[illegible]

Ans. (ii) Maxwell's distribution of molecular velocities :–

—The velocities of the gaseous molecules are different. In o
words, we can say that all the molecules do not possess the same veloci

[illegible] molecules [illegible]
[illegible]
[illegible]
[illegible]

[illegible] according to [illegible]
[illegible] the molecular [illegible]
[illegible] respectively, which

[illegible]

where [illegible] total number of the molecules
[illegible] the number of the molecules having these velocities
[illegible]
[illegible] molecular weight
[illegible] temperature

[illegible] of the total molecules [illegible]

[illegible]
[illegible] known as Maxwell-Boltzmann
[illegible]
[illegible] value of the above equation [illegible]

[illegible]

[illegible]

In this regard, a question is arisen that how many molecules are there which have the same magnitudes of their velocities. Of course, on that time, it was difficult to research upon this point but Maxwell had done this work successfully which was based on the rules of the probabilities known as Maxwell's distribution of molecular velocities.

—On the basis of the probability considerations, according to Maxwell and Boltzmann, the actual distribution of the molecular velocities depend upon their temperature and molecular weights respectively, which can be shown as—

$$\frac{dn_c}{n^1} = 4\pi\left(\frac{M}{2\pi RT}\right)^{1/2} e^{-\frac{MC^2}{2RT}} C^2 d_c$$

Where
- n^1 = Total number of the molecules
- dn_c = The number of the molecules having their velocities in between C & $C + dc$
- M = molecular weight
- T = Temperature

Actually $\frac{dn_c}{n^1}$ is such type of the fraction of the total molecules whose velocities lie in between C & $C + dc$.

The above equation can also be known as Maxwell-Boltzmann distribution law of molecular velocities.

—After dividing by 'd_c' on both sides of the above equation, we have

$$\frac{1}{n^1}\frac{dn_c}{d_c} = \frac{4\pi\left(\frac{M}{2\pi RT}\right)^{3/2} e^{-\frac{MC^2}{2RT}} C^2 \cancel{dc}}{\cancel{dc}}$$

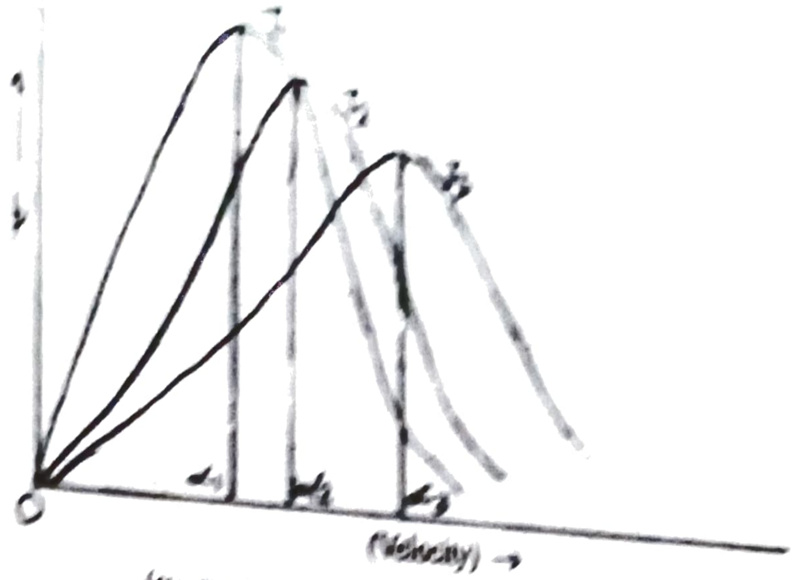
or,

$$p = \frac{1}{n^1}\frac{dn_c}{d_c} = 4\pi\left(\frac{M}{2\pi RT}\right)^{3/2} e^{-\frac{MC^2}{2RT}} C^2$$

where, p = probability of finding of such type of molecules having their velocities = C

