SUBJECT- CHEMISTRY
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PAPER – V
TOPIC - Schrodinger's wave equation and explain its importance

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Q write a short account of Schrodinger's wave equation and explain its importance.

Ans Bohr's model says that electron moves round the nucleus in fixed orbits. But according to schrodinger. The electron does not move round the nucleus in a fixed orbitals(paths). As a matter of fact. there is no sharp path for the electron- circular or elliptical. An electron is described mainly in terms of probability, So the electrons in e Bohr's theory occupy planets like orbits but as per Schrodinger equation, these move in orbitals. Schrodinges equation is a general equation which describes the behaviour of a small particle in terms of wave motion. It is as follows -

$$\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + \frac{8\pi^2 m}{h^2}(E-V)\psi = 0$$

where E is the total energy and V is the potential energy of The System and ψ is the function of the spatial coordinates x, y and z.

for hydrogen atom, there is one electron of charge -e is at a distance r from the nucleus of charge +e the potential energy of the System is $-ke^2/r$, the schrodinger equation will be

$$\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + \frac{8\pi^2 m}{h^2}\left(E + \frac{ke^2}{r}\right)\psi = 0$$

Schrodinger equation is very important because the first three quantum numbers (principle, azimuthal and magnetic) follows in the most natural way by solving the above differential quantum mechanical equation and no postulates, as we have in Bohr's theory, are necessary. However, in the case of Bohr's Theory, quantum numbers have to be inserted arbitrarily. The properties of the atom that can be measured are also given correctly by the equation. In other words, this average distance of the electron from the nucleus in a particular quantum state and also the average velocity with which the electron moves as calculated from this equation is almost The same as were calculated by Bohr. But the wave nature of electrons is considered only by Schrodinger wave equation.