



P.B. SIDDHARTHA COLLEGE OF ARTS & SCIENCE

Siddhartha Nagar, Vijayawada – 520 010

Autonomous - ISO 9001 – 2015 Certified

Title of the Paper (INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY)

Course Code: 22CHET01

Offered to: II B.Sc BZC

Course Type : Core (TH)

Year of Introduction: 2021

Year of offering: 2021

Year of Revision: 2021 -22

Percentage of Revision: -

Semester: III

Credits: 4

Hours Taught: 60 hrs. Per Semester

Max.Time : 4Hours

Course Prerequisites (if any): CHE T11A, CHE T21 A

Course Description: Reaction mechanism of Organometallic compounds, structure, preparation and properties of carbohydrates, amino acids, heterocyclic compounds, nitrogen compounds and laws of thermodynamics

Course Objectives:

1. To provide the students with a thorough understanding of the relationship between the structures, chemical bonds and chemical properties in organometallic chemistry
2. Understand the different classes of carbohydrates
3. Explain the reactions of amino acids and their impact on proteins
4. Describe the structure and properties of amines and amides.
5. Able to learn laws of thermodynamics

Course Outcomes: At the end of this course, students should be able to:

CO1: Remember the reaction mechanisms of organometallic compounds-**PO1**

CO2: Understand the different structures of Carbohydrates-**PO7**

CO3: Apply aromatic character on different heterocyclic compounds.-**PO7**

CO4: Analyze amino acid structures, types of amino acids, classifications, structure of proteins and types of proteins.**PO1, PO7**

CO5: Evaluate the concept of quantum efficiency and mechanisms of photochemical reaction-**PO1**

CO6: Create real time applications of thermodynamic laws-**PO1, PO7**

Syllabus

Course Details

Unit	Learning Units	Lecture Hours
I	Organo metallic Compounds Definition and classification of organo metallic compounds on the basis of bond type, Concept of hapticity of organic ligands.Metalcarbonyls:18electron rule, electron count of mononuclear, poly nuclear and substituted metal carbonyls of 3dseries.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).	8 Hr

II	<p>Carbohydrates Occurrence, classification and their biological importance, Mono saccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size of glucose and fructose, Haworth projections and conformational structures; Inter conversions of aldoses and ketoses; Killiani Fischer synthesis and Ruff degradation; Disaccharides–Elementary treatment of maltose, lactose and sucrose. Polysaccharides–Elementary treatment of starch.</p>	8 hr
III	<p>Amino acids and proteins 6h Introduction Amino: 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 7h 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.</p>	13Hr
IV	<p>Nitrogen Containing Functional Groups Preparation, properties and important reactions of nitrocompounds, amines and diazonium salts. 1. Nitro hydrocarbons 3h 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: 11h 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</p>	14 Hr

	<p>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.</p> <p>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).</p>	
V	<p>Photochemistry 5 h 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). 22</p> <p>Thermodynamics 12 h 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 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.</p>	17 Hr

Textbook:

1. Gopalan and Ramalingam Concise coordination chemistry
2. S Glasstone Text book of physical chemistry
3. J.D.Lee Concise Inorganic Chemistry
4. Satyaprakash, Tuli, Basu and Madan Advanced Inorganic Chemistry Vol-I
6. Bahl and Arunbahl A Text Book of Organic Chemistry
7. I L Finar A Text Book of Organic chemistry Vol I
8. I L Finar A Text Book of Organic chemistry Vol II

Recommended Reference book:

1. Basalo and Johnson Coordination Chemistry
2. .Mareloudan Organic Chemistry, Purdue Univ
3. Gurudeep Raj Advanced physical chemistry

Course Delivery method: Face-to-face / Blended

Course has focus on:

Employability / Entrepreneurship

Websites of Interest:

1. <https://www.sscasc.in/wp-content/uploads/downloads/Chemistry/Inorganic-Chemistry.pdf>
2. <https://microbenotes.com/amino-acids-properties-structure-classification-and-functions/>
3. <http://copharmacy.nahrainuniv.edu.iq/am/wp-content/uploads/2019/04/Heterocyclic-compounds-1-%D9%81%D8%B5%D9%84-%D8%AB%D8%A7%D9%86%D9%8A-%D9%85%D8%B1%D8%AD%D9%84%D8%A9-%D8%AB%D8%A7%D9%86%D9%8A%D8%A9-%D9%85%D8%A7%D8%AF%D8%A9-%D8%A7%D9%84%D8%B9%D8%B6%D9%88%D9%8A%D8%A9.pdf>
4. [https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_CHEM_330_-_Adventures_in_Chemistry_\(Alviar-Agnew\)/09%3A_Organic_Chemistry/9.09%3A_Nitrogen-Containing_Compounds-_Amines_and_Amides](https://chem.libretexts.org/Courses/Sacramento_City_College/SCC%3A_CHEM_330_-_Adventures_in_Chemistry_(Alviar-Agnew)/09%3A_Organic_Chemistry/9.09%3A_Nitrogen-Containing_Compounds-_Amines_and_Amides)
5. <https://byjus.com/physics/thermodynamics/>

Co-curricular Activities:

Continuous Evaluation: Monitoring the progress of student's learning Class Tests Work sheets and Quizzes Presentations, Assignments and Group Discussions.

