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Diploma in Pharmacy 1st Year

Pharmaceutical Chemistry

Experiment

To determine the melting point of organic compounds like naphthalene and benzoic acid.

Aim:

To determine the melting point of organic compounds like naphthalene and benzoic acid.

Reference :

‘ Dr. Gupta G.D. , Dr. Sharma Shailish , Kaur Baljeet ’ “Practical Manual of Pharmaceutical Chemistry” Published by Nirali Prakashan, Page no 52 - 55

Apparatus and Material Required :

Capillary tube, paraffin, laboratory thermometer with clamp, capillary tube, tripod, kerosene burner, naphthalene, benzoic acid, the aluminium block, and stand.

Theory:

Melting is the process of a compound changing from a solid to a liquid state

when heated, and the melting point is the temperature at which a solid in its pure form melts. Because every pure solid has a distinct melting point, determining the melting point help in the identification of the compound. The melting point of a material is lowered when impurities are present. As a result, melting point can also be used as a criterion for a compound's purity.

The temperature at which a compound changes from liquid to a gas is the boiling point of a compound. The temperature at which a vapour pressure of liquid becomes equal to atmospheric pressure is known as its boiling point. It is a property that is frequently used to determine the purity of a chemical.

Procedure:

Determining the Melting Point of Naphthalene

- 1) One end of the capillary tube should be closed by heating one end in the flame. Then it should be rotated for 2-3 minutes.
- 2) Naphthalene should be taken on a tile and crushed into a fine powder.
- 3) The closed end of the capillary tube should be placed between finger and thumb as shown in figure below.
- 4) The open end of the capillary tube should be dipped in the finely powdered naphthalene.
- 5) The capillary tube should be drained on the table to fill it with the compound to a length of about 1-2 cm.
- 6) The capillary tube should be attached to a thermometer with the help of a thread as shown in the figure below.
- 7) The capillary tube should be placed in the groove of the aluminium block.
- 8) It should be confirmed that the naphthalene-holding capillary tube is centred in the groove.
- 9) The aluminium block should be placed on the tripod and with the help of kerosene burner the block should be heated.
- 10) The temperature should be continuously monitored and noted as soon as the substance starts to melt.
- 11) The temperature (t_1) should be noted as soon as the compound starts to melt.
- 12) The temperature (t_2) should be noted as soon as the compound starts to melt.
- 13) The average of the two readings gives the correct melting point of the substance.

Determining the Melting Point of Benzoic Acid

- 1) Benzoic acid should be taken on a tile and crushed into a fine powder.
- 2) Capillary tube should be closed at its one end through heating.
- 3) The closed end of the capillary tube should be placed between finger and thumb as shown in above figure (a).
- 4) The open end of the capillary tube should be dipped in the finely powdered Benzoic acid.
- 5) The capillary tube should be gently drained to fill it with the compound to a length of about 1-2 cm.

- 6) The capillary tube should be attached to a thermometer with the help of a thread as shown in the above figure (b).
- 7) The capillary tube should be placed in the groove of the aluminium block.
- 8) It should be confirmed that the naphthalene-holding capillary tube is centred in the groove.
- 9) The aluminium block should be placed on the tripod and with the help of kerosene burner the block should be heated.
- 10) The temperature should be continuously monitored and noted as soon as the substance starts to melt.
- 11) The temperature (t_1) should be noted as soon as the compound starts to melt.
- 12) The temperature (t_2) should be noted as soon as the substance has completely melted.
- 13) The average temperature of the substance is determined.

Precautions

- 1) It should be confirmed that the samples of Naphthalene and Benzoic acid are dry and powdered.
- 2) The capillary tube and thermometer should be kept at the equal level.
- 3) The powder should be tightly packed into the capillary tube without any air gaps.

