

SOLUTION CALORIMETRY

NAME _____

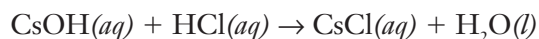
SECTION _____

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:



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 $4.18 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$, 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, $\text{C}_6\text{H}_{12}\text{O}_6$, is burned in a constant volume, bomb calorimeter. The temperature change is measured at $1.80 \text{ }^\circ\text{C}$. The calorimeter contains 1.05 kg and the “dry” calorimeter has a heat capacity of $650. \text{ J }^\circ\text{C}^{-1}$. Calculate the amount heat evolved per mol of glucose.