Name of the Asstt./ Asso.Professor: **Amit Kumar**
Class and Section: **B.Sc. 6th Semester, section C+D**
Subject/ Paper: **Atomic and molecular Spectroscopy**
Subject Lesson Plan: **12 weeks**

Week 1
DAY 1 Unit 1: Historical background of atomic spectroscopy, Introduction of early Observations,
DAY 2 emission and absorption spectra, Spectrum of hydrogen atom in Balmer series
DAY 3 Bohr atomic model, spectra of hydrogen atom explanations of spectral seris in hydrogen atom

Week 2
DAY 1 Variation in rydberg contant due to finite mass ,short coming of bohr's theory
DAY 2 Wilson'sommerfield quantisation rule, quantisation rule,
DAY 3 De-broglie interpretation of bohr quantisation law, , bohr's corresponding principle,

Week 3
DAY 1 Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short coming of bohr-sommerfied theory

DAY 2 Short coming of bohr-sommerfied theory, Vector atom model, space quantisation ,electron spin

DAY 3 coupling of orbital and spin angular momentum, Spectroscopic terms and their Notations, quantum numbers

Week 4
DAY 1 transition probability, selection rules, Vector atom model(single valence electron)
DAY 2 quarries of unit Inviting 1 and assignment 1 (allotment)
DAY 3 **Unit –II**: Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic filed; Larmors' precession and theorem

Week 5
DAY 1 Penetrating and Non-penetrating orbits, Penetrating orbits on the classical model; Quantum defect
DAY 2 spin orbit interaction energy of the single valance electron, spin orbit interaction for penetrating and non-penetrating orbits.
DAY 3 quantum mechanical relativity correction, Hydrogen fine spectra

Week 6

DAY 1 Main features of Alkali Spectra and their theoretical interpretation, term series and limits

DAY 2 Rydeburg-Ritze combination principle, Absorption spectra of Alkali atoms. observed doublet fine structure in the spectra of alkali metals and its Interpretation,

DAY 3 Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum .

Week 7

DAY 1 Test of Unit 1 and Unit 2

DAY 2 **UNIT-III:** Essential features of spectra of Alkaline-earth elements, Vector model for two valance electron atom: application of spectra.

DAY 3 Coupling Schemes;LS or Russell – Saunders Coupling Scheme and JJ coupling scheme

Week 8

DAY 1 Interaction energy in L-S coupling (sp, pd configuration)

DAY 2 Lande interval rule, Pauli principal and periodic classification of the elements

DAY 3 Two valance electron system-spectral terms of non-equivalent and equivalent electrons

Week 9

DAY 1 Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin.

DAY 2 **Unit –IV:** Zeeman Effect (normal and Anomalous),Experimental set-up for studying Zeeman effect,

DAY 3 Explanation of normal Zeeman effect(classical and quantum mechanical), Explanation of anomalous Zeeman effect(Lande g-factor)

Week 10

DAY 1 Zeeman pattern of D1 and D2 lines of Naatom, Paschen-Back effect of a single valence electron system

DAY 2 General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region)

DAY 3 Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule

Week 11

DAY 1 Zeeman pattern of D1 and D2 lines of Naatom, Paschen-Back effect of a single valence electron system

DAY 2 General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region)

DAY 3 Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule

Week 12

DAY 1 Raman Effect, Electronic Spectra.

DAY 2 Inviting queries and doubts on Unit-3

DAY 3 Unit test of Unit 3 & 4

Name of the Asstt. Professor: **Amit Kumar**

Class and Section: **B.Sc. 2nd Semester**

Subject/ Paper: **Electricity and Magnetism**

Lesson Plan: **From 20th February, 2024 to 15 May, 2024**

February :Week 3

Vector background and electric field: Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of avector and their physical significance

February :Week 4

Gauss"s divergence theorem, Stoke"s theorem.

Unit 2nd : **Magnetic field and magnetic properties :** Magnetic induction, Magnetic flux

Problem unit 1st

March: Week 1

Solenoidal nature of vector field of induction,properties of B (i) $\nabla.B= 0$ (ii) $\nabla \times B = \mu o J$, Magnetic Materials, types, Hysteresis curve and importance of Hysteresis Curve.

Problem unit 2nd

March: Week 2

Time varying electromagnetic fields and electromagnetic waves : Electromagnetic induction, Faraday"s laws of induction and Lenz"s Law,Derivation of Maxwell"s equations and their physical significance.

