experiment 2

Determination of boiling point

م.م غزوان ثامر قاسم

- The **boiling point** is defined as the temperature at which the vapor pressure of a liquid (the tendency of molecules at the surface to escape into the gas phase) becomes equal to the atmospheric pressure (760 mmHg).
- In other words, it is the temperature at which the vapor pressure of a liquid equals the external atmospheric pressure.
- The boiling point is considered one of the important physical constants of liquid organic compounds.

- **The boiling point is used for**:
- Identification of liquid organic compounds.
- Determination of the purity of liquid organic compounds.

- **The boiling point can be determined by two methods**:
- Simple distillation, used for large quantities.
- Siwoloboff method, using paraffin oil, for small quantities.

- The **heat of vaporization** is a measure of the energy required to overcome intermolecular forces in a liquid and to separate its molecules into the gas phase.

- **Intermolecular forces include**:
- Van der Waals forces
- Dipole–dipole interactions
- Hydrogen bonding

- **The boiling point of liquids is:**
- Inversely proportional to vapor pressure.
- Directly proportional to the external pressure applied on the liquid surface.
- Impurities generally increase the boiling point of liquids.

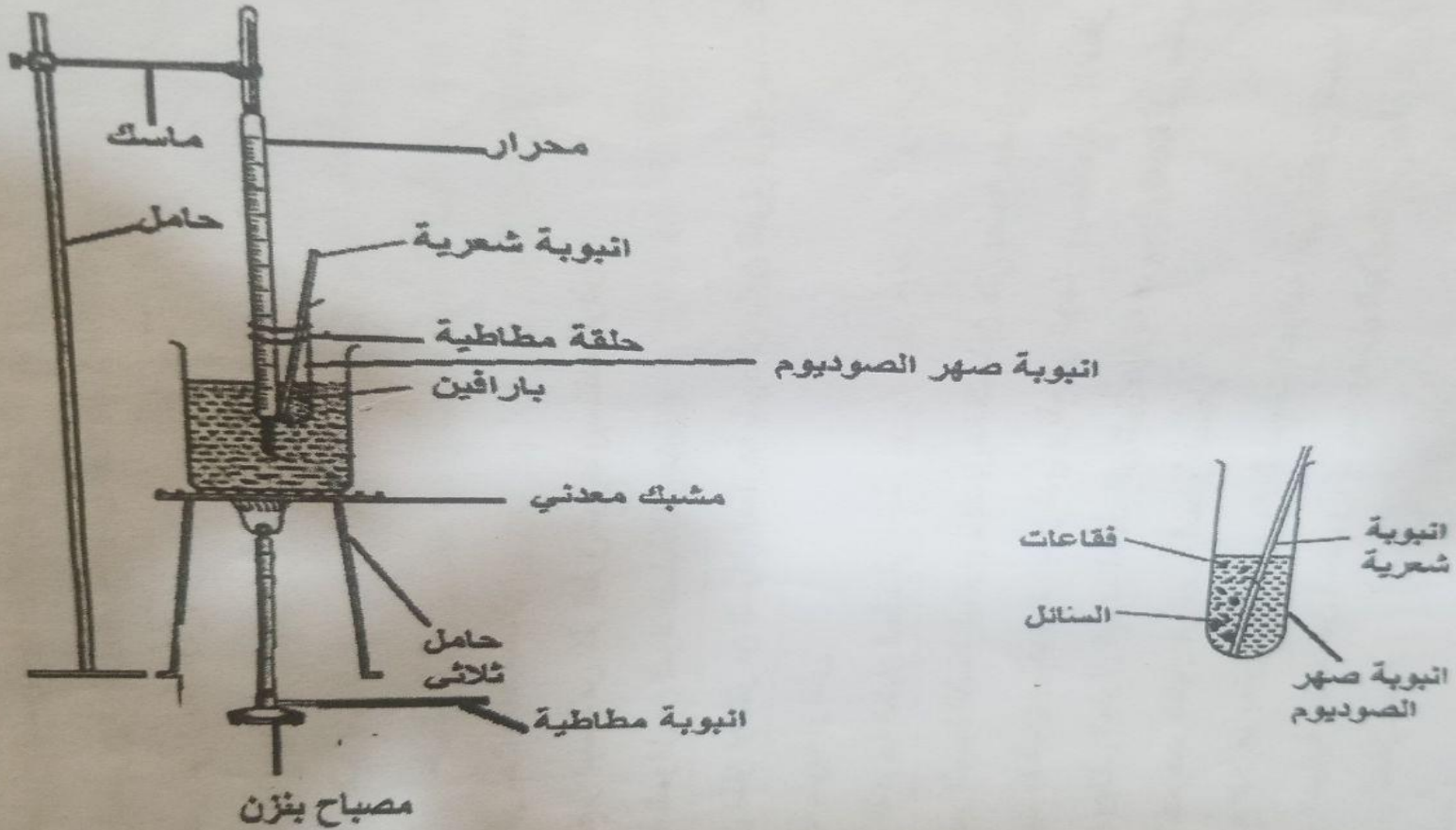
- **Factors affecting boiling point:**
- Impurities
- External pressure
- Intermolecular forces
- Molecular weight

Why use a capillary tube?

- Requires a small amount of sample
- Provides good heat distribution
- Helps observe bubble formation clearly

Procedure:

- Place about 2–3 mL of the liquid sample into a small boiling tube (fusion tube).
- Take a capillary tube and seal one end using a flame.
- Insert the capillary tube into the liquid with the open end facing downward and the sealed end upward.
- Attach the boiling tube to a thermometer using a rubber band so that both are at the same level.
- Fix the thermometer with a clamp and place the setup in a beaker containing paraffin oil.
- Heat gently until bubbles emerge from the capillary tube, then continue heating until a rapid and continuous stream of bubbles appears.
- Remove the heat source and record the temperature at the moment when bubbling stops and liquid begins to enter the capillary tube. This temperature is taken as the boiling point at atmospheric pressure.



جهاز قياس درجة حرارة الغليان