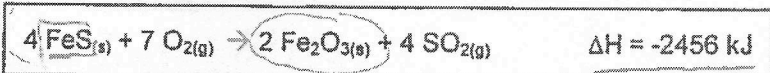


$$\Delta H = n \Delta_r H$$

Chapter 9 Worksheet #3: Enthalpy Changes

1. Iron (II) sulfide ore is roasted according to the following chemical equation



a) What is the molar enthalpy of reaction for iron (II) sulfide?

$$\Delta_r H = \frac{\Delta H}{n} = \frac{-2456 \text{ kJ}}{4 \text{ mol FeS}} = \boxed{-614 \frac{\text{kJ}}{\text{mol}}}$$

b) What is the molar enthalpy of reaction for iron (III) oxide?

$$\Delta_r H = \frac{\Delta H}{n} = \frac{-2456 \text{ kJ}}{2 \text{ mol Fe}_2\text{O}_3} = \boxed{-1228 \frac{\text{kJ}}{\text{mol}}}$$

c) What is the enthalpy change when 100 grams of iron (II) sulfide reacts?

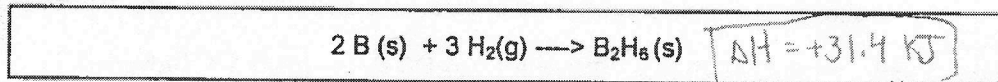
$$\Delta H = n \Delta_r H = \frac{100 \text{ g}}{87.92 \frac{\text{g}}{\text{mol}}} \times -614 \frac{\text{kJ}}{\text{mol}} = \boxed{-698 \text{ kJ}}$$

d) What is the quantity of energy released from the production of 0.100 mol of sulfur dioxide?

$$\Delta H = n \Delta_r H = 0.100 \text{ mol} \times -614 \frac{\text{kJ}}{\text{mol}} = \boxed{-61.4 \text{ kJ}}$$

$$\textcircled{1} \Delta_r H = \frac{\Delta H}{n} = \frac{-2456 \text{ kJ}}{4 \text{ mol SO}_2} = -614 \frac{\text{kJ}}{\text{mol}}$$

2. Boron reacts with hydrogen to form diboron hexahydride gas according to the following equation



The molar enthalpy of reaction for boron is +15.7 kJ/mol

a) Calculate the enthalpy change for the balanced reaction.

$$\Delta H = +15.7 \frac{\text{kJ}}{\text{mol}} \times 2 \text{ mol B} = +31.4 \text{ kJ}$$

b) What is the enthalpy change for the production of 10.0 grams of diboron hexahydride?

$$\Delta H = n \Delta_r H$$

$$= \frac{10.0 \text{ g}}{27.68 \frac{\text{g}}{\text{mol}}} \times +31.4 \frac{\text{kJ}}{\text{mol}} = \boxed{+11.3 \text{ kJ}}$$

$$\textcircled{1} \Delta_r H = \frac{\Delta H}{n} = \frac{+31.4 \text{ kJ}}{1 \text{ mol B}_2\text{H}_6} = +31.4 \frac{\text{kJ}}{\text{mol}}$$

c) How much hydrogen will be used up when 100 kJ of energy is absorbed?

$$n = \frac{\Delta H}{\Delta_r H} = \frac{+100 \text{ kJ}}{+10.47 \frac{\text{kJ}}{\text{mol}}}$$

$$= \boxed{9.55 \text{ mol}} \times 2.02 \frac{\text{g}}{\text{mol}}$$

$$\Delta_r H_{\text{H}_2} = \frac{\Delta H}{n} = \frac{+31.4 \text{ kJ}}{3 \text{ mol H}_2} = +10.47 \frac{\text{kJ}}{\text{mol}}$$

$$m = nM$$