

**Semester II**  
**General Chemistry Paper 103**

**UNIT I : Inorganic Chemistry :- ( 14 Marks )**

**(a) Chemical Bonding:-**

Covalent bond-Sidgwick Powel Theory, VSEPR Theory, Examples of  $\text{NH}_3$ ,  $\text{H}_2\text{O}$ ,  $\text{ClF}_3$ ,  $\text{SF}_4$ ,  $\text{SF}_6$ ,  $\text{I}_3^-$ ,  $\text{IF}_7$ ; Hybridization of atomic orbitals; Rules for Hybridization; Types of Hybridization and shape of some molecules ( $\text{sp}$ ,  $\text{sp}^2$ ,  $\text{sp}^3$ ,  $\text{sp}^3\text{d}$ ,  $\text{sp}^3\text{d}^2$ ).

**(b) Complex Compound:-**

Werner's Theory; Labile and inert complexes; Stability of complex compounds; Factors influencing the stability of complexes; Spectrochemical Series; V. B. theory for complexes – Examples of  $\text{ML}_4$  &  $\text{ML}_6$  type (Fe, Co, Ni, Mn).

**UNIT II : Inorganic Chemistry:- ( 14 Marks )**

**(a) Introduction of Wave Mechanics:-**

Wave equation and wave functions, its interpretation, significance of  $\Psi$  and  $\Psi^2$ , Limitations of acceptable wave functions, Normalized and orthogonal (orthonormal) wave functions, Eigen values and Eigen functions

**(b) Operator Concept in Quantum Chemistry:-**

Operators, type of operators, Hamiltonian Operator for H atom,  $\text{H}_2$  molecule,  $\text{H}_2^+$  ion, He, Li, Be and B atom.

**UNIT III : Organic Chemistry:- ( 14 Marks )**

**(a) Fundamentals of Stereochemistry:-**

Introduction, Stereochemical aspects of organic molecules, Chirality, Optical isomerism, Enantiomers and Diastereomers, R-S nomenclature, E-Z nomenclature.

**(b) Conformations:-**

Conformational analysis of Ethane, n-Butane & Cyclohexane.

## UNIT IV: Physical Chemistry:- ( 14 Marks )

### (a) Ionic equilibrium:-

Definition of basic terms: Electrical conductance, Specific conductance  
Equivalent conductance, Molar conductance, Cell constant & degree of  
Dissociation; Derivation of Ostwald's dilution law , its applications and  
Limitations; pH Scale, Hydrolysis, Relation between  $K_a$ ,  $K_b$ ,  $K_h$ , &  $K_w$  for  
Strong acid  $\rightarrow$  Strong base  
Strong acid  $\rightarrow$  Weak base  
Weak acid  $\rightarrow$  Strong base  
Buffer Solution, (Henderson – Hasselbalch equation), Indicator theory,  
Useful pH range of indicator for acid base titration.

### (b) Nuclear Chemistry:-

Radioactivity, Rutherford's disintegration theory, Soddy's group Displacement  
law, Packing fraction, Factors affecting stability of Nucleus (Mass defect,  
Binding energy, N / P ratio) .

## REFERENCE BOOKS

### UNIT I & II :

1. 'Elements of Quantum Mechanics' by **Michael D. Fayer**, Oxford University Press, Indian Edition,
2. 'Concise Inorganic Chemistry' by **J. D. Lee**, 5/E, Oxford University Press, Indian Edition.
3. 'Basic Inorganic Chemistry' by **F. A. Cotton and G. Wilkinson**, Wiley publication.
4. 'Inorganic Chemistry' by **Shriver & Atkins**, 4/E, Oxford University Press, Indian Edition.
5. 'Introductory Quantum Chemistry' by **A. K. Chandra**, 4/E, Tata MacGraw Hill Publishing Company Limited New Delhi.

