

B.Sc. Part - II (Physics)

Paper I – Electricity, Magnetism

Electrostatics

Coulomb's law, Electric Field and potentials, Field due to a uniform charged sphere, Derivations of Poisson and Laplace Equations, Gauss Law and its application: The Field of a conductor. Electric dipole, Field and potential due to an electric dipole, Dipole approximation for an arbitrary charged distribution, Electric quadrupole, Field due to a quadrupole, Electrostatic Energy of a charged uniform sphere, Energy of a condenser.

Unit -II

Magnetostatics

Magnetic field, Magnetic force on a current, Magnetic Induction and Biot – Savart Law, Lorentz Force, Vector and Scalar Magnetic potentials, Magnetic Dipole, Magnetomotive force and Ampere's Circuital theorem and its applications to calculate magnetic field due to wire carrying current and solenoid.

Unit -III

Electromagnetic Induction

Laws of Induction, Faraday's laws and Lenz's Law. Mutual and Self Induction, Vector potential in varying Magnetic field, Induction of current in continuous media, Skin effect. Motion of Electron in changing magnetic field, Betatron, Magnetic energy in field, Induced magnetic field (Time varying electric field), Displacement current, Maxwell's equations, Electromagnetic waves in free space, Poynting Vector, Theory and working of moving coil ballistic galvanometer.

Unit -IV

Dielectrics

Dielectric constant, polarization, Electronic polarization, Atomic or ionic Polarisation, Polarisation charges, Electrostatic equation with dielectrics, Field, force and energy in Dielectrics.

Magnetisation Properties of Matter

Intensity of magnetization and magnetic susceptibility, Properties of Dia, Para and Ferromagnetic materials, Curie temperature, Hysteresis and its experimental determination.

Paper II – Thermal Physics

Unit – I

Thermal equilibrium, Zeroth law of thermodynamics, Temperature concept, Equations of State, Van der Waal's equation, Critical constants, principle of corresponding states.

Unit –II

First law of thermodynamics , Absolute scale of temperature Entropy , Degradation of energy , Enthalpy Helmholtz function , Gibbs function , Maxwell's thermodynamics relations and their application.

Unit –III

Differential and Integral Joule Thomson effect, Inversion temperature, Liquification of gasses (no Experimental details). Adiabatic demagnetization, He I and II. Clausius Clapeyron equation.

Unit – IV

Kinetic theory, Maxwell – Boltzmann law, Equipartition of energy, Mean free path, transport phenomena, Brownian motion Avogadro number.

Thermodynamic and Kinetic temperature, Blackbody radiation, Stefan Boltzmann's law , Plsnck's law and its verification .

Paper III – Elements of Quantum Mechanics and Atomic Spectra.

Unit –I

Inadequacies of classical mechanics , Photoelectric phenomena , Compton effect , Wave-particle duality , de Briglie matter waves and their experimental verification , Heisenberg's Uncertainty principle , Complementary principle , Principle of superposition , Motion of wave packets .

Unit –II

Schr'odinger wave equation , Interpretation of wave function , Expectation values of dynamical variables , Ehrenfest theorem , Orthonormal properties of wave functions , One diomensional motion in step potential , Rectangular barrier , Square well potential , Particle in a box normalization .

Unit –III

Bohr atomic model, Sommerfeld elliptic orbits, Spin and orbital magnetic moments, Stern – Gerlach experiment, Pauli's exclusion principle and periodic table. Optical spectra of alkali and alkaline earth elements, Fine structure of spectral lines, Coupling schemes (LS and JJ) for two electron systems.

Unit -IV

Normal and anomalous Zeeman Effect and Paschen Back effect of one electron systems, Experimental observation, X-ray spectra – continuous and characteristic, their generation and uses, Spin and screening doublets.

Books Recommended:

1. A Beiser- Concept of Modern Physics, McGraw-Hill, New York.
2. R.M. Eisberg – fundamentals of Modern Physics, Wiley, New York.
3. H.E. White – Introduction to Atomic Spectra, McGraw-Hill, New York.