Name _____ Period _____
LTHS: Chemistry

Thermochemical Equations Worksheet

Answer the following questions. Show all your work using dimensional analysis. Be sure to use significant figures and watch your units.

1. How much heat will be released when 6.44 g of sulfur reacts with excess O_2 according to the following equation?

$$2S + 3O_2 \rightarrow 2SO_3 \quad \Delta H = -791.4 \text{ kJ}$$

$6.44\text{g S} \times \frac{1\text{mol}}{32.07\text{g}} \times \frac{-791.4\text{kJ}}{2\text{ mol}} = -79.5\text{ kJ}$

79.5 kJ released

2. How much heat will be released when 4.72 g of carbon reacts with excess O_2 according to the following equation?

$$C + O_2 \rightarrow CO_2 \quad \Delta H = -393.5 \text{ kJ}$$

$4.72\text{g C} \times \frac{1\text{mol C}}{12.01\text{g C}} \times \frac{-393.5\text{kJ}}{1\text{mol C}} = -155\text{kJ}$

155 kJ released

3. How much heat will be absorbed when 38.2 g of bromine reacts with excess H_2 according to the following equation?

$$H_2 + Br_2 \rightarrow 2HBr \quad \Delta H = 72.80 \text{ kJ}$$

$38.2\text{g Br}_2 \times \frac{1\text{mol Br}_2}{159.8\text{g Br}_2} \times \frac{72.80\text{kJ}}{1\text{mol Br}_2} = 17.4\text{ kJ}$

17.4 kJ absorbed

4. How much heat will be released when 1.48 g of chlorine reacts with excess phosphorus according to the following equation?

$$2P + 5Cl_2 \rightarrow 2PCl_5 \quad \Delta H = -886 \text{ kJ}$$

$1.48\text{g Cl}_2 \times \frac{1\text{mol Cl}_2}{70.90\text{g Cl}_2} \times \frac{-886\text{kJ}}{5\text{mol Cl}_2} = -3.70\text{ kJ}$

3.70 kJ released

5. How much heat will be released when 4.77 g of ethanol (C_2H_5OH) reacts with excess O_2 according to the following equation?

$$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O \quad \Delta H = -1366.7 \text{ kJ}$$

$4.77\text{g } C_2H_5OH \times \frac{1\text{mol } C_2H_5OH}{46.08\text{g } C_2H_5OH} \times \frac{-1366.7\text{kJ}}{1\text{mol } C_2H_5OH} = -141\text{kJ}$

141 kJ released

6. How much heat will be absorbed when 13.7 g of nitrogen reacts with excess O_2 according to the following equation?

$$N_2 + O_2 \rightarrow 2NO \quad \Delta H = 180 \text{ kJ}$$

$$13.7\text{g } N_2 \times \frac{1\text{mol } N_2}{28.02\text{g}} \times \frac{180\text{kJ}}{1\text{mol } N_2} = 88.0\text{kJ}$$

7. How much heat will be released when 11.8 g of iron reacts with excess O_2 according to the following equation?

$$3Fe + 2O_2 \rightarrow Fe_3O_4 \quad \Delta H = -1120.48 \text{ kJ}$$

$$11.8\text{g Fe} \times \frac{1\text{mol Fe}}{55.85\text{g Fe}} \times \frac{-1120.48\text{kJ}}{3\text{mol Fe}} = -78.9\text{ kJ}$$

78.9 kJ released

8. How much heat will be released when 18.6 g of hydrogen reacts with excess O_2 according to the following equation?

$$2H_2 + O_2 \rightarrow 2H_2O \quad \Delta H = -571.6 \text{ kJ}$$

$$18.6\text{g } H_2 \times \frac{1\text{mol } H_2}{2.02\text{g } H_2} \times \frac{-571.6\text{kJ}}{2\text{mol } H_2} = -2630\text{kJ}$$

9. How much heat will be transferred when 14.9 g of ammonia (NH_3) reacts with excess O_2 according to the following equation? Is this reaction endothermic or exothermic?

exothermic

$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O \quad \Delta H = -1170 \text{ kJ}$$

$$14.9\text{g } NH_3 \times \frac{1\text{mol } NH_3}{17.04\text{g } NH_3} \times \frac{-1170\text{kJ}}{4\text{mol } NH_3} = -256\text{ kJ}$$

256 kJ released

10. How much heat will be transferred when 5.81 g of graphite reacts with excess H_2 according to the following equation? Is this reaction endothermic or exothermic?

endothermic

$$6C(\text{graphite}) + 3H_2 \rightarrow C_6H_6 \quad \Delta H = 49.03 \text{ kJ}$$

$$5.81\text{g C} \times \frac{1\text{mol}}{12.01\text{g}} \times \frac{49.03\text{kJ}}{6\text{mol C}} = 3.95\text{kJ}$$