SOLUTION CALORIMETRY

NAME _____ SECTION _____

1. A 192 g sample of copper metal is heated to 100 °C in boiling water and then added to 750 g of water at 24.0 °C in a calorimeter. The heat capacity of the calorimeter is 50.0 J $°C^{-1}$. Calculate the final temperature of the water and the copper in the calorimeter. (NOTE: The specific heat of copper is 0.385 J g^{-1} $°C^{-1}$ and for water it is 4.184 J g^{-1} $°C^{-1}$.)

   a. Write the first law heat balance equation for this system.

   b. Solve for the final temperature.

2. When 100. mL of 0.200 M CsOH is mixed with 100. mL of 0.200 M HCl in a calorimeter the following reaction occurs:

$$CsOH(aq) + HCl(aq) \rightarrow CsCl(aq) + H_2O(l)$$

   The temperature of both solutions before mixing was 24.30 °C. After mixing, the temperature was 25.68 °C.

   a. What produces the heat in this experiment?

   b. What absorbs the heat in this experiment?

   c. Assuming the density of the resultant solution is 1.00 g mL^{-1}, what is the total mass of the solution?

d. Assuming the specific heat of the resultant solution is 4.18 J g^{-1} °C^{-1}, calculate the heat, q, in units of kJ associated (given off or absorbed) with the chemical reaction. Calculate the heat, q, in units of kJ, associated (given off or absorbed) with the "watery" solution.

e. Calculate the ΔH in units of kJ mol^{-1} of CsOH for the reaction.

3. A 0.692 g sample of glucose, $C_6H_{12}O_6$, is burned in a constant volume, bomb calorimeter. The temperature change is measured at 1.80 °C. The calorimeter contains 1.05 kg and the "dry" calorimeter has a heat capacity of 650. J °C^{-1}. Calculate the amount heat evolved per mol of glucose.