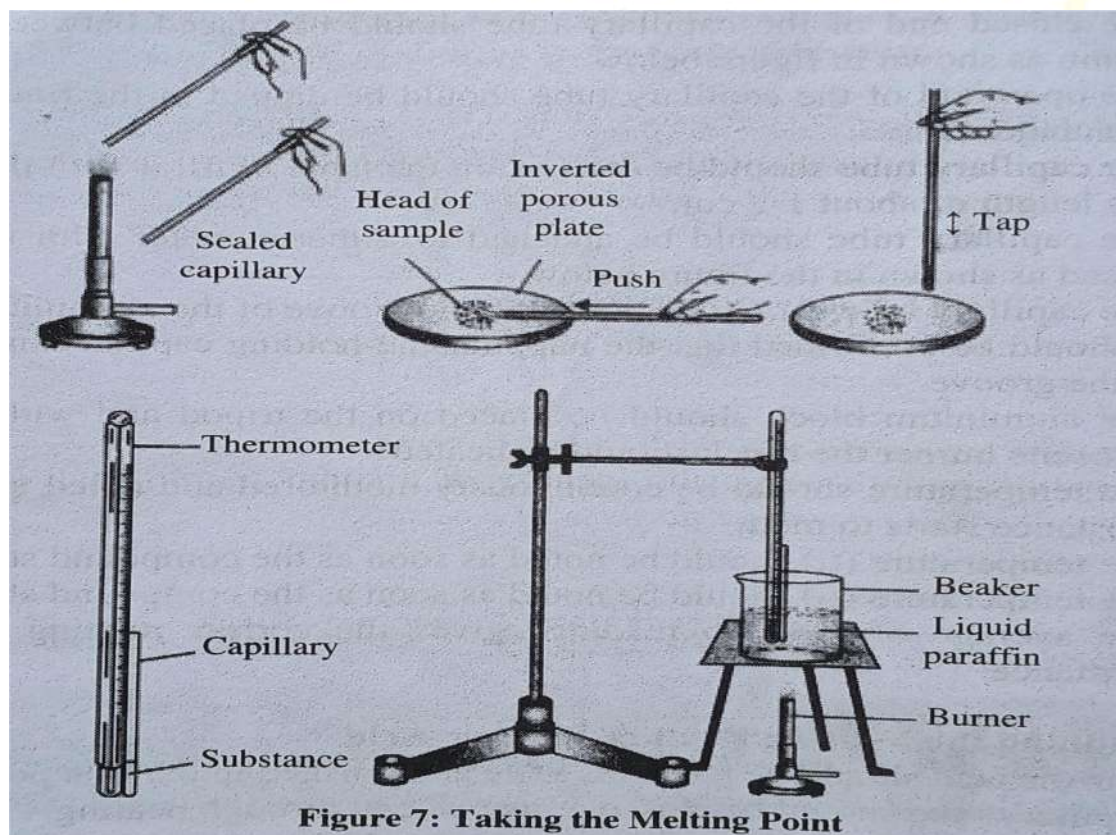


Figure 7: Taking the Melting Point

Observation Table

Temperature Observation of Naphthalene

Temperature t_1	60.06
Temperature t_2	100.56
The melting point of Naphthalene ($t_1+t_2/2$)	80.31

Temperature Observation of Benzoic acid

Temperature t_1	110
Temperature t_2	136.6
The melting point of Benzoic acid ($t_1+t_2/2$)	123.3

Calculation

The melting point of Naphthalene is given by $= t_1+t_2/2$

Where,

t_1 = Initial melting point at which compound starts melting

t_2 = Final melting point at which compound completely melts.

$$\text{So, melting point of Naphthalene} = \frac{60.06+100.56}{2} = \frac{160.62}{2} = 80.31$$

The melting point of Benzoic acid is given by $= t_1+t_2/2$

Where,

t_1 = Initial melting point at which compound starts melting.

t_2 = Final melting point at which compound completely melts.

$$\begin{aligned} \text{So, melting point of Benzoic acid} &= \frac{110 + 136.6}{2} \\ &= \frac{246.6}{2} = 123.3^\circ\text{C} \end{aligned}$$

Uses

It is useful for establishing the identity of a compound as well as providing a good estimate of the relative purity of the sample.

Result: The melting point of given organic compound naphthalene $80.26\text{ }^{\circ}\text{C}$ is about and benzoic acid to be $122.3\text{ }^{\circ}\text{C}$



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