CLUSTER UNIVERSITY SRINAGAR

SYLLABUS (FYUP UNDER NEP 2020)

Offered By Department Of CHEMISTRY

Semester 1st (Major Course)

Course Title: Chemistry-I

Course Code: UGCHM22J101 **Max. Marks 100**
Credits: 4 (Theory: 3, Practical: 1) **Theory External: 60; Min Marks: 24**
Contact Hrs: 75 (Theory: 45, Practical: 30) **Theory Internal (Continuous Assessment): 15 Marks, Min Marks: 06**
Practical Experimental Basis= 15, Min. Marks: 06
Practical Experimental (Continuous assessment) = 10, Min. Marks: 04

Course Objectives:

- To introduce students to the basic concepts of Chemical Bonding, valence bond and molecular orbital theories and their applications.
- To familiarize them with fundamental concepts of organic reaction mechanisms and give a basic understanding of the properties of two states of matter.

Course Outcomes: The students will be able to:

- Understand the nature and strength of forces between chemical constituents.
- Understand the applications of different theories of chemical bonding.
- Understand basic concepts of organic reaction mechanisms of aliphatic substitution and elimination reactions.
- Understand the structural and behavioral aspects of matter in liquid and gaseous states.

UNIT I: **(15 Hrs)**

Theories of Chemical Bonding and Molecular Structure

Types of bonding: Salient features of ionic and covalent bonding. Lattice energy and Born Haber cycle. Solvation energy and solubility of ionic solids. Covalent-character of ionic bond, Fajan's rules, Percentage ionic character of a polar covalent bond. Dipole moment and its applications.

Valence Bond Theory: Directional characteristics of covalent bond, types of hybridization and limitations of VB theory.

VSEPR Theory: Shapes of molecules/ions. (VO_3^{-1}, SF_6, IF_7, $SnCl_2$, XeF_2, XeF_6, $XeOF_4$); Bent's rule.

Molecular Orbital Theory: MO treatment of homo & hetero nuclear diatomic molecules (B_2, F_2, CO & HF). Energy level diagrams, Bond order and its applications.

UNIT II: **(15 Hrs)**

Fundamentals of Organic Reaction Mechanisms

Electron Displacement: Inductive, Electromeric, Resonance, Hyperconjugation and their applications.

Reactive Intermediates: Structure, generation and stability of carbocations, carbanions, free- radicals, benzynes, carbenes and nitrenes.

Aliphatic Substitution Reactions: Mechanistic details of SN^1, SN^2, SN^i reactions.

Factors affecting nucleophilic substitution reactions at allylic, benzylic, aliphatic trigonal and vinylic carbons.

UNIT III: **(15 Hrs)**

Gaseous and Liquid States

Gaseous State: Ideal Gas equation, Deviation of gases from ideal behavior, Van der Waal's equation of state. PV isotherms of real gases, continuity of states, isotherms of Van der Waal's equation. Relationship between critical constants and Van der Waal's constants, the law of corresponding states, reduced equation of state. Liquefaction of gases.

Concept of root mean square, average and most probable velocities (Derivation not needed), Qualitative discussion of the Maxwell's distribution of molecular velocities. Collision number, mean free path and collision diameter.

Liquid State: Viscosity: Types and factors affecting viscosity of liquids. Surface tension and factors affecting surface tension along with interfacial tension. Applications of surface tension in day to day life.

UNIT-IV: **(30 Hrs)**

PRACTICAL (Lab Work)

1. Preparation of solutions of different concentrations
2. Standardization of solutions (acids and bases).
3. Purification of organic compounds by crystallization and sublimation.
4. Detection of elements N, S and halogens in organic compounds.
5. Determination of density, relative density using Pyknometer/density bottle and viscosity using Ostwald Viscometer.
6. Measurement of surface tension of given liquids using Stalagmometer.

Books Recommended:

- Concise Inorganic Chemistry; J.D. Lee; 5thEdn., OUP/Wiley India Pvt. Limited, 2008
- Principles of Inorganic Chemistry; B.R. Puri, L.R. Sharma and K.C. Kalia; 33rdEdn., Milestone Publishers & Distributors/ Vishal Publishing Co., 2017
- Advanced General Organic Chemistry: A Modern Approach; S.K. Ghosh; 3rd Revised Edn., New Central, 2010.
- Organic Chemistry; R.T. Morrison, R.N. Boyd, S. K. Bhattacharjee; 7th Edn., Pearson India, 2011.
- Organic Reaction Mechanism; V. K. Ahluwalia and Rakesh Kumar Parashar; 4th edition.
- Advanced Organic Chemistry; Dr. Jagdamba Singh and LDS Yadav; Pragati edition, 2017.
- Principles of Physical Chemistry; B.R. Puri, L.R. Sharma and L.S. Pathania; 47th Edn.,Vishal Pubs & Co, 2017.
- Vogel's Qualitative Inorganic Analysis; G. Svehla; 7th Ed., Pearson Education. 2013,
- Advanced Practical Inorganic Chemistry; Gurdeep Raj; Krishna Prakashan Media (P) Ltd; 2013.
- Comprehensive Practical Organic Chemistry: Qualitative analysis Ahluwalia, V.K. & Sunita Dhingra; Universities Press, India, 2004.
- Advanced Practical Organic Chemistry; N. K. Vishnoi; 3rdEdn; Vikas Publishing, 2009.
- Advanced Practical Physical Chemistry; J.B. Yadav; Krishna Prakashan Media (P)Ltd, 2015.