ScienceCube

Boiling Point According to the Amount of Liquid

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1. **Observing and Explaining Changes in Boiling Point According to the Amount of Liquid**
2. **2. Finding and Explaining Examples Related to the Boiling Point of Substances in Daily Life**

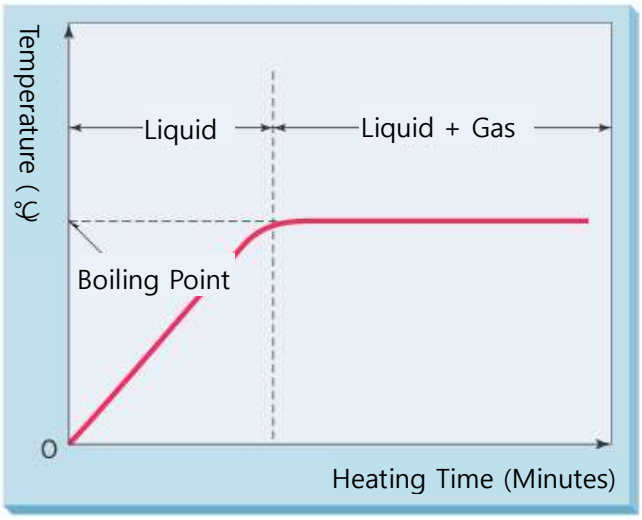
Fundamental Concept

1. **Boiling Point**:

- The temperature at which a liquid boils from within and changes into a gas.
- The temperature at which liquid and gas coexist.
- It has a constant value depending on the substance.
- It becomes a characteristic that can distinguish substances.

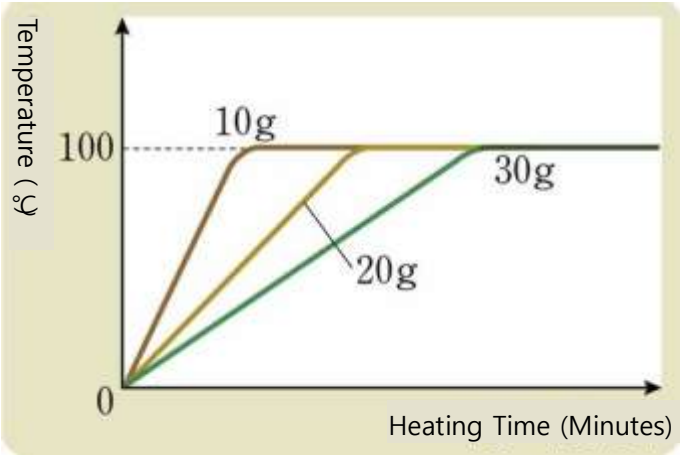
Substance	Boiling Point (℃)	Substance	Boiling Point (℃)
Iron	2872	Methanol	65
Mercury	358	Ethanol	78
Sodium Chloride	1465	Ammonia	-33
Naphthalene	218	Nitrogen	-196
Water	100	Oxygen	-183

2. Heating Curve of Liquid



- The temperature of a pure liquid remains constant even when heated while boiling.
- The absorbed heat is used entirely for the phase change (breaking the intermolecular forces of the liquid).

3. Amount of Liquid and Boiling Point



- The less the amount of liquid, the shorter the time to reach the boiling point.
- Changing the amount of liquid only changes the time taken to boil, not the boiling point.

