

**Semester I**  
**General Chemistry Paper 101**

**Unit I : Inorganic Chemistry (14 Marks )**

(a) **Lanthanides:-**

Electron configuration, Oxidation states, Magnetic properties, Color and absorption spectra of lanthanide ions, Lanthanide contraction, Separation and purification of Lanthanides: Ion-exchange and solvent extraction methods.

(b) **Actinides:-**

Electron configuration, Oxidation states, Magnetic properties, Color and absorption spectra of actinide ions, actinide contraction, Nuclear synthesis of trans uranic elements, Chain reaction, importance of Uranium, Comparison with lanthanide.

**Unit II : Organic Chemistry (14 Marks )**

(a) **Quantitative Analysis & Determination of Molecular Formula:-**

Determination of Nitrogen by Kjeldahl's method and Kjeldahl's method modified with boric acid . Molecular weight of organic acid by Ag-salt method and organic base by Chloroplatinate method, Numerical based on empirical and molecular formula.

(b) **Fundamentals of Organic Reactions:-**

Fission of covalent bond, types of reagents, Substitution Nucleophilic Unimolecular reaction mechanism ( $SN^1$ ), Substitution Nucleophilic Bimolecular reaction mechanism ( $SN^2$ ), Electrophilic Aromatic Substitution – Elementary treatment only (Nitration, Sulfonation, Halogenation & Friedel-Crafts Alkylation and Acylation)

**Unit III : Organic Chemistry (14 Marks )**

(a) **Alkanes:-** (Saturated Hydrocarbons)

Introduction, IUPAC nomenclature, Reduction of R-X, Wurtz's reaction, Hydrolysis of R-Mg-X, Decarboxylation of acid, Kolbe's electrolytic process, Free radical mechanism (Chlorination of Methane).

(b) **Alkenes & Alkynes:-** (Unsaturated Hydrocarbons)

Introduction, IUPAC nomenclature, Preparations (dehydration, dehalogenation, dehydrohalogenation), Reactions with  $H_2$ ,  $X_2$ , HX, HOCl,  $H_2SO_4$ , and Hydroboration; Oxidation reactions: (i) with cold alkaline  $KMnO_4$  (Baeyer's reagent), (ii) Oxidative cleavage with acidified or hot  $KMnO_4$ , (iii) Ozonolysis ( $O_3$ ); Polymerization; Reactions of terminal Acetylenes: (i) Addition of water, (ii) Na / liquid  $NH_3$ .

## Unit IV: Physical Chemistry (14 Marks)

(a) **Thermodynamics:-**

Zeroth law, first law, Second law of thermodynamics; proof of 2<sup>nd</sup> law (Carnot's Cycle); Entropy, of Gas and calculation of entropy for different processes; Kirchhoff's equation.

(b) **Chemical Kinetics:-**

Basic terms: molecularity, order of reactions. Unit for rate constant; Derivation of: first order rate constant, Second order rate constant for (a=b) and (a ≠ b). Third order rate equation (a=b=c). Determination of Half Life Time for 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> order reactions.

## REFERENCE BOOKS

### UNIT I :

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 II & 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 I

### Practical Paper 102

#### (a) Volumetric Analysis (Acid and Base)

- (1) Preparation and Standardization of NaOH and HCl
- (2) Succinic Acid -----NaOH
- (3) Oxalic Acid ----- NaOH  
(Hydrated & Anhydrous)
- (4)  $\text{Na}_2\text{CO}_3$  -----HCl

#### (b) Inorganic Qualitative Analysis (Two Radicals) (Minimum Eight Salts)

Water Soluble and Insoluble Inorganic salts of following cations and anions:

**Cations :**  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{NH}_4^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ba}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Sr}^{2+}$ ,  $\text{Fe}^{2+}$ ,  $\text{Fe}^{3+}$ ,  $\text{Al}^{3+}$ ,  
 $\text{Cr}^{3+}$ ,  $\text{Zn}^{2+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Co}^{3+}$ ,  $\text{Pb}^{2+}$ ,  $\text{Cu}^{2+}$ .

**Anions :**  $\text{S}^{2-}$ ,  $\text{SO}_4^{2-}$ ,  $\text{CO}_3^{2-}$ ,  $\text{PO}_4^{3-}$ ,  $\text{CrO}_4^{2-}$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{NO}_3^-$ ,  $\text{O}^{2-}$ .

### 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. 'Advanced Practical Inorganic Chemistry' by Gurdeep Raj, 9/E, Goel Publishing  
House, Meerut.
5. 'Vogel's Textbook of Macro and Semimicro Qualitative Inorganic Analysis',  
5/E, Orient Longman Ltd.