Chemistry 105 - Fundamental Chemistry
Fall 1997 - *Calorimetry: Heat Capacity and Specific Heat*

1. Calculate the heat capacity of a piece of iron if a temperature rise from 18 °C to 45 °C requires 112 J of heat.

2. How much heat in kilojoules is required to raise the temperature of (a) 20.0 g of water from 20.0 °C to 96.0 °C: (b) 120.0 g of ethanol from -10.5 °C to 44.5 °C?

3. A 48.7-g block of lead initially at 27.0 °C absorbs 93.5 J of heat. What is the final temperature of the lead?

4. A 10.25-g sample of a metal alloy is heated to 99.10 °C and is then quickly dropped into 20.0 g of water in a calorimeter. The water temperature rises from 18.51 °C to 22.03 °C. Calculate the specific heat of the alloy.

5. A 1.35-kg piece of iron (sp. heat = 0.449 J /g • °C) is quickly dropped into 0.817 kg of water and the water temperature rises from 23.3 °C to 39.6 °C. What must have been the initial temperature of the iron?

6. A piece of stainless steel (sp. heat = 0.50 J /g • °C) is taken from an oven at 178 °C and quickly immersed in 225 mL of water at 25.9 °C. The water temperature rises to 42.4 °C. What is the mass of the piece of steel? How precise is this method of mass determination? Explain.

7. A 500.0-mL sample of 0.500 M NaOH at 20.00 °C is mixed with an equal volume of 0.500 M HCl at the same temperature in a Styrofoam-cup calorimeter. The reaction:

$$HCl_{(aq)} + NaOH_{(aq)} \rightarrow NaCl_{(aq)} + H_2O_{(1)}$$

takes place and the temperature rises to 23.21 °C. Calculate the enthalpy change for the reaction.

8. A 65.0-mL sample of 0.600 M HI at 18.46 °C is mixed with 84.0 mL of a solution containing excess potassium hydroxide at 18.46 °C in a Styrofoam-cup calorimeter. The reaction:

$$HI_{(aq)} + KOH_{(aq)} \rightarrow KI_{(aq)} + H_2O_{(l)}$$

takes place and the temperature rises to 21.96 °C. Calculate the enthalpy change for the reaction.