

Phase Change Physics Activities

1. Latent Heats of Phase Changes

Purpose

You will observe the “latent heat” of changing the phase of a substance.

Materials

ice, sauce pan, hot plate, thermometer, stirrer (a wooden spoon works well), clock or timer

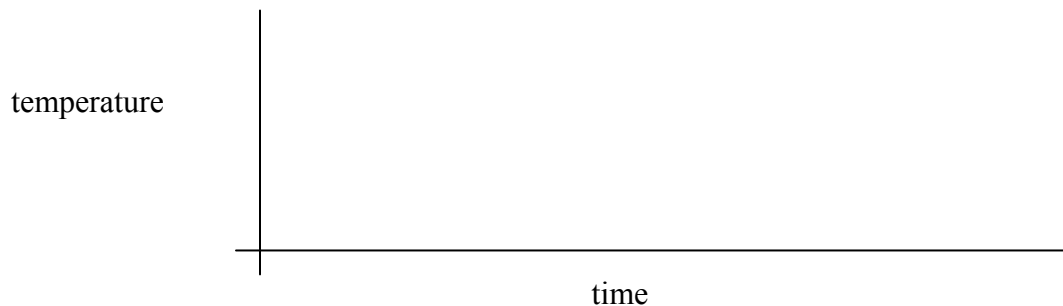
Overview

When ice melts to become liquid water, more is going on than simply a rise in its temperature! Any time a substance changes its phase, it absorbs or releases heat, but it does not always change its temperature in the process. This may sound incredible, but you will observe the consequences of this behavior in this activity.

You will heat ice until it melts and finally boils, recording the temperature of the sample at regular intervals.

Procedure

1. Predict: If you constantly heat a sample of ice on a hot plate, how will its temperature change as it melts, heats up, and finally boils? Sketch a graph of what you expect the temperature to be during that time.



1. Fill a saucepan with ice. Place a thermometer in the ice and allow its reading to stabilize. Record the temperature in the table.
3. Place the saucepan on the hot plate and turn the hot plate to its highest setting. (Some hot plates are touchy. If it turns off during this activity, turn its setting down until it clicks back on again.)
4. Stir the contents of the saucepan constantly and well. Measure the temperature of the contents every 30 s and record in the table. Continue measuring for at least three minutes after the water is boiling vigorously. If you run out of room in the table, continue your

measurements on another sheet of paper and warn the group after you not to use so much ice.

5. Also record in the blanks below the table the time at which all the ice was melted and the time at which the water began to boil.

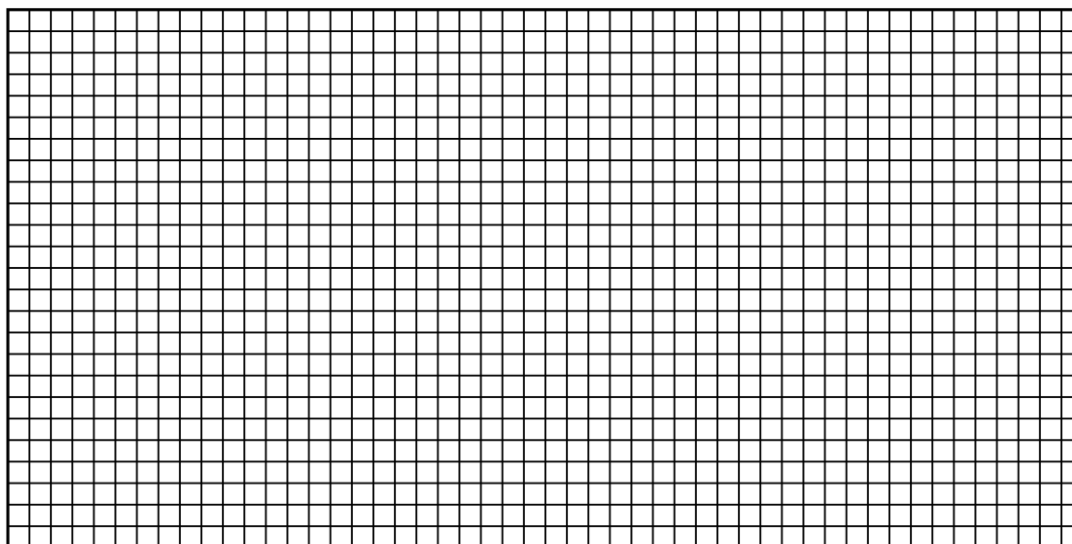
Heating-temperature measurements

time (min)	temp (°C)	time (min)	temp (°C)	time (min)	temp (°C)	time (min)	temp (°C)
0		5.0		10.0		15.0	
0.5		5.5		10.5		15.5	
1.0		6.0		11.0		16.0	
1.5		6.5		11.5		16.5	
2.0		7.0		12.0		17.0	
2.5		7.5		12.5		17.5	
3.0		8.0		13.0		18.0	
3.5		8.5		13.5		18.5	
4.0		9.0		14.0		19.0	
4.5		9.5		14.5		19.5	

Time ice completely melted: _____

Time boiling started: _____

6. Graph your results below. Scale your graph to us at least half of each axis. Label the axes.



3. Changing Phase without Heating

Purpose

You will see how temperature responds when a phase changes *without* heat input.

Materials

Ice, salt, insulated cup (possibly foam), stirrer, thermometer

Procedure

1. Place ice in the cup so that the cup is between half-full and completely full.
2. Place the thermometer in the ice and wait for its temperature to settle. Record the starting temperature here.
3. Add some salt to the ice and stir. What happens to the ice? What happens to the temperature? Record your observations.
4. Add more salt. Do any further changes occur?

Questions

1. Why does the phase change?
2. Why does the temperature change?
3. How does the energy of the system change?