Experiment (A)

Aim

Determination of melting point of ice.

MATERIALS AND APPARATUS REQUIRED

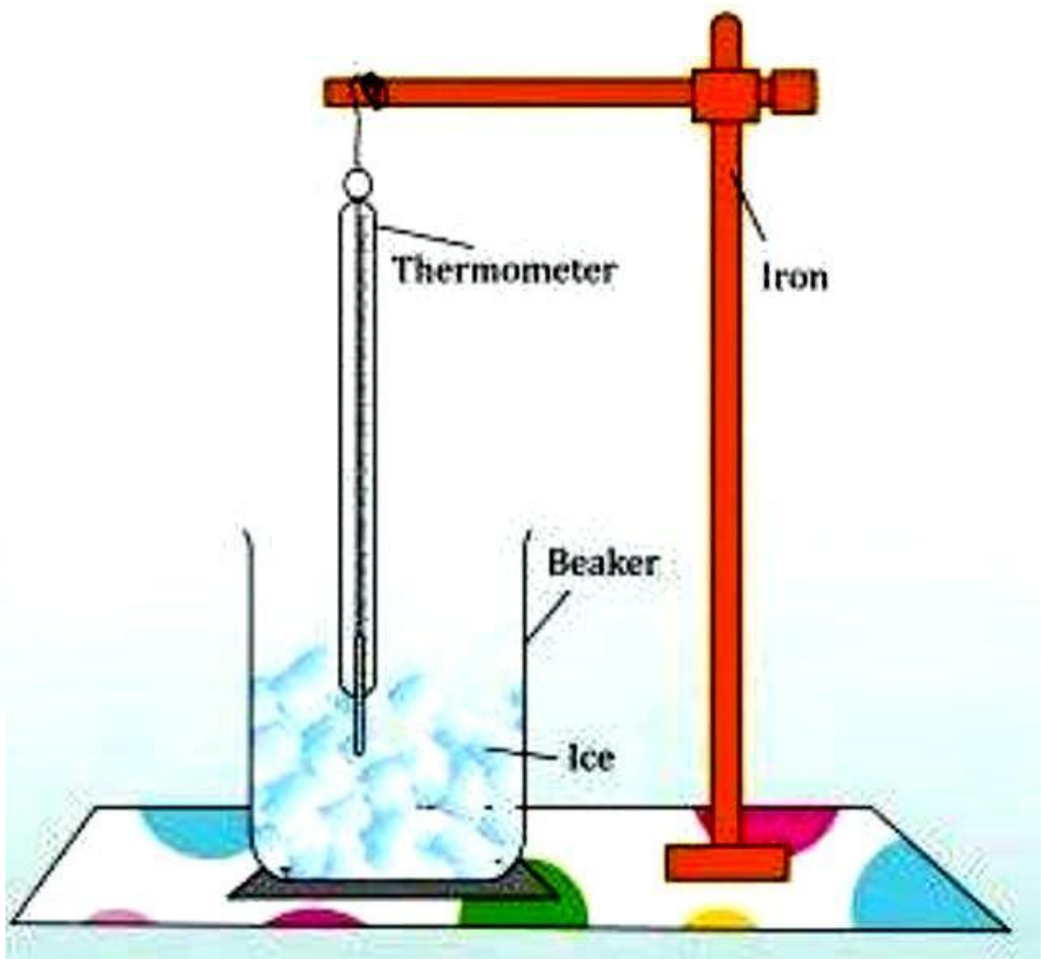
A glass beaker (200 mL), a Celsius thermometer, stopwatch, a glass rod, an iron stand and ice cubes prepared from distilled water.

THEORY

- Melting point of a solid is the fixed temperature at which a solid change into its liquid state.
- Once a solid attains its melting temperature, the temperature remains same until the entire solid converts into liquid.
- The temperature at which pure ice melts to form water is called melting point of ice. The melting point of pure ice is 0°C at a pressure of 76cm of mercury.
- The melting point of the ice decreases if pressure is applied on it.
- Melting point of ice also decreases on the addition of soluble substances such as common salt, nitre, etc.
- The latent heat of fusion is the heat required to convert 1kg of substance from solid state to liquid state at its melting point. The latent heat of ice is $3.34 \times 10^5 Jkg^{-1}$.

PROCEDURE

1. Note the range and the least count of the thermometer.
2. Take a beaker and fill it up to half with ice cubes formed from distilled water.
3. Suspend a Celsius thermometer by its hook from an iron stand.
4. Adjust the clamp or iron stand so that the bulb of thermometer is completely surrounded by ice.
5. Switch on the stopwatch and note the reading of thermometer and the state of ice in the beaker after every one minute till whole of the ice melts.
6. Continue recording the temperature till the temperature of
7. Arrangement to determine the melting point of ice the water so formed rises up to 1-2°C.



