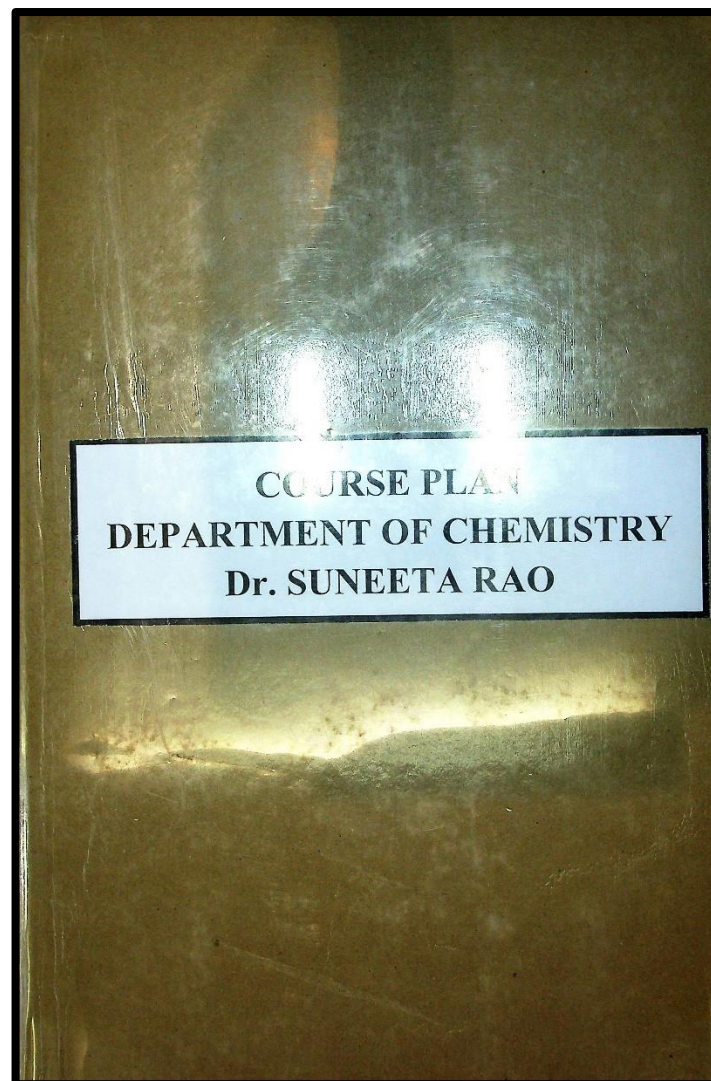




## SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER





**COURSE PLAN**  
**U.G. & P.G. Programs**  
**2021-22**  
**ODD SEMESTER**



**SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER**  
**B.Sc. II (SEMESTER III)**

**ORGANIC CHEMISTRY (CHE-302)**

Max. Marks: 75 (50Ext; 25 Int)

Min. Marks: 30(20 Ext; 10 Int)

Credit: 03

**COURSE PLAN**

SEM III Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III  Sep.	<b>Unit – III</b>  <b>Phenols</b> Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols-electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.	Structure and reactivity of Phenols and ethers	Audio- Visual Tutorials, Flipped Classroom, Peer group teaching	Illustrate the preparation and Chemical Reactions of Phenols, ethers and Epoxides	<u>Knowledge Based</u> -What is hypsochromic shift in UV spectroscopy?  -Discuss the effect of solvent polarity on electronic transition in UV spectrum.  <u>Understanding Based</u> -Compare the chemical behaviour of	Knowledge--50 Understanding-35 Higher Order-15



	<b>Ethers and Epoxides</b> Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions- cleavage and autoxidation, Ziesel's method. Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides				monohydric alcohols and dihydric alcohols. - Explain the factors affecting acidic strength of phenol and cresol.  <u>Higher Order Thinking Skills Based</u> -Justify the orientation of ring opening of ethers.	
Oct- Nov	<b>Unit – I</b> <b>Spectroscopy</b> <b>Electromagnetic Spectrum: Absorption Spectra</b>  Ultraviolet (UV) absorption spectroscopy- absorption laws (Beer-Lambert law), types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathchromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated dienes and enones, Application of electronic spectroscopy and Woodward rules for calculating $\lambda_{max}$ of conjugated dienes and	Interpretation of UV and IR spectra and their role in structural elucidation.	Problem Solving, PPT, Flipped Classroom	Assess the molecular structure using UV and IR Spectroscopy	-How we can differentiate between the pair of $CH_3CH_2CHO$ and $CH_3COCH_3$ with the help of IR spectral data?	



