In.M.Sc, Applied Chemistry (5 years)

8th Semester

FCYC----802	**Physical Chemistry-VI**		

Module-I **(12 hours)**

Chemical Kinetics-II: Complex reactions –opposing, parallel and consecutive reactions. Mechanism of reactions. Chain reactions –linear reactions, branching chains– explosion limits; Rice Herzfeld scheme.

Theories of reaction rates: Collision theory. Potential energy surfaces (basic idea). Transition state theory (both thermodynamic and statistical mechanics formulations). Theory of unimolecular reactions, Lindemann mechanism, Hinshelwood treatment, RRKM model (qualitative treatment).

Solution kinetics: Factors affecting reaction rates in solution. Effect of solvent and ionic strength (primary salt effect) on the rate constant. Secondary salt effects, isotope effect, Kramers theory. Diffusion limited reactions. Study of fast reactions using stopped flow and relaxation techniques.

Module II **(12 hours)**

Transport phenomena: Diffusion coefficients, Fick's first and second laws, relation between flux and viscosity, relation between diffusion coefficient and mean free path, relation between thermal conductivity/viscosity and mean free path of a perfect gas, Einstein relation, Nernst-Einstein equation, Stokes-Einstein Debye equation (SED), Einstein-Smoluchowski-equation.

Surface phenomena: Amphiphilic molecules and surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micelle concentration (CMC), Krafft temperature, Factors affecting the CMC of surfactants, counterion binding to micelles, thermodynamics of micellization, solubilization, microemulsions, reverse micelles, surface films (electrokinetic phenomena), catalytic activity at surfaces.

Module III **(10 hours)**

Physical Photochemistry: Franck-Condon Principle, Laws of Photochemical Equivalence. Unimolecular Photophysical Processes: vibronic transitions, Kasha's rule, fluorescence and phosphoroscenece, internal conversion, intersystem crossing. Mirror symmetry relationship, fluorescence life-time, quantum yields of various processes.

Bimolecular Photophysical Processes: Photo-induced electron-transfer and charge transfer processes, excimer and exiplex, fluroscence quenching. Radiative, Forster type and Dexter type enegy transfer.

Text Books Reference books

1. Chemical Kinetics-K. J. Laidler, pearson Education, 2004
2. D.A. McQuarrie and J. D. Simon: Physical Chemistry - A Molecular Approach.

Reference books

1. Fundamentals of Photochemistry- K. K. Rohatgi-Mukharjii, Wiley Eastern
2. Elements of Physical Chemistry, P. Atkins and J. de Paula, 6th edn, Oxpord Press, 2015.
3. Photochemistry – J. G. Calverts and J. N. Pitts, John-Wiley & Sons

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J. R. Lakowicz, Principles of Fluorescence Spectroscopy