Calorimetry & Enthalpy in Heating Curves

Name:____________________

Part I: Calorimetry

$q = m \times C_p \times \Delta T$	$\Delta T = T_{final} - T_{initial}$	$q_{system} = -q_{surrounding}$

1. A block of metal with a mass of 70.3 grams is heated to 100.°C and then dropped into a Styrofoam cup calorimeter containing 50.0 grams of water at 22.5°C. The final temperature of the block and water together is 32.7°C.

    a. If the heat gained by the water was lost by the metal, calculate the temperature change of the metal.

    b. Calculate the temperature change of the water?

    c. Set up $\mathbf{q_{metal} = -q_{water}}$ to solve for the specific heat of the metal.

    d. Use a reference sheet of specific heats to determine the identity of the metal.

2. **<u>CHALLENGE</u>:** A block of copper with a mass of 95.4 grams is heated to 100.°C and dropped into a Styrofoam cup calorimeter containing 50.0 grams of water at 24.0°C. The metal and water are allowed to come to a constant equilibrium temperature.

    a. Set up an algebraic ***expression*** for "q_{copper}". *The specific heat of copper is on the reference sheet.*

    b. Set up an algebraic ***expression*** for "q_{water}". *The specific heat of water is on the reference sheet.*

    c. Use $\mathbf{q_{metal} = -q_{water}}$ to solve for the final temperature of the water and copper combined.

3. **<u>CHALLENGE</u>:** A 63.5 gram chunk of copper was heated in a Bunsen burner flame until it was red hot. It was then dropped into a Styrofoam cup calorimeter containing 100. grams of water at 21.0°C. The metal and water were allowed to come to a constant equilibrium temperature of 65.7°C.

    a. Calculate the heat energy (q) of the water.

    b. What was the initial temperature of the copper? ***(Remember:*** $q_{metal} = -q_{water}$***)***

    c. Calculate the temperature change of the copper.

Part II: Enthalpy & Heating Curves

$q = m \times C_p \times \Delta T$	$q = m \times \Delta H_{fus}$	$q = m \times \Delta H_{vap}$

4. Calculate the total amount of heat ($q/\Delta H$) required to completely convert 50.0 grams of ice at -10.0°C to steam at 120.°C. *Hint: Draw a heating curve to determine ΔT's for each phase change.*