

Quantum Mechanics

1/ Origin of quantum theory :

- Inadequacy of classical mechanics .
- Difficulties with classical theories of black body radiation and origin of quantum theory of radiation .
- Planck's quantum hypothesis and radiation law .
- Quantum theory of radiation and photons .
- Photoelectric effect .
- Bohr's theory of atomic structure .
- Bohr Corresponding principle .

2/ Schrodinger equation and its mathematical Application :

- Development of the wave equation .
- Definition of an operator .
- Operator Algebra .
- Eigenvalue and Eigenfunction .
- Solution of time dependent Schroedinger equation .
- Physical Significance of Ψ .
- Orthogonal , Normalized and Orthonormal functions .
- Expectation Values .
- Probability Current density .
- Ehrenfest theorem .

3/ Fourier techniques and momentum representation :

- Momentum eigenfunctions and their Significance .
- Fourier analysis .
- The Kronecker Delta and Dirac Delta function .
- Co-ordinate and momentum representation .
- Schroedinger wave equation momentum representation .
- Significance of momentum wavefunction .
- Dirac Delta normalization .

4/ One dimensional problems :

- The Free particle .
- A Single Step barrier .
- Energy levels of particle enclosed with in a rigid walls with infinitely High sides .
- Energy levels for square well potential or finite Potential well .
- Simple harmonic oscillator .

5/ Three dimensional problems :

- The Free particle .
- The particle in a box .
- The Square well Potential .
- The harmonic oscillator .
- The hydrogen atom .
- The total angular momentum and Spherical harmonic .

6/ Perturbation Theory :

- Perturbation theory for non – degenerate levels .
- First order perturbation theory for degenerate levels .
- Time dependent perturbation theory .
- The normal helium atom .
- Harmonic perturbation .
- The variation Method .