	<p><math>\alpha</math>, <math>\beta</math> - unsaturated carbonyl compounds.</p> <p><b>Infrared (IR) absorption spectroscopy</b>-molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorption of various functional groups and interpretation of IR spectra of simple organic compounds.</p>					
Dec.	<p><b>Unit – II</b></p> <p><b>Alcohols</b> Classification and nomenclature. Monohydric alcohols-nomenclature, methods of formation, Chemical reactions of alcohols. Dihydric alcohols and trihydric alcohols-nomenclature, formation, chemical reactions of vicinal glycols and pinacol-pinacolone rearrangement. Trihydric alcohols-nomenclature and methods of formation, chemical reactions, Role of alcohols in sanitization process against covid 19.</p>	Structure and reactivity Of monohydric, dihydric and trihydric alcohols.	Assignments, Group discussion, Audio Visual Tutorials	Summarize the reactivity of primary, Secondary and tertiary alcohols		

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## B.Sc. II (SEMESTER III)

### PRACTICALS (CHE-303)

Max. Marks: 50(40Ext; 10 Int)

Min Marks: 20(16 Ext;4 Int)

Credit: 02

### COURSE PLAN

SEM Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III <i>Sep.</i>	<b>Inorganic Chemistry</b> <ul style="list-style-type: none"> <li>Calibration of fractional weights, pipettes and burettes. -Preparation of standard solutions.</li> <li>Dilution 0.1 M to 0.001 M solutions.</li> </ul>	Preparation of solutions and dilution	Demonstration of Experiment with use of different apparatus and glassware	Understand the practical applications of various aspects of chemistry	<u>Knowledge Based</u> Practical File Work  <u>Understanding Based</u> -To determine percentage composition of acetic acid in commercial vinegar using NaOH.	Knowledge—30  Understanding-50  Higher Order-20
<i>Oct. - Nov.</i>	<b>Volumetric Analysis</b> <ul style="list-style-type: none"> <li>Determination of acetic acid in commercial vinegar using NaOH.</li> <li>Determination of alkali content-antacid tablet using HCl.</li> <li>Estimation of calcium content in chalk as calcium</li> </ul>	Volumetric Analysis	Demonstration of the exercise		-To determine alkali content in antacid tablet. <u>Higher Order Thinking Skills Based</u>  Viva Voce	



	oxalate by potassium permanganate.  • Estimation of hardness of water by EDTA.  • Estimation of ferrous and ferric dichromate method.  • Estimation of copper using thiosulphate					
Dec.	<b>Gravimetric Analysis.</b> • Analysis of Cu as CuSCN  • Ni as Ni-dimethylglyoxime.	Gravimetric Analysis.	Demonstration of Experiment with Use of different Apparatus like oven, desiccator, suction pump and crucible.			

  
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**SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER**  
**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)

Credit: 06

**COURSE PLAN**

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
Sem I  Nov.	<b>UNIT I</b>  <b>Nature of Bonding in organic molecules</b>  Aromaticity in benzenoid and non- benzenoid compounds, Huckel's rule, energy level of $\pi$ molecular orbital, annulenes, antiaromaticity, homoaromaticity	Nature of Bonding in organic molecules	E-content, Flipped Classroom, Peer Group Teaching	Predict structure and bonding in common organic molecules and mechanism of organic reactions.	<u>Knowledge Based</u> - What is Antiaromaticity? -Define Homoaromaticity.  <u>Understanding Based</u> -Compare the aromaticity of tropone and tropolone. - Summarize the aromatic behaviour	Knowledge-25 Understanding-45 Higher Order-30





	<b>Reaction Mechanism: Structure and Reactivity</b> Types of reactions, types of mechanisms, General methods for the determination of reaction mechanism – stereochemical evidences, kinetic evidences and isotope effects. Thermodynamic and kinetic requirements for a reaction, kinetic and thermodynamic control.	Structure and Reactivity of organic compounds	Audio Visual Tutorials, E-content, Group Discussions		of (10)-and (14)-Annulenes  <u>Higher Order Thinking Skills Based</u>  -Explain how reactivity is effected at bridgehead positions in free radical reaction mechanism. - Elaborate primary kinetic isotope effect and secondary kinetic isotope effects.	
Dec. - Jan.	<b>UNIT II</b> $SN^2$ , $SN^1$ , mixed and SET mechanism	Aliphatic Nucleophilic Substitution Reactions	E-content, Flipped Classroom, Peer Group Teaching	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 Reactions	Audio Visual Tutorials, E-content, Group Discussions			
	Bimolecular mechanism,	Aliphatic Electrophilic	E-content, Group			



