# Melting Ice is Hot Stuff!

Name _____ Date _____ Teacher _____

Introduction: There are three states of matter that we are familiar with here on Earth; solid, liquid, and gas. Water exists on Earth in all three states. Some examples of this are; liquid in our rivers and oceans, gas as water vapor in our atmosphere, and solid as ice at the far Northern and far Southern regions of our planet. An energy change occurs any time a substance changes its state of matter. When ice melts, energy is needed, required. This is called endothermic. Energy must be supplied to break the molecular bonds that hold the water molecules together. We can actually measure the energy involved by creating a crude temperature measuring device called a calorimeter. We shall do this using Styrofoam© cups, a lid and a thermometer. From the temperature change, we can calculate the **Molar Heat of Fusion of Ice**, the amount of energy required to change one mole of liquid water to one mole of solid water at its freezing point. Of course, we will be melting the ice instead of freezing the water, but all we have to do is realize that the temperature change we are noting is that of the water, which is supplying the energy necessary to melt the ice.

Materials:
- 2, Styrofoam© cups, one large and one small
- Alcohol thermometer
- Plastic cup lid
- Triple Beam balance
- Ice

Procedure:
1. Bring the materials, except the ice, to your lab area.
2. Assemble the calorimeter;
   fill the large cup ½ full of water
   place the plastic lid on the large Styrofoam© cup
   insert the thermometer through the straw hole in the lid.
3. Measure the mass of the small cup and record the mass in your data table.
4. Take the small cup to the materials table and get a few pieces or cubes of ice.
5. Quickly measure the mass of the ice and cup together then record in your data table.
6. Place the small cup with the ice into the large Styrofoam© cup. Place the thermometer in the water that surrounds the small cup with the ice, placing the lid firmly on the top of the large cup.
7. Quickly record the beginning temperature of the water. You are concerned with the difference in beginning and ending temperatures of the water.
8. Allow the ice to melt and record the ending temperature of the water.

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|---|---|
| 1. Mass of small cup | |
| 2. Mass of ice and small cup | |
| 3. Mass of ice, subtract #1 from #2 | |
| 4. Beginning temperature of water in large cup | |
| 5. Ending temperature of water in large cup | |

  

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| 6. Change of temperature, subtract #5. from #4. | |
| 7. Calculate the number of moles of ice, divide #3. by 18 | |
| 8. Calculate the Molar Heat of Fusion of ice, divide #6. by #7 | |

Calculations:

1. Calculate the number of grams of ice by subtracting the mass of the small Styrofoam© cup from the mass of the cup and ice together.
   _____g of ice and small cup - _____g of small cup = _____g of ice

2. Calculate the number of moles of water, ice, you have by dividing the mass of ice by 18 g.

   $$\_\_\_\_\_ \text{ g of ice } X \quad \frac{1 \text{ mol}}{18 \text{ g}} = \_\_\_\_\_ \text{ mol ice}$$

3. Calculate the change of temperature by subtracting the ending temperature of the water from the beginning temperature.
   _____ $C^o$ - _____ $C^o$ = _____ $\Delta$ temperature

4. Calculate the Molar Heat of Fusion of Ice by dividing the change of temperature by the number of moles.
   _____ $\Delta$ temperature/_____ mol ice = _____MH of Fusion of ice

Questions:

1. What is the source of the energy used to melt the ice? _____
2. What is the use of the energy during the melting of the ice? (See Introduction)
   _____
3. What do you propose the amount of energy would be if this lab involved freezing water of the same mass of ice melted in this lab? _____