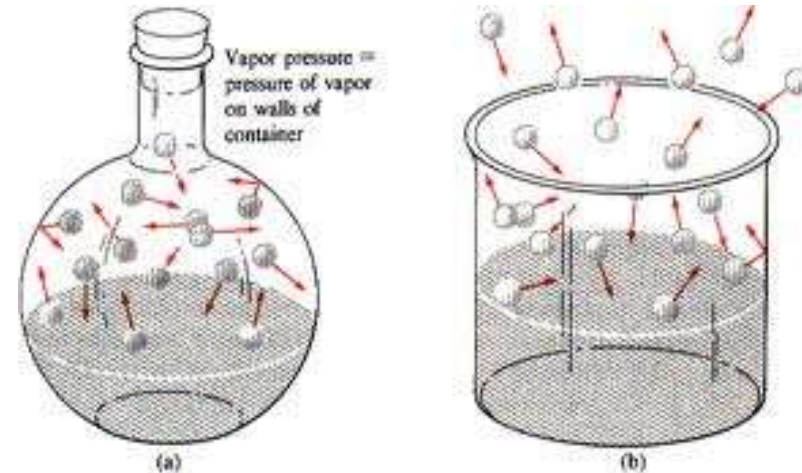


The Liquid state

- ▶ Vapor pressure of liquids:
- ▶ When the rate of condensation equals the rate of vaporization at a definite temperature, the vapor

becomes saturated and a dynamic equilibrium is established. The pressure of the saturated vapor above the liquid is then known as the **equilibrium vapor pressure**

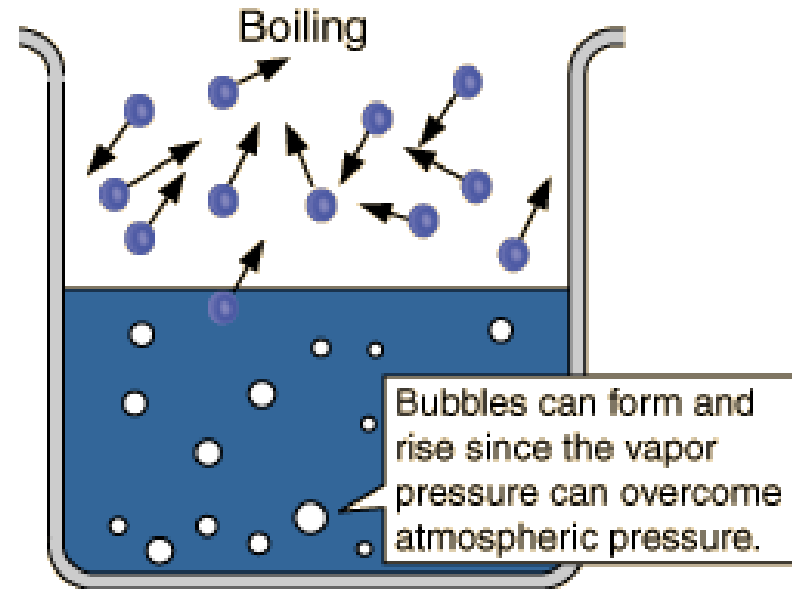
- ▶ *Vapor pressure increase with increase in temperature.*



Boiling

If a liquid is placed in an open container and heated until the vapor pressure equals the atmospheric pressure, the vapor will form bubbles that rise rapidly through the liquid and escape into the gaseous state.

- ▶ The temperature at which the vapor pressure of the liquid equals the external or atmospheric pressure is known as the **boiling point**.



- ▶ The boiling point may be considered the temperature at which thermal agitation can overcome the attractive forces between the molecules of a liquid. Therefore, the boiling point of a compound, like the heat of vaporization and the vapor pressure at a definite temperature, provides a rough indication of the magnitude of the attractive forces.
- ▶ The boiling points of normal hydrocarbons, simple alcohols, and carboxylic acids increase with molecular weight. WHY??
- ▶ Polar molecules usually have higher boiling point than nonpolar. WHY??

Heat of Vaporization & critical temperature

- *Clausius–Clapeyron Equation:*

$$\log \frac{p_2}{p_1} = \frac{\Delta H_v(T_2 - T_1)}{2.303 RT_1 T_2}$$

- ▶ where p_1 and p_2 are the vapor pressures at absolute temperatures T_1 and T_2 , and ΔH_v is the **molar heat of vaporization**, that is, the heat absorbed by 1 mole of liquid when it passes into the vapor state.
- ▶ Heats of vaporization vary somewhat with temperature. For example, the heat of vaporization of water is 539 cal/g at 100°C; it is 478 cal/g at 180°C,