

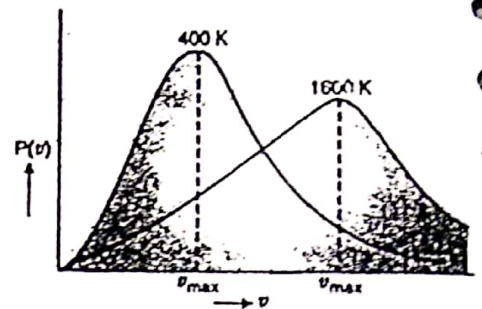
- Q2. Explain the following for gas atoms:
- Most probable speed
 - Average speed
 - R.M.S. speed

Ans.a) Most Probable speed:

We may define *most probable speed of the molecules of a gas as that speed which is possessed by maximum fraction of total number of molecules of the gas.*

It can be shown that

$$C_{mp} = \sqrt{\frac{2 k_B T}{m}} \quad (1)$$



- b) Mean speed or Average speed:

Mean speed or Average speed is the average speed with which a molecule of the gas moves.

$$C_{av} = \frac{C_1 + C_2 + \dots + C_n}{n}$$

From Maxwellian speed distribution law, we can show that

$$C_{av} = \sqrt{\frac{2.56 k_B T}{m}} \quad (2)$$

Where m is mass of each molecule, k_B is Boltzmann constant and T is temperature of the gas.

- c) Root Mean Square Speed:

Root mean square speed of gas molecules is defined as the square root of the mean of the squares of the random velocity of the individual molecules of a gas.

$$C_{rms} = \sqrt{\frac{C_1^2 + C_2^2 + \dots + C_n^2}{n}}$$

From Maxwellian speed distribution law, we can show that

$$C_{rms} = \sqrt{\frac{3 k_B T}{m}} \quad (3)$$

Where the symbols have their usual meaning.

From equations (1), (2) and (3), we find that $C_{mp} : C_{av} : C_{rms} = \sqrt{2} : \sqrt{\frac{8}{\pi}} : \sqrt{3}$

$\therefore C_{rms}$ is maximum and C_{mp} is minimum, out of the three

