Operator:— In Quantum Mechanics the role of operator is very important. An Operator, operate a function and changes the nature of function.

It means a function goes under operation by an Operator and provides another function which is different from the original function.

In other words we can say an operator is a symbol, giving instructions for transforming a given mathematical function into another function according to a defined rule.

Operators has no physical meaning if it stands alone.

It is more clear by the following example.

"$\frac{\partial}{\partial x}$" is an operator which in itself has no physical meaning, but if put before a function, it transforms the function into its first derivative with respect to x,

i.e $\frac{\partial}{\partial x} x^2 = 2x$

Here Operator '$\frac{\partial}{\partial x}$' transforms the function x^2 into another function $2x$.

If $\hat{A}$ denotes an operator which transforms the function $f(x)$ into another function $g(x)$,

Then we can write it as,

$$\hat{A} f(x) = g(x).$$

For every physically measurable property of a microscopic system such as position, momentum, Energy... etc. in Classical mechanics, there corresponds an operator in Quantum mechanics.

For example, The operator for Linear momentum in one dimension (along x-axis i.e P_x) is as follow

$$\hat{P}_x = \frac{h}{2\pi i}\frac{\partial}{\partial x}$$

$$= \frac{h \times i}{2\pi i \times i}\frac{\partial}{\partial x}$$

$$= \frac{ih}{2\pi i^2}\frac{\partial}{\partial x} \quad \left[i^2 = -1 \ \& \ \frac{h}{2\pi} = \hbar\right]$$

So, $$\hat{P}_x = -i\hbar\frac{\partial}{\partial x}$$

And the operator for angular momentum along x-axis,

$$\hat{L}_x = \frac{h}{2\pi i}\left(y\frac{\partial}{\partial z} - z\frac{\partial}{\partial y}\right)$$

$$\hat{L}_x = -i\hbar\left(y\frac{\partial}{\partial z} - z\frac{\partial}{\partial y}\right)$$

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