

B.Sc. Botany and B.Sc. Physics

24UCH301: General Chemistry

Unit 1: Coordination Chemistry

Introduction - Types of ligands – Anionic, cationic and neutral complexes – IUPAC nomenclature -Chelation-industrial importance of EDTA, Biological role of hemoglobin and Chlorophyll. Bonding theories- Werner's theory and Sidgwick's concept of coordination - Valence bond theory - Geometries of coordination numbers 4 and 6 – Limitations of VBT.

Unit 2: Electron Displacement Effects And Halogen Compounds

Polar effects: Inductive effect – Relative Strength of Aliphatic monocarboxylic acid and aliphatic amines. Resonance – Condition for resonance. Consequences of resonance – resonance of energy. Basic property of aniline and acidic property of phenol. Hyperconjugation – Heat of hydrogenation - Bond length and dipole moment. Steric effect. Halogen containing compounds: Important chlorohydrocarbons used as solvents. Pesticides – Dichloromethane, chloroform, carbon tetrachloride, DDT and BHC.

Unit 3: Fundamental Concepts in Organic Chemistry

Hybridization: Orbital overlap, hybridization, and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, FriedelCraft's alkylation, and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.

Unit 4: Solid State, Energetics and Phase rule

Solidstate: Typical crystal lattices - unit cell, elements of symmetry, Bragg's equation, Weiss Indices, Miller indices, simple body centered and face centered lattices. Energetics: Thermodynamic scale of temperature, spontaneous and Non-spontaneous processes–entropy – Gibbs free energy. Phase rule: Phase, component, degree of Freedom, phase rule definitions – one component system–water system.

Unit 5: Solutions and Kinetics

Solutions: Raoult's law - Deviation from ideal behaviour - positive deviation - Negative deviation - Fractional distillation. Kinetics: Rate - order - molecularity - pseudo first order - determination of order by graphical method - Effect of temperature on the rate - Energy of activation .

Text Books:

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLalNagin Chand & Co., 34th Edition (2014)
2. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., 22nd Edition (2016).
3. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical chemistry, (35th edition), New Delhi: ShobanLal Naginchand and Co. 48th Edition (2021)

Reference Books:

1. J.D. Lee, 'Concise Inorganic Chemistry', 20th revised edition, Sultan Chand & Sons, 2000.
2. Morrison, R.T. and Boyd, R.N., Bhattacharjee, S. K. Organic Chemistry (7th edition), Pearson, India, (2011).
3. Jerry March, "Advanced Organic Chemistry, Reaction, Mechanism and Structure", 7th Edition, Wiley Inter Science (2013).
4. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan& Co Ltd.

24UCH302: Applied Chemistry**Unit 1: Nuclear Chemistry**

Theory of Nuclear Reactions - Comparison of nuclear and chemical reactions - subatomic particles, structure of the nucleus - shell model, liquid drop model, Stability of nucleus-n/p ratio, mass defect, and binding energy. Types of nuclear reactions- Nuclear fission- theory of nuclear fission- chain reaction, atom bomb- nuclear reactors, moderators, coolants; Nuclear fusion- hydrogen bomb- nuclear reactors in India.

Unit 2: Carbohydrates, Amino Acids and Proteins

Carbohydrates: classification – glucose and fructose– preparation and properties – structure of glucose. Amino acids and proteins: Amino acids – Classification based on structure. Essential and non-essential amino acids – preparation, properties and uses. Proteins – Classification based on physical properties and biological functions. Structure of proteins – primary and secondary (elementary treatment).

Unit 3: Polymers and Rubbers

Polymers: Preparation, properties and uses of: Poly olefins – Polythene – PTFE – PVC – Polypropylene – Polystyrene Rubbers: Natural and synthetic rubbers: Constitution of natural rubber – Butyl – Buna-N – Neoprene – Polyurethane – Silicone rubbers, drawbacks of natural rubbers - uses of natural rubber - thermoplastics and thermosetting resins

Unit 4: Industrial Chemistry

Fuels: Fuel gases: Natural gas, water gas, semi-water gas, carbureted water gas, producer gas, CNG, LPG, and oil gas. Silicones: Synthesis, properties, and uses of silicones. Fertilizers: Urea, ammonium sulfate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.

Unit 5: Surface and Photochemistry

Surface Chemistry: Emulsions, gels – preparation, properties - Electrophoresis and applications. Chromatography – Column, paper, and thin layer Chromatography. Photochemistry: Laws of photochemistry and applications.

Text Books:

1. R.D. Madan, “Modern Inorganic Chemistry”, 2nd edition, S. Chand & Company Ltd., 2000.
2. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edition, New Delhi, ShobanLal Nagin Chand & Co., 2013.
3. Bahl, B.S. and Bahl, A., Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (2010).
4. Puri B.R., Sharma L.R. and Pathania M.S. Principles of Physical chemistry, (35th edition), New Delhi: ShobanLal Naginchand and Co. (2013)

Reference Books:

5. J.D. Lee, ‘Concise Inorganic Chemistry’, 20th revised edition, Sultan Chand & Sons, 2000.
6. Morrison, R.T. and Boyd, R.N., Bhattacharjee, S. K. Organic Chemistry (7th edition), Pearson, India, (2011).
7. Jerry March, “Advanced Organic Chemistry, Reaction, Mechanism and Structure”, 7th Edition, Wiley Inter Science (2013).
8. Glasstone S. and Lewis D., Elements of Physical Chemistry, London, Mac Millan& Co Ltd.

24UCH351: Volumetric and Organic Qualitative Analysis

Experiments:

I. Volumetric Analysis

1. Estimation of HCl Vs NaOH using a standard oxalic acid solution
2. Estimation of oxalic acid Vs KMnO_4 using a standard oxalic acid solution
3. Estimation of Iron (II) sulphate by KMnO_4 using a standard Mohr’s salt solution.
4. Estimation of KMnO_4 Vs thio using a standard $\text{K}_2\text{Cr}_2\text{O}_7$ solution.
5. Estimation of copper (II) sulphate by $\text{K}_2\text{Cr}_2\text{O}_7$ solution

II Organic Analysis

Analysis of the following organic compounds.

1. Carbohydrate, 2. Amide, 3. Aldehyde, 4. Ketone, 5. Acid

The students should perform the specific tests for elements, aliphatic or aromatic, saturated or unsaturated and functional group present and record their observations.

Text Books:

1. N. S. Gnanaprakasam and G. Ramamurthy, Organic Chemistry Lab Manual; S.V. Printers, 1987.
2. Venkateswaran V, Veeraswamy R., Kulandaively A.R., Basic principles of practical chemistry, 2nd edition, New Delhi, sultan chand & sons, (1997)

References Books:

1. A. I. Vogel, A. R. Tatchell, B. S. Furniss, A. J. Hannaford and P. W. G. Smith, Vogel's Textbook of Practical Organic Chemistry; 5th Ed., Prentice Hall, 1989.