	SEI mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and the solvent polarity.	Substitution Reactions	Discussions , Flipped classroom			
	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, Vismier reaction, Gattermann-koch reaction.	Aromatic Electrophilic Substitution Reactions	Audio Visual Tutorials, E-content, Group Discussions			
Feb .	<b>UNIT III</b> <b>Free Radical Reactions</b> Types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance, Reactivity for aliphatic and aromatic substrates at a	Types of Free Radical Reactions	Flipped Classrooms, E-content, Assignments	Explain different types of free radical reactions		



	bridgehead, Reactivity in the attacking radicals, the effect of solvent on reactivity. Allylic halogenations (NBS), oxidation of aldehydes to carboxylic acids, auto-oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts, Sandmeyer reaction. Free radical rearrangement, Hunsdiecker reaction.					
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**SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER**  
**M.Sc. CHEMISTRY (FINAL)**  
**SEMESTER III**

**PHOTOCHEMISTRY AND SOLID STATE CHEMISTRY (CHEM-302)**

Max. Marks: 100 (70Ext; 30 Int)

Min. Marks: 40(28 Ext; 12 Int)

Credit: 06

**COURSE PLAN**

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
Sem III  sep.	<b>Unit-II</b> <b>Photochemical Reactions</b> Interaction of electromagnetic radiation with matter, type of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometry.	Different types of fates of excited molecules	Audio Visuals Tutorials, Quiz, Flipped classroom	Analyse various concepts of photochemical reactions and Photochemistry of Alkenes.	<u>Knowledge Based</u> - Define Quantum Yield. -What is actinometry? <u>Understanding Based</u> - Conclude fates of various types of excited molecules. - Discuss mechanism of 1,2-alkyl shift in photochemical isomerization of aromatic	Knowledge-25 Understanding-45 Higher Order-30
	<b>Determination of Reaction Mechanism</b> Classification, rate constants	Methods of determination of reaction mechanism	E-content, Flipped classroom, Group Discussion			



	and life time of reactive energy state- determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Type of photochemical reactions- photodissociation, gas-phase photolysis.				compounds. <u>Higher Order Thinking Skills Based</u> - Explain Norrish Type -I photochemical reactions of carbonyl compounds.
	<b>Photochemistry of Alkenes</b> Intermolecular reactions of the olefinic bond-geometrical isomerism cyclisation reaction, rearrangement of 1,4-and 1,5-dienes.	Types of photochemical reactions of alkenes	Audio Visuals Tutorials, Flipped classroom, Peer Group Teaching		- Discuss the following reactions with mechanism and suitable examples-
Oct. - Nov.	<b>Unit-III</b> <b>Photochemistry of Carbonyl Compounds</b> Intramolecular reactions of the carbonyl compounds- saturated, cyclic and acyclic, $\alpha$ , $\beta$ -unsaturated, cyclohexadienones, Intermolecular cycloaddition reaction- dimerisation and oxetane formation.	Photochemical reactions of Carbonyl Compounds	E-content, Group Discussion, Assignments	Elaborate the photochemistry of various organic compounds.	(i) Photo-Fries rearrangement (ii) Barton reaction





<b>Photochemistry of Aromatic Compounds</b>  Isomerisations, additions and substitutions.	Photochemical reactions of Aromatic Compounds	Audio Visual Tutorials, Flipped Classroom			
<b>Miscellaneous Photochemical Reactions</b> Photo-Fries reactions of anilides. Photo-Fries rearrangement. Barton reaction. Singlet molecular oxygen reactions. Photochemical formation of smog. Photo Degradation of polymers.	Different types of Photochemical Reactions	Quiz, Group Discussion, Audio Visual Tutorials			

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**COURSE PLAN**  
**U.G. & P.G Programs**  
**2021-22**  
**EVEN SEMESTER**



SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER  
B.Sc. II (SEMESTER IV)

ORGANIC CHEMISTRY (CHE-402)

Max. Marks: 75 (50 Ext; 25 Int)

Min. Marks: 30(20 Ext; 10 Int)

Credit: 03

SEM IV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
FEB	<b>Unit I</b> <b>Aldehydes and Ketones</b> Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from 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	Structure and reactivity of Aldehydes and ketones	PPT, Student Assignments, Flipped Classroom, Group discussion	Illustrate the preparation and Chemical Reactions of Aldehydes and ketones	<u>Knowledge Based</u> -Write the structural formulas of 2-pentanone.  -Give the structural formula of Picric acid?  <u>Understanding Based</u> -Describe the difference among primary, secondary and tertiary amines. - Discuss the	Knowledge--50 Understanding-35 Higher Order-15



