

References:

Theory:

- McQuarrie, D. A. (2008), Mathematics for Physical Chemistry, University Science Books.
- Mortimer, R. (2005), Mathematics for Physical Chemistry, 3rd Edition, Elsevier.
- Steiner, E. (1996), The Chemical Maths Book, Oxford University Press.
- Yates, P. (2007), Chemical Calculations, CRC Press.
- Harris, D. C. (2007), Quantitative Chemical Analysis, 6th Edition, Freeman, Chapters 3-5.

Practical:

- Levie, R.D. (2001), How to use Excel in analytical chemistry and in general scientific data analysis, Cambridge University Press.
- Kapoor, K.L. (2019), A Textbook of Physical Chemistry, Vol.7, 1st Edition, McGraw Hill Education.

Teaching Learning Process:

- Blend of conventional blackboard teaching and modern teaching learning tools
- Problem solving and quizzes for enhanced understanding of the concepts
- Explaining the algorithm for solving a problem.

Assessment Methods:

- Class Tests at Periodic Intervals.
- Written assignment (s) / Presentation by individual students
- End semester University Theory and Practical Examination

Keywords: Hardware, Software, Programming Language, ASCII, BCD, QBASIC, library functions, Library commands, mathematical operators, QBASIC commands, Library commands, mathematical operators, QBASIC commands numerical methods, graphs.

11.2.7. Course Code: CHEMISTRY(DSE-C1)

Course Title: Functional Group Organic Chemistry- II

Total Credits: 04 (Credits: Theory-02, Practical-02)

(Total Lectures: Theory- 30, Practical-60)

Objectives: This is designed for better understanding of the organic functional groups, which include carboxylic acids and their derivatives (aliphatic and aromatic), amines (aliphatic & aromatic), diazonium salts and their reactivity patterns. The concept of amino acids, peptides has also been introduced with detailed reactions mechanistic pathways will be discussed to unravel the spectrum of organic chemistry and the extent of organic transformations.

Learning Outcomes:

By the end of the course, the students will be able to:

- Understand and explain the differential behavior of organic compounds based on fundamental concepts learnt.
- Formulate the mechanism of organic reactions by recalling and correlating the fundamental properties of the reactants involved.
- Understand and demonstrate how the structure of biomolecules determines their chemical properties, reactivity and biological uses.
- Design newer synthetic routes for various organic compounds.

Unit I: Carboxylic acids and their derivatives (aliphatic and aromatic)

Preparation: Acidic and alkaline hydrolysis of esters. Reactions: Hell-VolhardZelinsky reaction, the acidity of carboxylic acids, the effect of substitution on acid strength. 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 and Perkin condensation.

(Lectures: 10)

Unit II: Amines (aliphatic & aromatic) and Diazonium Salts

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, the basicity of amines.

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

(Lectures: 10)

Unit III: Amino Acids

Amino Acids and Peptides -Zwitterion, isoelectric point and electrophoresis. Preparation of amino acids: Strecker synthesis and using Gabriel's phthalimide synthesis. Reactions of amino acids: ester of $-\text{COOH}$ group, acetylation of $-\text{NH}_2$ group, complexation with Cu^{2+} ions, ninhydrin test.

Determination of the primary structure of peptides by degradation Edman degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme). Synthesis of simple peptides (up to dipeptides) by N-protection (*t*-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid-phase synthesis. An elementary approach to the structure of proteins.

(Lectures: 10)

PRACTICALS (Credits :02, Laboratory Periods: 60)

1. Estimation of Carboxylic acids (ascorbic acid and any other water soluble acid). (*Take at least two samples*).

2. Estimation of aniline by bromination ($\text{KBr} + \text{KBrO}_3$) method.
3. Estimation of glycine by Sorenson's method.
4. Titration curve of glycine and determination of its Isoelectric point.
5. Systematic qualitative identification and derivative preparation of organic compounds following these functional groups amine 1° -, 2° - and 3° -amines, amide and nitro-compounds.

REFERENCES:

Theory:

- Morrison, R. N.; Boyd, R. N. (2010) Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Finar, I. L. (2002) Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
- Ahluwalia, V.K.; Bhagat, P.; Aggarwal, R.; Chandra, R. (2005), Intermediate for Organic Synthesis, I.K. International.
- Solomons, T. W. G.; Fryhle, C. B. ; Snyder, S. A. (2016), Organic Chemistry, 12th Edition, Wiley.

Practical:

- Ahluwalia, V.K.; Dhingra, S.; Gulati, A. (2005), College Practical Chemistry, University Press (India) Ltd.
- Ahluwalia, V.K.; Dhingra, S. (2004), Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press.
- Vogel, A.I. (1972), Textbook of Practical Organic Chemistry, Prentice-Hall.
- Jeffery, G.H.; Bassett, J.; Mendham, J.; Denney, R.C. (1989), Vogel's Textbook of Quantitative Chemical Analysis, John Wiley and Sons.

Teaching Learning Process:

- Teaching Learning Process for the course is visualized as largely student-focused.
- Transaction through an intelligent mix of conventional and modern methods.
- Engaging students in cooperative learning.
- Learning through quiz design.
- Problem solving to enhance comprehension.

Assessment Methods:

- Presentations by Individual Student/ Group of Students
- Class Tests at Periodic Intervals.
- Written assignment(s)
- End semester University Theory Examination Presentations by Individual Student/ Group of Students

Keywords: Carboxylic Acids and Derivatives, Nitro Compounds, Amines and Diazonium Salts, Amino Acids, Peptides, Zwitterion, Isoelectric Point.