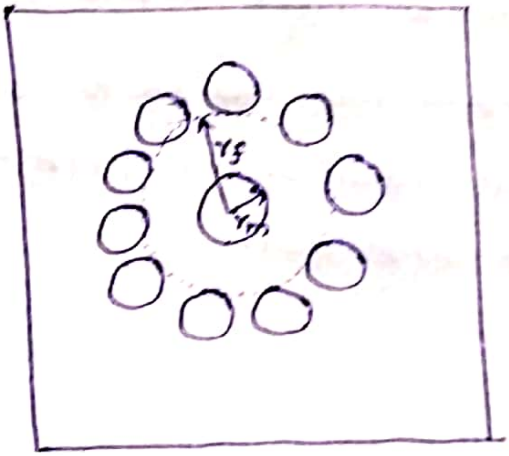
* Free Volume in Liquid :-

In a liquid the molecules move over an infinitesimally small distance before colliding with one another. This is due to the fact that each molecule in a liquid is tightly surrounded by almost 10 to 12 neighbours forming a sort of spherical cage which can be approximated to a spherical box of radius r_f which is only slightly bigger than the enclosed molecule of radius r_m. It is evident that the centre of the caged molecule can move about in a very small volume. This volume of a mole of molecule is known as free volume.



Thermodynamically it can be shown that the magnitude of the free volume is approximately 0.37 cm^3. The free volume per molecule is thus equal to 0.61 Å. Thus we have—

$$(4/3)\,\pi r_f^3 = 0.61\ Å$$

where $r_f = 0.54$ Å.

*. Vapour Pressure :-

The vapour pressure of a liquid at a given temperature is defined as the pressure of the vapour in equilibrium with the liquid at that temperature.

The vapour pressure measures the ease with which a liquid can be converted into vapour. i.e. it is a measure of the volatility of the liquid. It is a measure of the escaping tendency of a molecules from the surface of the liquid.

As the temperature rises, the number of molecules escaping from the liquid surface increases and there is increase in the no. of vapour molecules in the space above the liquid when there equilibrium is attained. Hence, Vapour pressure of a liquid increases with rise in temperature.