

PANJAB UNIVERSITY, CHANDIGARH

B.Sc. Part-II SEMESTER-III Paper—C

Paper—C : Quantum Physics-I

Time Allowed : 3 Hours

UNIT-I

Formalism of Wave Mechanics :

- (i) Planck's formula of Black body radiation and energy quantization.
Wave-particle duality—Photoelectric effect. X-ray diffraction, Compton effect, Pair production. Photon and gravity.
De Broglie waves, wave packet, Phase velocity and Group velocity, Electron microscope, Particle in a box, Particle diffraction, Davisson-Germer experiment, Interferometry with particles.
- (ii) Quantum mechanics, Wave equation, Plausible arguments leading to time-dependent Schrodinger equations, Born's interpretation, normalization, Probability current. Probability conservation equation, Principle of superpositions.
- (iii) Fundamental postulates of quantum mechanics. Eigenvalues and eigenfunctions. Operator formalism, Position, momentum and energy operators, expectation values, Ehrenfest theorem, Hermitian operators.

UNIT-II

Problems in One and Three Dimensions :

- (i) Steady-state Schrodinger equation, Application to stationary states for one dimension, Potential step, potential barrier, Tunnel effect examples, Scanning Tunneling microscope, rectangular potential well, Linear harmonic oscillator.
- (ii) Schrodinger equation for spherically symmetric potential, spherical harmonics, hydrogen atom energy levels and eigenfunctions, Principal, Orbital and Magnetic quantum numbers, Electron probability density.