CHM 110 – Heat – Practice Problems

Solve the problems.

1) Find the mass of propane (C_3H_8, FW = 44.09 g/mol) required to heat 1.00 gal (3.78 L) of water from 25.0 °C to 100.0 °C. Then, find the mass of propane required to vaporize the water at 100.0 °C. Assume the density of water at 25.0 °C is 1.00 g/ml.

$$\mathbf{C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(}\boldsymbol{l}\mathbf{);} \quad \Delta H = \mathbf{-2220\ kJ}$$

$$\mathbf{H_2O(}\boldsymbol{l}\mathbf{) \rightarrow H_2O(g);} \quad \Delta H = \mathbf{44.0\ kJ}$$

2) Sodium bicarbonate thermally decomposes to form sodium carbonate, water, and carbon dioxide.

$$\mathbf{2NaHCO_3(s) \rightarrow\ Na_2CO_3(s) + H_2O(g) + CO_2(g)}$$

Calculate the enthalpy change of the decomposition of 42.5 g of solid $NaHCO_3$.

3) Calculate the enthalpy change for the combustion of 175 L of H_2S gas at 25 ^oC and 1.00 atm pressure. The thermochemical equation for the process is given below.

$$\mathbf{2H_2S(g) + 3O_2(g) \rightarrow 2SO_2(g) + 2H_2O(g)\ ;\quad \Delta H = -1036\,kJ}$$