OBSERVATIONS:

Record your observations in the table given below:

S. No	Time in Minutes	Temperature in °C	Sate of the ice
1.	0		Solid/ partly Solid /partly liquid/liquid
2.	1		
3.	2		
4.	3		
5.	4		

RESULTS:

The melting point of ice =_____°C

PRECAUTIONS:

1. The bulb of the thermometer should be kept surrounded with ice cubes.
2. Ice should be stirred regularly to keep a uniform temperature throughout.
3. Note temperature by keeping your eyes in line with the level of mercury.

Experiment (B)

Aim

To determine the boiling point of water.

MATERIALS AND APPARATUS REQUIRED

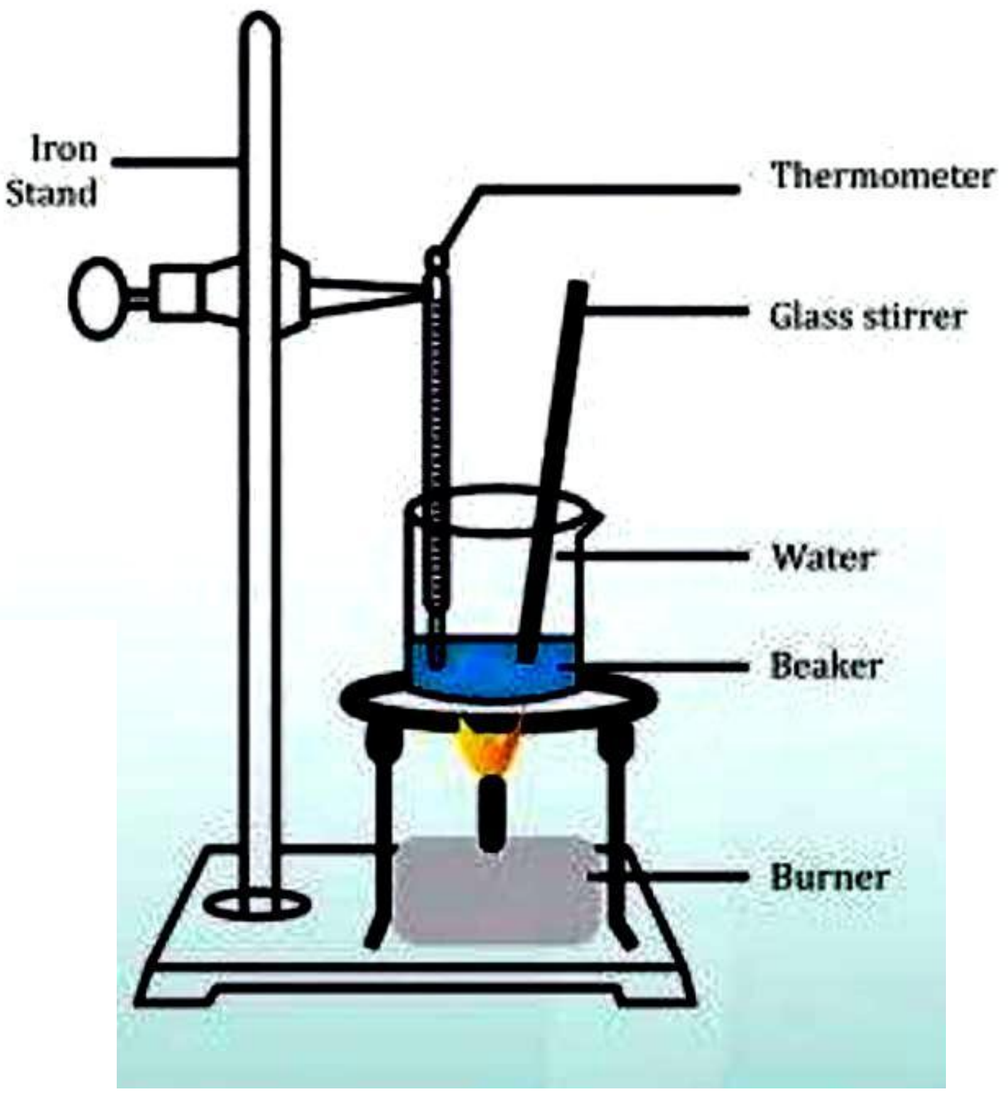
A round bottom flask (250ml) fitted with two holed stoppers, a wire gauze, a tripod stand, a Celsius thermometer (−10°C to 110°C), a glass rod, an iron stand, spirit lamp or Bunsen burner, distilled water, stopwatch, laboratory stand, water and glass tube.

