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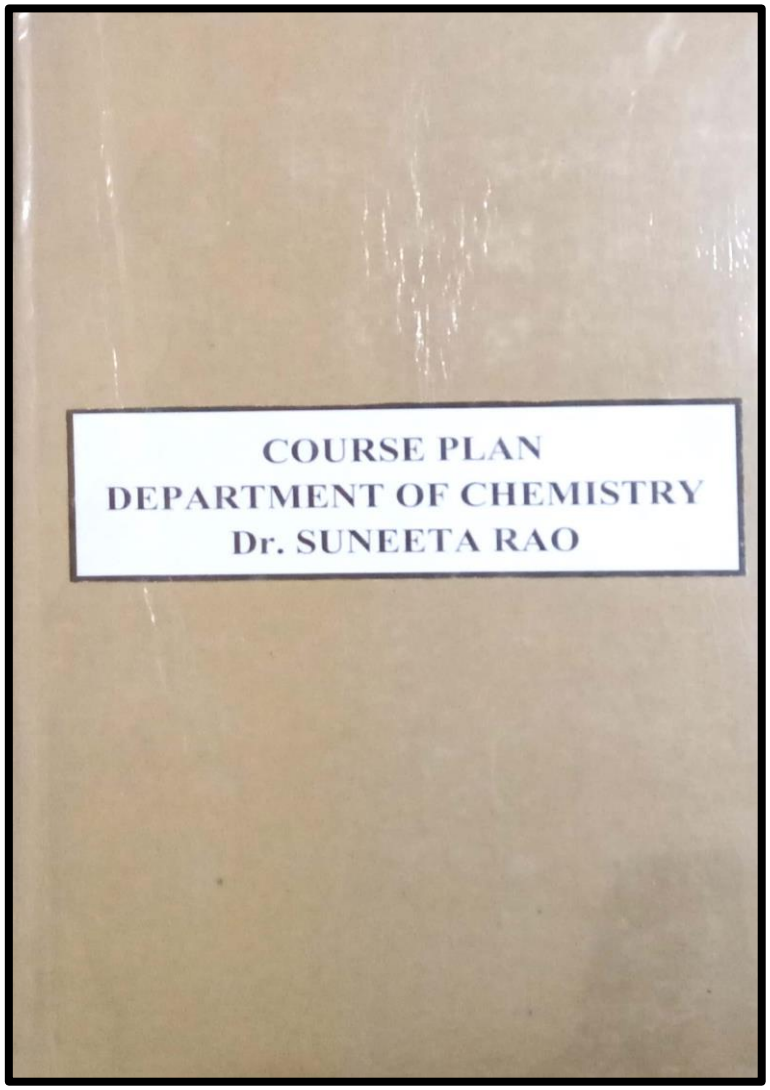

