M.Sc. I Paper III **First Semester**

PHYSICAL CHEMISTRY **Marks: 80**

I. Chemical dynamics: 20Hrs

Theory of reaction rate: collision, activated complex and unimolecular reaction i.e. Lindemann and preliminary ideas (Hinshelwood, Rice Ramopereger and RKKM theories), thermodynamics of reaction rate.

The ideas of reaction kinetics in solution with special reference to kinetic salt effects.

The fast reaction kinetics, fundamental aspects of NMR, Relactation methods, flow and flesh photolysis. Preliminary ideas of molecular reaction dynamics.

Simple ideas of Oscillatory chemical reaction, belosov- Zhabotinsky reaction.

Photochemical reaction: Chain reaction involving Hydrogen Chlorine, Hydrogen- bromine reaction and pyrolysis if acetaldehyde. Kinetics of enzyme reaction.

II. Surface chemistry: 25 Hrs

A. Adsorption

Surface tension, capillary action , pressure difference across curved surface (Laplace equation), vapor pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation surface area (BET equation), surface film of liquids (electro –kinetic phenomenon), catalytic activity at surface.

B. Micelles

Surface active agent, classification of surface active agent, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactant, counter ion binding to micelles, thermodynamics of micellization – phase separation and moss action models , solubilization, micro emulation, reverse micelles.

C. Macromolecules:

Polymer –definition, classification of polymer, electrically conducting , five resistant, liquid crystal polymer, kinetics and mechanism of polymerization (Chain reaction and step growth), molecular mass, number and mass average molecular mass, molecular mass determination (Osmometry, diffusion and light scattering methods),sedimentation, chain configuration of macromolecules, calculation of average dimensions of various chain structures.

III. Electrochemistry: 25 Hrs

Activity, activity coefficient, Debye-Huckel theory for electrolytic solution, determination of activity and activity coefficient, ionic strength.

Electrochemistry of solution, Debye-Huckel – Onsager treatment and its extension, ion solvent interaction, Debye Huckel, B Jerum mode.

Thermodynamics of electrified interface equation, deviation of electro-capillarity, Lippmann equation (surface excess), methods of determination, structure of electrified interfaces. Guoy Chapman, Stern, Bockris, Devanathan method.

Over potential, exchange current density, deviation of Butler- Volmer, Tafel plot.

Electrocatalysis – Influence of various parameters, Hydrogen electrode.

Nernst-Planck equation, electrocardiography.

Polarography theory, likovic equation, half wave potential and its significant.

Introduction to corrosion, homogenous theory, form of corrosion, corrosion monitoring and prevention Methodism.

IV. X-ray and electron diffraction 20 Hrs

Bragg condition, miller indices, Laue method Bragg method, Debye-Scherrer method of X-ray structural analysis of crystals, index reflection, identification of unit cell from systematic absences in diffraction pattern. Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules, Ramchandran diagram.

Scattering intensity vs. scattering angle, Wierl equation, measurement technique, elucidation of structure of simple gas phase molecule. Low energy electron diffraction and structure of surfaces.