

**BSC. (LIFE SCIENCE)- CHEMISTRY COMPONENT
SEMESTER-IV**

DISCIPLINE SPECIFIC CORE COURSE CHEM-DSC -10: Chemistry- IV: Chemistry of Carboxylic Acids & their Derivatives, Amines and Heterocycles

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Chemistry of Carboxylic Acids & their Derivatives, Amines and Heterocycles DSC-10: Chemistry- 04	04	02	-	02	Class 12th with Physics, Chemistry, Mathematics	

Learning Objectives

The Learning Objectives of this course are as follows:

- To introduce the basics of coordination chemistry and which are of immense importance to biological systems, qualitative and quantitative analysis, catalysis, medicines, paints and pigments etc.
- Nomenclature, isomerism, bonding in coordination compounds has been dealt with in sufficient detail along with special emphasis on important coordination compounds in the biological system.

Learning outcomes

By studying this course, students will be able to:

- Understand terms: ligand, denticity of ligands, chelate, coordination number.
- Systematically name coordination compounds.
- Discuss the various types of isomerism possible in Octahedral and Tetrahedral coordination compounds.
- Use Valence Bond Theory to predict the structure and magnetic behaviour of metal complexes and understand the terms inner and outer orbital complexes.
- Explain the meaning of the terms Δ_o , Δ_t , pairing energy, CFSE, high spin and low spin and how CFSE affects thermodynamic properties like lattice enthalpy and hydration enthalpy.
- Explain magnetic properties and colour of complexes on basis of Crystal Field Theory
- Understand reaction mechanisms of coordination compounds and differentiate between kinetic and thermodynamic stability.
- Discuss the application of coordination compounds in the biological systems such as Hemoglobin, myoglobin and some enzymes

Syllabus

Unit 1: Carboxylic acids and their Derivatives (aliphatic and aromatic) (Hours:13)

Preparation: Oxidation reactions of alcohols, aldehydes and ketones, Acidic and alkaline hydrolysis of esters; Reactions: Hell-Volhard Zelinsky reaction,

Carboxylic acid derivatives (aliphatic): Preparation: Acid chlorides, anhydrides, esters and amides from acids and their interconversion, Claisen condensation. Reactions: Relative reactivities of acid derivatives towards nucleophiles, Reformatsky reaction, Perkin condensation.

Active methylene compounds: Keto-enol tautomerism. Preparation and synthetic applications of ethyl acetoacetate

Unit 2: Amines (aliphatic & aromatic) and Diazonium Salts (Hours:10)

Amines

Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs Saytzeff elimination, carbylamine test, Hinsberg test, reaction with HNO_2 , Schotten-Baumann reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation; basicity of amines.

Diazonium salt

Preparation: from aromatic amines; Reactions: conversion to benzene, phenol and dyes.

Unit 3: Heterocyclic Compounds (Hours:07)

Introduction, classification, structure, nomenclature and uses. Preparation and properties of the following heterocyclic compounds with reference to electrophilic and nucleophilic substitution: furan, pyrrole, thiophene, and pyridine.

PRACTICALS:

Credits: 02

(Laboratory periods: 60)

1. Systematic qualitative analysis and preparation of suitable crystalline derivative (carboxylic acids, carbonyl, alcohols, phenols, amines (1° , 2° , 3°) and amides).
2. Preparation:
 - a. Acetylation of Aniline and Phenols.
 - b. Benzoylation of Aniline and phenols.

The above derivatives should be prepared using 0.5-1g of the organic compound. The solid samples must be collected and may be used for recrystallization and melting point.

References:

Theory:

1. Morrison, R. N.; Boyd, R. N. **Organic Chemistry**, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. **Organic Chemistry** (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Ahluwalia, V.K.; Bhagat, P.; Aggarwal, R.; Chandra, R. (2005), **Intermediate for Organic Synthesis**, I.K. International.
4. Solomons, T. W. G.; Fryhle, C. B.; Snyder, S. A. (2016), **Organic Chemistry**, 12th Ed., Wiley.
5. Parashar, R.K., Negi, B. (2016) **Chemistry of Heterocyclic Compounds**, Ane Books Pvt Ltd.

Practical:

1. Ahluwalia, V.K.; Dhingra, S.; Gulati, A. (2005), **College Practical Chemistry**, University Press (India) Ltd.
2. Ahluwalia, V.K.; Dhingra, S. (2004), **Comprehensive Practical Organic Chemistry: Qualitative Analysis**, University Press.
3. Pasricha, S., Chaudhary, A. (2021), **Practical Organic Chemistry: Volume I**, I K International Publishing House Pvt. Ltd., New Delhi.
4. Pasricha, S., Chaudhary, A. (2021), **Practical Organic Chemistry: Volume II**, I K International Publishing House Pvt. Ltd., New Delhi.
5. Vogel, A.I. (1972), **Textbook of Practical Organic Chemistry**, Prentice-Hall.
6. Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), **Vogel's Textbook of Quantitative Chemical Analysis**, John Wiley and Sons.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.