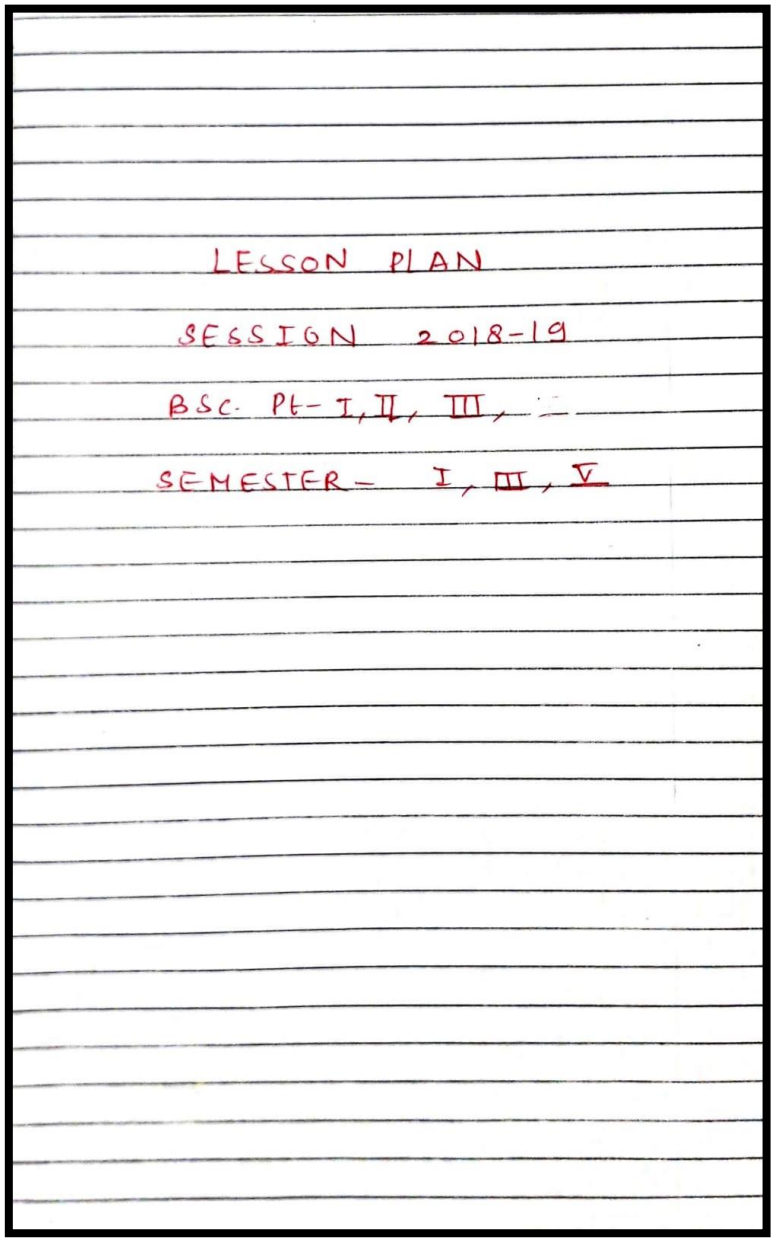
LESSON PLAN
SESSION 2018-19
BSC. Pt- I, II, III,
SEMESTER- I, III, V

ORGANIC CHEMISTRY (PAPER II) (CHE-102)

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
JULY	**Unit – I** **Structure and Bonding** Hybridization, bond characteristics, Vander Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperconjugation, aromaticity, inductive and field effects.	Structure and electronic effects in reference to organic molecules.	PPT, Demonstration, Flipped Classroom, Flow Chart,	Predict structure and bonding in common organic molecules and mechanism of organic reactions.	*Knowledge Based* - Define Saytzeff rule. - Why peroxide effect is observed in addition of H-Br and not for H-Cl and H-I ? *Understanding Based* - Arrange the following alkenes in the decreasing order of their stabilities explain with reason $CH_2=CH_2$, $R_2C=CH_2$, $R_2C=CR_2$ -Compare the	Knowledge--60 Understanding-30 Higher Order-10
	Mechanism of Organic Reactions Curved arrow notation, Types of reagents , Types of organic reactions. Energy considerations. Reactive intermediates, carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with example). Assigning formal charges.	Reagents and Intermediate in various Organic reactions				

AUGUST	**Unit – II** **Alkanes** Methods of preparation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.	Structure and reactivity of alkanes	PPT, Demonstration, Flipped Classroom	Review the preparation and chemical reactions of alkanes and cycloalkanes	stability of cyclopropane and cyclohexane. *Higher Order Thinking Skills Based* -Justify the unequal formation of 1,2 and 1,4 products in 1,3-Butadiene at different temperatures. - Evaluate Substitution at the allylic and vinylic positions of alkenes.	
	Cycloalkanes Nomenclature, methods of preparation. chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. cyclopropane ring: banana bonds.	Structure , stability and reactivity of cycloalkanes				
SEPTEMB ER-	**Unit – III** **Alkenes** Nomenclature of alkenes, methods of preparation,					

OCTOBER	mechanism of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. Saytzeff rule, Hoffmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes- mechanisms involved in hydrogenation, electrophilic and free radical additions, Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes.	Structure and reactivity in context to regioselectivity in different alkenes.	Group Discussions, Diagrams, Models	Summarize the chemical behaviour of alkenes, dienes and alkynes.		
	Alkynes Nomenclature, structure and bonding in alkynes. Methods of preparation, chemical reactions of alkynes- hydrogenation, halogenation, hydrohalogenation, hydration, hydroboration and hydroxylation, ozonolysis of alkynes, acidity of alkynes, mechanism of electrophilic and nucleophilic addition reactions, metal-ammonia reductions, oxidation and polymerization, acidity of alkynes, characteristics of terminal alkynes.	Electrophilic addition and reactions of alkynes	Diagrams, Models, Demonstration, Flow Charts			