—By plotting the graph p Vs.c at the several temperatures, say

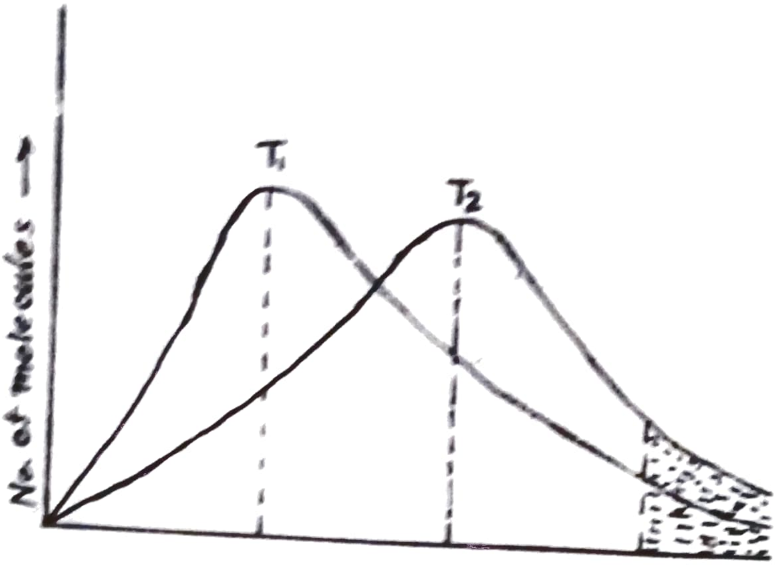
T_1, T_2, T_3 ......



($\alpha_1, \alpha_2, \alpha_3$ ...... indicates the most probable velocities)

Effect of temperature on velocity distribution :

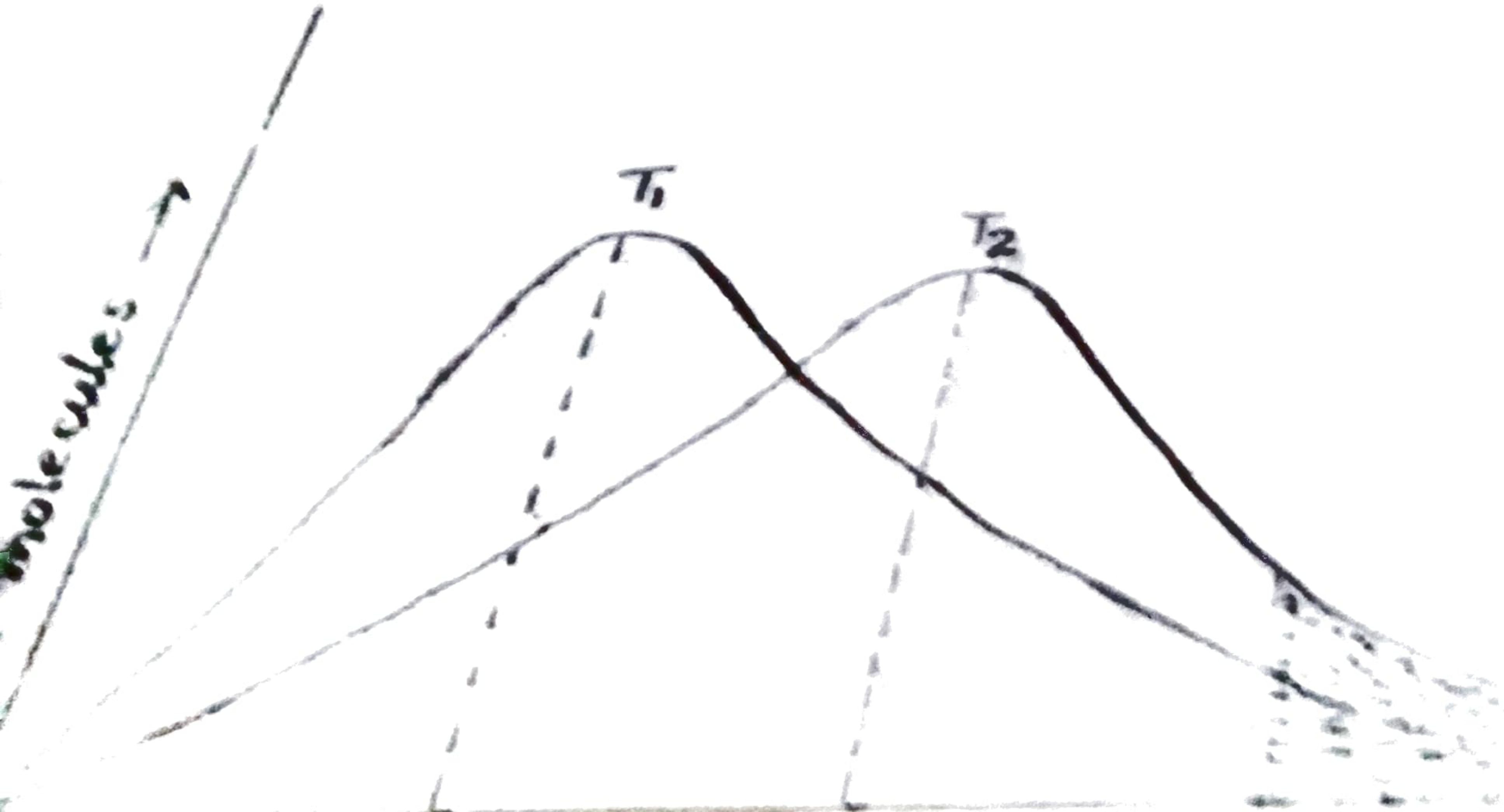
—The velocity distribution of the gaseous molecules is influenced by the increase in temperature.



