

GOVERNMENT COLLEGE FOR WOMEN, SIRSA

DEPARTMENT OF PHYSICS

LESSON PLAN (2023-24)

BSC-I

JANUARY

Rotation of rigid body, Moment of inertial, Torque, angular momentum, Kinetic Energy of rotation. Theorem of perpendicular and parallel axes (with proof), Moment of inertia of solid sphere, hollow sphere, spherical shell, solid cylinder, hollow cylinder and solid bar of rectangular cross-section, Fly wheel, Moment of inertia of an irregular body, Acceleration of a body rolling down on an inclined plane.

Elasticity, Stress and Strain, Hook's law, Elastic constant and their relations, Poisson's ratio, Torsion of cylinder and twisting couple, Determination of coefficient of modulus of rigidity for the material of wire by Maxwell's needle, Bending of beam (Bending moment and its magnitude), Cantilever and Centrally loaded beam, Determination of Young's modulus for the material of the beam and Elastic constants for the material of the wire by Searle's method.

FEBRUARY

Assumption of Kinetic theory of gases, pressure of an ideal gas (with derivation), Kinetic interpretation of Temperature, Ideal Gas equation, Degree of freedom, Law of equipartition of energy and its application for specific heat of gases, Real gases, Vander wall's equation, Brownian motion(Qualitative).

Maxwell's distribution of speed and velocities (derivation required), Experimental verification of Maxwell's law of speed distribution: most probable speed, average and r.m.s. speed, Mean free path, Transport of energy and momentum, Diffusion of gases.

MARCH

Energy bands in solids, Intrinsic and extrinsic semiconductors, carrier mobility and electrical resistivity of semiconductors, Hall effect, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode, Zener diode as a voltage regulator. Light emitting diodes (LED), Photoconduction in semiconductors, Photodiode, Solar Cell, p-n junction as a rectifier, half wave and full wave rectifiers (with derivation), filters (series inductor, shunt capacitance, L-section or choke, π and R.C. filter circuits).

Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes), Common base, common emitter and common collector characteristics of transistor, Constants of a transistor and their relation, Advantages and disadvantages of C-E configuration. D.C. load line .Transistor biasing; various methods of transistor biasing and stabilization.

APRIL

Amplifiers, Classification of amplifiers, common base and common emitter amplifiers, coupling of amplifiers, various methods of coupling, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation), Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers. Oscillators, Principle of oscillation, classification of oscillators, Condition for self sustained oscillation: Barkhausen criterion for oscillation, Tuned collector common emitter oscillator, Hartley oscillator, C.R.O. (Principle and Working).

السنة

DEPARTMENT OF PHYSICS

LESSON PLAN (2023-24)

BSC-II

JANUARY

Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent. Probability, statistical probability, A- priori Probability and relation between them, probability theorems, some probability considerations, combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of Coins, Permutations and combinations, distributions of N (for $N=2,3,4$) distinguishable and indistinguishable particles in two boxes of equal size, Micro and Macro states, Thermodynamical probability, Constraints and Accessible states, Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact-- β parameter, Entropy and Probability (Boltzman's relation).

Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics. M. B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of σ and β), speed distribution law & velocity distribution law. Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian distribution.

FEBRUARY

Need for Quantum Statistics: Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E. gas, Degeneracy and B.E. Condensation, Fermi-Dirac energy distribution law, F.D. gas and Degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law, Fermi Dirac gas and degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law for electron gas in metals, Zero point energy, Zero point pressure and average speed (at 0 K) of electron gas, Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, Comparison of three statistics.

Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature, Einstein theory of specific heat, Criticism of Einstein theory, Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories.



MARCH

Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygen's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).

Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem, even and odd functions, Fourier series of functions $f(x)$ between (i) 0 to 2π , (ii) $-\pi$ to π , (iii) 0 to π , (iv) $-L$ to L , complex form of Fourier series, Application of Fourier theorem for analysis of complex waves: solution of triangular and rectangular waves, half and full wave rectifier outputs, Parseval identity for Fourier Series, Fourier integrals.