	Diens- Nomenclature and classification of dienes: isolated, conjugated and comulated dienes. Structure of allenes and butadiene method of formation, polymerization. Chemical reactions-1,2 and 1,4 additions, Diels-Alder reaction.	Structure of dienes and thermodynamic and kinetic control of reactions	PPT, Demonstration, Flipped Classroom			

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COURSE PLAN

SEMV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JULY	**UNIT I** **Nuclear Magnetic resonance (NMR) spectroscopy.** Proton magnetic resonance(^{1}H NMR) spectroscopy, nuclear shielding and deshielding chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2,-tribromoethane, ethyl acetate, toluene and acetophenone. Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.	Structural elucidation of organic compounds.	PPT, Flipped classrooms, Group discussions	Predict structure of various organic molecules using NMR Spectroscopy	*Knowledge Based* -How many signals do you expect for the following molecules in the NMR spectrum. (i) CH_3CH_2Cl (ii) CH_3CH_2OH - What are chemically equivalent protons. Explain with suitable examples. *Understanding Based* - Compare the advantage of Ziegler-Natta catalyst over addition	Knowledge--40 Understanding-40 Higher Order-20

AUGUST	**UNIT II** **Organometallic Compounds** Definition, nomenclature and classification of organometallic compounds, Organo-magnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.	Properties of Organometallic Compounds and Synthetic Polymers, Properties of fats and oils.	Flipped classrooms, Quiz	Summarize the Chemical Properties of Organometallic Compounds and Synthetic Polymers.	polymerisation. - Why alkyllithium are called Super Grignard reagent ? *Higher Order Thinking Skills Based* - Give the structural formula of the compounds on the basis of PMR data. C_7H_8 9.1 ppm (5H), Singlet, 2.3 ppm (3H), Singlet - Explain how alkylation of DEM is helpful in designing organic synthesis?	
	Synthetic Polymers Definition of monomers and polymers. Classification of polymers. Different types of processes for polymerization and their mechanisms (ionic, free radical and Ziegler-Natta catalyst). Preparation and uses of some polymers viz., nylons, polyesters, polyvinyl chloride, Teflon, Bakelite, urea and melamineformaldehyde resins. Natural rubber (isolation, structure and vulcanization). Synthetic elastomers – buna -S, butyl rubber and polyurethane.		Diagrams, Charts			

	Fats, Oil and Detergents Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value, Soaps, synthetic detergents, alkyl and aryl sulphonates.					
SEPTEMBER-OCTOBER	**UNIT III** **Organic Synthesis via Enolates** Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate : the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1, 3-dithianes. Alkylation and acylation of enamines.	Application of enolates in Organic Synthesis	PPT, Flipped classrooms, Group discussions	Assess the chemical properties of enolates and chemical nature of fats and oils.		

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B.Sc. I (SEMESTER I)

PRACTICALS (CHE-103)

Max. Marks: 50(40Ext; 10 Int) Min Marks: 20(16 Ext;4 Int) Credit: 02

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JULY	**Inorganic Chemistry** Semi-micro Analysis- separation and identification of four ions, cation analysis from Groups I, II, III, IV, V and VI, anion analysis including interfering radicals.	Seperation of Inorganic Mixture	Demonstration of the exercise	Understand the practical applications of various aspects of chemistry	*Knowledge Based* Practical File Work *Understanding Based* - To Seperate the Inorganic Mixture. -To determine the melting point of the given organic compound. *Higher Order Thinking Skills Based* Viva Voce	Knowledge--30 Understanding-50 Higher Order-20
AUGUST	• Calibration of Thermometer • Determination of Melting Point • Determination of boiling points	Laboratory Techniques	Exercises with Use of different Apparatus and glasswares			

SEPTEMBER-OCTOBER	• Distillation • Crystallization • Decolorisation and crystallization using charcoal • Sublimation (Simple and Vacuum)	Laboratory Techniques	Exercises with Use of different Apparatus and glasswares.			

