Calorimetry

1. Octane, C_8H_{18}, has a specific heat of 2.22 J/(g·K). What quantity of heat, in kJ, is required to raise the temperature of 125.00 g of octane from 15.0 °C to 28.0 °C?

2. Consider the equation below:

$$NH_4NO_3\ (s) \rightarrow NH_4^+\ (aq) + NO_3^-\ (aq)$$

A 4.25 g sample of solid ammonium nitrate is dissolved in 60.0 g of water in a coffee cup calorimeter. The temperature decreases from 22.5 °C to 17.4°C. Calculate ΔH, in kJ/mol of NH_4NO_3, for this dissolution process. Assume the specific heat of the solution is that of water, 4.184 J/(g·K). Is this an endothermic or an exothermic process?

3. A 1.00 g sample of pine nuts was burned in a bomb calorimeter containing 250.0 grams of water at an initial temperature of 22.5 °C. Once the reaction was completed, the temperature of the water was 49.2 °C. The heat capacity of the calorimeter is 8.74 J/°C. Calculate the heat of combustion for the pine nuts in kJ/g. How many Cal (food calories) is 100. g of pine nuts?