ADVANCE CHEMISTRY- VI (ORGANIC CHEMISTRY)

CREDIT HOURS: 3

Course Objectives: Students will gain knowledge about the stereochemical behavior of organic molecules and acquire an ability to propose mechanism of simple reactions.

1. **Acid-base strength:**
   pKa and Ka values, electronic effects (Inductive and resonance effects), field effect, solvent effect, hyper-conjugation, hydrogen bonding, steric and stereo-chemical effects, and hybridization.

2. **Stereochemistry**
   (a) Conformation Analysis
   The concept of conformational analysis in ethane, propane, n-butane, pentane, cyclopentane, cyclohexane, substituted alkanes, substituted cycloalkanes and decalins.

   (b) Optical isomerism:
   Configuration, Chirality and symmetry, optical isomerism upto three chiral carbon atoms, enantiomers and diastereomers, R and S nomenclature, Racemates, Racemization and Resolution of Racemates, epimerization. Walden inversion, Stereoisomerism in biphenyls, allenes and spiro-compounds

   (c) Geometrical isomerism
   Cis & Trans, and Z & E conventions, Determination of configuration, Geometrical isomerism in cyclic compounds.

3. **Active Methylene Compounds:**
   Alkylation, arylation, and acylation of active methylene compounds, Acid and base catalysed aldol condensation. Conditions, mechanism and synthetic applications of the following reactions; Claisen, Claisen Schmidt, Knoevenagel, Perkin, Reformatsky, and Stobbes condensations, Darzen's glycosidic ester synthesis, Mannich and Wittig reactions.

4. **Free radical Reactions:**
   Introduction, generation methods, relative stability, structure, free radical reactions and industrial applications.

5. **Oxidation and Reduction reactions:**
   a. Oxidation Reactions:
   Introduction, Oxidation of saturated hydrocarbons, olefinic double bonds, aromatic rings, systems containing oxygen such as alcohols, aldehydes, ketones, oxidative decarboxylation, of acids, oxidation of systems containing nitrogen such as amines, hydrazines etc..

   b. Reduction Reactions:
   Introduction, Reduction of alkenes, alkynes, and aromatic rings, hydrogenolysis, reduction of benzylic and allylic systems, aldehydes and ketones, alcohols, pinacols, epoxides, acids and their derivatives, Reduction of system containing nitrogen such as imines, oximes and nitro compounds

6. **Spectroscopy:**
   a. IR Spectroscopy:
   Electromagnetic radiations: IR; modes of vibration, sampling techniques, factors influencing the vibration frequencies and industrial applications

   b. UV Spectroscopy:
   Ultraviolet (UV) or electronic spectroscopy: electronic transition; factors influencing the λmax. value.

Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

RECOMMENDED BOOKS:

1. Organic Chemistry, Volume I (6th ed.) & II (5th ed.) by I.L. Finar, Pearson Education (singapore) Pte Ltd, 2008.
2. March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, 6th ed. by Michael B. Smith, Jerry March, Wiley, 2007.
3. Organic Chemistry, eth Ed.; by S. H. Pine, McGraw Hill: New York,1987.
4. Organic Chemistry 6th ed. by Francis A. Carey, McGraw Hill, 2005.
5. Organic Chemistry 6th d, by R. T. Morrison, R. N. Boyd, and R. K. Boyd, Benjamin Cummings, 1992,.
6. Modern Synthetic Reactions 2nd ed. by H.O.House , W.A. Benjamin Inc., Menlo Park, CA
7. Principles in Organic Synthesis by R.O.C Norman & J. M. Coxon,1993, Chapman and Hall, 1993.
8. Organic Chemistry by Jonathan Clayden, Nick Geeves, Stuart Warren, Oxford University Press 2000.
9. Spectroscopic Methods in Organic Chemistry 6th ed. by D. Williams and I. Fleming. Wiley-VCH, 1991.
10. Spectrometric identification of Organic Compounds 6th ed. by R. M. Silverstein and F. X. Webster, Wiley, 2007.
11. Organic Spectroscopy and Chromatography by M Younas, ILMI, Pakistan, 2007.

ADVANCE CHEMISTRY LAB- VI (ORGANIC CHEMISTRY)

CREDIT HOURS: 1

1. **Organic Preparations:**
   a. Benzyl alcohol; Ethyl benzene; benzilic acid, p-Nitrophenol, acetophenone oxime, acetophenone arylHydrazone.

   b. Synthesis of compounds containing nitro, halogeno, amino, carboxylic and carbonyl functionalities (depends upon the availability of chemicals).

2. **Quantitative and Qualitative Analysis of Organic compounds:**
   a. . Estimation of glucose, and Number of acetyl groups,
   b. Physical/ Chemical separation of mixture containing two compounds, identification and derivitization.

Evaluation Criteria

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Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

RECOMMENDED BOOKS:

1. Practical Organic Chemistry by F. G. Mann and B. C. Saunders, Longman, UK, 1978
2. Vogel's Textbook of Practical Organic Chemistry (5th ed.) by A.I. Vogel, A.R. Tatchell, B.S. Furnis, A.J. Hannaford, P.W.G. Smith, 1989, Longman UK, 1989.
3. The Systematic Identification of Organic Compounds, (8th ed.) by Ralph L. Shriner et al., Wiley, 2003.
4. Advanced Practical Organic Chemistry, by J. Leonard, B. Lygo, G. Procter, CRC, 1994.
5. Advanced Practical Organic Chemistry (2nd ed.) by N. K. Vishnoi, Vikas Publishing House Pvt Ltd , India, 1996.