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SOPHIA GIRLS' COLLEGE, AJMER (*AUTONOMOUS*)
M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER I

ORGANIC REACTION MECHANISM I (CHEM-102)

MAX MARKS: 100(70EXT; 30 INT) **MIN. MARKS: 40(28 EXT;12 INT)**

COURSE PLAN

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JULY	UNIT I Aromaticity in benzenoid and non benzenoid compounds, Huckel's rule, energy level of π molecular orbital, annulenes,anti aromaticity, homoaromaticity.	Nature of Bonding in organic molecules	Diagrams, Charts	Predict structure and bonding in common organic molecules and mechanism of organic reactions.	*Knowledge Based* - What is Antiaromaticity ? Explain briefly. -Define Homoaromaticity.	Knowledge-25 Understanding-45 Higher Order-30

	Types of reactions and mechanisms. General methods for the determination of reaction mechanism – stereochemical evidences, kinetic evidences and isotope effects. Thermodyamic and kinetic requirements for a reaction.	Structure and Reactivity of organic compounds	3 D models, Charts		*Understanding Based* -Compare the aromaticity of tropone and tropolone. - Classify thearomatic behavior of (14)-and (18)-Annulenes *Higher Order Thinking Skills Based* - Explain ArSN2 with suitable examples. - Elaborate primary kinetic isotope effect and secondary kinetic isotope effects.	
AUGUST	**UNIT II** SN^2, SN^1, mixed and SET mechanism	Aliphatic Nucleophilic substitution	Diagrams, Demonstration	Review various aliphatic and aromatic substitution reactions.		
	$ArSN^1$, $ArSN^2$, benzyne and SRN1 mechanism. Reactivity-effect of substrate structure, leaving group and attacking nucleophile. The von Richter, Sommelet-Hauser and Smiles rearrangements.	Aromatic Nucleophilic Substitution	Flowcharts, PPT			

	Bimolecular mechanism, SE1 mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and the solvent polarity.	Aliphatic Electrophilic Substitution	3D Models, PPT			
	Arenium ion mechanism, orientation and reactivity, energy profile diagrams. ortho/para ratio, ipso attack, orientation in other ring system. quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, Vismeir reaction, Gattermann-koch reaction.	Aromatic Electrophilic Substitution	Demonstration, PPT			
SEPTEMBER-OCTOBER	Free radical reactions and mechanism, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehead. Effect of solvent on reactivity. Allylic halogenations(NBS),	Free Radical Reactions	Flipped Classrooms, Demonstration	Explain different types of free radical reactions		

	oxidation of aldehydes to carboxylic acids, coupling of alkynes and arylation of aromatic compounds by diazonium salts, Sandmeyer reaction. Free radical rearrangement, Hunsdiecker reaction.					

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M. Sc. CHEMISTRY (PREVIOUS) SEM-I PRACTICALS (CHEM-105)

AUGUST	**Organic Chemistry** **Qualitative Analysis** Separation, purification and identification of compounds of binary mixture (two solids). **Quantitative Analysis** **(a)** Determination of Iodine value of an oil sample. (b) Determination of Acid Value of an oil sample. (c)Determination of Saponification value of an oil sample.	Qualitative Analysis and Quantitative Analysis			- Viva Voce	

