

# ANDHRA UNIVERSITY-SCHOOL OF CHEMISTRY

## I Semester

### CH-104 PHYSICAL CHEMISTRY-I (Effective from the admitted batch of 2015-16)

#### UNIT-I:

Thermodynamics: Chemical equilibrium- effect of temperature on equilibrium constant- Van't Hoff equation. Partial molar quantity- different methods of determination of partial molar quantity. Chemical potential- Phase rule and its derivation, Gibbs-Duhem equation, Duhem-Margules equation, Classius-Clapeyron equation. Nernst heat theorem. Third law of thermodynamics- Determination of the absolute entropy- Apparent exceptions to Third law of thermodynamics.

#### UNIT-II:

Micelles and Macromolecules: Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization- phase separation and mass action models, solubilization, micro emulsion, reverse micelles.

Polymers- Definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerization. Molecular mass- Number and mass average molecular mass, molecular mass determination- Osmometry, viscometry, diffusion and light scattering methods. Sedimentation, chain configuration of macromolecules, calculation of average dimensions of various structures.

#### UNIT-III:

Chemical Kinetics: Theories of reaction rates- Collision theory- Limitations, Transition state theory. Effect of ionic strength- Debye Huckel theory-Primary and secondary salt effects. Effect of dielectric constant, effect of substituent, Hamett equation -limitations- Taft equation. Consecutive reactions, parallel reactions, opposing reactions (Uni molecular steps only, no derivation). Specific and general acid-base catalysis. Skrabal diagram. Fast reactions- different methods of studying fast reactions- flow methods, relaxation methods- temperature jump and pressure jump methods.

#### UNIT-IV:

Photochemistry: Electronic transitions in molecules, Franck-Condon principle. Electronically excited molecules- singlet and triplet states, spin-orbit interaction. Quantum yield and its determination. Actinometry. Derivation of fluorescence and phosphorescence quantum yields. 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

#### Reference Books:

1. Thermodynamics for Chemists, Samuel Glasstone
2. Chemical Kinetics by K.J.Laidler, McGraw Hill Pub.
3. Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.
4. Introduction to Polymer Science, V.R. Gowriker, N.V.Viswanadhan and J. Sreedhar., Wiley Easter.
5. Micelles, Theoretical and applied aspects, V.Moroi, Plenum publishers.

**SCHOOL OF CHEMISTRY ANDHRA UNIVERSITY**  
**II Semester**  
**CH-204 PHYSICAL CHEMISTRY-II**  
**(Effective from the admitted batch of 2015-16)**

**UNIT-I:**

Physical methods of molecular structural elucidation: Magnetic properties of molecules- theories of magnetic susceptibility- measurement of magnetic susceptibility. Principle and theory of NMR spectroscopy- Nature of spinning particle and its interaction with magnetic field. Chemical shift and its origin. Spin-Spin interaction-experimental methods. Application of NMR to structural elucidation- Structure of ethanol, dimethylformamide, styrene and acetophenone.

**UNIT-II:**

Electron Spin Resonance: Principle and experimental technique- g-factor, line shapes and line widths- hyperfine interactions- applications of ESR studies to the structure of free radicals, metal complexes and biological systems.

**UNIT-III:**

Electrochemistry I: Electrochemical cell- Galvanic and electrolytic cell. Concentration cell with and without transference- effect of complexation on redox potential- ferricyanide/ferrocyanide couple, Iron(III) phenanthroline/ Iron(II) phenanthroline couple. Determination of standard potential. Activity coefficient from EMF data. Primary and secondary cells, batteries examples. Fuel cells.

**UNIT-IV:**

Electrochemistry II: The electrode-electrolyte interface. The electrical double layer. The Helmholtz-Perrin parallel-plate model, the Gouy-Chapman diffuse-charge model and the Stern model. Electrode reactions: Charge transfer reactions at the electrode-electrolyte interface. Exchange current density and overpotential. Derivation of Butler-Volmer equation. High field approximation, Tafel equation, Low field equilibrium, Nernst equation. Voltametry- Concentration polarization, experimental techniques.

**Text Books:**

4. Physical Chemistry by Peter Atkins and Julio de Paula, Oxford University Press.
5. Physical Chemistry by G.W. Castellon, Narosha Publishing House
6. Physical chemistry by K.L. Kapoor

**Reference Books:**

6. Introduction to Electrochemistry, S.Glasstone.
7. Fundamentals of Molecular Spectroscopy, Banwell
8. Spectroscopy by Barrow.