SCH4U

Energy Changes

Hess' Law Worksheet

1 Calculate ΔH° for the reaction:

$$3FeO(s) + \frac{1}{2}O_2(g) \rightarrow Fe_3O_4(s)$$

given the following data.

$$Fe(s) + \frac{1}{2}O_2(g) \rightarrow FeO(s) \qquad \Delta H^\circ = -272 \text{ kJ mol}^{-1}$$

$$3Fe(s) + 2O_2(g) \rightarrow Fe_3O_4(s) \qquad \Delta H^\circ = -1118 \text{ kJ mol}^{-1}$$

2 Calculate ΔH° for the reaction:

$$S(s) + O_2(g) \rightarrow SO_2(g)$$

given the following data.

$$S(s) + \frac{3}{2}O_2(g) \rightarrow SO_3(g) \qquad \Delta H^\circ = -395.2 \text{ kJ mol}^{-1}$$

$$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g) \qquad \Delta H^\circ = -198.2 \text{ kJ mol}^{-1}$$

3 Calculate ΔH° for the reaction:

$$2NO_2(g) \rightarrow N_2O_4(g)$$

given the following data.

$$N_2(g) + 2O_2(g) \rightarrow 2NO_2(g) \qquad \Delta H^\circ = +67.7 \text{ kJ mol}^{-1}$$

$$N_2(g) + 2O_2(g) \rightarrow N_2O_4(g) \qquad \Delta H^\circ = +9.7 \text{ kJ mol}^{-1}$$

4 Calculate ΔH° for the reaction:

$$2N_2(g) + 5O_2(g) \rightarrow 2N_2O_5(g)$$

given the following data.

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l) \qquad \Delta H^\circ = -285.8 \text{ kJ mol}^{-1}$$

$$N_2O_5(g) + H_2O(l) \rightarrow 2HNO_3(l) \qquad \Delta H^\circ = -76.6 \text{ kJ mol}^{-1}$$

$$\frac{1}{2}N_2(g) + \frac{3}{2}O_2(g) + \frac{1}{2}H_2(g) \rightarrow HNO_3(l) \qquad \Delta H^\circ = -174.1 \text{ kJ mol}^{-1}$$

5 Calculate ΔH° for the reaction:

$$2C(s) + H_2(g) \rightarrow C_2H_2(g)$$

given the following data.

$$C_2H_2(g) + \frac{5}{2}O_2(g) \rightarrow 2CO_2(g) + H_2O(l) \qquad \Delta H^\circ = -1300 \text{ kJ mol}^{-1}$$

$$C(s) + O_2(g) \rightarrow CO_2(g) \qquad \Delta H^\circ = -394 \text{ kJ mol}^{-1}$$

$$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l) \qquad \Delta H^\circ = -286 \text{ kJ mol}^{-1}$$