CURRICULAM PLAN

Even Semester (2020-21)

B.Sc. (H) Chemistry II year, Sem IV

Name of the teacher: Dr. Shilpika Bali Mehta

Name of Paper: ORGANIC CHEMISTRY – III, Nitrogen containing functional groups, Polynuclear Hydrocarbons, Heterocyclic Chemistry, Alkaloids and Terpenes.

UPC: 32171402

Contents	**Allocation of Lectures**	**Month wise schedule to be followed**	**Tutorial/Assignments/Presentation etc**
Unit 1: Nitrogen Containing Functional Groups: Preparation, properties and important reactions of amines and diazonium salts, nitro compounds, nitriles and isonitriles. A) Amines: Introduction, classification, chirality in amines (pyramidal inversion), importance and general methods of preparation. Properties: Physical properties, Basicity of amines: Effect of substituents, solvent and steric effects. Distinction between Primary, secondary and tertiary amines using Hinsberg's method and nitrous acid. Discussion of the following reactions with emphasis on the mechanistic pathway: Gabriel Phthalimide synthesis, Hoffmann-Bromamide reaction, Carbylamine reaction, Mannich reaction, Hoffmann's exhaustive methylation, Hofmann-elimination reaction and Cope elimination. Diazonium Salts: Preparation and synthetic applications of diazonium salts including preparation of arenes, haloarenes, phenols, cyano and nitro compounds. Coupling reactions of diazonium salts(preparation of azo dyes). B) Nitro compounds (Aliphatic and Aromatic):Nomenclature, classification and general methods of preparation: from alkyl halides, alkanes, oxidation of amines and oximes and diazonium salts. Properties: Physical properties, discussion	18	1st week of Jan – 1st week of Feb	• Syllabus Overview • Books Suggestions • Related Examples and Problems

on the following reactions with mechanism: Reaction with alkali and its synthetic applications, condensation reaction, Mannich reaction, Hydrolysis,Reduction-electrolytic reduction, reduction in acidic, basic and neutral medium (for aromatic compounds),reaction with nitrous acid, Electrophilic substitution-Halogenation, nitration and sulphonation reaction, and Nucleophilic substitution on the ring. C) Nitriles: Introduction, Nomenclature and uses. Preparation from the following reactions: Dehydration of amides and aldoximes, substitution reaction in alkyl halides and tosylates, from Grignard reagents and from dehydrogenation of primary amines. Properties: Physical properties, discussion on the following reactions with mechanism: Reaction with Grignard reagent, hydrolysis, addition reaction with HX,NH3,reaction with aqueous ROH, Reduction reactions-catalytic reduction and Stephen's reaction, Condensation reactions-Thorpe Nitrile Condensation. D) Isonitriles: Introduction, Nomenclature and uses. Preparation from the following reactions: Carbylamine reaction, substitution in alkyl halides and dehydrogenation of N-substituted formamides. Properties: Physical properties, discussion on the following reactions with mechanism: Hydrolysis, reduction, addition of– HX, X2 and sulphur, Grignard reaction, oxidation and rearrangement.			
Unit 2: Polynuclear Hydrocarbons Introduction, Classification, Structure, Nomenclature and uses. Aromaticity of polynuclear hydrocarbons, structure elucidation of Naphthalene and general	16	2nd week of Feb- 1st week of March	• Group Discussions • Previous year Question paper's solving • Related Examples and Problems

methods of preparation of naphthalene, phenanthrene and anthracene (including Haworth method, Friedel Craft acylation, Diels Alder reaction, Elbs reaction and Pschorr Synthesis). Relative reactivity of naphthalene, phenanthrene and anthracene in comparison to benzene. Properties: Physical properties, discussion on the following reaction (with mechanism) for Naphthalene, Anthracene and Phenanthrene: Addition reactions, Oxidation, Electrophilic substitution-Friedel Craft reaction, Chloromethylation, Halogenation, Formylation, Nitration and sulphonation. Reduction reaction and Diels Alder reaction. **Unit 3:** Heterocyclic Compounds Introduction, importance, classification and nomenclature of heterocyclic compounds (containing only one hetero atom). General discussion on the following aspects of heterocyclic compounds: Structure, aromaticity in 5-membered and 6-membered rings containing one heteroatom; Basicity and relative reactivity towards electrophilic substitution reactions(amongst five membered and six membered rings)			• Assignments Allocation
Unit 3 (continued): General methods of synthesis for: Furan, Pyrrole (Paal-Knorr synthesis, Knorr pyrrole synthesis, Hantzsch synthesis), Thiophene, Pyridine (Hantzsch synthesis), Indole(Fischer indole synthesis and Madelung synthesis, reduction of o-nitrobenzaldehyde), Quinoline and isoquinoline, (Skraup synthesis, Friedlander's synthesis, Knorr quinoline synthesis, Doebner-Miller synthesis, Bischler-Napieralski reaction, Pictet-	14	2nd week of March – 1st week of April	• Group Discussions • Previous year Question paper's solving • Related Examples and Problems

Spengler reaction, Pomeranz-Fritsch reaction) Properties: Physical properties, discussion on the following reaction (with mechanism) for Furan, Pyrrole, thiophene, Pyridine, Indole, Quinoline and Isoquinoline: Electrophilic substitution-Nitration, sulphonation, halogenation, Formylation, acylation, mercuration and carboxylation. Oxidation,Reduction, Addition, Reactions showing acidic /basic character.Reaction with diazonium salts, Ring opening, Ring expansion and Nucleophilic substitution reaction wherever applicable should be discussed			
Unit 4: Alkaloids Introduction, Natural occurrence, Classification, Uses, general structural features, general methods for structure elucidation including Hoffmann's exhaustive methylation and Emde's method. Structure elucidation, synthesis and physiological action of Nicotine. **Unit 5:** Terpenes Introduction, Occurrence, Uses, classification, isoprene and special isoprene rule; general methods of structure elucidation including distinction between isopropylidene and isopropenyl group, Elucidation of structure, synthesis and industrial applicationof Citral.	12	2nd week of April – 4th week of April	• Assignment Results Discussion • Doubts Resolved • Previous year Question paper's solving

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