THEORY

1. Take 25-30 ml of water in a boiling tube and add few pumice stones to it.
2. Clamp the boiling tube on iron stand with two holed cork, in one hole fix the thermometer and in the other one fix the delivery tube.
3. Place the thermometer above the water in the flask as shown in the figure and record its temperature.
4. Place a burner under the boiling tube.
5. Read the temperature and record it in the given observation table till the water boils. Record the reading after the time interval of 1 minute.

PROCEDURE

1. Note the range and least count of the thermometer.
2. Take about 125 to 150ml of water in the round bottom flask and close its mouth by using a two holed stopper.
3. Fix the thermometer in one of the hole of the stopper and fix a glass tube in other hole of the stopper.
4. Place the wire gauze on a tripod stand and keep the flask over it. Start heating the water with Bunsen burner.
5. Switch on the stopwatch and note the reading of the thermometer after fixed interval of time of one minute. When the temperature rises above 80°C, reduce the time interval to 1/2 minute.
6. Record the thermometer readings continuously for 5 minutes after the water in the flask begins to boil. This is the boiling point of water.



OBSERVATION TABLE

Boiling Point of Water

S.No.	Temperature when water starts boiling (t_1 °C)	Temperature when water continues to boil till constant (t_2 °C)	Boiling point of water $\left(\frac{t_1+t_2}{2}\right)$ °C
1.			
2.			

RESULTS:

1. Boiling Point of water is _____ °C.
2. Once the boiling point is attained the temperature reading on the thermometer does not change for sometime.

PRECAUTIONS

1. Choose a better-quality thermometer whose graduated scale is clearly readable.
2. Record the temperature in whole numbers.
3. While reading the thermometer the eye level should be parallel with mercury level.
4. Dip only the bulb of thermometer into water/ice.
5. Thermometer should not touch the walls of beaker or boiling tube.

VIVA VOCE

Q1. Define the boiling point of a liquid.

Ans. The boiling point of a liquid is the temperature at which the vapour pressure of a liquid is equal to the pressure of the gas above it.

Q2. What do you understand by the vapour pressure of a liquid?

Ans. The pressure that the vapours exert on the surface of the liquid at equilibrium is called the vapour pressure of that liquid.

Q3. What is the difference between evaporation and boiling?

Ans.

Evaporation	Boiling
1. Evaporation occurs at all temperatures.	1. Bolling occurs at a fixed temperature.
2. Evaporation is a surface phenomenon	2. Boiling is a bulk phenomenon.

Q4. How does the boiling point of water change at high altitudes as compared to sea level? Why?

Ans. The boiling point decreases at higher altitudes because the atmospheric pressure at higher altitudes is less and less energy is required to make vapour pressure equal to atmospheric pressure.

Q5. Two liquids A and B have boiling points equal to 35 °C and 70 °C respectively. Which has a higher vapour pressure? Explain why.

Ans. Liquid 'A' has higher vapour pressure. A liquid which has a higher vapour pressure would require lesser heat energy so that the vapour pressure becomes equal to atmospheric pressure.

Q6. Out of water and ether, which has a higher vapour pressure?

Ans. Ether has a higher vapour pressure. The intermolecular interaction between ether molecules is less

and therefore, it vaporizes easily and has a higher vapour pressure.

Q7. On adding a non-volatile solute to water, what happens to its boiling point?

Ans. The boiling point of water increases

Q8. Why cooking in a pressure cooker is faster?

Ans. In a pressure cooker, the pressure is high and therefore, the boiling point of water increases and cooking is faster.

Q9. What is the melting point of pure ice?

Ans. It is 0 °C or 273 K.

Q10. How does the addition of a non-volatile solute affect the melting point of ice?

Ans. The melting point of ice decreases.

Q11. Can you change a liquid into vapours below its boiling point?

Ans. Yes, through the process of evaporation which is a surface phenomenon. For example, drying clothes at a lower temperature.

Q12. Which ionic and covalent solids have a lower melting point?

Ans. The covalent solid has a lower melting point.

Q13. Why do they have a lower melting point?

Ans. It is so because covalent compounds have low intermolecular forces of interaction, which can be broken down easily.

Q14. Why do ionic compounds have higher melting points?

Ans. Ionic compounds have high melting points due to electrostatic forces of interaction existing between the ions.

Q15. Nonpolar compounds are volatile. Give reason.

Ans. Nonpolar compounds have weak van der Waals forces existing between the molecules, and they are, therefore, volatile.

Q16. Why are ionic compounds crystalline?

Ans. Ionic compounds are crystalline in nature as they have ions arranged in a specific three-dimensional nature.

Q17. Using melting points, how can we characterise a substance?

Ans. For a pure substance, the melting point will be sharp, i.e., the compound melts completely within a range of 2 °C.

Q18. Would the boiling point of distilled water and hard water be the same?

Ans. No, because hard water contains nonvolatile impurities (Ca and Mg salts) and therefore hard water will have a higher boiling point.