

ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS) VISAKHAPATNAM

III SEMESTER	CHEMISTRY	5 Hrs/Week
CH 3204 (3)	PHYSICAL CHEMISTRY	Max. Marks : 60
w.e.f 2017-2018('AE' batch)	SYLLABUS	

**OBJECTIVES :**

1. To enable the students to apply physical laws to chemical phenomena
2. To enable the students to study the structure of matter and the tools employed for its study.
3. To enable the students to have basic idea about speeds of reactions and to understand higher order reactions and derive their rate constants in order to predict the course of the reaction.
4. To enable the students to get the proper knowledge about surface chemistry .
5. To enable the students to know fundamentals of Photochemistry.

**COURSE:**

**UNIT – I :**

**1. Gaseous state :** Ideal and real gases ; Deviation of Real gases from ideal behaviour, deviation from Boyle's law, P-V Isotherms of real gases, compressibility factor  $Z$  , causes for deviation ; Vanderwaal's equation of state, volume and pressure corrections, Andrew's isotherms of  $\text{CO}_2$ , continuity of state, critical phenomenon, critical constants, Vanderwaal's equation and critical state, Relationship between critical constants and Vanderwaal's constants, Law of corresponding states ( Reduced equation of state ), Joule Thomson effect.

**Liquid state:** Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals.

**2. Chemical kinetics:** Introduction – Types of reactions – Rate of reaction – rate law - order of reaction –molecularity – zero order reactions : explanation, examples and derivation of rate constant – I order reactions : derivation of rate constant, examples and numerical problems – II order reactions : derivation of rate constant, examples and numerical problems – III order reaction : derivation of rate constant and examples – Units of rate constant – pseudo molecular reactions – methods of determination of order of reaction : Integration method, fractional change method, Van't Hoff's differential method, Graphical method & Ostwald's isolation method. Collision theory of bimolecular reactions (qualitative treatment) Effect of temperature on the rate of reaction. Arrhenius equation and calculation of activation energy.

**UNIT – II :**

**3. Surface chemistry-Colloidal State:** Introduction, Classification of colloids, lyophilic and lyophobic colloids ; preparation, purification. General properties of colloids : kinetic ( Brownian movement) , optical (Tyndall effect) and electrical ( Electrophoresis) properties of colloids ; Origin of charge on colloidal particles, preferential adsorption of common ion, Electric double layer ( Helmholtz and Stern ) theories, Zeta potential, coagulation of colloids, Hardy – Schulze's rule, flocculation value, stability of colloids, protection of colloids, gold number. Emulsions : Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses.

**4. Adsorption:** Physical adsorption, chemisorption. differences, Freundlich, Langmuir adsorption isotherms. Applications of adsorption.

**Catalysis:** Introduction, general characteristics of catalytic reactions, homogeneous and heterogeneous and autocatalysis reactions, comparison with examples, Examples for acid/ base catalyzed reactions -inversion of cane sugar; conversion of acetone to diacetone alcohol, hydrolysis of esters, mutarotation of glucose; Catalytic activity at surfaces, mechanisms of heterogeneous catalysis, Langmuir – Hinshel Wood mechanism.

**Enzyme catalysis;** Characteristics of enzyme catalysis, Kinetics of enzyme catalyzed reactions, Michaelis – Menten law, significance of Michaelis constant ( $K_m$ ), factors affecting enzyme catalysis, effect of temperature, pH, concentration and inhibitor, catalytic efficiency.

### UNIT – III :

**5. Phase Equilibrium:** Introduction, phase, component and degrees of freedom, Gibb's phase rule equation, Thermodynamic Derivation of Gibbs phase rule. Construction of phase diagram- Application of phase rule to : i. One component system - water system ii. Two component systems: simple eutectic systems, Lead –Silver system, desilverisation of lead (Pattinson's process), NaCl -water system, freezing mixtures.

**6. Photochemistry:** General features of absorption - Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity. Single and double beam spectrophotometers. Application of Beer-Lambert law. Interaction of radiation with matter, photoprocesses, differences between photochemical and thermochemical reactions; photophysical processes and photochemical processes. Laws governing photo chemical reactions, Grotthus – Draper's law, Stark – Einstein's law of photochemical equivalence ; Quantum efficiency, high and low quantum yields, photochemical reactions –  $H_2Cl_2$  and  $H_2Br_2$  reactions ; Jablonski diagram depicting various processes occurring in the excited state, Luminescence, Fluorescence, Phosphorescence.

### REFERENCE BOOKS:

1. Text Book of physical chemistry – P.L.Soni and O.P. Dharmarha, 20<sup>th</sup> Edition, Sultan Chand and Sons, New Delhi .
2. Elements of Physical Chemistry – B.R. Puri, L.R. Sharma & Madan S. Pathania, 43<sup>rd</sup> Edition, 2008, Vishal Publishing Co., Jalandhar.
3. Essentials of physical chemistry – B.S.Bahl and G.D. Tuli, 25<sup>th</sup> Edition, Sultan Chand and Sons, New Delhi.
4. Physical Chemistry , Part – II – R.K.Prasad, Bharati Bhawan, Patna.
5. Numerical Chemistry – Dr. P.Bahadur – G.R.Bathia and Sons , Muzaffarnagar, U.P.
6. Principles of physical chemistry by Prutton and Marron
7. Text book of physical chemistry by K L Kapoor
8. Unified Chemistry (Vol.2) (B.Sc. I) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhjana. Sixth Revised Edition, 2010.
9. Unified Chemistry (Vol.2) (B.Sc. II) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhjana. Sixth Revised Edition, 2010.
11. Unified Chemistry (Vol.2) (B.Sc. III) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhjana. Sixth Revised Edition, 2010.

**Practical paper - III**

**ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM**

**III SEMESTER**

**CHEMISTRY**

**TIME: 3Hrs/Week**

**CH 3251 (2)**

**VOLUMETRIC ANALYSIS - I**

**Marks: 50**

**w. e .f 2017-2018'AE' batch**

**PRACTICAL SYLLABUS**

**OBJECTIVES:** To enable the students to –

- Conduct experiments designed for volumetric analysis
- Interpret experimental/investigative data
- Apply theory-based tools to solve simple chemical problems related to subject areas

1. Determination of Fe (II) using  $\text{KMnO}_4$  with oxalic acid as primary standard.
2. Determination of Zn using EDTA
3. Determination of Mg using EDTA

**REFERENCES:**

1. Vogel's Text Book of Quantitative Inorganic Analysis, IV Edition J.Bassett, R.C.Denny, G.H.Jeffery, J.Mendhan ELBS/Longman, England
2. Practical Monograph prepared by the Department.