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. II

SUBJECT – PHYSICS PAPER- I **Min. Marks : 17**

THERMODYNAMICS, KINETIC THEORY AND STATICAL PHYSICS **Max.Marks:50**

UNIT I

The law of thermodynamics: The Zeroeth law, first law of thermodynamics, internal energy as a state function, reversible and irreversible change, Carnot's theorem and the second law of thermodynamics. Clausius theorem inequality. Entropy, Change of entropy in simple cases: (i) Isothermal expansion of an ideal gas (ii) Reversible isochoric process (iii) Free adiabatic expansion of an ideal gas. Concept of Entropy, Entropy of the universe. Entropy change in revercible and irrevercible process. Entropy as a thermodynamic variable ,S-T diagram. Principle of increase of entropy. The thermodynamic scale of temperature. Third law of thermodynamics. Concept of negative temperature.

UNIT II

Thermodynamic functions , Internal energy, Enthalpy, helmholts functions and Gibb's free energy, Maxwell thermodynamical equations and their applications. TdS equations, energy and heat capacity equations, Applications of Maxwell's equations in joul-Thomsom cooling, adeabetic cooling of system, Wanderwall Gas, Clausius- Clapeyron heat equation.

Black body radiation: Pure temperature dependence, Stefan – Boltzmann law, pressure of radiation, spectral distribution of black body radiation, Wien's displacement law, Rayleigh – Jean's law, Planck's quantum theory of radiation.

UNIT III

Maxwellian distribution of speeds in an ideal gas: Distribution of speeds and of velocities, experimental verification, distinction between mean, rms and most probable speed values. Doppler's broadening of the spectral lines.

Transport phenomena in gases: Molecular collisions mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure. Behaviour of real Gases: Deviations from the Ideal Gas Equation. The Virial equation. Andrew's experiments. Experiments on CO_2 gas. Critical constant.

UNIT IV

The statistical basis of thermodynamics: Probability and thermodynamic probability, principle of equal a priori probabilities, statistical postulates. Concept of Gibb's ensemble, accessible and inaccessible states. Concept of phase space, Gamma phase space and mu phase space. Equilibrium before two systems in thermal contact, Probability and entropy, Boltzmann entropy relation. Boltzmann canonical distribution law and its applications, law of equipartition of energy. Transition to quantum statistics: 'h' as a natural constant and its implications, cases of particle in a one – dimensional box and one – dimensional harmonic oscillator.

UNIT V

Indistinguishability of particles and its consequences, Bose–Einstein & Fermi–Dirac conditions. Concept of partition function, Derivation of Maxwell - Boltzmann, Bose - Einstein and Fermi - Dirac statistics through canonical partition function. Limits of B–E and F–D statistics to M –B statistics. Application of B –E statistics to black body radiation. Application of F- D statistics to free electros in a metal.

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CLASS B. SC. II

SUBJECT – PHYSICS PAPER- II **Min. Marks : 17**

Title: WAVES, ACOUSTICS & OPTICS **Max .Marks: 50**

UNIT I

Waves in media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves. Waves over liquid surface: gravity waves and ripples. Group velocity and phase velocity and relationship between them. Production and detection of Ultrasonic and Infrasonic waves and application.

Reflection, refraction and diffraction of sound: Acoustic impedance of a medium, percentage reflection and refraction at a boundary, impedance matching for transducers, diffraction of sound, Principle of a sonar system, sound ranging.

UNIT II

Fermat's principle of extremum path, the aplanatic points of a sphere and other applications. Cardinal points of an optical system, thick lens and lens combinations. Lagrange's equation of magnification, telescopic combination, telephoto lenses. Monochromatic aberrations and their reductions; aspherical mirrors and Schmidt corrector plates, alpanatic points, oil immersion objectives, meniscus lens. Optical instruments: entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces (Ramsden & Huygen's eyepieces).

UNIT III

Interference of light : The principle of superposition, two slit interference, coherence requirement for the sources, optical path retardation, Conditions for sustained interference, Theory of Interference, Thin fins. Newton's rings and Michelson interferometer and their applications for precision determination of wavelength, wavelength deference and the width of spectral lines. Multiple beam interference in parallel film and Fabry – Perot interferometer. Rayleigh refrectometer, Twymann Green Interferometer and its uses.

UNIT IV

Fresnel half- period zones, Phasor diagram and integral calculus methods, the intensity distribution, Zone plates, Diffraction due to straight edge , Fraunhofer diffraction at a slit and duble slit, Diffraction at N parallel slits, plane diffraction grating, Rayleigh criteria, resolving power of grating, prism, telescope. Polarized light and its mathematical representation, production of polarized light by reflection, refraction and scattering. Polarization by double refraction and Huygen's theory, Nicol prism, retardation plates, production and analysis of circularly and elliptically polarized light. Optical activity and Fresnel's theory, Biquartz polarimeter.

UNIT V

Laser system: Basic properties of Lasers, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion. Types of lasers: Ruby and He – Ne lasers and Application of lasers: Application in communication, Holography and basics of non – linear optics and generation of harmonics.