

GOVT. D. B. GIRLS' P. G. (AUTO.) COLLEGE
RAIPUR CHHATTISGARH

DEPARTMENT OF PHYSICS

SYLLABUS OF B. Sc. PHYSICS

SESSION 2020 – 2021

DEPARTMENT OF PHYSICS

B. Sc. PHYSICS ANNUAL EXAMINATION 2020

THEORY

Class	No.	TITLE	MARKS	
			Max.	Min.
B. Sc I	Paper I	MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER	50	17
	Paper II	ELECTRICITY, MAGNETISM AND ELECTROMAGNETIC THEORY	50	17
B. Sc II	Paper I	THERMODYNAMICS, KINETIC THEORY AND STATICAL PHYSICS	50	17
	Paper II	WAVES, ACOUSTICS & OPTICS	50	17
B. Sc III	Paper I	RELATIVITY, QUANTUM MECHANICS, ATOMIC, MOLECULAR AND NUCLEAR PHYSICS	50	17
	Paper II	SOLID STATE PHYSICS, SOLID STATE DEVICES AND ELECTRONICS	50	17

PRACTICAL

Class	Practical	Max.	Min.
B. Sc. I	Group A and Group B	50	17
B. Sc. II	Group A and Group B	50	17
B. Sc. III	Group A and Group B	50	17



GOVT. D. B. GIRLS' P. G. (AUTONOMOUS) COLLEGE
RAIPUR, C. G.
CLASS B. SC. I

SUBJECT – PHYSICS PAPER- I
MECHANICS, OSCILLATIONS AND PROPERTIES OF MATTER

Min. Marks : 17

Max.Marks:50

Unit-I Mechanics

Cartesian, Cylindrical and Spherical co-ordinate system, Inertial and non-inertial frames of reference, uniformly rotating frame, Coriolis force and its applications. Motion under a central force, Kepler's laws. Effect of centrifugal and Coriolis force due to earth's rotation. Center of mass (C.M.). Lab and CM frame of reference, motion of C.M. of system of particles subject to external forces, elastic and inelastic collisions in one and two dimensions, Scattering angle in the laboratory frame of reference. Conservation of linear and angular momentum. Conservation of energy.

Unit-II Oscillations and Rigid body Motion

Rigid body motion, rotational motion, moment of inertia and their products, principal moments and axes. Introductory idea of Euler's equations. Potential well and periodic oscillations, case of harmonic oscillations, differential equation and its solution, kinetic and potential energy, examples of simple harmonic oscillations, spring and mass system, simple and compound pendulum, torsional pendulum.

Unit-III Superposition of Harmonic Motions

Bifilar oscillations, Helmholtz resonator, LC circuit, vibrations of a magnet, oscillations of two masses connected by a spring. Superposition of two simple harmonic motions of the same frequency, Lissajous figures, case of different frequencies. Damped harmonic oscillator, power dissipation, quality factor, examples, driven (forced) harmonic oscillator, transient and steady states, power absorption, resonance.

Unit- IV. Motion of charged Particles in electric and Magnetic Fields

(Note: The emphasis here should be on the mechanical aspects and not on the details of the apparatus mentioned which are indicated as applications of principles involved.)

E as an accelerating field, electron gun, case of discharge tube, linear accelerator, E as a deflecting field, CRO, sensitivity. Transverse B field, 180 degree deflection, mass spectrograph, curvature of tracks for energy determination, principle of a cyclotron. Mutually perpendicular E and B fields, velocity selector, its resolutions. Parallel E and B fields, positive ray parabolas, discovery of isotopes, elements of mass spectrographs, principle of magnetic focusing (lens).

Unit- V. Properties of Matter

Elasticity : Strain and stress, elastic limit, Hook's law. Modulus of rigidity. Poisson's ratio. Bulk modulus. Relation connecting different elastic-constants, twisting couple of a cylinder (solid and hollow). Bending moment, Cantilever, Young modulus by bending of beam.

Viscosity : Poiseuille's equation of liquid flow through a narrow tube, equations of continuity. Euler's equation, Bernoulli's theorem, viscous fluids, streamlin and tuberlent flow. Poiseull's law. Coefficient of viscosity, Stoke's law. Surface tention and moleculer interpretation of surface tention, surface energy. Angle of contact. Wetting.

 

Min. Marks : 17

Max.Marks:50

Unit I Mathematical Background

Repeated integrals of a function of more than one variable, definition of a double and triple integral. Gradient of a scalar field and its geometrical interpretation, divergence and curl of a vector field and their geometrical interpretation, line, surface and volume integrals, flux of a vector field. Gauss's divergence theorem. Green's theorem and Stoke's theorem and their physical significance. Kirchoff's law Ideal constant-voltage and Constant-current Sources. Thevenin theorem, Norton theorem. Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem.

Unit-II Electrostatics

Coulomb's law in vacuum expressed in vector form. Calculations of E for simple distributions of charges at rest, dipole and quadrupole fields. Work done on a charge in an electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Relation between Electric potential and electric field, torque on a dipole in a uniform electric field and its energy, flux of the electric field. Gauss's law and its application for finding E due to (1) an infinite line of charge, (2) a charged cylindrical conductor, (3) an infinite sheet of charge and two parallel charged sheets, capacitors, electrostatic field energy. Force per unit area on the surface of a conductor in an electric field, conducting sphere in a uniform field.

Unit-III Dielectrics; steady and Alternating Currents

Dielectric constant. Polar and Non Polar dielectrics. Dielectrics and Gauss's Law. Dielectric Polarization. Electric Polarization vector P, electric displacement vector D. Relation between three electric vectors, Dielectric susceptibility and permittivity. Polarizability and mechanism of Polarization. Lorentz local field. Clausius Mossotti equation, Debye equation.

Ferroelectric and Paraelectric dielectrics. Steady current, current density J, non-steady currents and continuity equation, rise and decay of current in LR, CR and LCR circuits, decay constants, AC circuits, complex numbers and their applications in solving AC circuit problems, complex impedance and reactance, series and parallel resonance, Q factor, power consumed by an AC circuit, power factor.

Unit-IV Magnetostatics

Magnetization Current and magnetization vector M, three magnetic vectors and their relationship. Magnetic permeability and susceptibility. Diamagnetic, paramagnetic and ferromagnetic substances. B.H. Curve, cycle of magnetization and hysteresis, Hysteresis loss. Biot and Savart's law and its applications: B due to (1) a straight Current Carrying Conductor and (2) Current Loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole), Ampere's circuital law (Integral and Differential Forms).

Unit- V. Time Varying Fields and Electromagnetic Waves

Electromagnetic induction, Faraday's law, electromotive force, $\mathcal{E} = \int \mathbf{E} \cdot d\mathbf{r}$, integral and differential forms of Faraday's law, mutual and self inductance, transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density. The wave equation satisfied by E and B, Plane electromagnetic waves in vacuum, Poynting's vector.

 