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

## SEMESTER - IV CHEMISTRY TIME:4HRS/WEEK

CH 4203 (3) **INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY** MAX.MARKS:100

w.e.f. 20-21 admitted batch-“20AH” **SYLLABUS**

**COURSE OUTCOMES:** At the end of the course, the student will be able to;

1. To learn about the laws of absorption of light energy by molecules and the subsequent photo chemical reactions.
2. To understand the concept of quantum efficiency and mechanisms of photo chemical reactions.

## UNIT – I: ORGAN METALLIC COMPOUNDS:

Definition and classification of organometallic Compounds on the basis of bond type, Concept of hapticity of organicligands.

**METAL CARBONYLS:** 18 electronrule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3dseries.Generalmethods of preparation of mono and binuclear carbonyls of 3d series. P-acceptor behaviour of carbon monoxide. Synergic effects (VB approach) - (MO diagram of CO can be referred to for synergic effect to IR frequencies).

## UNIT – II: CARBOHYDRATES:

**Occurrence,classificationandtheirbiologicalimportance,Monosaccharides:** Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ringsize of glucose and fructose, Haworth projections and conformationalstructures; Interconversions of aldosesandketoses; Killiani-Fischer synthesis and Ruffdegradation; Disaccharides– Elementary treatment of maltose, lactose and sucrose. Polysaccharides–Elementary treatment of starch.

## UNIT- III: AMINO ACIDS AND PROTEINS:

**INTRODUCTION:** Definition of Amino acids, classification of Amino acids into alpha, beta, and gamma amino acids. Natural and essential amino acids - definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples - Glycine, Alanine, valine and leucine) by following methods: a) from halogenated carboxylic acid b) Gabriel Phthalimide synthesis c) strecker's synthesis.

Physical properties: Zwitter ion structure - salt like character - solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups - lactams from gamma and delta amino acids by heating- peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

## HETEROCYCLIC COMPOUNDS

**INTRODUCTION AND DEFINITION:** Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole - Aromatic character – Preparation from 1, 4, - dicarbonyl compounds, Paul-Knorr synthesis.

Properties: Acidic character of pyrrole - electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan.

Pyridine – Structure - Basicity - Aromaticity- Comparison with pyrrole- one method of preparation and properties - Reactivity towards Nucleophilic substitution reaction.

**UNIT- IV: NITROGEN CONTAINING FUNCTIONAL GROUPS:**

Preparation, properties and important treactions of nitrocompounds, amines and diazonium salts.

## 1.NITRO HYDROCARBONS

Nomenclature and classification-nitro hydrocarbons, structure -Tautomerism of nitroalkanes leading to aci and keto form, Preparation of Nitroalkanes, reactivity -halogenation, reaction with HONO (Nitrous acid), Nef reaction and Mannich reaction leading to Micheal addition and reduction.

## 2.AMINES:

Introduction, classification, chiralityin amines (pyramidal inversion), importance and general methods of preparation.

**Properties :** Physical properties, Basicity of amines: Effect of substituent, solvent and steric effects. Distinction between Primary, secondary and tertiary aminesusingHinsberg’s method and nitrousacid. Discussion of the following reactions with emphasis on the mechanistic.

**Pathway:** Gabriel Phthalimide synthesis, Hoffmann- Bromamidere action, Carbylaminere action, Mannich reaction, Hoffmann’s exhaustive methylation, Hof mannelimination reaction and Copeelimination.

**Diazonium Salts**: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds. Coupling reactions of diazonium salts (preparation of azo dyes).

**UNIT- V : PHOTOCHEMISTRY**

Difference between thermal and photochemical processes, Laws of photochemistry- Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, Photosensitized reactions- energy transfer processes (simple example).

## THERMODYNAMICS:

The first law of thermodynamics-statement, definition of internal energy and enthalpy, Heat capacities and their relationship, Joule-Thomson effect- coefficient, Calculation of work for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes, State function. Temperature dependence of enthalpy of formation- Kirch off s equation, Second law of thermodynamics Different Statements of the law, Carnot cycle and its efficiency, Carnot theorem, Concept of entropy, entropy as a state function, entropy changes in reversible and irreversible processes. Entropy changes in spontaneous and equilibrium processes. Third law of thermodynamics, Nernst heat theorem, Spontaneous and non- spontaneous processes, Helmholtz and Gibbs energies-Criteria for spontaneity.

**CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:**

**CONTINUOUS EVALUATION :** Monitoring the progress of student’s learning Class Tests, Work sheets and Quizzes Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality Semester-end Examination: critical indicator of student’s learning and teaching methods adopted by teachers throughout the semester.

**LIST OF REFERENCE BOOKS:**

1. Concise coordination chemistry by Gopalan and Ramalingam
2. Coordination Chemistry by Basalo and Johnson
3. Organic Chemistry by G.Mareloudan, Purdue Univ
4. Text book of physical chemistry by S Glasstone
5. Concise Inorganic Chemistry by J.D.Lee
6. Advanced Inorganic Chemistry Vol-I by Satyaprakash, Tuli, Basu and Madan
7. A Text Book of Organic Chemistry by Bahl and Arunbahl
8. A Text Book of Organic chemistry by I L FinarVol I
9. A Text Book of Organic chemistry by I L FinarVol II
10. Advanced physical chemistry by Gurudeep Raj.

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