March: Week 3

Boundary conditions at interface between two different media,Propagation of electromagnetic wave (Basic idea, no derivation),Poynting vector and Poynting theorem

Problem unit 3rd

April: Week 1

D.C. and A.C. circuits: D.C. Network theorems: Thevenin"s theorem,

April: Week 2

Norton theorem, Superposition theorem;

Analysis of LCR Series and parallel resonant circuits.

April: Week 3

Problem of unit 4, Test unit 2

April: Week 4

Problem of unit 1, Test unit 4

Pt. C.L.S. Govt. College, Karnal

LESSON PLAN (w.e.f. January 2024)

Name: Amit Kumar
Class: B.Sc. III year 6th Sem

Subject: Physics
Paper: Solid State and Nano Physics

Month/Week	Contents
Week 1	Crystalline and Glassy forms, liquid crystals, crystal structure, periodicity, lattice and basis
Week 2	Crystal translational vectors and axis, unit cell and primitive cell
Week3	Weigner Seitz primitive cell, symmetric operations for a 2D crystal
Week 4	Bravias Lattice in 2D and 3 D, crystal planes and Miller indices, interplaner spacing
Week 5	Crystal structure of zinc sulphide, sodium chloride and diamond Test of unit 1
Week 6	X ray diffraction, Bragg's Law
Week7	Experimental X ray diffraction method, K space and reciprocal lattice
Week 8	Physical significance of reciprocal lattice, reciprocal lattice vectors
Week 9	Reciprocal lattice to a SC, BCC, FCC Test of Unit 2
Week 10	Superconductivity- Introduction, survey of superconductivity, superconducting systems
Week 11	High temperature superconductors, isotopic effect, critical magnetic field, Meissner effect, London Theory and Pippard's equation, classification of superconductors
Week 12	BCS theory, flux quantization, Josephson's effect, Practical applications of superconductivity and limitations, power applications of superconductors.
Week 13	Introduction to nano physics, benefits and challenges in molecular manufacturing, molecular assembler concept
Week 14	Understanding advance capabilities, vision and objective of nano technology, nano technology in different fileds.
Week 15	Revision and test of unit 3 and 4.

Amit Kumar — Asst Prof - Physics

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Lesson Plan B.Sc 4th sem Physics

January : Paper 2

Week1 Unit-1: Polarization

Polarization: Polarisation by reflection, refraction and scattering, Malus Law,Phenomenon of double refraction, Huygen's wave theory of double refraction (Normaland oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate andhalf wave plate,

Week 2 : **Continued ;** production and detection of (i) Plane polarized light (ii) Circularlypolarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).

Doubts and Test

Week 3 : **Unit-II: Fourier analysis**

Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance andlimitations of Fourier theorem, even and odd functions, Fourier series of functions f(x)between (i) 0 to 2pi, (ii) −pi to pi, (iii) 0 to pi, (iv) −L to L, complex form of Fourierseries, Application of Fourier theorem for analysis of complex waves: solution oftriangular and rectangular waves , half and full wave rectifier outputs, Parseval identityfor Fourier Series, Fourier integrals.

Doubts and Test

Week 4 **Unit III: Geometrical Optics I**

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.

Doubts and Test

Febuary : Paper 1

Week1 Unit –I: Statistical Physics I

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, combinationspossessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of Coins.

Week 2: Holidays

Week 3: Permutations and combinations, distributions of N (forN= 2,3,4) distinguishable and indistinguishable particles in two boxes of equal size,Micro and Macro states ,Thermo dynamical probability, Constraints and Accessible states,Statistical fluctuations, general distribution of distinguishable particles in compartmentsof different sizes, Condition of equilibrium between two systems in thermal contact-- β parameter, Entropy and Probability (Boltzman's relation).

Doubts and Test

Week 4: Unit –II: Statistical Physics II

Postulates of statistical physics, Phase space, Division of Phase space into cells, threekinds 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.

Doubts and Test

March

Week 1 Unit-III: Quantum Statistics

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.

Doubts and Test

Week 2

Continued ; 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.

Doubts and Test

Unit-IV: Theory of Specific Heat of Solids

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.

Doubts and Test

Week 3 : Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories.

Test and Doubts of Paper 1 (unit 1,2,3 & 4)

April

Week 1 : Unit-IV: Geometrical Optics II

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

Fiber Optics

Asst Prof Physics
Mr. Amit Kumar

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.

Week 2

Unit 3 Unit III: Fourier transforms

Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations.

Week 1 Revision and Test