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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 (t2) 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 de 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.

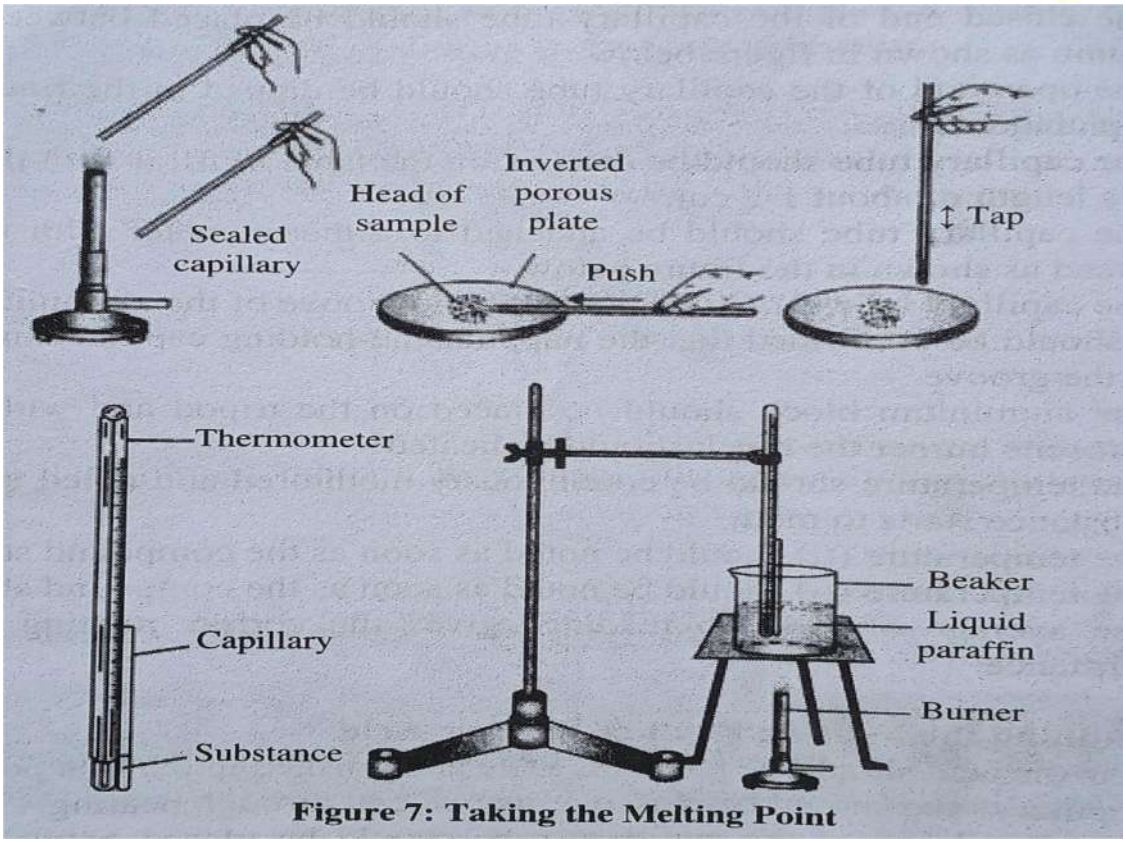

Figure 7: Taking the Melting Point

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.

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.

So, melting point of Benzoic acid = $\frac{110 + 136.6}{2}$

$= \frac{246.6}{2} = 123.3\ ^\circ C$

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 °C is about and benzoic acid to be 122.3 °C

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