Name _____

Heat in Reactions Review

1. Given the following data:

$4CuO \rightarrow 2Cu_2O + O_2$ $\quad \Delta H^\circ = 288$ kJ

$Cu_2O \rightarrow Cu + CuO$ $\quad \Delta H^\circ = 11$ kJ

Net: $2Cu + O_2 \rightarrow 2CuO$

How much Copper would be required to mix with excess oxygen to raise the temperature of 250 grams of Ice from -5°C to 67°C?

2. How much energy is released when 89 grams of water vapor (steam) is cooled from 503 K to 354 K?

3. How much propane would have to be burnt to raise the temperature of a beaker of 40 grams of water from 19°C to 45°C given that the standard enthalpy of the reaction is 1804 kJ/mol of propane.

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4. In the following reaction, how many kilojoules (kJ) of heat will be transferred if 35 grams of dinitrogen pentoxide is reacted with 15 grams of water? Is the heat absorbed or released?

$$N_2O_5(g) + H_2O(l) \text{ ---> } 2HNO_3(l) \quad \Delta H° = -76.6 \text{ kJ}$$

5. Using the data below, calculate how many grams of NO will be required in the net reaction to heat a beaker of 50 grams of ice suspended above the reaction from -8°C to 25°C assuming all heat released by the reaction is absorbed by the water molecules.

$2O_3 \rightarrow 3O_2$	-427
$O_2 \rightarrow 2O$	+495
$NO + O_3 \rightarrow NO_2 + O_2$	-199

Net: $NO + O \rightarrow NO_2$

Heat in Reactions Review Problems

1. If 2000 kJ of heat is transferred in the reaction below, how many grams of iron were reacted? How many grams of rust (Iron (III) oxide) were produced?

$$4Fe + 3O_2 \rightarrow 2Fe_2O_3 \qquad \Delta H = -1652 \text{ kJ}$$

2. The above reaction is being used to heat a beaker of 100 g of water suspended above the reaction vessel. Assuming all heat is transferred to the water molecules, how many grams of iron will be required to react with excess oxygen to heat the water from ice at -12°C to water at a temperature of 75°C?

3. Given the following data:

$$P_4 + 6Cl_2 \rightarrow 4PCl_3 \qquad \Delta H = -1225.6 \text{ kJ}$$
$$P_4 + 5O_2 \rightarrow P_4O_{10} \qquad \Delta H = -2967.3 \text{ kJ}$$
$$PCl_3 + Cl_2 \rightarrow PCl_5 \qquad \Delta H = -84.2 \text{ kJ}$$
$$PCl_3 + 1/2O_2 \rightarrow Cl_3PO \qquad \Delta H = -285.7 \text{ kJ}$$

Calculate ΔH for the reaction:

$$P_4O_{10} + PCl_5 \rightarrow 10Cl_3PO$$

4. Given the following data:

$Fe_2O_3(s) + 3CO(g) \rightarrow 2Fe(s) + 3CO_2(g)$ -23 kJ

$3Fe_2O_3(s) + CO(g) \rightarrow 2Fe_3O_4(s) + CO_2(g)$ -39 kJ

$Fe_3O_4(s) + CO(g) \rightarrow 3FeO(s) + CO_2(g)$ +18 kJ

Net Reaction: $FeO(s) + CO(g) \rightarrow Fe(s) + CO_2(g)$

-How many grams of Iron (II) oxide would be required to react with excess carbon monoxide to raise the temperature of 80 grams of ice from -15°C to 40°C?