

Paper – II CHN-702(P) Physical Chemistry

Unit :- 1

- **Principles of Reactivity** : Mechanistic significance of entropy, enthalpy and Gibb's free energy. Arrhenius equation. Transition state theory. Uses of activation parameters. Hammond's postulate. Bell-Evans-Polanyi principle. Potential energy surface model. Marcus theory of electron transfer- Reactivity and selectivity principles.
- **Structural Effects on Reactivity** : Linear free energy relationships (LFER). The Hammett equation, substituent constants, theories of substituent effects. Interpretation of ρ -values. Reaction constant k . Deviations from Hammett equation. Dual-parameter correlations, inductive substituent constant. The Taft model, ρ_1 -and ρ_R - scales.

Unit -2

- **Electrochemical reaction of special** : Electrocatalysts and electrocatalysis, Special features of electrocatalysis, Electricity storage density, Energy density and power, Electricity storage using alkali metals and non aqueous solutions.
- Ionic liquids : Definition, Features of ionic liquids, Methods of simple ionic liquids (Lattice oriented models), Solvent properties of fused non-metallic oxides, Fused oxide system in metallurgy.
- **Protons in solution** : Proton solvation, Heat of Hydration of proton, Proton Transport (Abnormal mobility of proton, conduction by chain reaction, Quantum mechanical proton jumps), Proton mobility in ice.

Unit :-3

- **Solvation and Solvent Effects** : Qualitative understanding of solvent-solute effects on reactivity. Thermodynamic measure of solvation. Effects of solvation on reaction rates and equilibria.
- Various empirical indexes of solvation based on physical properties, solvent-sensitive reaction rates, spectroscopic properties and scales for specific solvation.
- Use of solvation scales in mechanistic studies. Solvent effects from the curve-crossing model.

Unit :- 4

- **Capillary electrophoresis** : Basic, Principles, Instrumentation & Applications.
- **Coulometry and Chronopotentiometry**: Basic, Instrumentation & Application.
- **Polarography**: Principle, wave equations, Instrumentation & Application. Voltammetry (Cyclic voltametry, Anodic stripping)
- **Amperometry** : Basic Principle, Instrumentation & Application