

- MODERN PHYSICS

Special theory of relativity

Time dilation, length contraction, twin paradox, relativity of mass, mass and energy, relation of mass with energy, relativity of kinetic energy, general theory of relativity.

Particular properties of waves

Electrooptic effect, Quantum theory of light, X-ray, X-ray diffraction, Compton effect, gravitational red shift.

Wave properties of particles

De Broglie waves, wave function, wave and group velocity, Diffraction of particles, the uncertainty principle, Applications of uncertainty principle, the wave and particle duality.

Atomic structure

Atomic theories, Alpha-particle scattering, the Rutherford scattering formula, nuclear dimensions, electron orbits, atomic spectra, Bohr atom, energy levels and spectra, atomic excitation, correspondence principle.

Quantum mechanics

The wave equation, Schrodinger's equation, time dependent form, steady-state form, the expectation values, energy quantization, wave function, simple harmonic oscillator, particle in a box,

Molecular physics

Molecular formation, the bonds, vibrational and rotational levels, molecular spectra, binding energy.

Statistical mechanics

Statistical distribution rules, Maxwell-Boltzmann distribution, molecular energy in ideal gas, Bohr-Einstein distribution, black body radiation, Fermi-Dirac distribution

Ultra-sonic waves

Acoustic and sonic waves, the magnetic confinement effect, resonant vibrations in crystals, ultra sonic wave detection, ultra sonic wave speed in liquids, applications.

Selected topics and applications

The laser physics, holography, superconductivity, plasma physics, Vacuum technology, vacuum instruments, thin films.