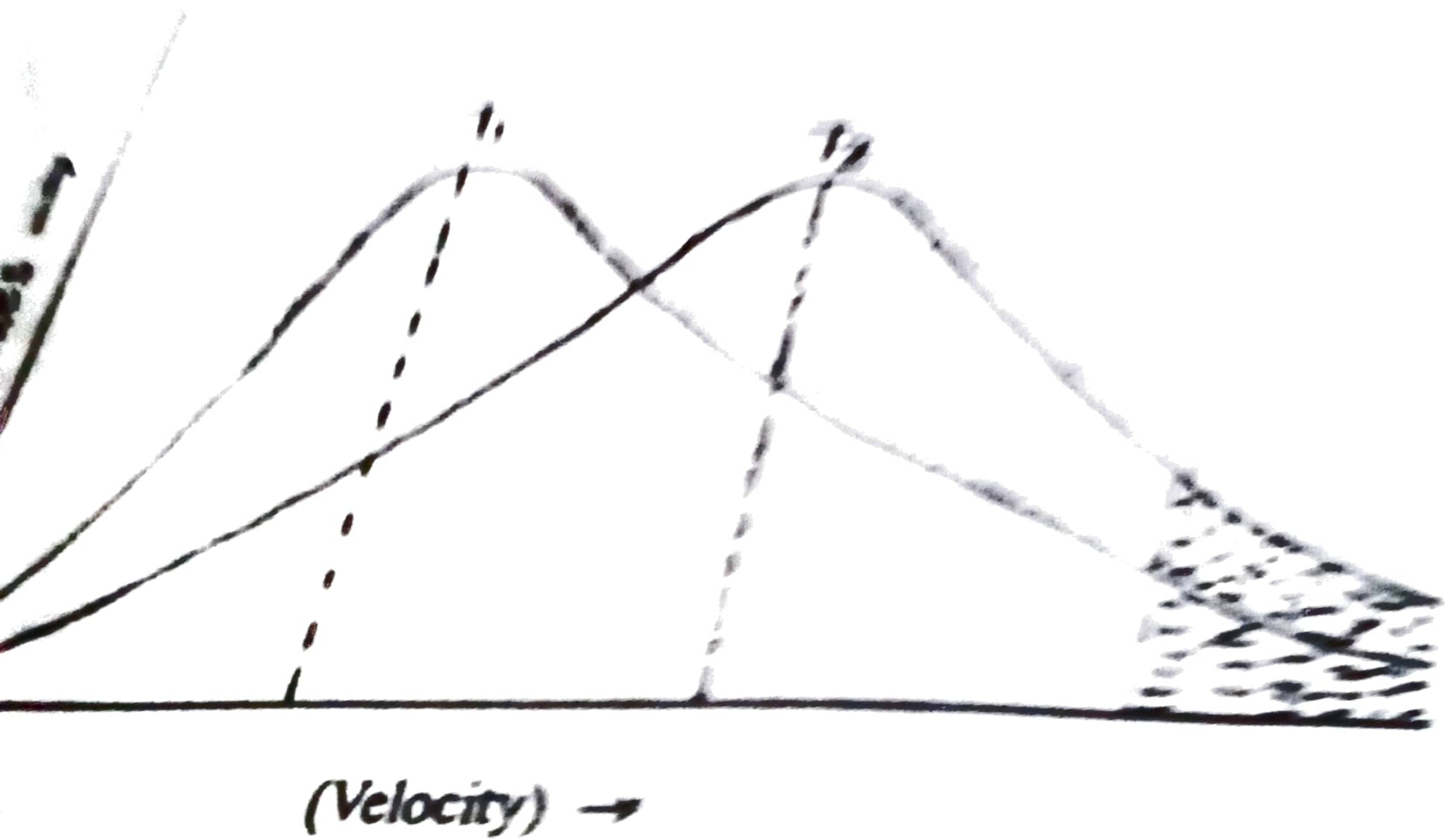
(Velocity) →

—Let us suppose that T_1 and T_2 are the two different temperatures, then at the higher temperature, the most probable velocity will be high but the molecules which have already if got the most probable velocities then in that cases, their number will be decreased. Due to the reason that in such cases they were widely distributed.

—Since the energy of the molecules is a function of velocity. Therefore, the distribution of the energy among the molecules follows the same pattern which is followed by the distribution of the velocities and



molecules →
T1
T2


T₁
T₂
(Velocity) →