Exercise 4.31 – Manipulation of equations

Q431-01 The enthalpy of formation of water is -286 kJ. What is the enthalpy change for the combustion of hydrogen under standard conditions?

Q431-02 The enthalpy of formation of carbon dioxide is -394 kJ. What is the enthalpy change of the following reaction?

$$2CO_2(g) \longrightarrow 2C(s) + 2O_{2(g)}$$

Q431-03 Using the following information:

$$C(s) + O_2(g) \longrightarrow CO_2(g) \quad \Delta H = --394 \text{ kJ.}$$

Find the energy change when 1.8 g of carbon dioxide are formed

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Q431-04 Consider the reaction:

$$4Al(s) + 3O_2(g) \longrightarrow Al_2O_3(s) \qquad H = -3339 \text{ kJ.}$$

Calculate the amount of heat evolved when 10.0 g of aluminum burns in oxygen.

Q431-05 Consider the reaction:

$$K(s) + ½Cl_2(g) \longrightarrow KCl(s); \qquad H = -439 \text{ kJ.}$$

How much energy is released when 10 g of KCl(s) is formed.

Q431-06 When concentrated sulphuric acid is added to water, heat is liberated. The heat of dilution is about -75.3 kJ/mole. How much heat would be released if 3.4 g of H_2SO_4 were added to excess water?

Q431-07 Given the reaction:

$$C_8H_{18}(l) + 12½O_2(g) \longrightarrow 8CO_2(g) + 9H_2O(l) \qquad \Delta H = -5473 \text{ kJ.}$$

Determine the number of grams of octane required to produce 100 kJ of energy.

Q431-08 When concentrated sulphuric acid is added to water, heat is liberated. The enthalpy of dilution is -75.3 kJ/mol. Predict the mass of sulphuric acid needed to release 100 kJ of energy when added to excess water.

Q431-09 Given the following enthalpy changes:

$$S(s) + O_2(g) \longrightarrow SO_2(g); \ \Delta H = x \text{ kJ.}$$
$$S(s) + 1½O_2(g) \longrightarrow SO_3(g); \ \Delta H = y \text{ kJ.}$$

In terms of x and y, what is the enthalpy change for the reaction below?

$$2SO_3(g) \longrightarrow 2SO_2(g) + O_2(g)$$

Q431-10 Given the following enthalpy changes:

$$CaO(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + H_2O(l) \qquad \Delta H = x \text{ kJ.}$$
$$CaCO_3(s) + 2HCl(aq) \longrightarrow CaCl_2(aq) + H_2O(l) + CO_2(g) \quad \Delta H = y \text{ kJ.}$$

In terms of x and y, what is the enthalpy change for the reaction below?

$$CaO(s) + CO_2(g) \longrightarrow CaCO_3(s)$$