Name ______________________ **Honors Chemistry** ___/___/___

Heat of Solution & Calorimetry

Demo 1. I will pour 100. g of H_2O into a Styrofoam coffee cup calorimeter. Record the initial temperature. Add approximately 10. grams of calcium chloride to the water. Record the final temperature. Identify which substance is endothermic and which substance is exothermic.

Initial Temperature: ___________________ Final Temperature: ___________________

H_2O mass: __________________________ $CaCl_2$ mass: _________________________

Total mass: _________________________ $CaCl_2$ moles: _________________________

Endothermic: ________________________ Exothermic: _________________________

Determine the heat flow using the formula: $q = (mC\Delta T)_{solution}$

Determine the heat of solution in kJ/mol using the formula: $\Delta H_{solution} = \dfrac{q}{\text{moles of salt}}$

Demo 2. I will pour 100. grams of H_2O into a Styrofoam coffee cup calorimeter. Record the initial temperature. Add approximately 10. grams of sodium nitrate to the water.

Initial Temperature: ___________________ Final Temperature: ___________________

H_2O mass: __________________________ $NaNO_3$ mass: ________________________

Total mass: _________________________ $NaNO_3$ moles: _______________________

Endothermic: ________________________ Exothermic: _________________________

Determine the heat flow using the formula: $q = (mC\Delta T)_{solution}$

Determine the heat of solution in kJ/mol using the formula: $\Delta H_{solution} = \dfrac{q}{\text{moles of salt}}$

Demo 3: Determine the specific heat capacity of a rock.

Initial Temperature Rock: ___________________ Initial Temperature Water: ___________________

Final Temperature: ________________________

Mass of Water: ___________________________ Mass of Rock: ______________________________

Endothermic: ______________________________ Exothermic: ________________________________

Use the formula $\mathbf{(mC\Delta T)_{water} = -(mC\Delta T)_{rock}}$ to determine the specific heat capacity of the rock:

Solve each of the following calorimetry problems.

1. An unknown metal with a mass of 45.68 grams is heated to a constant temperature of 300.0°C. The object is then submerged in 200.0 grams of water at 22.0°C. The final temperature of the water is 44.7°C. The specific heat capacity of water is 4.184 J/g°C. Determine the specific heat capacity of the unknown substance.

Substance	Specific Heat Capacity ($J \cdot g^{-1} \cdot °C^{-1}$)
Au	0.129
H_2O	4.184

2. A gold ring that weighs 3.81 g is heated to 84.0°C and placed in 50.0 g of H_2O at 22.1°C. What is the final temperature?

3. A piece of metal weighing 418.4 grams was put into a boiling water bath. After 10 minutes, the metal was immediately placed in 250.0 grams of water at 40.0°C. The maximum temperature that the system reached was 50.0 °C. What is the specific heat of the metal?

Substance	Specific Heat Capacity ($J \cdot g^{-1} \cdot °C^{-1}$)
Al	0.89
H_2O	4.184

4. An aluminum bar that weighs 13.81 g is heated to 250.0°C and placed in 120.0 g of H_2O at 23.9°C. What is the final temperature?