Thermochemistry Podcast #4: Enthalpy Change and Calorimetry

1. When 12.3-g of magnesium reacts with 1000.0g of hydrochloric acid in a calorimeter, it raises the temperature of the system from 22.5˚C to 48.3˚C. Use 4.184 J/g˚C for the specific heat of the system to calculate the value of ΔH_{rxn}?

ΔH_{rxn} = -215.9 kJ/mol

2. When 13.5-g of ammonium nitrate is dissolved in water in a coffee cup calorimeter and the dissolution cools 1000.0-g of water from 32.3˚C to 29.5˚C. Use 4.184 J/g˚C for the specific heat of the system to calculate the $\Delta H_{dissolution}$.

$\Delta H_{dissolution}$ = + 70.39 kJ/mol

3. (a). A propane (C_3H_8) torch is ignited, and 25.6-g of the propane gas are used to heat a 1000-g sample of water in a glass beaker from 25 ˚C to 41.8 ˚C. What is the value of $\Delta H_{combustion}$?

$\Delta H_{combustion}$ = -121.1 kJ/mol

(b). This experimental value calculated in part (a) is much less than the accepted value for the enthalpy of combustion of propane. Suggest at least three different reasons for this experimental discrepancy.

4. When solid lithium is added to excess aqueous aluminum sulfate, 229.7 kJ/mol of energy is released. If 12.1-g of lithium reacts with excess aluminum sulfate, thermal energy is released. If this thermal energy is then used to heat 1000.0-g of water, how much will the temperature of the water rise? Δt = 16 ºC

5. For the dissolving of sulfuric acid, H_2SO_4 the value of ΔH=-236 kJ/mol. If 2.54-g of sulfuric acid dissolves in 100.0-g of 20.0˚C water, what will be the final temperature of the water? t_f = 34.3 ºC