

The effect of Normalisation on Partition Function – A Brief Review

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In this review we wish to report a most probable approach of normalisation on partition function. And also the nature of thermal wave function as a normalised parameter.

In quantum mechanics the state of a subatomic particle can be described by a function $\Psi(x,y,z,t)$, called wave function for three dimensional degrees of freedom. It determines all measurable quantities of all the systems at a particular state. The probability of finding the particles in between x and $x+dx$, y and $y+dy$, z and $z+dz$ at a time t is equal to $\Psi \Psi^* dx dy dz$. Here Ψ and Ψ^* are the conjugate wave functions which can be integrated by the theorem of normalisation.

Since the particle is finite so the probability density is to be integrated in overall space ranging from

$-\infty$ to $+\infty$ can be as described $\int_{-\infty}^{+\infty} \Psi \Psi^* dV = 1$ where $V(x,y,z)$ (Eqn. 1).

Since in the Eqn 1. the maximum value of Probability is taken so we have to constrain boundary condition to probability, just like for an one dimensional potential well the above equation

is restricted within the range $0 \leq x \leq a$. $\int_0^a \Psi \Psi^* dx = 1$ (Eqn.2).

In statistical mechanics also we are all aware of the most significant term Partition function (q).

The Parameter determines the average number of states that are thermally accessible to a molecule at a particular temperature. So just like electronic wave function the molecular wave function should be normalised.

The term q interprets the thermal wave function of equally spaced energy levels like $0, \epsilon, \dots, n\epsilon$. So $q = \phi(g_j, \epsilon_j)$ at a fixed temperature Temperature T . g_j signifies the level of degeneracy. Eqn.1 can be applied for q to obtain the Eqn.4 as $\int_0^{n\epsilon} q q^* dv = 1$ or $\int_0^{n\epsilon} |q|^2 dv = 1$ (Eqn. 3), $v = \phi(g_j, \epsilon_j)$.

In this way the normalisation procedure helps us to ascertain the certainty of uncertainty starting from electronic wave function to molecular wave function. But it is the paradox that what a conjugate wave function really means? . Just only the square of the absolute value of wave function to make the function more probable ie to convert the wave nature of a particle to its corresponding particle nature. Otherwise the duality term becomes always uncertain or unnatural or beyond our imagination.

REFERENCES

- [1] [en.m.wikipedia.org/wiki/ Normalisation](https://en.m.wikipedia.org/wiki/Normalisation).
- [2] en.m.wikipedia.org/wiki/Partition_function .
- [3] www.av8n.com/physics/thermo/ partition-function.