



Shree H. N. Shukla College of Science

(Affiliated to Saurashtra University)

Shree H. N. Shukla College Campus, Nr. Lalpari Lake, Bh. Marketing Yard, Amargadh – Bhichri,
Rajkot. Mo. : 97277 53360, 90990 63150

BSc SEMESTER III CHEMISTRY SYLLABUS [C-301]

Unit-I

1. Basics of Wave mechanics and Applications to 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 H_2^+ & H_2 , Potential energy and Schrodinger's equation for H_2^+ & H_2 , Derivation of normalized wave function of H_2^+ based on M.O.T., Hybridization ; Derivation coefficient of wave function of sp, sp^2 & sp^3 Hybridization.

Unit-II

2. Basics 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) Physical Properties of Aryl Halides Chemical Reactions of Aryl Halides: Nucleophilic aromatic substitution S_NAr (Benzyne mechanism or Elimination- Addition mechanism) Other reactions of Aryl halides: Wurtz-Fittig and Fittig reaction, Ullmann reaction, Formation of Organometallic Compounds Relative reactivity of alkyl halides vs allyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Unit-III

4. Alcohols, Phenol, Ethers & Epoxides [7-hours]

Alcohols Preparation of Monohydric alcohols: from alkyl halides; using Grignard reagent; by reduction of aldehydes, ketones, carboxylic acid and esters. Physical Properties of alcohols Chemical Reactions: Reaction with sodium, with carboxylic acids (esterification), with acid chloride & anhydride; Reaction with HX, reaction with PX_5 , PX_3 , $SOCl_2$; Dehydration of alcohols and Oxidation (with alkaline $KMnO_4$, acidic dichromate, conc. HNO_3) Distinction between Primary, secondary & tertiary alcohols: Lucas test Victor Meyer Test Diols: oxidation of diols by periodic acid and lead tetraacetate.

Phenol :(Phenol case) Physical properties; 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 $LiAlH_4$.



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Organic Compounds of Nitrogen: [5-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, ammonolysis of halogen compounds, Reduction of amides, Hoffmann bromamide degradation) Reactions of primary alkyl & aryl amines: [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. Phase Equilibrium & Phase Rule: [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).

Unit - V

8. Solutions of Non- Electrolytes: [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 nonideal 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,



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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

CHEMISTRY PRACTICALS

CHEMISTRY PRACTICALS SEMESTER III [C 301]

1. Organic Qualitative Analysis [minimum 10]

**[Minimum ten organic mixtures should be analyzed & recorded by the students;
of which minimum should be six bifunctional]**

Identification of an organic compound through the functional group analysis and determination of melting point or boiling point

2. Organic Volumetric Estimation: [Standard solution to be given]

1. To determine the amount of $-\text{CONH}_2$ in the given Acetamide solution
2. To determine the amount of Phenol / m-cresol in the given solution
3. To determine the amount of Aniline / p-toludine in the given solution
4. To determine the amount of Ester in the given solution
5. To determine the amount of Glucose in the given solution
6. To determine the amount of $-\text{COOH}$ in the given carboxylic acid

PAPER STYLE – PRACTICALS

CHEMISTRY PRACTICALS