{2(g)} \qquad \Delta H° = -878.2 \text{ kJ}$$

(a) How much heat is released when 3.0 mol $ZnS_{(s)}$ reacts with excess oxygen?

[A: 1.3×10^3 kJ]

(b) How much heat is released when 2.3×10^{-2} mol $ZnS_{(s)}$ reacts with excess oxygen?

[A: 10 kJ]

(c) What is the enthalpy change when 223.9 g $ZnS_{(s)}$ reacts with excess oxygen?

[A: $\Delta H = -1009$ kJ]

(d) What is the enthalpy change when 0.96 g $ZnO_{(s)}$ is produced?

[A: $\Delta H = -5.2$ kJ]

2. Slaked lime ($Ca(OH)_{2(s)}$) is produced when lime (calcium oxide, $CaO_{(s)}$) reacts with liquid water. 65.2 kJ of heat is released for each mol of $Ca(OH)_2$ that is produced.

   (a) Write a thermochemical equation for the reaction.

   [A: $CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_2 \quad \Delta H = -65.2$ kJ]

   (b) What is the enthalpy change when 523.3 kg of lime reacts with excess water?

   [A: $\Delta H = -6.08 \times 10^5$ kJ]

3. The following reaction represents the complete combustion of hexane, $C_6H_{14(l)}$, at SATP.

   $$C_6H_{14(l)} + \frac{19}{2}O_{2(g)} \rightarrow 6CO_{2(g)} + 7H_2O_{(l)} \quad \Delta H^\circ = -4163 \text{ kJ}$$

   (a) If 0.537 mol of carbon dioxide is produced in the reaction represented by the equation above, how much heat is released by the reaction?

   [A: 373 kJ]

   (b) If 25.0 kg of hexane is burned in sufficient oxygen, how much heat will be released?

   [A: 1.21×10^6 kJ]

   (c) What mass of hexane is required to produce 1.0×10^5 kJ of heat by complete combustion?

   [A: 2.1 kg]