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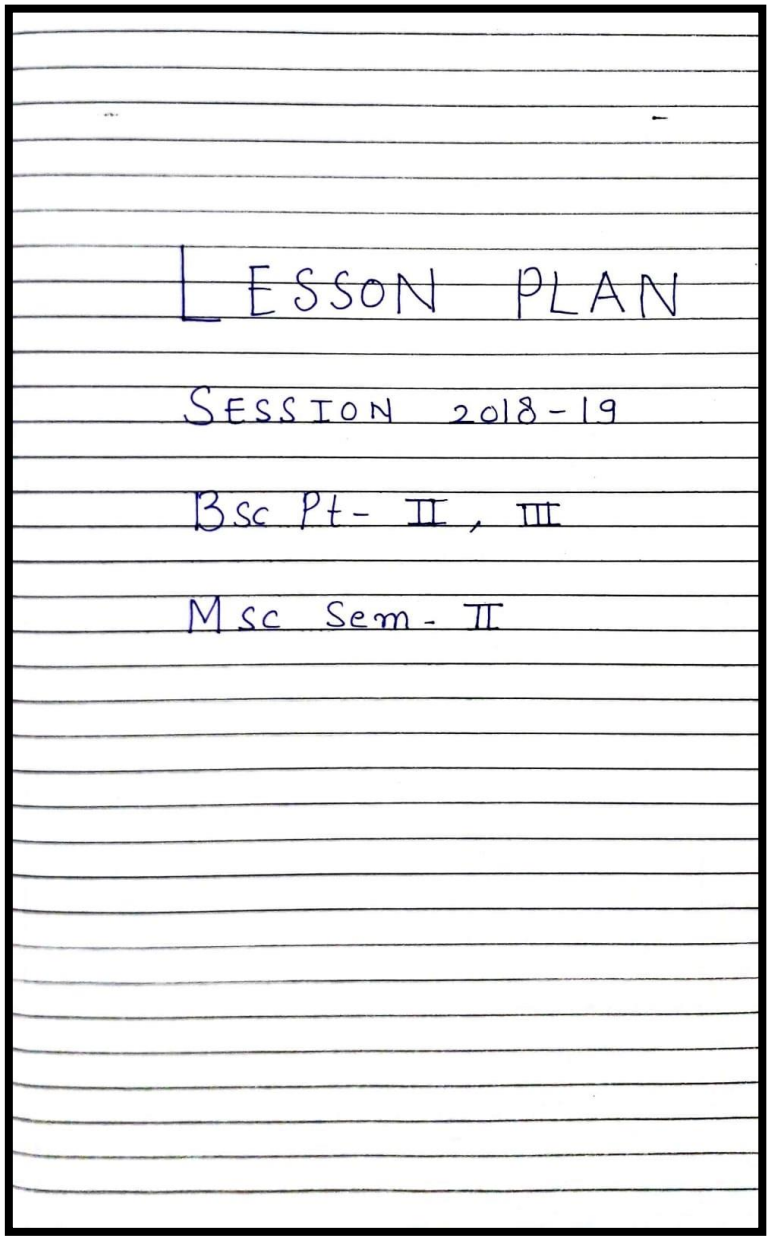
LESSON PLAN
SESSION 2018-19
Bsc Pt- II, III
Msc Sem- II

B.Sc. I (SEMESTER II)

PRACTICALS (CHE-203)

Max. Marks: 50(40Ext; 10 Int) Min Marks: 20(16 Ext;4 Int) Credit: 02

COURSE PLAN

SEM II Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II DECEMBER-JANUARY	1. Organic Chemistry Qualitative Analysis Detection of extra elements (N,S and halogens) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.	Identification of Functional Groups	Demonstration of the exercise	Understand the practical applications of various aspects of chemistry	*Knowledge Based* Practical File Work *Understanding Based* - To identify the functional group in the given organic compound. - To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalyzed by hydrogen ions at room temperature. *Higher Order Thinking Skills Based*	Knowledge--30 Understanding-50 Higher Order-20
FEBRUARY	• To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalyzed by hydrogen ions at room temperature. • To study the effect of acid strength on the hydrolysis of an ester.	Kinetics of Chemical reactions.	Exercises with Use of different Apparatus and glasswares			

	• To compare the strengths of HCl and H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate. • To study the distribution of iodine between water and CCl_4				Viva Voce	
MARCH-APRIL	• To study the distribution of benzoic acid between benzene and water. • To prepare arsenious sulphide sol and compare the precipitating power of mono-,bi- and trivalent anions. • To determine the percentage composition of a given mixture (non interacting systems) by viscosity method. • To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl methyl ketone).	Methods to determine percentage composition of binary mixture.	Exercises with Use of different Apparatus and glasswares.			

