

# How water melts, boils and freezes

Grade 6 science (Year 7 · Class 6) · Lab

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Class: \_\_\_\_\_

What happens to the temperature of ice as you keep heating it until the water boils? In this lab you take readings every two minutes and look for the flat sections of the graph. You then use your results to find the melting point and boiling point of water.

**Level:** Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS1-4

## Aim

To measure how the temperature of ice changes with time as it is heated until the water boils, and to find the melting and boiling points.

## Equipment

- 250 mL beaker
- Crushed ice from the freezer (about 100 g)
- Thermometer reading from  $-10^{\circ}\text{C}$  to  $110^{\circ}\text{C}$
- Hot plate or tripod with a gentle heater
- Stopwatch and a glass stirring rod

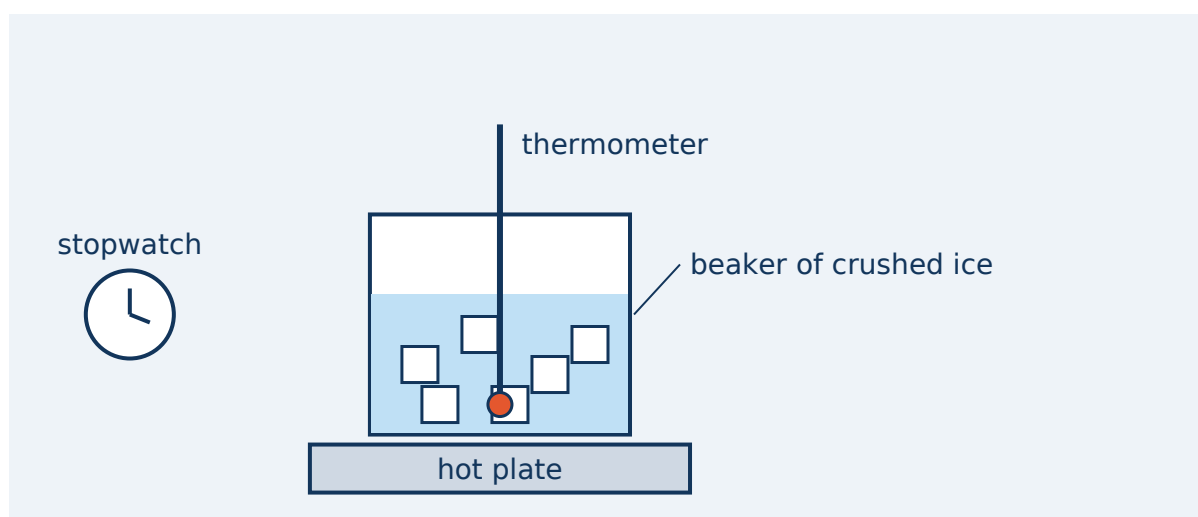
## Safety

### Safety

Wear goggles. The hot plate, the beaker and the steam can burn you. Keep long hair tied back and stand to the side of the beaker. Never leave the heater on without supervision.

## Method

1. Half fill the beaker with crushed ice and place the thermometer in it, without touching the glass.
2. Start the stopwatch and the hot plate together and record the temperature.
3. Record the temperature every 2 min. Stir gently before each reading.
4. Keep going until the water boils and the reading stays steady for three readings in a row.
5. Turn off the heat and let everything cool before clearing up.



Heating crushed ice in a beaker while recording the temperature.

## Results

Sample measurements from one group:

| Time (min)       | 0  | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
|------------------|----|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Temperature (°C) | -4 | 0 | 0 | 0 | 0 | 3  | 13 | 24 | 35 | 47 | 58 | 69 | 80 | 90 | 98 | 99 | 99 | 99 |

## Analysis questions

### Question 1 Length of the melting plateau

Use the table to find the time for which the temperature stayed at 0 °C.

### Question 2 Rate of warming

Calculate the average rate of warming of the water between 12 min and 24 min.

### Question 3 Explain the flat sections

Explain why the temperature stays constant at 0 °C and at 99 °C.

### Question 4 Boiling point reading

The pure water boiled at 99 °C instead of 100 °C. Suggest two reasons.

### Question 5 Why stir?

Explain why the water and ice should be stirred before each reading.

### **Question 6 Use of crushed ice**

Explain why crushed ice is better than a large lump.

### **Question 7 Improve the lab**

Suggest one change that would make the data more reliable.