

Unit 1: Atomic Physics & X-Rays

Vector atom model – Coupling schemes – Pauli's exclusion principle – Zeeman effect – Paschen back effect (Quantitative treatment) - Bohr correspondence principle.

Lyman series-X-rays – Continuous and characteristic X-ray spectra – Moseley's law – Hard and soft X-rays-Applications.

Unit 2: Quantum Physics

Dual nature of matter waves – De Broglie concept of matter wave-Group velocity and phase velocity –Wave function-Continuity conditions-Schrodinger equation – time dependent equation, time independent equation - Particle in a box.

Unit 3: Spectroscopy

Optical activity- Laurent's half shade polarimeter- Dipole moment-Vibration of diatomic molecules-IR Spectra. Polarizability-Raman effect-Classical theory of Raman effect. Magnetic moment of proton-Principles of NMR-Application-MRI. Rotation of molecules-Principles of microwave spectra-Rotation of H₂O molecule-Application-Microwave Oven.

Unit 4: Maser and Laser

Description and working of the Ammonia Maser – Laser-Spontaneous and stimulated emission-Einstein's coefficients- Population inversion-Methods of pumping–Ruby laser – semiconductor laser-Helium-Neon laser – Applications (Quantitative study only)

Unit 5: Nuclear Physics

Lawrence cyclotron-Betatron.

Structure of Nucleus – Liquid drop model – shell model – Magic numbers - Evidence of shell model.

Mass-energy equivalence-Derivation of $E=mc^2$. Nuclear Fission-Chain reaction-Fission reactor-Energy release per fission-Energy equivalent in KWH-Breeder reactor - Thermonuclear fusion-Stellar energy- Carbon cycle-Proton cycle. C¹⁴ dating-Radioactive dating.

Unit 6: Transducers and Display Devices

Classification of transducers – Strain gauge- Gauge factor – Displacement Transducer –Capacitive, Potentiometric and Piezo electric transducer – Thermistor - Characteristics of thermistor- Temperature measurement with the thermistor in a bridge circuit – Photosensitive devices-Photodiode, Phototransistor, Photovoltaic cell and LDR – Optoelectronics –Optocoupler, LCD, Plasma & TFT displays.

Books for study:

1. Arthur Beiser, *Concepts of Modern Physics* (6th Ed), Mc Graw Hill Book Co (2005).
2. T.A Little Field And Thorley, *Atomic And Nuclear Physics* (3rd Edition), Elbs and Van Nostrand Reinhold Co., Ltd., London
3. Murugesan, *Modern Physics*, S.chand & Co, New Delhi
4. A.K.Saxena, *Principle of Modern Physics*, Narosa Publishing House Pvt Ltd. New Delhi (2005)
5. S.P.Singh, M.K.Bagde , *Quantum Mechanics*, S.Chand & Co (2000), New Delhi.
6. Colin.N.Banwell and Elaine M.Mccash, *Fundamentals of Molecular Spectroscopy*, 4th edition.Tata McGraw-Hill Publishing Company Ltd.
7. A.D.Helfrick & W.D.Cooper , *Modern electronic Instrumentation and Measurement techniques*, Prentice-Hall of India(1990) New Delhi.
8. Robert Resnick and David Halliday – *Fundamentals of Physics* 6th edition, John Wiley & sons, Inc.