

ACHARYA NAGARJUNA UNIVERSITY

DEPARTMENT OF CHEMISTRY

M.Sc. CHEMISTRY :: SEMESTER-II

PAPER-I: PHYSICAL CHEMISTRY-II (R22CH21)

(For the students admitted from the A.Y. 2022-2023 onwards)

Max. Marks: 100

(Internal-30M & External-70M)

SYLLABUS

Learning Objectives:

- ✓ To know the Third law and Statistical thermodynamics and Nernst Heat theorem, Entropy and probability.
- ✓ To know the classification of polymers, molecular weights determination.
- ✓ To know the Butler-Volmer equation, polarography and Amperometric titrations.
- ✓ To know the Hydrogen-oxygen reaction, Quantum yield and Stern - Volmer equation.
- ✓ To know the hydrolysis of ATP, thermodynamics of biopolymer solutions.

UNIT-I

12H

Thermodynamics II: Third law and Statistical thermodynamics-Nernst Heat theorem - Third law of thermodynamics - Its limitations - Determination of absolute entropy - Concept of distribution - Thermodynamic probability and most probable distribution - Ensemble-ensemble averaging - Maxwell-Boltzmann distribution law - Partition function - Fermi-Dirac statistics - Bose Einstein statistics - Entropy and probability - Boltzmann-Planck equation - Calculation of thermodynamic properties in terms of partition function - Application of partition function - Chemical equilibrium and partition function - Translational, rotational and electronic partition function - Entropy of Monoatomic gases (Sackur - Tetrode equation).

UNIT-II

12H

Polymer Chemistry: Classification of polymers - Free radical, ionic and Zeigler -Natta Polymerisation - kinetics of free radical polymerisation - Techniques of polymerisation - Glass transition temperature - Factors influencing the glass transition temperature - Number average and Weight average, Molecular weights - molecular weights determination - End group analysis - Osmometry - Light scattering and ultra centrifugation methods.

UNIT-III

12H

Electro Chemistry II: Electrode potentials - Double layer at the interface - rate of charge transfer - Decomposition potential - Over potential - Tafel plots - Derivation of Butler - Volmer equation for one electron transfer - electro chemical potential. Electro catalysis - Fuel cells-Theory of polarography - Diffusion current - Ilkovic equation - Equation for half- wave potential – Applications of polarography - Amperometric titrations -Corrosion - Forms of corrosion - prevention methods.

UNIT-IV

12H

Chemical Kinetics: Branching Chain Reactions - Hydrogen-oxygen reaction - lower and upper explosion limits - Fast reactions - Study of kinetics by flow methods - Relaxation methods - Flash photolysis - Acid base catalysis - protolytic and prototropic mechanism - Enzyme catalysis.

Photo Chemistry: Quantum yield and its determination - Actinometry - Reactions with low and high quantum yields - Photo sensitisation - Exciplexes and Excimers - Photochemical equilibrium – Chemiluminescence - Kinetics of collisional quenching-Stern - Volmer equation - Photo Galvanic cells.

UNIT-V

12H

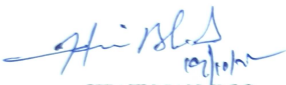
Biophysical Chemistry: Standard free energy change in biochemical reactions, exergonic and endergonic reactions, hydrolysis of ATP, thermodynamics of biopolymer solutions, chain configuration of bio polymers, calculation of average dimensions. Membrane equilibrium, ion transport through cell membrane, dialysis and its function. Structure and functions of proteins, enzymes, DNA and RNA in living systems, forces involved in bio polymer interactions, electrostatic forces, hydrophobic forces, molecular expansion and dispersion forces.

Reference Books:

- 1) Physical chemistry, G.K. Vemulapalli (Prentice Hall of India).
- 2) Physical chemistry, P.W. Atkins. ELBS
- 3) Chemical kinetics - K.J. Laidler, McGraw Hill Pub.
- 4) Text book of Physical Chemistry, Samuel Glasstone, Macmillan pub.
- 5) Statistical Thermodynamics - M.C. Gupta.
- 6) Polymer Science, Gowriker, Viswanadham, Sreedhar
- 7) Elements of Nuclear Science, H.J. Arniker, Wiley Eastern Limited.
- 8) Quantitative Analysis, A.I. Vogel, Addison Wesley Longmann Inc.
- 9) Physical Chemistry-G.W. Castellan, Narosa Publishing House, Prentice Hall
- 10) Physical Chemistry, W.J. Moore, Prentice Hall
- 11) Polymer Chemistry - Billmeyer
- 12) Fundamentals of Physical Chemistry, K K Rohatgi-Mukherjee. Wiley Eastern Limited Publications.
- 13) Statistical Thermodynamics - M.Dole.
- 14) M.N. Hughes, The Inorganic chemistry of Biological Processes, John Wiley and Sons, New York 2nd Edition, 1981.
- 15) A text book of Biochemistry, AV.S.S. Rama Rao.
- 16) Physical Chemistry by Atkenes.

Learning Outcomes:

- ✓ Students understand the Third law of thermodynamics, Maxwell-Boltzmann distribution law and Sackur - Tetrode equation.
- ✓ Students understand the Free radical, ionic and Zeigler -Natta Polymerisation.
- ✓ Students understand the Butler - Volmer equation and Ilkovic equation.
- ✓ Students understand the Branching Chain Reactions, Enzyme catalysis and Photochemical equilibrium.
- ✓ Students understand the free energy change in biochemical reactions, exergonic and endergonic reactions, DNA and RNA in living systems in biopolymer interactions.


CHAIRMAN, BOS
PG CHEMISTRY
Dr. B. HARI BABU, M.Sc., Ph.D.
CHAIRMAN, BOS IN CHEMISTRY (PG)
Acharya Nagarjuna University
Nagarjuna Nagar-522 510, A.P., India