Name:_____

Thermodynamics Unit - Quantifying Heat (Group Problems)

1. How much heat, in joules, is required to raise the temperature of 205 g of water from 21.1 °C to 91.4 °C?

2. A constant pressure (coffee cup type) calorimeter having a heat capacity of 472 $J*ºC^{-1}$ is used to measure the heat evolved when the following aqueous solutions, both initially at 22.6 ºC, are mixed: 100 g of solution containing 6.62 g of lead(II) nitrate, $Pb(NO_3)_2$, and 100. g of solution containing 6.00 g of sodium iodide, NaI. The final temperature is 24.2ºC. Assume that the specific heat of the mixture is the same as that for water, 4.184 $J*g^{-1}* ºC^{-1}$. Calculate the amount of heat evolved in the reaction. Calculate the ΔH of the reaction as written.
– $Pb(NO_3)_2(aq) + 2NaI(aq) \rightarrow PbI_2(s) + 2\ NaNO_3(aq)$

3. The thermo chemical equation for the combustion of cyclohexane

$$C_6H_{12}(l) + 9O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$$

$\Delta H = -3920$ kJ/mol at 298 K.

What is the change in internal energy for the combustion of 1.00 mol $C_6H_{12}(l)$ at 298K?

4. Compare the energy of combustion of H_2 to CH_4 using a bomb calorimeter with a heat capacity of 11.3 kJ/ºC. When a 1.50 g sample of methane gas was burned with excess oxygen in the calorimeter, the T increased by 7.3 ºC. When a 1.15 g sample of hydrogen gas was burned with excess oxygen, the temperature increase was 14.3 ºC. Calculate the energy of combustion (per gram) for hydrogen and methane.

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