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ORGANIC CHEMISTRY (PAPER II) (CHE-402)

SEM IV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV DECEMBER-JANUARY	**Unit – I** **Aldehydes and Ketones** Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones from acid chlorides , 1,3-dithianes and carboxylic acid. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Use of acetals as protecting group, Oxidation of aldehydes and ketones, Baeyer-villiger oxidation of ketones, Cannizzaro reaction, reductions of aldehydes and ketones, Halogenation of enolizable ketones	Structure and reactivity of Aldehydes and ketones	PPT, Demonstration, Flipped Classroom, Group discussion	Illustrate the preparation and Chemical Reactions of Aldehydes and ketones	*Knowledge Based* -Write the structural formulas of 2-pentanone. -Write the structural formula of Picric acid? *Understanding Based* -Differentiate between primary , secondary and tertiary amines. -What are Phase Transfer Catalyst? *Higher Order Thinking Skills Based*	Knowledge--50 Understanding-35 Higher Order-15

FEBRUARY	**Unit – II** **Organic Compounds of Nitrogen** Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes, Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid. Halonitroarenes: reactivity, Structure and nomenclature of amines, physical properties, Stereochemistry of amines, Amines salts as phase-transfer catalysts. Preparation of alkyl and aryl amines , Gabriel-phthalimide reaction, Hoffmann bromamide reaction. Reaction of amines, electrophilic aromatic substitution in aryl amines, Synthetic transformation of aryl diazonium salts, azo coupling.	Synthesis and reactivity of various N containing compounds	PPT, Quiz, Flipped Classroom	Summarize the reactivity of nitroalkanes, Amines, and diazonium salts.	-Differentiate between the reactivity of aldehydes and ketones. -How we can separate the mixture of three types of amines.	

MARCH -APRIL	**Unit – III** **Carboxylic Acids** Nomenclature, structure and bonding, Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxy acids: malic, tartaric and citric acids, dicarboxylic acid.	Structure and reactivity Of Carboxylic acids and Hydroxy acids	Flow charts,PPT, Demonstration, Group discussion	To Compare the reactivity of carboxylic acids and acid derivatives.		
	Carboxylic Acid Derivatives - Synthesis of acid chlorides, esters, anhydrides and amides. Relative stability of acyl derivatives, Physical properties, interconversion of acid derivatives, Mechanisms of esterfication and hydrolysis (acidic and basic).	Synthesis and interconversion of acid derivatives	PPT, Quiz, Flow Chart			

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ORGANIC CHEMISTRY (PAPER II) (CHE-602)

COURSE PLAN

SEM VI Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
DECEMBER-JANUARY	**UNIT I** **Carbohydrates** Definition, Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. Mechanism of mutarotation. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides(starch and cellulose) without involving structure determination.	Structural and functional analysis of Carbohydrates	PPT, Flipped classrooms, Group discussions	Summarize the properties of carbohydrates	*Knowledge Based* -Define Carbohydrates. -Draw the Haworth projection formula of glucose. *Understanding Based* - What is the relation between a nucleoside and nucleotide? - Compare pyridine and pyrrole on the basis of the following properties: (i) Basic nature (ii) Nucleophilic substitution	Knowledge--40 Understanding-40 Higher Order-20

	FEBRUARY	**UNIT II** **Amino Acids, Peptides, Proteins and Nucleic Acids** Classification, structure and stereochemistry of amino acids. Acid base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α- amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and structures of proteins. Proteins denaturation/ renaturation. Nucleic acids: Introduction, Constitution of nucleic acids. Ribnonucleosides and ribonucleotides. The double helical structure of DNA	Structure, classification, properties and synthesis of amino acid, peptides, proteins and nucleic acid	Flipped classrooms, Quiz, Diagrams	Explain the nature and behavior of amino acids and nucleic acids.	(iii) Electrophilic substitution *Higher Order Thinking Skills Based* - Describe double helical structure of DNA. - Discuss the comparative aromatic nature of pyrrole, thiophene and furan.	

MARCH-APRIL	**UNIT III** **Heterocyclic compounds** Introduction : Molecular orbital picture and aromatic characteristics of pyrrole , furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparision of basicity of pyridine, piperidine and pyrrole.	Aromatic characteristics, preparation and chemical reactions of five membered and six membered heterocyclic compounds	PPT, Group discussions, Charts	Assess the reactivity and stability of heterocyclic compounds.		

