

Laboratory #11

Phase Changes and Pressure

Part A. Slicing Ice

Concepts

Pressure; Regelation; Freezing; Melting

Introduction

Metal is one of the best conductors of heat and it has a very low specific heat (it changes temperature easily). We are all familiar with this because if you go to a metal telephone pole on a cold ($< 30^{\circ}\text{F}$) winter day, you don't want to lick the pole. We also know this because a metal spoon will dish the first scoop of ice cream pretty well, but the second sticks to it, because the spoon has already gotten so cold. Why then are ice skates made out of metal? Shouldn't the skates freeze to the icy surface?

As you have learned in class, the reason ice skates work is because of regelation. The pressure that the blade exerts on the ice locally melts the ice and allows the blade to slide along with low friction. This experiment will demonstrate regelation.

Procedure

- Hang two heavy masses with a metal cord over a large block of ice.
- Wait for a long time (do another lab and come back to it).
- Answer the lab questions.

Part B: Cool Off By Boiling!? No Way . . .

Concepts

Pressure; Boiling Point; Temperature; Cooling Process

Introduction

Coastal cities and small islands have temperatures that don't fluctuate very much because it takes a lot of energy to change the temperature of the water that surrounds the area. The temperature of the water is not easily changed because it has a high specific heat. It is even harder to change the phase of water, which means that it takes even more energy. In this experiment you will see where some of the extra energy comes from.

Procedure

- Measure the temperature the big jug of water.
- Put some water from the big jug into your little beaker
- Put the beaker into a bell jar.
- Pump the air out of the chamber.
- Watch what happens.
- Bring the chamber back to atmospheric pressure (Very slowly!).
- Measure the temperature of the water.

