M.Sc. Semester -IV
Physical Chemistry
CHNN-701(P)
Paper-1

Unit:-1 Photo Chemistry-2 **25% (15 Hours)**

Basics: Nature and importance of singlet and triplet oxygen, Photochemical equivalence and photo stationary states (with examples), consequence of light absorption (Jablonski diagram, radiative, non-radiative and chemical reactions, Frank codon principle, Anti stroke behaviour.

Florescence: Theory of Florescence, Relation between Florescence intensity and concentration,

Quenching of Florescence, Kinetics of Quenching of Florescence (Photo peroxidation reaction),

Factors affecting Quenching of florescence, Difference between fluorescence, Phosphorescence and Chemiluminescence.

Mechanism of Reaction: Ene reactions, Cycloaddition reactions, Reduction reaction, Radiolysis of water photo conductivity, CO_2 reduction

Energy conversion and storage: Photo sensitizers, Transition metal complex, Metal complex sensitizers, reaction sensitized by Mercury, Chlorine, Excimers and Exciplexes.

Unit:-2 The Colloidal State **25% (15 Hours)**

Colloidal systems:

Classification of colloids: Liophobic and Liophilic sols.

Preparation of hydrophobic colloidal solutions: despertion methods and condensation methods

Purification of colloidal solutions:

Properties of colloidal systems: (1) Electrical properties: Charge on colloidal particles, the electrical

double layer, DLVO theory of the stability of liophobic colloids, coagulation of colloidal solutions

(2) Electro kinetic properties: Electrophoresis and electroosmosis

Determination of size of colloidal particles

Surfactants (Surface-active agents)

Hydrophile- Lipophile balance (HLB): (1) Micelle formation: The mass action model and the phase separation model, shape and structure of micelles, micellar

aggregation numbers, the critical micelle concentration (CLC), factors affecting CMC in aqueous media, thermodynamic approach to CMC, thermodynamics of Micellization, Micelle concentration range (MTR) or Kraft point

Solubilisation: Location of solubalizates in micelles, the phase rule of solubilisation, Emulsification by surfactants: Macro emulsions, factors determining stability of emulsions, microemulsions

Theories of Emulsions: (1) Qualitative theories Bancroft rule (2) Quantitive theories, The selections of surfactants as emulsifying agents, Gels and their preparations, Importance and applications of colloids.

Unit:-3 Chemical Kinematics 25% (15 Hours)

Theories of reaction rates: Kinetic theory of collision, Rate theory of based on statistical mechanics, early dynamical theories and CTST

Unimolecular reactions: Perrin, Lindmann-Christiansen, Hisnhel wood, RRK, RRRM and Slater,

Conventional transition state theory

Chain reactions: Features and kinetics of chain reaction, autooxidation, kinetics of branched chain

reactions, explosion limits, a kinetic isotope effect (primary and secondary)

Reactions in solutions: Theory of absolute reaction rate, applicable to reaction in solution (Ideal and real solution), Linear free energy relationship and Hammett equation, Deviation from Hammett equation. Significance of and p

Examples: kinetics of organic decomposition of CH_3CHO, butane, reaction between H_2 and O_2.

Unit 4:- Spectroscopy 25% (15 Hours)

UV-visible: principle, instrumentation, determination of pK value of indicator, and instability constant, qualitative and quantitative analysis.

Raman Spectroscopy: Raman effect, difference from IR and fluorescence, nature of spectra, selection rule, basic instrumentation and applications.

Atomic absorption spectroscopy: Basic principle, advantages over flame emission spectroscopy, basic instrumentation and applications

Emission spectroscopy: Basic principle, radiative and non-radiative decay, internal conversion, basic instrumentation and applications.

Books:-

(1) Fundamentals of photochemistry, R.K. Rohatgi and Mukherji, Tata McGraw Hall

(2) Essentials of photochemistry, A. Gilbert and J. Baggott, Black well scientific publishers
(3) Introductory Photochemistry, A. Cox and T camp, McGraw Hall
(4) Organic photochemistry, J. Coxon and B. Hilton, Cambridge university press
(5) Essentials of nuclear chemistry, Hari Jeevan Arnikar, New Age international (1995)
(6) Nuclear and radiochemistry (3rd edition), Gerhart Friedlander, Joseph W. Kennedy, Edward
S. Macias and Julian Malcolm Miller, John Willey and Sons publications
(7) Modern Nuclear Chemistry, Walter D. Loveland, David J. Morrissey and Glenn T. Seaborg, John Willey and sons publications
(8) Handbook of nuclear chemistry (2nd edition): VOL.1: Basics of nuclear science; VOL.2: elements and isotopes formation, transformation, distribution, edited by Attila Vertis, Sandor Nagy, Zoltan Klencsar, Rezso Gyorgy Lovas, Frank Rosch, Springer publications.
(9) Principle of Physical Chemistry by Puri Sharma Pathania
(10) Chemical Kinetics, Keith J. Laidler, McGraw Hill
(11) Modern spectroscopy, J.M. Hollas, McGraw Hill
(12) Basic principles of spectroscopy, H. Chang, McGraw Hill
(13) Spectroscopy methods of organic chemistry, D.H. Williams and I. Fleming, tata McGraw Hill
(14) Spectroscopy, P.S. Kalsi, Pragati Prakashan, 1998.
(15) Advanced physical Chemistry By Gurdeep Raj.