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SOPHIA GIRLS' COLLEGE, AJMER (*AUTONOMOUS*)
M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER II

REACTION MECHANISM-II and STEREOCHEMISTRY (CHEM-202)

MAX MARKS: 100 (70EXT; 30 INT) **MIN. MARKS: 40(28 EXT;12 INT)**

COURSE PLAN

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II DECEMBER-JANUARY	UNIT I **1. Addition to Carbon-Hetero Multiple Bonds** Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acids and esters . Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation reaction involving enolates-Aldol, Knoevenagel. Claisen, Mannich, Benzoin, Perkin	Addition reactions and Condensation reaction mechanism	Diagrams, Charts	Explain the mechanism of various types of condensation and elimination reactions.	*Knowledge Based* - Define plane of symmetry with examples. - What is Perkin reaction. Explain with mechanism. *Understanding Based* - Discuss Benzoin Reaction with	Knowledge-25 Understanding-45 Higher Order-30

	and Stobbe reactions.Hydrolysis of esters and amides.				mechanism. - Illustrate E1 Reaction Mechanism with example . *Higher Order Thinking Skills Based* - Discuss the mechanism of aldol and cross aldol condensation with mechanism. - Explain 1,3 dipolar cycloaddition and cheleotropic reactions.	
	2. Elimination reactions The E2,E1 and E1CB mechanism and their spectrum , Orientation of the double bond , reactivity effect of substrate structure , attacking base, leaving group and the medium, Mechanism and orientation in Pyrolytic elimination.	Mechanism of different types of Elimination reactions	3 D models, Charts			
FEBRUARY	**UNIT II** **Stereochemistry** Elements of symmetry, Chirality, molecules with more than one chiral center, threo and erythroisomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms,groups and faces,stereospecific and stereroselective synthesis .Asymmetric synthesis. Optical activity in the absence of chiral carbon (biphenyls, allenes and	Different stereochemical aspects of organic compounds	Diagrams, Demonstration	Analyse the stereochemistry of organic compounds.		

	spiranes), chirality due to helical shape. Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus. Conformational analysis of cycloalkanes and decalins, steric strain due to unavoidable crowding.					
MARCH-APRIL	**Unit – III** **Pericyclic Reactions** Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene,1,3,5-hexatriene and allyl system. Classification of pericyclic reaction. Woodward-Hoffmann correlation diagrams. FMO and PMO approach Electrocyclic reactions- conrotatory and disrotatory motions, 4n, 4n+2 and allyl systems. Cycloadditions-antarafacial and suprafacial additions, 4n, 4n+2 systems, 2+2	Concepts of Cycloaddition reactions and Sigmatropic rearrangements	Flipped Classrooms, Demonstration	Review the various aspects of pericyclic reactions		

	addition of ketenes, 1,3 dipolar cycloaddition and cheleotropic reactions. Sigmatropic rearrangements-suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties, 3,3-and 5,5-sigmatropic rearrangements. Claisen, Cope and aza-Cope rearrangements, Ene reaction.					

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M.Sc. Practical CHEM-205

Sem II

FEBRUARY	**Organic Chemistry** **(a) Organic synthesis (any five)** (i) Acetylation: Acetylation of cholesterol and separation of cholesteryl acetate by column chromatography. (ii) Oxidation: Adipic acid by chromic acid oxidation of cyclohexanol. (iii) Aldol condensation:	Organic synthesis and Quantitative Analysis	Demonstration of the organic synthesis reaction		*Understanding Based* - Mechanism of various Chemical reactions. -To analyse the concept of DO, BOD and COD.	

	Dibenzal acetone from benzaldehyde. (iv) Sandmeyer reaction: p-chlorotoluene from p-toluidine. (v) Cannizzaro reaction: 4-chlorobenzaldehyde as substrate. (vi) Friedel Crafts Reaction: β-Benzoylpropionic acid from succinic anhydride and benzene. (vii) Aromatic electrophilic substitutions: Synthesis of p-nitroaniline and p-bromoaniline **(b) Quantitative Analysis (any two)** (i) Determination of DO of a water sample. (ii) Determination of COD of a water sample. (iii) Determination of BOD of a water sample				*Higher Order Thinking Skills Based* - Viva Voce	

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