Practice – Heats of Formation

1. Calculate ΔH^o_f (kJ) for the following reaction from the listed standard enthalpies of formation:

$$CO(g) + NH_3(g) \rightarrow HCN(g) + H_2O(g)$$

ΔH^o_f $CO(g) = -110.5$ kJ
ΔH^o_f $NH_3(g) = -46.1$ kJ
ΔH^o_f $HCN(g) = +135.1$ kJ
ΔH^o_f $H_2O(g) = -241.8$ kJ

2. Use the given standard enthalpies of formation to determine the heat of reaction of the following reaction:

$$2\ Cl_2(g) + 2\ H_2O(l) \rightarrow 4\ HCl(g) + O_2(g)$$

ΔH^o_f $H_2O(l) = -285.8$ kJ/mole
ΔH^o_f $HCl(g) = -92.3$ kJ/mole

3. Use the given standard enthalpies of formation to determine the heat of reaction of the following reaction:

$$2\ Ag_2S(s) + 2\ H_2O(l) \rightarrow 4\ Ag(s) + 2\ H_2S(g) + O_2(g)$$

ΔH^o_f $Ag_2S(s) = -32.6$ kJ/mole
ΔH^o_f $H_2S(g) = -20.6$ kJ/mole
ΔH^o_f $H_2O(l) = -285.8$ kJ/mole

4. The heats of formation of $CO_2(g)$ and $H_2O(l)$ are -394 kJ/mole and -285.8 kJ/mole respectively. Using the data for the following combustion reaction, calculate the heat of formation of $C_6H_5CO_2H(s)$.

$$2\ C_6H_5CO_2(s) + 15\ O_2(g) \rightarrow 14\ CO_2(g) + 6\ H_2O(l)$$
$$\Delta H^o_{rxn} = -6454 \text{ kJ}$$

5. The heats of formation of $CO_2(g)$ and $H_2O(l)$ are -394 kJ/mole and -285.8 kJ/mole respectively. Using the data for the following combustion reaction, calculate the heat of formation of $C_4H_{10}(g)$.

$$2\ C_4H_{10}(g) + 13\ O_2(g) \rightarrow 8\ CO_2(g) + 10\ H_2O(l)$$
$$\Delta H^o_{rxn} = -5756.1 \text{ kJ}$$

6. The heats of formation of $CO_2(g)$ and $H_2O(l)$ are -394 kJ/mole and -285.8 kJ/mole respectively. Using the data for the following combustion reaction, calculate the heat of formation of $C_3H_4(g)$.

$$C_3H_4(g) + 4\ O_2(g) \rightarrow 3\ CO_2(g) + 2\ H_2O(l)$$
$$\Delta H^o_{rxn} = -1939.1 \text{ kJ}$$