Name: _____ **15 Pts.**

Honors Chemistry Worksheet: Heats of Reaction

1. For the reaction of $S_{(s)} + O_{2(g)} \rightarrow SO_{2(g)} \quad \Delta H = -296$ kJ
   How much heat is evolved when 355 grams of sulfur is burned in excess oxygen?

2. In the fermentation of glucose, $C_6H_{12}O_6$, ethanol (C_2H_5OH) and carbon dioxide gas formed. If each mole of glucose yields 67 kJ, how much energy would have been released when 350. ml of pure ethanol is formed. Density of ethanol is 0.79 g/ml.

3. Given: $C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(l)} \quad \Delta H = -2221$ kJ. The combustion of a sample of propane, C_3H_8, released 35 MJ of heat. What volume of C_3H_8 and O_2 gas were required at STP?

4. *Using the information above in question #3*. 20.0 grams of propane reacted with 70.0 grams of oxygen. If all of this heat was transferred to 5.0L of water at 12.0ºC what would the final temperature of the water be?
   Recall Calorimetry? $Q = C_p \cdot m \cdot \Delta T$, $C_{pH2O} = 4.18 J/g.^oC$

5. Consider the explosive reaction of diborane in the air:

$B_2H_{6(g)} + 3O_{2(g)} \rightarrow B_2O_{3(s)} + 3\,H_2O_{(g)} \quad \Delta H = -2035$ kJ

a.) Calculate the heat released when 1.0 gram of diborane is burned?

b.) What amount of heat is generated when 500. liters of O_2 is reacted at STP?

c.) How much heat is released when a mixture of 30.0 g of B_2H_6 and 30.0 g of O_2 is reacted?

6. Compare the two fuels H_2 and CH_4:

Ignition of H_2 gas: $2H_2 + O_2 \rightarrow 2\,H_2O \quad \Delta H = -572$ kJ

Combustion of CH_4 (methane): $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O \quad \Delta H = -891$ kJ

a.) Which source of energy gives more energy per gram? (*Show calculations for both amounts in kJ/g*)

b.) Find the amount of energy that is released when 25.0 liters of methane reacts with 60.0 liters of oxygen at STP.

7. Given: $Fe_2O_{3(s)} + 3\,CO_{(g)} \rightarrow 2\,Fe_{(s)} + 3\,CO_{2(g)} \quad \Delta H = -23$ kJ

What amount of heat energy is released when 3.31 grams of iron(III) oxide reacts with 1.18 grams of carbon monoxide?