B. Sc. SEMESTER - II

CHM 121(T): General Chemistry – II

Credit – 4, Hours - 60

Course Outcomes:

After the completion of this course, student will be able to-

CO-1. Understand the basic concepts of formation of chemical bond**,** Conductivity, hydrolysis, stereochemistry, different blocks of periodic Table and periodic Properties.

CO-2. Gain the basic knowledge of types of chemical bonds and compounds, electric conductance, isomerism and periodic properties.

CO-3. Understand and solve the problems related to geometry and structure of compounds, hybridization, different types of conductance, hydrolysis of salts, buffer solution, isomerism, chirality, nomenclature, different periodic properties trends in group and period.

CO-4. Gain the skills regarding the solutions of problems related with industries and efficiency to work in industries.

CO-5. Understand interpretation, analysis, investigation and solution problems regarding bonding and structure, ionic equilibrium, stereochemistry, different elements of periodic table and their different properties.

CO-6. Gain research ideas in the discovery of new elements and Interdisciplinary subjects.

CO-7. Justify the derivations and principles related to bonding and structure, Stereochemistry, ionic equilibrium and periodic properties trends in group and period.

CO-8. Participate in the discussion, involvement in classroom teaching, laboratory work and field based work.

CO-PO mapping (connecting Cos with POs)

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8
CO-1	3	3	2		2			2
CO-2	3	3	2			2	1	2
CO-3	2	2	3		2	2	1	1
CO-4		2		3	2	1	2	1
CO-5	2		2	2	3	2		2
CO-6	2	2		2	1		3	2
CO-7	3	3	2		2		2	
CO-8	2	2	1	2		3	1	3

UNIT – I – Bonding and Structure **[25 Marks]**
[15 Hours]

Chemical bond, Types of Bond (Ionic, Covalent, Coordinate and Metallic Bond), Ionic Bond, Conditions and factors governing the formation of Ionic Bond, Properties of Ionic Compounds, Covalent Bond, Covalency, Conditions for the formation of Covalent Bond, Properties of Covalent Compounds, Failure of octet rule (Lewis Concept) in Covalent Compounds, Covalent Bond having partial Ionic character, Co-ordinate Bond, Condition for the formation of Co-ordinate Bond, , Properties of Co-ordinate Compounds, Metallic Bond, Conditions for the formation of Metallic Bond, Hydrogen Bond, Properties of Hydrogen Bond, Types of Hydrogen Bond, Sidgwick Powel theory, VSEPR theory and its application for CH_4, NH_3, H_2O, CIF_3, SF_4, SF_6, I_3^-, IF_7, Hybridization of atomic

orbitals, Rules for Hybridization, Types of hybridization and shape of molecules with sp, sp^2, sp^3, sp^3d, sp^3d^2 hybridization.

UNIT II - Ionic Equilibrium **[25 Marks]**
[15 Hours]

Definition of basic terms: Electrical conductance, Specific conductance, Equivalent conductance, Molar conductance, Cell constant and its determination, Incomplete dissociation, Degree of dissociation, Oswald's dilution law and its limitations, Kohlraush law and its application, Debye – Huckel theory, Self ionization of water and Ionic product of water $K_{w,}$ pH Scale, Hydrolysis of different salts (strong acid and weak base, strong base and weak acid, weak acid and weak base) including relation between K_a , K_b , K_h , h, K_w and their pH equation, Buffer Solutions, Henderson – Hasselbalch equation, Indicator theory, useful pH range of indicator for acid and base titration.

UNIT III - Stereochemistry **[25 Marks]**
[15 Hours]

Introduction, Stereochemical aspects of organic molecules, Chirality, Optical isomerism, Enantiomerism and Diastereoisomerism, threo and erythro diastereomers, mesomerism, racemization(in lactic acid & tartaric acid), resolution of enantiomers, resolution technics, inversion, Relative and absolute configuration, sequence rules, D & L and R-S nomenclature, Geometric isomerism, E-Z nomenclature, geometric isomerism in oximes (only nomenclature) and alicyclic compounds, Difference between configuration and conformation, Conformational analysis of Ethane, n-Butane & Cyclohexane, Axial and equatorial bonds, conformational analysis of mono substituted cyclohexane derivatives (only mnomethylcyclohexane), Newman projection and Sawhorse formula, Fischer and flying wedge formula.

UNIT IV - Periodic table and Periodic Properties [25 Marks]
[15 Hours]

s, p, d, f block elements, the long form of periodic table. Detailed discussion of the following properties of the elements, with reference to s & p-block elements.

(a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table.

(b) Atomic radii (van der Waals)

(c) Ionic and crystal radii.

(d) Covalent radii

(e) Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy, Applications of ionization enthalpy.

(f) Electron gain enthalpy, trends of electron gain enthalpy.

(g) Electronegativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffé's electronegativity scales. Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity.

REFERENCE BOOKS

1. '**Concise Inorganic Chemistry**' by J. D. Lee, 5th Ed., 2013, Wiley India.

2. '**Basic Inorganic Chemistry'** by F. A. Cotton, Geoffrey Wilkinson, Carlos A Murilloand Manfred Bochmann, 6th Ed., Wiley publication.

3. '**Inorganic Chemistry'** by Shriver & Atkins, 5th Ed., 2013, Oxford University Press.

4. **'Satya Prakash's Modern Inorganic Chemistry'** by Dr. R. D. Madan, 1987, S. Chand, New Delhi.

5. **'Principles of Inorganic Chemistry'** by Puri, Sharma and Kalia, 2018, Vishal Publishing Co., Jallandhar – Delhi.

6. '**Elements of Physical Chemistry**' by Peter Atkins & Julio De Paula, 5/E, Indian Edition, OxfordUniversity Press.

7. '**Physical Chemistry**' by P. W. Atkins, 7/E, 2002, Indian Edition Oxford University Press.

8. '**Physical Chemistry**' by W. J. Moore, 6/E, 1996, MacGraw Hill Publication.

9. '**Principle of Physical Chemistry'** by Puri, Sharma & Pathania, 41/E, Vishal Publishers.

10. '**Essentials of Physical Chemistry'** by Bahl & Tuli, 22/E, S. Chand publication, New Delhi.

11. '**Advanced Physical Chemistry**' by Gurdeep Raj, 19/E, Goel Publishing House Meerut

12. **'*Organic Chemistry'*** *Morrison, R.T. and Boyd, R.N. 6th Ed. 1992, Prentice Hall* International, Inc., London.

13. '**Text book of Organic Chemistry**' by P. L. Soni and H. Chawla, 26/E, 1995, Sultan Chand & Sons Publication, New Delhi.

14. '**Text book of Organic Chemistry**' by P. S. Kalsi, 1999, MacMillan of India Pvt. Ltd.

15. '**Organic Chemistry'** by Bhupinder Mehta, Manju Mehta, 2/E, 2015, Prentice Hall of India Pvt. Ltd, New Delhi.