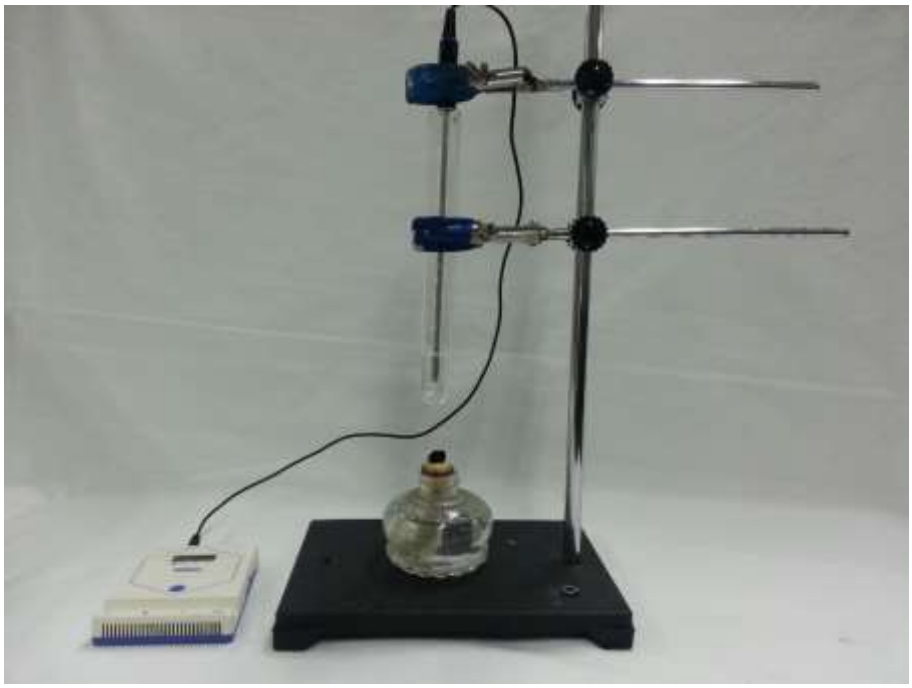
Experiment

Materials Needed

Interface, Science# program, Temperature sensor, Two test tubes, Alcohol lamp, Stand, Two clamp holders, Water, Boiling stones, Lighter

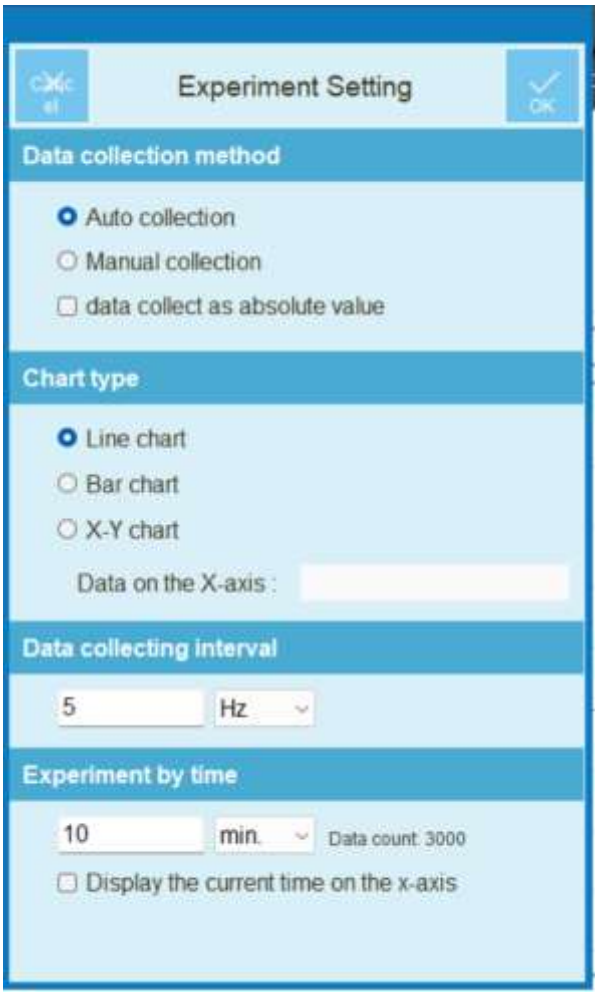
Experimental Setup

1. Put 10 mL of water in one test tube and 20 mL of water in the other test tube, and add boiling stones.
2. Fix two clamp holders on the stand, submerge the temperature sensor in the 10 mL water test tube, and secure each test tube with the clamp holders. (Ensure the temperature sensor does not touch the wall or bottom of the test tube.)
3. Place the alcohol lamp under the test tubes.



Interface Setup

1. Run Science#.
2. Connect the temperature sensor to the interface, and connect the interface to Science# via Bluetooth or cable. Science#.
3. Press the button to set up the experimental environment as shown below or press the button for automatic setup.



Data Collection

1. Press the button and light the alcohol lamp with the lighter

1. When the water in the test tube reaches the boiling point, press the button  to stop the experiment.
2. Switch to the test tube with 20 mL of water and measure the boiling point using the same method.

Data Analysis

Recording Data

1. Simultaneously display and compare the heating curves of water according to the amount of liquid in a single chart.

2. Find the boiling points from the heating curves of different amounts of water and record them in the table below. Explain how they differ.

Volume of Distilled Water	10 mL	20 mL
Boiling Point (℃)		

Data Application

1. Is there a horizontal section in the heating curve of the liquid? If so, explain the reason for the horizontal section.

2. Summarize and explain how the boiling point changes according to the amount of liquid based on the experiment results.

3. Explain the reason for adding boiling stones before boiling the water.


Report
(For Teachers)
Report
(For Students)