Calculate the enthalpy change for the reaction:

$$2\ H_2S + 3\ O_2 \rightarrow 2\ SO_2 + 2\ H_2O$$

$$\Delta H_{rxn} = \sum \Delta H_f^\circ\,(\text{products}) - \sum \Delta H_f^\circ\,(\text{reactants})$$

$$= \left[\left(\frac{2\text{ mol } SO_2}{\text{mol rxn}}\right)\left(\frac{-296.830\text{ kJ}}{\text{mol } SO_2}\right) + \left(\frac{2\text{ mol } H_2O}{\text{mol rxn}}\right)\left(\frac{-241.818\text{ kJ}}{\text{mol } H_2O}\right)\right]$$

$$- \left[\left(\frac{2\text{ mol } H_2S}{\text{mol rxn}}\right)\left(\frac{-20.50\text{ kJ}}{\text{mol } H_2S}\right) + \left(\frac{3\text{ mol } O_2}{\text{mol rxn}}\right)\left(\frac{0.00\text{ kJ}}{\text{mol } O_2}\right)\right]$$

$$= -1036.30\text{ kJ (mol rxn)}^{-1}$$

0.0432g of Magnesium is placed into 50.0 mL of 6.00 M Hydrochloric acid (s = 4.17 J g^{-1} $°C^{-1}$, d = 1.01 g mL^{-1}). The temperature increased from 22.4°C to 38.5°C. What is the enthalpy change for the reaction:

$$Mg + 2\ HCl \rightarrow MgCl_2 + H_2\ ?$$

$$q_{cal} = ms\Delta T = \left(0.0432\text{ g} + (50.0\text{ mL})\left(\frac{1.01\text{ g}}{\text{mL}}\right)\right)(4.17\text{ J g}^{-1}\ ^\circ\text{C}^{-1})(38.5^\circ\text{C} - 22.4^\circ\text{C})$$

$$= 3.3933\times10^3\text{ J}$$

$$q_{rxn} = -q_{cal} = -3.3933\times10^3\text{ J}$$

$$\Delta H = \frac{q_{rxn}}{n} = \frac{-3.3933\times10^3\text{ J}}{0.0432\text{ g Mg}} \times \frac{24.3050\text{ g Mg}}{1\text{ mol Mg}} \times \frac{1\text{ mol Mg}}{1\text{ mol rxn}} = -1.909\times10^6\text{ J (mol rxn)}^{-1}$$