GAYATRI VIDYA PARISHAD
COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)
Affiliated to Andhra University | | Accredited by NAAC and NBA
VISAKHAPATNAM

DEPARTMENT OF ORGANIC CHEMISTRY

M.Sc. (PREVIOUS) CHEMISTRY SYLLABUS
SEMESTER-II
PAPER-IV: PHYSICAL CHEMISTRY-II
(Effective from the admitted batch of 2022-2023)

Credits: 4		**Theory: 4 Hours**
Max Marks: 100	**External: 80**	**Internal: 20**

Course Outcomes (COs)/Course Specific Outcomes (CSOs):

CO 1: To know the various types of crystal structures of solids, determine the Bragg's equation, Band theory and Basic concept of superconductivity.
CO 2: Understanding of magnetic resonance spectroscopies and its applications in free radicals systems.
CO 3: To know various polymerizations and its determination through various methods.
CO 4: To know the importance of photochemistry and its applications in organic and inorganic chemistry.
CO 5: Understanding of various electrochemical cells and concentration cells with and without transference.

Course learning outcome (LOs):
Upon completion of the course the students should be able to:
LO 1: To learn the various types of crystal structures of solids, Miller indices.
LO 2: Determination of structures of molecules using NMR and ESR.
LO 3: Different types of polymerization reactions useful in polymer industry.
LO 4: Basic concepts of photochemistry and how reactions will be affected in presence of light.
LO 5: Calculations of solubility product and EMF of a cell.

UNIT-I **[12 Hours]**

Crystal structure of solids: Fundamental of lattices, unit cell, Bravais lattices, symmetry elements in crystals, radius ratios; Miller indices. Structures and types of solids. Structure determination by X-ray diffraction (Bragg's equation). Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility and its measurement.
Electric properties-Band theory, the band structure of metals, insulators, and semiconductors. The temperature dependence of conductivity of extrinsic semiconductors. Basic concept of superconductivity.

UNIT-II: **[12Hours]**

Classification of polymers - Free radical, ionic and Zeigler - Natta Polymerization - kinetics of free radical polymerization - Techniques of polymerization - Glass transition temperature - Factors influencing the glass transition temperature.
Number average and Weight average, Molecular weights - molecular weights determination-Osmometry and Viscometry methods.

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UNIT-III: **[12 Hours]**

Electrochemistry I: Ionic mobilities and conductivities - Debye-Huckel theory of strong electrolytes, Debye-Huckel onsagar equation-limitations- mean activity coefficient-Verification of Debye-Huckel limiting law.

Electro chemical cell- Galvanic and electrolytic cell. Nernst equation- Concentration cell with and without transference- effect of complexation on redox potential- ferricyanide/ferrocyanide couple, Iron (III) phenonthroline/Iron(II) phenonthroline couple. Fuel Cells.

UNIT-IV: **[12 Hours]**

Electrochemistry II: The electrode-electrolyte interface. The electrical double layer. Gouy-Chapman diffuse-charge model and Stern model. Electrodics: Charge transfer reactions at the electrode-electrolyte interface.

Derivation of Butler-Volmer equation. High field approximation, Tafel equation, Low field equilibrium, over voltage. Corrosion - Concentration polarization - Polarography -Half wave potential and Ilkovic equation.

UNIT-V: **[12 Hours]**

Photochemistry: Electronic transitions in molecules, Franck-Condon principle. Electronically excited molecules- singlet and triplet states, spin-orbit interaction. Quantum yield and its determination by Actinometry. Quenching effect- Stern Volmer equation.

Photochemical equilibrium and delayed fluorescence- E-type and P-type. Photochemical primary processes, types of photochemical reactions- photodissociation, addition and isomerization reactions with examples.

Text Books:

1. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
2. Physical Chemistry by G.W. Castellon, Narosha Publishing House
3. Physical chemistry by K.L. Kapoor.
4. Principles of photochemistry, Rohitgee Mukhargee.

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