Chemistry **Name: _____**

MOLAR HEAT OF FUSION MAKEUP

Background:

Energy is needed to melt a solid. When a solid changes to a liquid there must be a change in the way that the particles (molecules or atoms) are organized. The molecules that comprise ice must be organized in fixed positions. While the ice is in the solid state the molecules are not able to slide between and among each other. This results in the fixed shape of ice. After the ice melts, the water molecules are no longer held in rigid, fixed positions, but are able to move around and slide between one another. You can stir water and pour it into a container of any size and shape. The energy absorbed when ice melts is utilized in the reorganization of the water molecules from being rigid and fixed to being mobile. The reverse occurs when water freezes. Energy must be withdrawn and the molecules are again in the rigid and fixed positions. The energy absorbed when ice melts is called the HEAT OF FUSION.

The **purpose** of this laboratory activity is to determine the molar heat of fusion of ice.

Procedure:

1. Measure the mass of the dry calorimeter.
2. Pour between 60-80 mL of warm water into the calorimeter. Record the mass to obtain the mass of the warm water.
3. Record the temperature of the warm water.
4. Obtain a small beaker of ice. Place the ice into the warm water being careful to put only ice and not water from the melted ice into the warm water.
5. Stir the ice water mixture until the temperature of the ice water is as close to 0°C as possible. Use plenty of ice.
6. Remove the un-melted ice. You may use tongs.
7. Obtain the mass of the calorimeter, warm water and melted ice.

Data:

Mass of the dry calorimeter 2.50 g

WARM WATER DATA		MELTED ICE WATER DATA	
Mass of warm water (in calorimeter)	**66.0 g**	**Mass of water & melted ice**	**86.0 g**
Initial temperature of warm water (°C)	**22.0°C**	**Initial temperature of ice (°C)**	**0°C**
Final temperature of mixture (°C)	**0°C**	**Final temperature of mixture (°C)**	**0°C**
Specific Heat Capacity of Water (cal/g•°C)	**1.00 cal/g•°C**	**Specific Heat Capacity of Water (cal/g•°C)**	**1.00 cal/g•°C**

Analysis Questions: *Show your work and use units!!*

1. Determine the temperature change of the warm water.

2. Calculate the amount of heat energy lost by the warm water in cooling.

3. How much heat energy did the ice gain in melting? Explain how this is determined.

4. Calculate the mass of ice that melted in the calorimeter.

5. Determine the number of moles of ice that melted in the calorimeter.

6. Using the above data (#3 and #5), determine the heat energy absorbed by one mole of ice in melting. ***This is the Heat of Fusion*** **(ΔH_{fus})** ***in calorie / mole.***

7. Convert the Heat of Fusion from units of *calorie / mole* **TO** units of *kilojoules / mole*. (Useful conversion factors: 1 calorie = 4.186 joules, 1000 joules = 1 kilojoule)

8. On a previous worksheet (titled: *Energy Calculations*), you will find the accepted value for the molar heat of fusion for ice. Use this value ,along with your experimental ΔH_{fus} from #7, to determine the percent error.

9. Compare the temperature of the un-melted ice with the temperature of the melted ice.
   a. Does the ice change temperature when it melts?

   b. Does the ice absorb heat energy when it melts?

   c. Is it possible that there is no temperature change while heat energy is being absorbed? Explain.