Heat of Fusion of Ice

Problem

How much heat is required to melt a gram of ice?

Introduction

Ice and water can coexist at the freezing point. To melt the ice energy must be added. In this lab you will determine the amount of heat required to melt a gram of ice.

Prelaboratory Assignment

- ✓ Read the entire experiment before you begin.
- ✓ Answer the Prelaboratory Questions.
 - 1. You could have made volume measurements of the water and used the density of water as 1.0 g /mL to make your calculations. Why would this introduce error?
 - 2. Why must excess ice be added? What problems might occur if this ice were not in excess?

Materials

Apparatus Safety goggles Lab apron Styrofoam cups (2) Lid for cup (with 2 holes) Plastic spoon Stirrer Thermometer Reagents

Ice chips (or small cubes) at 0°C Water



- 1. Thermometers are fragile. Be careful in handling them and never use a thermometer as a stirring rod. If you are using a mercury thermometer and it breaks, notify your teacher immediately. Mercury vapors are poisonous.
- 2. Safety goggles and a lab apron must be worn in the laboratory at all times.

Procedure

- 1. Place one Styrofoam cup into the other. This is your calorimeter.
- 2. Place 75.0 g of water at room temperature in the calorimeter. Record the temperature of the water.
- **3.** Using a paper towel, remove the residual water from several ice chips and add them to the water in the calorimeter. Cover the calorimeter.

- 4. Gently stir the water as the ice melts. Do not stir too vigorously or you will affect the temperature of the water. Add ice if necessary (there should always be ice present).
- 5. When the temperature of the ice-water mixture is 0°C, use a plastic spoon to remove any excess ice in the calorimeter. Be careful not to take any water.
- 6. Measure and record the final mass of the water.



- 1. Return all materials to their proper locations. Your teacher will tell you where to place the foam cups.
- 2. Wash your hands thoroughly before leaving the laboratory.

Analysis and Conclusions

Complete the **Analysis and Conclusions** section for this experiment either in your Report Sheet or in your lab report as directed by your teacher.

- 1. Determine the heat transferred from the water to the ice.
- 2. According to your results, how much heat is required to melt a gram of ice?
- **3.** The actual value for the heat of fusion of ice is about 330 J/g. Determine the percent error in your value.
- 4. Would each of the following scenarios cause you to calculate a heat of fusion higher or lower than the accepted answer? Explain your answer.
 - **a.** The ice you add to the calorimeter has a significant amount of water on it.
 - **b.** The ice is initially colder than 0° C.
 - c. A significant amount of water is taken when the excess ice is removed from the calorimeter.

Something Extra

We assume that all of the heat transfer in the calorimeter is from the water to the ice. Design an experiment to determine the heat transferred to the environment surrounding the calorimeter.