

Iceberg of DOOM



Introduction:

An iceberg has broken off a glacier on the coast of Western Greenland. It has managed to make its way down the St. Lawrence River, as if completely unaware of the direction of the river. It then passed through Lake Ontario, plowed straight through the Niagara Falls and found itself in Lake Erie. At which point it paused to take stock of its current situation. Finding nothing of value to destroy in Lake Erie it proceeded to follow the Detroit River North into Lake Huron. Once there its destination was obvious to any casual observer... Riverside Illinois. Yes Riverside Illinois. All it needs to do is travel through Lake Huron into Lake Michigan, jump over about 4 miles of land into the Des Plaines River and it will be on a collision course of destruction.

Your job is to find out exactly how much energy will be required to melt this 150,000 metric ton beast. In order to calculate this you will first need to investigate a property of matter called the molar heat of fusion. During the first part of our investigation we will need you to find the molar heat of fusion of water.

The molar heat of fusion is the amount of energy required to melt 1 mole of a substance, kJ/mol. The specific heat of water is $4.184 \text{ J/g}\cdot^{\circ}\text{C}$. Using this value you can calculate the amount of heat gained or lost to liquid water. If ice is added to warm water the water will cool down. Using the specific heat you can calculate the amount of energy lost from the liquid. We will assume that all energy lost from the liquid is gained by the ice.

Your first job is to write a procedure that will allow you to measure the appropriate data. This procedure should be in the form of picture steps. You then need a data table. Remember the data table is only for data you record. Not calculations.

Things to consider: Water has a density of 1.00 g/mL , so you do not need a balance to mass the water. I would recommend starting with water around 50°C - 60°C , and cool it down to the single digits by adding ice continuously. Remove any ice still left in the cup.

Procedure:

Data Table:

Heat of Fusion of Water

Calculations/Results:

Conclusion:

Questions:

1. If melt water from the ice bucket is added to the calorimeter how would this affect your heat of fusion?
2. Why is important to have a final temperature of around 0°C ?
3. How would your heat of fusion be affected if you were to leave the ice in the cup when you found its final mass?
4. Ethanol has a heat of combustion of -1370 kJ/mol . How many grams of ethanol will be required to melt the iceberg?