### UNIT III :

1. 'Organic Chemistry' by **G. Marc Loudon**, 4/E, 2010, Oxford University Press, Indian Edition.
2. 'Organic Chemistry' by **Robert Thornot Morrison, Robert Neilson Boyd**, 6/E, 1992, Prentice Hall of India Pvt Ltd, New Delhi.
3. 'Text book of Organic Chemistry' by **P. L. Soni and H. M. Chawla**, 26/E, 1995, Sultan Chand & Sons Publication, New Delhi.
4. 'Text book of Organic Chemistry' by **P. S. Kalsi**, 1999, MacMillan of India Pvt. Ltd.
5. 'Organic Chemistry' by **Bhupinder Mehta, Manju Mehta**, Prentice Hall of India Pvt.Ltd, New Delhi.

### UNIT IV :

1. 'Elements of Physical Chemistry' by **Peter Atkins & Julio De Paula**, 5/E, Oxford University Press, Indian Edition.
2. 'Physical Chemistry' by **P. W. Atkins**, 7/E, 2002, Oxford University Press, Indian Edition.
3. 'Physical Chemistry' by **W. J. Moore**, MacGraw Hill Publication, 1996, 6/E.
4. 'Principle of Physical Chemistry' by **Puri, Sharma & Pathania**, 41/E, Vishal Publishers.
5. 'Essentials of Physical Chemistry' by **Bahl & Tuli**, 22/E, S. Chand publication New Delhi .
6. 'Advanced Physical Chemistry' by **Gurdeep Raj**, 19/E, Goel Publishing House, Meerut.

## SEMESTER II

### Practical Paper 104

#### (a) Organic Spotting :- ( 06 Solids and 04 Liquids).

List organic compounds having different mono functional groups:

##### Solids :

Acids : (i) Benzoic acid (ii) Oxalic acid (iii) Succinic acid

Phenols : (i)  $\beta$ -Naphthol (ii)  $\alpha$ -Naphthol

Neutral : (i) Urea (ii) Thiourea (iii) Benzamide (iv) Naphthalene

##### Liquids :

(i) Aniline (ii) Nitrobenzene (iii) Benzaldehyde (iv) Ethanol

(v) Ethylacetate (vi) Chloroform (vii) Chlorobenzene (viii) Acetone

#### (b) Volumetric Analysis:-

Redox Titrations:-

(1)  $\text{KMnO}_4$ .....  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

(2)  $\text{K}_2\text{Cr}_2\text{O}_7$ .....  $\text{FeSO}_4$   $(\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$

Complexometric Titration by EDTA:-

(1) Estimation of  $\text{Ca}^{+2}$  ..... EDTA

(2) Estimation of  $\text{Mg}^{+2}$  ..... EDTA

## REFERENCE BOOKS

1. **‘Vogel’s Textbook of Quantitative Chemical analysis’** Revised by **G. H. Jeffery, J. Bassett, J. Mendham & R. C. Denney**, 5/E, ELBS (English Language Book Society) Longman.
2. **‘Analytical Chemistry’** by **Dhruba Charan Dash**, PHI Learning Private Ltd, New Delhi, 2011.
3. **‘Analytical Chemistry’** by **Gary D. Christian** , 4/E, John Wiley & Sons.
4. **‘Comprehensive Practical Organic Chemistry – Qualitative Analysis’** by **V. K. Ahluwalia, Sunita Dhingra** University Press (India) Private Limited, Hyderabad, First Indian Reprint 2010.
5. **‘Organic Analytical Chemistry theory and Practice’** by **Mohan Jag**, Narosa Publication, New Delhi. (2003).
6. **‘Elementary Practical Organic Chemistry Part-2, Qualitative Organic Analysis’** by **Arthur I. Vogel**, -CBS Publishers & Distributers, New Delhi.(Second edition, reprint 2004)
7. **‘Advanced practical Organic Chemistry’** by **J. Leonard, B. Lygo, G. Procter**, (First Indian reprint , 2004),Publication-Stanley Thornes ( Publishers) Ltd.