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MJC - sem III Unit - I

(Kinetic Theory of Gases.)

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* **Ideal Gas:-** An ideal gas is a theoretical gas composed of a set of randomly-moving, non-interacting point particles. The ideal gas concept is useful because it obeys the ideal gas law, a simplified equation of states, and is amenable to analysis under statical mechanics.

* **MAXWELL - BOLTZMANN STATISTICS :-**

On the basis of assumptions of the Kinetic theory of gases and by applying the laws of probability, James Clerk Maxwell in 1859 derived the law of distribution of speeds among the molecules for an ideal gas in thermal equilibrium.

Later, in 1892, Boltzmann derived his fundamental non-linear integro-differential relation. Which is known as Boltzmann transport equation. This distributions are known as Maxwell-Boltzmann distribution, after the founder of the theory.

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MJC (SEM-III) Unit-I

Statistical Equilibrium:-

Consider a gas having 'N' molecules at a certain temperature and pressure. Suppose its volume, temp, and pressure are constant. The total energy U of this system remains constant. The energy states available to the particles are $E_1, E_2, E_3, \ldots$ etc.

Suppose, that at any given instant of time, n_1 particles are in state of energy E_1, n_2 particles in energy state E_2, and so on.

$\therefore N = n_1 + n_2 + n_3 + \ldots$

$\Rightarrow N = \sum_i n_i$ ——— (1)

where $i = 1, 2, 3, \ldots$ etc

$\therefore$ The total energy of the system

$U = n_1E_1 + n_2E_2 + n_3E_3 + \ldots$

$$\boxed{U = \sum_i n_i E_i} \quad \text{——— (II)}$$

For an isolated system, the total energy U is constant. Thus

$$\boxed{U = \sum_i n_i E_i = \text{constant}}$$