MODEL PAPER FOR INTERNAL EXAMINATION

Max. Marks: 30

Max. Time: 90min

Answer all Questions. All questions carry equal marks.

(Restrict to a maximum of 2 subdivisions)

Unit -I

- | | | | |
|--------|------|-----------|----|
| 1. (a) | (i) | 10M | L1 |
| | | OR | |
| | (ii) | 10M | L1 |
| (b) | (i) | 5 M | L2 |
| | | OR | |
| | (ii) | 5 M | L2 |

Unit –II

- | | | | |
|--------|------|-----------|----|
| 2. (a) | (i) | 10M | L3 |
| | | OR | |
| | (ii) | 10M | L3 |
| (b) | (i) | 5 M | L2 |
| | | OR | |
| | (ii) | 5 M | L2 |

MODEL PAPER FOR SEMESTER END EXAMINATION
SEMESTER-III BZC
CHEMISTRY COURSE -IV: INORGANIC, ORGANIC & PHYSICAL
CHEMISTRY

Time: 3 hours

Maximum Marks: 70

PART- A

5 X 4 = 20 Marks

Answer the following questions. Each carries **FOUR** marks

1. a) Describe the 18 electron rule of mono nuclear and polynuclear metal carbonyls with suitable examples. **L1-CO1**

Or

b) Discuss the structure of Ni(CO)₅. **L1-CO1**

2. a) Tell epimers and anomers. Give examples. **L1-CO2**

Or

b) Describe Mutarotation. **L1-CO2**

3. a) Explain about iso electric point and zwitter ion. **L2-CO3**

Or

b) Summarize the Paul-Knorr synthesis of five membered heterocyclic compounds. **L2-CO3**

4. a) Interpret Tautomerism shown by nitro alkanes – **L2-CO4**

Or

b) State basic nature of amines. – **L2-CO4**

5. a) Compare the differences between thermal and photochemical reactions. – **L2-CO5**

Or

b) Infer heat capacities and derive $C_p - C_v = R$ **L2-CO5**

PART- B

5 X 10 = 50 Marks

Answer **ALL** the questions. Each carries **TEN** marks

9 (a). Comment on organo metallic compounds? Discuss their Classification on the basis of type of bonds with examples. **L2-CO1**

(or)

(b). Interpret the general methods of preparations of mono & bi-nuclear carbonyls of 3d series. **L2-CO1**

10 (a). Describe the constitution, configuration and ring size of glucose. Draw the Haworth and Conformational structure of glucose. **L1-CO2**

(or)

(b). (i) Explain Ruff's degradation. **L1-CO2**

(ii) Explain Kiliani- Fischer synthesis.

11.(a). Explain amino acids? Write any three general methods of preparation of amino acids. **L1-CO3**

(or)

(b). Describe the aromatic character of Furan, Thiophene and Pyrrole. **L1-CO3**

12.(a). Interpret the mechanism for the following. **L2-CO4**

(i) Nef reaction (ii) Mannich reaction

(or)

(b). (i) Summarize Hinsberg separation of amines. **L2-CO4**

(ii) Discuss any three synthetic applications of diazonium salts.

13.(a). Comment on quantum yield? Explain the photochemical combination of Hydrogen-Chlorine and Hydrogen - Bromine. **L2-CO5**

(or)

(b). Comment on entropy. Describe entropy changes in the reversible and irreversible process. **L2-CO5**



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Title of the Paper (Organic Qualitative analysis)

Course Code :22CHEL01

Offered to: II B.Sc BZC

Course Type : Core (Pr)

Year of Introduction: 2021

Year of offering: 2021

Year of Revision: 2021 -22

Percentage of Revision: -

Semester: III

Credits: 1

Hours Taught: 30 hrs. Per Semester

Max.Time : 2Hours

Course Prerequisites (if any): Basics of Organic compound analysis

Course Description:

Course Objectives:

1. Explain the chemistry of common organic chemistry reactions
2. Classify organic compounds based on functional groups
3. Analysis of an organic compound through systematic qualitative procedure

Course Outcomes: At the end of this course, students should be able to:

CO1: Understand the application of concepts of different organic reactions studied in theory part of organic chemistry.

CO2: Determine melting and boiling points of organic compounds

CO3: Identification of Organic compound with suitable derivatives

Syllabus

Course Details

Unit	Learning Units	Practical Hours
I	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	30 Hr

Textbook:

Laboratory manual

Course Delivery method: Demonstration of Practical

Course has focus on:

MODEL PAPER
SECOND YEAR B.Sc. (BZC) DEGREE EXAMINATION
SEMESTER-III
Organic Qualitative analysis
CHE P01

Total Marks: 50M

Part-I	
Internal continuous Assessment	- 15Marks
Part-II	
Semester end exam	- 35Marks