<u>SRIASNM GOVERNMENT COLLEGE, PALAKOL, W.G. DT</u> <u>(Affiliated to Adikavi Nannaya University, Rajahmundry)</u> <u>(Accredited with NAAC "B" Grade with 2.61 CGPA points)</u> <u>II B.Sc.</u> <u>SEMESTER – IV (Wef 2020-21 batch)</u>

Paper IV (Inorganic, Organic and Physical Chemistry) 60hrs (4 h / w)

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 photochemical reactions.
- 2. To understand the concept of quantum efficiency and mechanisms of photochemical reactions

UNIT I:

Organ metallic Compounds: Definition and classification of organometallic compounds on the basis of bond type, Concept of hapticity of organic ligands. Metal Carbonyls:18electronrule, electron count of mononuclear, polynuclear and substituted metal carbonyls of 3d series. General methods 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, classification and their biological importance, Monosaccharides: Constitution and absolute configuration glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth Projection And Conformational Structures; Interconversions of aldoses and ketoses; Kiliani-Fischer synthesis and Ruff degradation; 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.

6h

8h

8h

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 - electrophilic 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 reactions of nitro compounds, amines and diazonium salts.

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.

Amines:

Introduction, classification, chirality in 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 amines using Hinsberg's method and Nitrous Acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel Phthalimide synthesis, Hoffmann- Bromamide Reaction, Carbylamine Reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction and Cope elimination.

Diazonium Salts: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, amino 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- Kirchoff'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

.

5h

12h

7h

3h

11h

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.

Additional Inputs:

Derivatives of Furan: Furfural preparations and properties.

Co-curricular activities and Assessment Methods

- 1. Continuous Evaluation: Monitoring the progress of student's learning
- 2. Class Tests, Work sheets and Quizzes
- 3. Presentations, Projects and Assignments and Group Discussions: Enhances critical thinking skills and personality
- 4. Semester-end Examination: Critical Indicator of Student's Learning and Teaching Methods adopted by teachers throughout the semester.

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

SRI A S N M GOVERNMENT COLLEGE, PALAKOL, W.G. DT (Affiliated to Adikavi Nannaya University, Rajahmundry) (Accredited with NAAC "B" Grade with 2.61 CGPA points)

MODEL PAPER THREE YEAR B.Sc DEGREE EXAMINATION SECOND YEAR EXAMINATIONS SEMESTER IV

Paper – IV: Inorganic, Organic & Physical Chemistry

i aper –i v. morgane, organe & i nystear Chemistry	
Time: 3Hrs.	Max. Marks: 75
Section – A	
Answer ALL the questions. Each carries TEN marks.	5 X 10 = 50 M
1. (a). What are organometallic compounds? Discuss the of type of bonds with examples.	ir Classification on the basis
(OR)	
(b). Discuss the general methods of preparations of me	ono & bi-nuclear carbonyls of 3d
series.	
2. (a). Discuss the constitution, configuration and ring size	ze of glucose. Draw the Haworth
and Conformational structure of glucose.	0
(OR)	
(b). (i) Explain Ruff's degradation. (ii) Explain Kilian	i- Fischer synthesis.
3. (a). What are amino acids? Write any three general me	ethods of preparation of amino acids.
(OR)	
(b). Discuss the aromatic character of Furan, Thiopher	ne and Pyrrole.
4. (a). Write the mechanism for the following.	
(i) Nef reaction (ii) Mannich reaction	
(OR)	
(b), (i) Explain Hinsberg separation of amines	
(ii) Discuss any three synthetic applications of dia	zonium salts
5 (a) What is quantum vield? Explain the photochemics	a combination of Hydrogen
Chloring and Hydrogen Broming	in comoniation of frydrogen-
Chiornie and riverogen - Bronnie.	

(OR)

Section - B

Answer any FIVE of the following questions. Each carries FIVE marks. 5x5 = 25M

- 6. Describe the 18 electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples.
- 7. What are epimers and anomers. Give examples.
- 8. Discuss about iso electric point and Zwitter ion.
- 9. Discuss the Paul-Knorr synthesis of five membered heterocyclic compounds.
- 10. Explain Tautomerism shown by nitro alkanes
- 11. Discuss the basic nature of amines.
- 12. Write the differences between thermal and photochemical reactions.
- 13. Derive heat capacities and derive Cp Cv = R

⁽b). Define entropy. Describe entropy changes in the reversible and irreversible process.

Practical – IV

Organic Qualitative analysis Lab 30hrs (3h / w)

Course outcomes:

At the end of the course, the student will be able to;

- 1. Use glassware, equipment and chemicals and follow experimental procedures in the laboratory
- 2. Determine melting and boiling points of organic compounds
- 3. Understand the application of concepts of different organic reactions studied in theory part of organic chemistry

Organic Qualitative analysis

50 M

Analysis of an organic compound through systematic qualitative procedure for functional group identification including the determination of melting point and boiling point with suitable derivatives.

Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars.