Bachelors with Chemistry as Major
6th Semester

Title of the course: Selected Topics in Organic Chemistry

Course Code: CHM622J2 **Credits:** Theory-4, Lab-2

Theory (4 credits: 60 Hours) **Max. Marks**: 100, **Min Marks:** 36

Course objectives:

To impart knowledge to the students about molecular rearrangement reactions, general organic chemistry, heterocyclic chemistry, natural products and medicinal chemistry.

Learning Outcome:

On completion of the course the student should be able to:

- Understand the fundamentals of various types of organic reactions, their mechanism and applications.
- Importance of heterocyclic chemistry and cyclization processes
- Recognize the importance of the chemical aspects of rearrangements, natural products and chemistry involved in medicine.

Unit-I Molecular Rearrangements (15 Hours)

Introduction, Mechanism, stereochemical implications and applications of rearrangement reactions. Migration to Electron-Deficient Carbon: Wagner-Meerwein, Pinacol and Semipinacol Rearrangements, Dienone-Phenol Rearrangements. Migration to Electron-Deficient Nitrogen: Beckmann Rearrangement, Hofmann Degradation. Migration to Electron-Deficient Oxygen: The Baeyer-Villiger rearrangement Anionic Rearrangements: Benzil-Benzylic acid rearrangement, Favorskii Rearrangement

Unit-II Heterocyclic Compounds (15 Hours)

Introduction and Nomenclature, Aromatic and non-aromatic heterocyclic, basicity and acidity of nitrogen heterocyclics. Tautomerism in heterocycles, Meso-ionic systems.

Structure and synthesis of Furan, Pyrrole and Thiophene (Pall-Knorr synthesis), Indole (Fischer synthesis), Benzofuran (From Phenolates), Benzothiophene (From Thiophenolates), Pyridine (Hantzsch synthesis), Quinoline(Skraup synthesis) and Isoquinoline (Bischler-Napieralki).

Unit-III Natural Products (15 Hours)

Prostaglandins: Introduction, Structural features, Physiological Functions and Medicinal Uses of Different Prostaglandins.
Terpenoids: Introduction, Isoprene Rule, Classification and Uses. Biosynthesis of Terpenoids.
Steroids: Introduction, Classification, Structural features and Functions of Different Classes of Steroids.Biosynthesis of Cholesterol. Cholesterol and Heart Diseases.

Alkaloids: Introduction, classification, important representative examples from each class, qualitative tests, pharmaceutical applications and general methods of isolation.

Unit-IV Medicinal Chemistry. (15 Hours)

Drug Design: Classification and sources of drugs, concept of lead compounds and lead modification. Analogues, prodrugs, factors governing drug design.

Structure activity relationship (SAR),Isosterism, bioisosterism, changing the size and shape,changing the number of methylene groups in chain, changing the degree of unsaturation. Effect of introduction of methyl groups, halogens, hydroxyl, carbonylic, thiols,sulphidegroups and introdction/removal of ring systems on pharmacological activity.

Elementary idea of QSAR

Antibiotics: Pencillins V & G, chloroamphenicoland ciprofloxacin.

Books Recommended:

1. Organic Chemistry, 5th Ed. Vol I &II, I.L.Finar (Persion, 2008)
2. Organic Chemistry 8thEd. - F. A. Carey and Robert M. Giuliano (McGraw Hill-2012).
3. Organic Chemistry5th Ed, R.J. Fessenden, J.S. Fessenden. (Brooks/Cole-1993).
4. Organic Chemistry, A mechanistic Approach, Penny Chaloner (CRC Press-2015).
5. Organic Chemistry, Paula Y, Bruice (Pearson, New Age International Edition)
6. Organic Chemistry - 2ndEd., J. Hornback. (Brooks/Cole- 2006).
7. Organic Chemistry, 5thEd., John McMurry. (Brooks/Cole-2000).
8. Advanced Organic Chemistry, 5thEd., F.A Carey & R.J Sundberg (Springer-2007).
9. Organic Chemistry, 2ndEd., Jonathan Clayden (OUP-2016).
10. Organic Chemistry, 11thEd., Solomons, T.W.G., (Wiley-2015).
11. Organic Chemistry, 7thEd. Morrison, Boyd and Bhattacharya. (Pearson-2013.)
12. Heterocyclic Chemistry, 5th Ed, J .A. Joule and Mills (Wiely 2010)
13. Medicinal Chemistry,Ashutosh Kar, New age International Publisher, 2007)

Practical (2 credits: 60 Hours) Max. Marks: 50, Min Marks: 18

1. Group tests for different classes of natural products.,
   - Terpenoids
   - Steroids
   - Alkaloids.
2. Blackman rearrangement – Acetophenone to acetanilide.
3. Isolation of caffeine from Tea/ Isolation of Cholesterol from sheep's brain or Gall stone.
4. Preparation of Aspirin/ Benzocaine/ Paracetamol

Books Recommended:

1. Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
2. Comprehensive Practical Organic Chemistry: Qualitative analysis Ahluwalia, V.K. &Sunita Dhingra; Universities Press, India, 2004.
3. Advanced Practical Organic Chemistry; N. K. Vishnoi; 3rdEdn; Vikas Publishing, 2009.