Saurashtra University

Re-accredited by NAAC
Grade 'A' CGPA 3.06

BSc Semester **III & IV**

Chemistry Syllabus

With effect from June 2017

BSc Chemistry Semester III & IV
[2017-18]

Unit wise Distribution

Unit-I	Inorganic		[12-hours]
Unit-II	Inorganic		[08-hours]
Unit-II	Organic		[04-hours]
Unit-III	Organic		[12-hours]
Unit-IV	Organic		[04-hours]
Unit-IV	Physical		[08-hours]
Unit-V	Physical		[12-hours]
		Total	**: 60 hours**

BSc Semester **III Chemistry Syllabus**

Unit-I

1. **Wave mechanics and MO theory [12 hours]**

   Introduction of wave Mechanics, Postulates of wave Mechanics, Interpretation of ψ, ψ^2, $\psi\psi^*$, Derivation of Schrodinger's equation in three dimensions (Cartesian Coordination), Eigen function & Eigen value, Orthogonal & Normalized wave function and problems on it, Concept of Molecular Orbital Theory, Characteristic of Molecular Orbital, Wave function of H2+ & H2, Potential energy and Schrodinger's equation for H2+ & H2, Derivation of normalized wave function of H2+ based on M.O.T., Hybridization ; Derivation co efficient of wave function of Sp, Sp2 & Sp3 Hybridization.

Unit-II

2. **Chemistry of Lanthanide Elements [8 hours]**

   Introduction, Position in the periodic table, Occurrence & Important ores, Isolation of Lanthanide Elements from ore, Individual Isolation by (I) Ion Exchange Method (II) Solvent Extraction Method, Electronics Configuration with necessary Explanation, Oxidation State & their Stability, Magnetic properties, Color, Isotopes, spectral properties, Lanthanide Contraction, Misch Metal, Uses of Lanthanides & their Compounds.

3 **Aryl halides: [4-hours]**

Preparation (by direct halogenation, from diazonium salts), nucleophilic aromatic substitution, SNAr, Benzyne mechanism

Other reactions of Aryl halides: Wurtz-Fitting, Fitting reaction, Ulmann reaction

Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Unit-III

4. **Alcohols, Phenols, Ethers and Epoxides: [6-hours]**

Alcohols: Preparation: Preparation of 1^0, 2^0 and 3^0 alcohols: using Grignard reagent; by reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification and oxidation (with alkaline KMnO4, acidic dichromate, conc. HNO3)

Diols: oxidation of diols by periodic acid and lead tetraacetate

Phenols :(Phenol case)

Acidity and factors affecting it;

Reactions: Electrophilic substitution (Nitration, halogenation and sulphonation),

Ethers: Preparation of Ethers by Williamson Synthesis

Reactions: Substitution Reaction [Reaction with Cl_2 in dark & Reaction of Cl_2 in light], Reactions involving C-O bond cleavage [hydrolysis, reaction with H_2SO_4, cold HI & hot HI]

Epoxides: Reactions of epoxides with alcohols, ammonia derivatives and $LiAlH_4$.

5. **Nitrogen Containing Functional Groups: [6-hours]**

Amines

Classification of amines (Aliphatic and Aromatic)

Basicity of amines, effect of substituent on basicity of amines

Preparation of amines (by reduction of nitro compounds, reaction of organic halides with ammonia, Hoffmann degradation of amides)

Reactions of primary alkyl & arylamines: [Reaction with acid chlorides, aryl sulphonyl chlorides, alkylhalides, HNO_2]

Chemical reactions of Aniline: Electrophilic substitution (nitration, bromination, sulphonation), Diazotization of Aniline and reactions of Diazonium salt

Hinsberg Reaction to distinguish between Primary, Secondary and Tertiary amines

Preparation and important reactions of **nitro compounds, nitriles and isonitriles**

Unit-IV

6. **Name Reactions and Rearrangements [4-hours]**

Name Reaction: Reimer-Tiemann reaction, Kolbe's Schmidt reaction, Carbylamine reaction

Rearrangement: Pinacol-Pinacolone Rearrangement, Fries Rearrangement, Claisen Rearrangement,

7. **<u>Phase Equilibrium:</u> (8 hours)**

Introduction, Criteria of phase equilibrium, Explanation of terms: Phases, Components and Degrees of freedom of a system , Gibbs Phase Rule, Limitations of Phase Rule, Phase Diagram, Phase diagrams of one-component systems (water and sulphur)

Two component systems: Condensed Phase Rule, Eutectics system (Lead-Silver) and Park method of desilverization, Congruent melting point system (Mg – Zn) and Incongruent melting point system (Na - K).

<u>Unit - V</u>

8. **<u>Solutions:</u> (8 hours)**

Introduction, Factors affecting solubility, Types of solutions, Types of liquid – liquid solutions

Miscible Liquid Pair: Ideal solutions and Raoult's law, Deviations from Raoult's law (Non-ideal solutions), Vapour pressure - composition curves of ideal and non-ideal solutions, Temperature - composition curves of ideal and non-ideal solutions.

Distillation of ideal and non-ideal solutions, Lever rule, Fractional column and Bubble cap tower, Azeotropes.

Immiscible Liquid Pair: Introduction, Principle of steam distillation and its applications.

Numericals,

Solution of Gas in Liquid: Factors affecting solubility of a gas., Effect of pressure (Henry's Law), Numericals.

9. Nernst Distribution Law: (4 hours)

Introduction, Nernst Distribution Law, Its limitations, Modified Nernst Distribution Law [Solute associate in the solvent, Solute dissociate in the solvent, Solute enters into chemical reaction with solvent], Applications, Solvent extraction Numericals

Reference book:

1. UGC Inorganic Chemistry - H. C. Khera (Pragati Prakashan)
2. Principles of Inorganic chemistry – Puri, Sharma & Kalia
3. Concise Inorganic Chemistry - J. D. Lee
4. Advanced Inorganic Chemistry- Cotton and Wilkinson
5. Basic Inorganic Chemistry - Gurdeep & Chatwal
6. Organic Chemistry (Volume I, II & III) by S.M. Mukherji, S.P. Singh and R.P. Kapoor
7. A Text Book of Organic Chemistry (II Edition) by Raj K. Bansal
8. Name Reactions in Organic Synthesis by Dr. A.R.Parikh et. al
9. Reactions and Rearrangements by Gurdeep Chatwal
10. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tli and Arun Bahl, S. Chand & Co.. New Delhi
11. Elements of Physical Chemistry, Late B.R. Puri, L. R. Sharma and Madan Pathania, Vishal Publishing Co. Jalandhar
12. Principles of Physical Chemistry, Samule H. Maron and Carl F. Prutton, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi
13. Physical Chemistry, B. K. Sharma, Goel Publication House. Meerut.