

ACHARYA NAGARJUNA UNIVERSITY - UG SYLLABUS

Group: B.Sc

Subject: Modern Physics

Year: III

Sem: V

Unit-I:

Atomic and molecular physics: Introduction – Drawbacks of Bohr's atomic model- Sommerfeld's elliptical orbits-relativistic correction (no derivation). Vector atom model and Stern-Gerlach experiment – quantum numbers associated with it. L-S and j-j coupling schemes. Zeeman effect and its experimental arrangement. Raman effect, hypothesis, Stokes and Anti Stokes lines. Quantum theory of Raman effect. Experimental arrangement – Applications of Raman effect.

Unit-II:

Matter waves & Uncertainty Principle: Matter waves, de Broglie's hypothesis - wavelength of matter waves, Properties of matter waves - Davisson and Germer experiment – Phase and group velocities.

Heisenberg's uncertainty principle for position and momentum (x and p), & energy and time (E and t). Experimental verification - Complementarity principle of Bohr.

Unit-III:

Quantum (wave) mechanics: Basic postulates of quantum mechanics-Schrodinger time independent and time dependent wave equations-derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.

Unit-IV:

General Properties of Nuclei: Basic ideas of nucleus -size, mass, charge density (matter energy), binding energy, angular momentum, parity, magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) - Magic numbers.

Radioactivity decay: Alpha decay - basics of α -decay processes. Theory of α -decay, Gamow's theory, Geiger Nuttal law. β -decay, Energy kinematics for β -decay, positron emission, electron capture, neutrino hypothesis.

Unit -V:

Crystal Structure: Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg's law, experimental techniques, Laue's method and powder diffraction method.

Superconductivity: Introduction - experimental facts, critical temperature - critical field - Meissner effect – Isotope effect - Type I and type II superconductors - BCS theory (elementary ideas only) - applications of superconductors.

Reference Books:

1. BSc Physics, Vol.4, Telugu Academy, Hyderabad
2. Molecular Structure and Spectroscopy by G. Aruldas. Prentice Hall of India, New Delhi.
3. Modern Physics by R. Murugesan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Modern Physics by G. Aruldas & P. Rajagopal. Eastern Economy Edition.
5. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
6. Quantum Mechanics, Mahesh C Jain, Eastern Economy Edition.
7. Nuclear Physics, Irving Kaplan, Narosa publishing House.
8. Nuclear Physics, D.C. Tayal, Himalaya publishing House.
9. Elements of Solid State Physics, J.P. Srinivastava, Prentice Hall of India Pvt. Ltd.
10. Solid State Physics, A.J. Dekker, McMillan India.