APRIL

Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations, (iii) to the following functions:

1. $f(x) = e^{-x^2/2}$

1 $|X| < a$

2. $f(x) =$

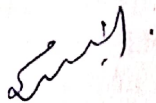
0 $|X| > a$

Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses.

Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies.

Fiber Optics

Optical fiber, Critical angle of propagation, Mode of Propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication, Advantages.



DEPARTMENT OF PHYSICS

LESSON PLAN (2023-24)

BSC-III

JANUARY

Crystalline and glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis, crystal translational vectors and axes. Unit cell and Primitive Cell, Wigner Seitz primitive Cell, symmetry operations for a two dimensional crystal, Bravais lattices in two and three dimensions. Crystal planes and Miller indices, Interplaner spacing, Crystal structures of Zinc Sulphide, Sodium Chloride and Diamond.

X-ray diffraction, Bragg's Law and experimental X-ray diffraction methods. K-space and reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c.

FEBRUARY

Historical introduction, Survey of superconductivity, Super conducting systems, High Tc Super conductors, Isotopic Effect, Critical Magnetic Field, Meissner Effect, London Theory and Pippards' equation, Classification of Superconductors (type I and Type II), BCS Theory of Superconductivity, Flux quantization, Josephson Effect (AC and DC), Practical Applications of superconductivity and their limitations, power application of superconductors.

Definition, Length scale, Importance of Nano-scale and technology, History of Nantechnology, Benefits and challenges in molecular manufacturing. Molecular assembler concept, Understanding advanced capabilities. Vision and objective of Nano-technology, Nanotechnology in different field, Automobile, Electronics, Nano-biotechnology, Materials, Medicine.

MARCH

Introduction of early observations, emission and absorption spectra, atomic spectra, wave number, spectrum of Hydrogen atom in Balmer series, Bohr atomic model(Bohr's postulates) , spectra of Hydrogen atom , explanation of spectral series in Hydrogen atom, un-quantized states and continuous spectra, spectral series in absorption spectra, effect of nuclear motion on line spectra (correction of finite nuclear mass), variation in Rydberg constant due to finite mass, short comings of Bohr's theory, Wilson sommerfeld quantization rule, de-Broglie interpretation of Bohr quantization law, Bohr's corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld theory, Vector atom model; space quantization, electron spin, coupling of orbital and spin angular momentum, spectroscopic terms and their notation, quantum numbers associated with vector atom model, transition probability and selection rules.

Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic filed; Larmors' precession and theorem.

Penetrating and Non-penetrating orbits, Penetrating orbits on the classical model;

Quantum defect, spin orbit interaction energy of the single valence electron, spin orbit interaction for penetrating and non-penetrating orbits, quantum mechanical relativity correction, Hydrogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, Rydberg-Ritz combination principle, Absorption spectra of Alkali atoms, observed doublet fine structure in the spectra of alkali metals and its Interpretation, Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum.

APRIL

Essential features of spectra of Alkaline-earth elements, Vector model for two valence electron atom: application of spectra.

Coupling Schemes: LS or Russell – Saunders Coupling Scheme and JJ coupling scheme, Interaction energy in L-S coupling (sp, pd configuration), Lande interval rule, Pauli principal and periodic classification of the elements, Interaction energy in JJ Coupling (sp, pd configuration), equivalent and non-equivalent electrons, Two valence electron system-spectral terms of non-equivalent and equivalent electrons, comparison of spectral terms in L-S And J-J coupling, Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin.

Zeeman Effect (normal and Anomalous), Experimental set-up for studying Zeeman effect, Explanation of normal Zeeman effect (classical and quantum mechanical), Explanation of anomalous Zeeman effect (Lande g-factor), Zeeman pattern of D1 and D2 lines of Na atom, Paschen-Back effect of a single valence electron system. Weak field Stark effect of Hydrogen atom.

Molecular Physics

General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region), Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra.

