1. Lippard, S.J.; Berg, J.M. (1994), **Principles of Bioinorganic Chemistry**, Panima Publishing Company.
2. Greenwood, N.N.; Earnshaw, A. (1997), **Chemistry of the Elements**, 2nd Edition, Elsevier

Teaching Learning Process:

- Conventional chalk and board teaching,
- Class interactions and discussions
- Power point presentation on important topics.

Assessment Methods:

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

Keywords: Bioinorganic chemistry; Sodium potassium pump; chlorophyll, ATP, Haemoglobin, myoglobin, ferritin, transferrin, toxicity, heavy metal ions, antidotes

Course Code: CHEMISTRY- GE-4

Course Title: Basic Concepts of Organic Chemistry

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

Total Lectures: Theory- 30, Practical- 15 of 4 hrs each

Objectives: This course is designed to teach the fundamentals of organic chemistry and the introduction of a new concept of visualizing the organic molecules in a three- dimensional space. To establish the applications of these concepts, different types of organic reactions are introduced. The constitution of the course strongly aids in the paramount learning of the concepts and their applications.

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.

- Learn and identify many organic reaction mechanisms including free radical substitution, electrophilic addition and electrophilic aromatic substitution.
- Differentiate between various types of organic reactions possible on the basis of reaction conditions

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Theory:

Unit 1: Basic Concepts **Lectures: 6**

Electronic displacements and their applications: Inductive, electromeric, resonance and mesomeric effects and hyperconjugation. Dipole moment, acidity and basicity.
Homolytic and heterolytic fissions with suitable examples. Types, shape and relative stability of carbocations, carbanions and free radicals. Electrophiles and nucleophiles
Concept of Aromaticity: Huckel's rule

Unit 2: Stereochemistry **Lectures: 10**

Stereoisomerism: Optical activity and optical isomerism, asymmetry, chirality, enantiomers, diastereomers. specific rotation; Configuration and projection formulae: Newmann, Sawhorse, Fischer and their interconversion. Chirality in molecules with one and two stereocentres; meso configuration.
CIP rules: Erythro/Threo, D/L and R/S designations.
Geometrical isomerism: *cis-trans, syn-anti* and *E/Z* notations.

Unit 3: Types of organic reactions **Lectures: 14**

Introduction to substitution, addition, elimination, isomerization, rearrangement, oxidation and reduction reactions.
Free radical substitutions (Halogenation), concept of relative reactivity v/s selectivity. Free radical reactions in the biological reactions
Mechanisms of E1, E2, Saytzeff, Hoffmann eliminations and Cope elimination. Biological dehydration reactions
Electrophilic Additions reactions of alkenes and alkynes: mechanism with suitable examples, (Markownikoff/Antimarkownikoff addition), syn and anti-addition; addition of H_2, X_2, hydroboration-oxidation, ozonolysis, hydroxylation.
Nucleophilic substitution reactions – S_N1 and S_N2 mechanisms with stereochemical aspects and effect of solvent; nucleophilic substitution vs. elimination. Biological methylating agents
Electrophilic aromatic substitution: halogenation, nitration, sulphonation, Friedel Crafts alkylation/ acylation with their mechanism. Directing effects of groups in electrophilic substitution.

Practicals: **Credits: 02**

(Laboratory periods: 15 of 4 hrs each)

1. Calibration of a thermometer and determination of the melting points of the organic compounds (Kjeldahl method, electrically heated melting point apparatus and BODMEL)
2. Purification of the organic compounds by crystallization using the following solvents:
 a. Water b. Alcohol c. Alcohol-Water

3. Determination of boiling point of liquid compounds. (Boiling point lower than and more than 100 °C by distillation, capillary method and BODMEL)
4. Acetylation of one of the following compounds: amines (aniline, *o*-, *m*-, *p*- toluidines and *o*-, *m*-, *p*-anisidine) and phenols (*β*-naphthol, salicylic acid) either by conventional or green method.
5. Bromination of acetanilide/aniline/phenol either by conventional or green method.
6. Nitration of chlorobenzene/nitrobenzene.

References:

Theory:

1. Sykes, P. (2005), **A Guide Book to Mechanism in Organic Chemistry**, Orient Longman.
2. Eliel, E. L. (2000), **Stereochemistry of Carbon Compounds**, Tata McGraw Hill.
3. Morrison, R. N.; Boyd, R. N., Bhattacharjee, S.K. (2010), **Organic Chemistry**, 7th Edition, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Mehta B.; Mehta M. (2015), **Organic Chemistry**, PHI Learning Private Limited
5. Bahl, A; Bahl, B. S. (2012), **Advanced Organic Chemistry**, S. Chand.

Practicals:

1. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. (2012), **Vogel's Textbook of Practical Organic Chemistry**, Pearson.
2. Mann, F.G.; Saunders, B.C. (2009), **Practical Organic Chemistry**, Pearson Education.

Teaching Learning Process:

- Lectures in class rooms
- PowerPoint presentations/videos
- Hands-on learning using 3-D models

Assessment Methods:

- Presentation/assignment by students
- Class Test at Periodic Intervals
- Written Assignment
- Continuous evaluation in practicals
- End Semester University Theory and Practical Exams

Keywords: Electronic effects, Huckel rule, Stereochemistry, Free radical substitutions, eliminations reactions, electrophilic additions, ozonolysis, nucleophilic substitution reactions, electrophilic aromatic substitution