LESSON 99

LAB

Where's the Heat? Heat and Phase Changes

Name _____

Date _____ Period _____

Purpose

To examine the temperature of water as it undergoes phase changes.

Materials

- hot plate
- bucket of crushed ice
- 100 mL beaker
- 250 mL beaker
- large foam cup
- water
- 2 thermometers
- ring stand and clamp to hold thermometer (optional)

Part 1: Melting Ice

Procedure and Questions

1. Place about 50 mL of crushed ice in a 100 mL beaker.
2. Use your thermometer to record the initial temperature of the ice. Try not to let the thermometer touch the glass.
3. Every two minutes, measure the temperature. On the data table, record the time, the temperature, and the phase or phases present in the beaker.
4. Proceed to Part 2 of the lab while occasionally monitoring the temperature of the water. Stop when the water temperature measures at least 5 °C.

Time (min)	0	2	4	6	8	10	12	14	16	18	20
Temperature (°C)											
Phase(s)											

5. How does the temperature of the water change over time?

6. Describe the system and the surroundings, and the direction of heat transfer.

7. Does heat transfer occur the entire time? Explain your reasoning.

8. What is the highest temperature that you expect for the system? Explain.

9. Is the melting of ice endothermic or exothermic? Explain.

Part 2: Cooling Hot Water with Ice

Procedure and Questions

1. Carry out an experiment to measure how much ice it takes to cool 100 g of liquid water from 60 °C to 10 °C. Describe your procedure.

2. How much ice did you add?
3. Why was the final temperature below the midpoint of the temperatures of the ice and the hot water?

4. Determine the amount of heat transferred from the 100 g of hot water to cool it from 60 °C to 10 °C.

5. Determine the amount of heat transferred to the frozen water sample to warm it from 0 °C to 10 °C.

6. The difference between the amounts of heat you calculated in Questions 4 and 5 is the heat required to melt the ice, called the **heat of fusion.** Calculate the heat of fusion per gram of ice that melted.

7. **Making Sense** Imagine that you heat an ice cube. Why do you think the temperature does not change while the ice is melting? What happens to the kinetic energy of the ice? Of the water after the phase change is complete?

8. **If You Finish Early** Sketch a graph of temperature versus time for cooling water vapor to make liquid water and then solid ice.