الكيمياء العضوية

المحاضره الاولى

درجة الانصهار

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Melting Point of Pure Compounds

The melting point of a pure compound is the temperature at which the solid phase and liquid phase exist in equilibrium at a given atmospheric pressure.

- **Structure of Solid Materials**
- A solid substance consists of crystals formed from thousands of molecules that cannot be seen with the naked eye.
- These crystals are held together by intermolecular forces called Van der Waals forces, and they are arranged in a regular and ordered structure.

- **Properties of Matter in the Solid State**
- The properties of matter in the solid state are:
- The intermolecular distances are very small and the attractive forces are strong.
- There is no freedom of movement or rotation because of the strong intermolecular forces.
- Shape and volume are fixed.

- **Effect of Heat on Solids**
- Thermal energy is used to overcome the lattice energy that holds the molecules together in the crystal.
- As a result, the system changes from an ordered structure (solid state) to a random arrangement (liquid state).

- **Importance of Melting Point**
- The melting point is considered one of the physical constants of solid organic compounds.
- It is used for:
- Identification of solid organic compounds.
- Determination of the purity of solid organic compounds.

- **Purity Determination**
- The purity of a solid compound can be estimated by determining the melting range.
- If the difference is small (1–2 °C), the compound is considered pure.
- If the difference is large (more than 3 °C), the compound is considered impure.

Melting range:

- The difference between the temperature at which melting begins and the temperature at which melting is completed.

- **Factors Affecting Lattice Energy and Melting Point**
- Lattice energy and melting point depend on:
- Molecular weight
- Nature of the compound (ionic or covalent)
- Polarity of the molecules

- **Experimental Procedure**
- Take a capillary tube about 6 cm long made of soft glass and seal one end using a flame.
- Place the sample on a dry porous ceramic plate.
- Grind the sample well and introduce it into the capillary tube to a height of about 1 mm from the sealed end.

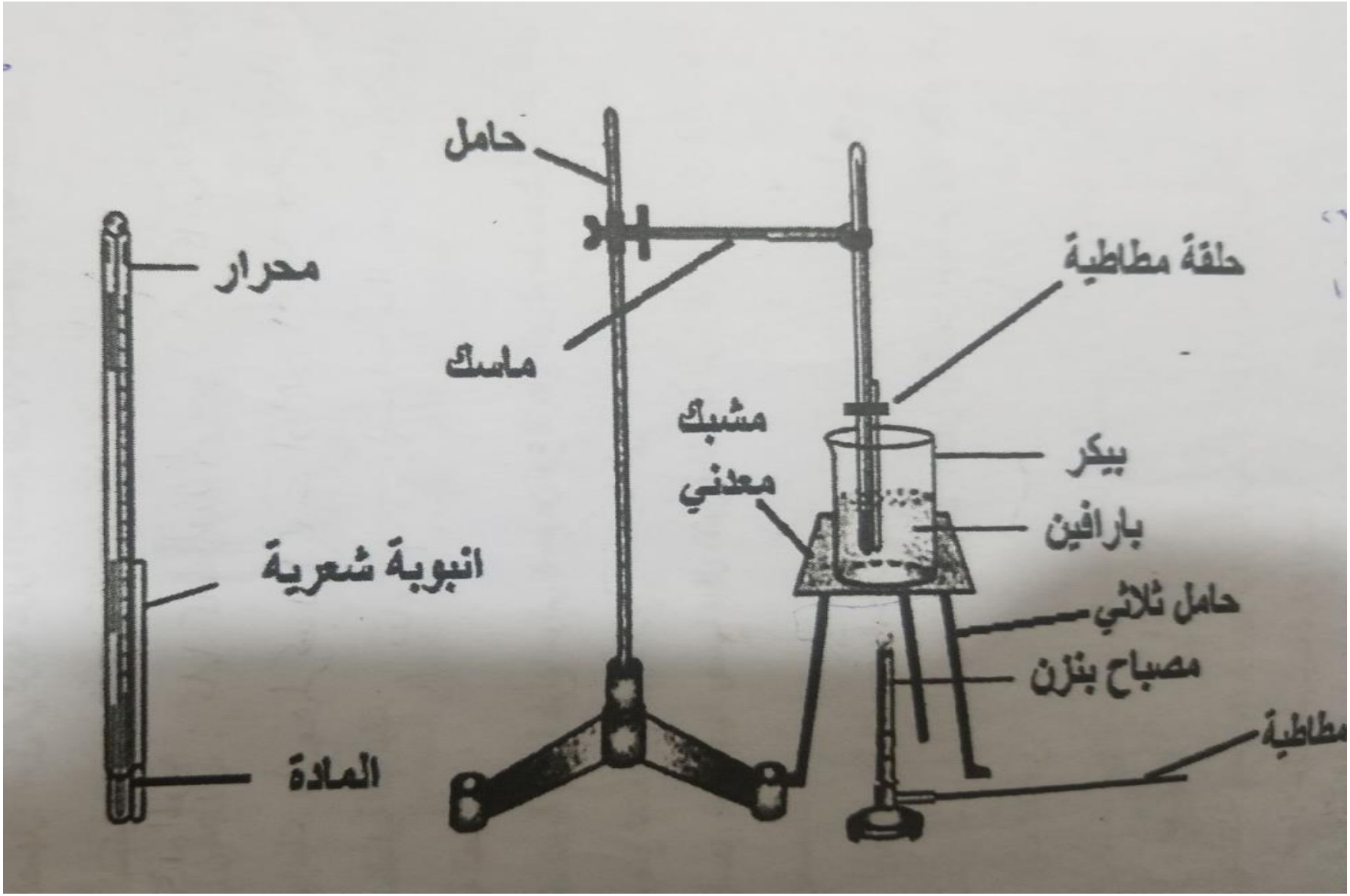
- **Experimental Procedure (continued)**
- Attach the capillary tube to a thermometer using a rubber band, ensuring that the end containing the sample is as close as possible to the thermometer bulb.
- Place them together in a beaker containing paraffin oil.
- Heat the paraffin oil very slowly, and record the temperature at the beginning of melting and at the end of melting.

- It is preferable to use a Kofler melting point apparatus instead of a beaker, because it provides more uniform heat distribution.

Factors Affecting the Melting Point

- Presence of impurities in the sample.
- Heating rate.
- Inaccuracy of the thermometer.

- Why Paraffin Oil is Used for Heating
- Paraffin oil is preferred for heating because:
- It has a relatively low heat capacity, allowing its temperature to change easily during heating or cooling.
- It can be heated up to about 220 °C without decomposition due to its high boiling point.
- It is non-flammable, inexpensive, widely available, and non-toxic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