Thermodynamics for Biological Systems:
Classical and Statistical Aspects
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Lecture – 56
Thermodynamic Probability

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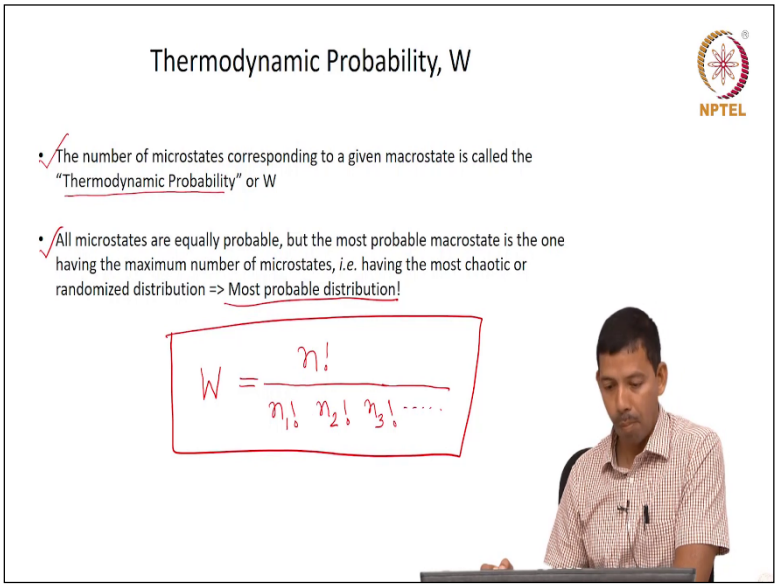

The number of microstates corresponding to a given macro state is called the Thermodynamic Probability and that is denoted by capital W, and it is a very important quantity in statistical thermodynamics. The Thermodynamic Probability (W) can be written for, in general, for a system of n particles.

So, if you have a system of n particle (total number of particle) and let us say particles are distributed in different energy states as you know n1, n2 and n3 where n1 is basically number of particles in energy state 1, n2 is the number of particles in microstate 2, n3 is number of particles energy state 3 and so on and so on so forth. So, this W can be defined as

$$W = \frac{n!}{n_1!\ n_2!\ n_3!\ \ldots\ \ldots}$$

So, this is the outcome of the definition of thermodynamic property which says that all microstates are equally probable, the number of microstates what we have seen for number of microstates for the second example. So, all microstates are equally probable but the most probable macro state is the one which is having the maximum number of microstates.

That is having the most chaotic or randomized distribution and that's the definition of most probability distribution. So, most probability distribution is the one where as number of microstates are maximum.