EXERCISE 13-A

<u>Thermochemistry</u>

OBJECTIVES:

1. To determine the specific heat of water.

2. To determine the heat change that accompanies a particular chemical reaction.

The specific heat of any material is the number of calories required to change the temperature of one gram of the substance by 1 degree Celsius. Heat measurements are made in a device called a calorimeter. A simple calorimeter is shown in Figure 13-1.
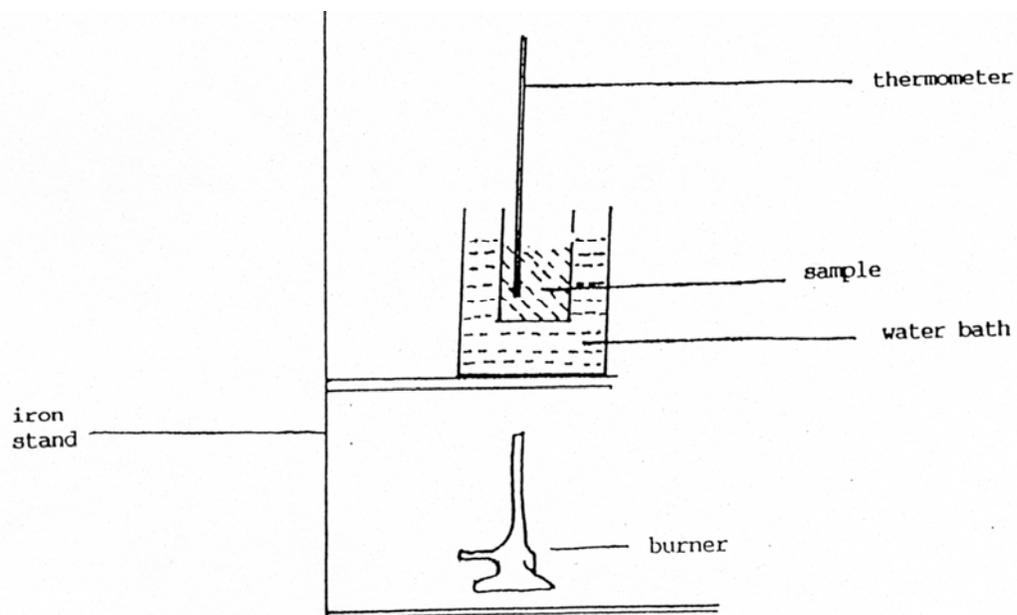

Figure 13-1

In chemical reactions there will be some energy change. Usually this change involves heat. In this experiment you will measure the heat change when an acid and a base react with each other.

In both parts of this experiment you will make use of the following relationships:

Heat Lost = Heat Gained 13-1

Heat Lost or Gained = Specific Heat x Mass x Temperature Change 13-2

Equipment

1. ring stand

2. iron ring

3. wire guase

4. thermometer

5. styrofoam cup

6. 250 ml beaker

7. 100 ml beaker

Procedure

A. Specific Heat of Water

1. Add approximately 50 grams of water to a styrofoam cup measured to the nearest 0.01 g.

2. Measure the temperature of the water in the cup to the nearest 0.1 ℃.

3. Add another 50 grams of water to a 100 ml beaker again measured to nearest 0.01 g.

4. Place the 100 ml beaker in a 250 ml beaker which is 1/2 to 3/4 filled with water. Heat the water bath to a temperature of 60-70°C. Maintain this temperature for about 5 minutes. Measure and record the temperature of the 50 grams of water to the nearest 0.1°C.

5. Cool your thermometer back to room temperature. Then place it in the calorimeter. Quickly remove the 50 grams of hot water from the water bath. Wipe the outside of the beaker dry and pour the water into the calorimeter. Stir thoroughly but carefully with the thermometer. The mercury level in the thermometer will rise to a maximum and then fall. Determine this maximum temperature to the nearest 0.1°C.

6. Calculate the ratio of heat lost to heat gained from your data using expression 13-1.

7. What should this ratio be and why?

8. Calculate your percent error and show your work.

9. Consider the following facts: Some heat is required to raise the styrofoam cup's temperature. Some heat radiates through the cup walls and the open top of the cup. What effect do these heat losses have on your results? Explain in detail how these factors affected your percent error.

ANSWER SHEET

EXERCISE 13-A

NAME _____ SECTION_____ DATE_____

A.

   1. Weight of cold water .... _____

   2. Temperature of cold water .... _____

   3. Weight of hot water... _____

   4. Temperature of hot water .... _____

   5. Temperature of mixture.. _____

   6. Calculate ratio of heat lost to heat gained.............. _____

   7. Accepted Ratio .... _____

   8. Percent error .... _____

   9. Explanation: