CHM-102C **Chemistry-II (Credit 4)**

Unit I

1. Types of organic reactions and mechanism e.g. substitution, elimination, addition, condensation, rearrangement reactions, radical and pericyclic reactions with examples.

2. Cycloalkanes – Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings

3. Aromatic hydrocarbons; Preparation from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: (Case benzene): electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) Side chain oxidation of alkyl benzenes.

Unit II

1. Alkyl Halides Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions. Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

2. Aryl Halides Preparation (Chloro, Bromo and Iodo-benzene) from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

Unit III

Gaseous States; Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. Van der Waals equation of state for real gases. Boyle temperature (derivation not required). Critical phenomena, critical constants and their calculation from van der Waals equation. Andrews isotherms of CO2. Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules.

Unit IV

CHM-101CL Chemistry Laboratory Course I Credit 02

1. Qualitative Analysis of Inorganic Mixtures (excluding interfering radicals)

2. Preliminary investigations and qualitative analysis of solid organic compounds with functional groups detection.

BOOKS Recommended:

1. Vogel Qualitative Inorganic Analysis, G. Svehla; Pearson Education 7Th Edition (2002)
2. Elementary Practical Organic Chemistry: Qualitative Organic Analysis Part 2, A. I. Vogel; Pearson India; 2nd edition (2010)
3. Textbook of Practical Organic Chemistry; Vogel, A.I.; Tatchell, A.R; Furnis, B.S., Hannaford, A.J. & Smith, P.W.G;, 5th ed.; Prentice-Hall; 1996.
4. Practical Organic Chemistry; Mann, F.G. & Saunders, B.C.; Orient-Longman; 1960.
5. Laboratory Manual in Organic Chemistry; R.K. Bansal; Wiley Eastern.
6. Experimental Organic Chemistry;; P.R. Singh, D.S. Gupta and K.S. Barpal; Vol I & II Tata McGraw Hill.
7. Advanced Practical Organic Chemistry; N. K. Vishnoi; Vikas Publishing House Pvt Ltd; 1996.

McGraw Hill)
2. Advanced Practical Physical Chemistry, J.B. yadav; Goel Publishing House; 20th ed.; 2001.
3. Jadav, J. B. Advanced Practical Physical Chemistry, 7th edn., (Goel, 2008).
4. Advanced Experimental Chemistry; J.N. Gurtu and R. Kapoor; Vol. I; 1st ed.; S. Chand & Co; 2000.
5. Practical Physical Chemistry; Khosla, B. D.; Garg, V. C. & Gulati, A.; R. Chand & Co.; 2011.
6. Textbook of Practical Organic Chemistry; Vogel, A.I.; Tatchell, A.R; Furnis, B.S., Hannaford, A.J. & Smith, P.W.G; 5th ed.; Prentice-Hall; 1996.
7. Practical Organic Chemistry; Mann, F.G. & Saunders, B.C.; Orient-Longman; 1960.
8. Laboratory Manual in Organic Chemistry; R.K. Bansal; Wiley Eastern.
9. Experimental Organic Chemistry; P.R. Singh, D.S. Gupta and K.S. Barpal; Vol I & II Tata McGraw Hill.
10. Advanced Practical Organic Chemistry; N. K. Vishnoi; Vikas Publishing House Pvt Ltd; 1996.

1. Liquid States; Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer
2. Solids; Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X–Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals.

Books Recommended:

1. Atkins, P., Paula, J. de. Elements of Physical Chemistry, 4th edn. (Oxford University Press, 2005).
2. Shriver, D. F., Atkins, P. W. Inorganic Chemistry 3rd edn, (Oxford University Press, 1999).
3. Principles of physical chemistry, Puri, Sharma, Pathanai; Vishal Publishing Co.; 47th edition edition (2016)
4. Principles of Inorganic Chemistry, L.R. Sharma , K.C. Kalia and B.R. Puri; Milestone Publishers & Distributors/ Vishal Publishing Co.; 33rd edition edition (2016)
5. Smith, M. B., March, J. March's Advanced Organic Chemistry, Reaction Mechanism and Structure (John Wiley, 2001).
6. A textbook of Organic Chemistry; R.K. Bansal; 4th ed.; Wiley-Eastern; 2003.
7. Organic Chemistry; Vol I; I. L. Finar; 6th ed.; ELBS; 2004.
8. Organic Chemistry; Morrison and Boyd; 6th ed.; PHI; 2003.
9. Organic Chemistry, Solomons and Frhyle; Wiley India Pvt Ltd; Eighth edition (2006)

CHM-102CL Chemistry Laboratory Course II Credit 02

1. Preparation of buffer solution and measurement of pH.
2. Viscosity measurement of solution
3. Measurement surface tension of liquid by stalagmometer.
4. Separation and identification of a binary mixture of solid organic compounds

Books Recommended:

1. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh & Sons Experiments in Physical Chemistry, R. C Das and B. Behra (Tata

Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; *cis – trans* nomenclature; CIP Rules: R/ S (for upto 2 chiral carbon atoms) and E / Z Nomenclature (for upto two C=C systems).

Unit – IV

1. Alkanes: Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe'ssynthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation.
2. Alkenes: Preparation: Dehydration of alcohol and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk.KMnO4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition) Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation.
3. Alkynes: Preparation: Acetylene from CaC2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alk. KMnO4.

Books Recommended:

1. Principles of physical chemistry, Puri, Sharma, Pathanai; Vishal Publishing Co.; 47th edition edition (2016)
2. Principles of Inorganic Chemistry, L.R. Sharma , K.C. Kalia and B.R. Puri; Milestone Publishers & Distributors/ Vishal Publishing Co.; 33rd edition edition (2016)
3. Lee, J. D. Concise Inorganic Chemistry, 5thedn. (Chapman & Hall, 2002).
4. Organic Chemistry, Solomons and Frhyle; Wiley India Pvt Ltd; Eighth edition (2006)
5. Carey, F. A., Sundberg, R. J. Advanced Organic Chemistry, 4th edn., (Plenum Publishers, 2001).
6. Atkins, P., Paula, J. de. Elements of Physical Chemistry, 4th edn. (Oxford University Press, 2005).
7. Clayden, J., Greeves, N., Warren, S., Wothers, P. Organic Chemistry (Oxford University Press, 2008).