	ketones: with potassium permanganate and potassium dichromate. Oxidation of aldehydes with Tollen's reagent, Fehling solution and sodium hypohalite (haloform reaction), Baeyer-villiger oxidation of ketones, Cannizzaro reaction, reductions of aldehydes and ketones with $\text{LiAlH}_4$ and $\text{NaBH}_4$ , MPV, Clemmensen, Wolff-kishner, reductions, Halogenation of enolizable ketones				order of relative stability of acyl anhydride  <u>Higher Order Thinking Skills Based</u>  - Discuss the order of relative stability of acyl anhydride -How we can separate the mixture of three types of amines.	
MARCH	<b>Unit – II</b> <b>Organic Compounds of Nitrogen</b> 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-	Synthesis and reactivity of various N containing compounds	Audio Visual Tutorials, Flipped Classroom, Group discussion	Summarize the reactivity of nitroalkanes, Amines, and diazonium salts.		



	phthalimide reaction, Hoffmann bromamide reaction. Reaction of amines, electrophilic aromatic substitution in aryl amines, Synthetic transformation of aryl diazonium salts, azo coupling.					
APRIL- MAY	<b>Unit – III</b> <b>Carboxylic Acids</b> 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. <b>Carboxylic Acid Derivatives -</b> Synthesis of acid chlorides, esters, anhydrides and amides. Relative stability of acyl derivatives, Physical properties, interconversion of acid derivatives, Mechanisms of esterification and hydrolysis (acidic and basic).	Structure and reactivity Of Carboxylic acids and Hydroxy acids and Synthesis and interconversion of acid derivatives	Peer Group Teaching, Quiz, Flipped Classroom, E-content	To Compare the reactivity of carboxylic acids and acid derivatives		

  
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**SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER**  
**B.Sc. II (SEMESTER IV)**

Max. Marks: 50(40Ext; 10 Int)

Min Marks: 20(16 Ext;4 Int)

Credit: 02

**COURSE PLAN**

SEM Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV FEB	<b>Organic Chemistry</b> <b>(A) Chromatography</b> (i) Separation, R <sub>f</sub> values and identification of organic compounds. (ii) Preparation and separation of 2,4-dinitrophenylhydrozone of acetone, 2-butanone, hexan-2- and 3-one using toluene and light petroleum (40:60). (iii) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5)	Separation of organic compounds by chromatographic method	Demonstration of the experiment	Understand the practical applications of various aspects of chemistry	<u>Knowledge Based</u> Practical File Work  <u>Understanding Based</u> -To identify the given organic compound.  - To determine the transition temperature of the given substance by thermometric method (MnCl <sub>2</sub> ·4H <sub>2</sub> O)	Knowledge--30 Understanding-50 Higher Order-20



MARC H- APRIL	<b>(B) Qualitative Analysis</b> Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.	Identification of an organic compound	Demonstration of the method of identification, Flow Chart		<u>Higher Order Thinking Skills Based</u> Viva Voce	
MAY	<b>Physical Chemistry (Any Four)</b> 1. Determination of the transition temperature of the given substance by thermometric method (e.g. $\text{MnCl}_2 \cdot 4\text{H}_2\text{O} / \text{SrBr}_2 \cdot 2\text{H}_2\text{O}$ ) 2. To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system) and to determine the concentration of that solute in the given phenol-water system. 3. To construct the phase diagram of two component (e.g. diphenylaminebenzophenone) system by cooling curve method. 5. To determine the enthalpy of neutralization of a weak acid/weak	Determination of the transition temperature, enthalpy of neutralization	Exercises with Use of different Apparatus and Demonstration of the exercise			



	base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid/weak base.					
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**SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER**  
**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)

Credit:06

**COURSE PLAN**

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II APRIL	<b>UNIT I</b> <b>Addition to Carbon-Hetero Multiple Bonds</b> 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 and Stobbe reactions. Hydrolysis of esters and amides.	Addition reactions and Condensation reaction mechanisms	E-content, Flipped Classroom, Group Discussion	Explain the mechanism of various types of condensation and elimination reactions.	<u>Knowledge Based</u> - Define plane of symmetry with examples. - What is Perkin reaction. Explain with mechanism. <u>Understanding Based</u> - Discuss Benzoin Reaction with mechanism. - Illustrate E1 Reaction Mechanism with example. <u>Higher Order Thinking Skills Based</u> - Discuss the	Knowledge-25 Understanding-45 Higher Order-30





	<b>Elimination reactions</b> 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	Assignments, Group Discussion, Flipped Classroom		mechanism of aldol and cross aldol condensation with mechanism.	
MAY - JULY	<b>UNIT II</b> <b>Stereochemistry</b> Elements of symmetry, Chirality, molecules with more than one chiral center, threo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective synthesis Asymmetric synthesis. Optical activity in the absence of chiral carbon (biphenyls, allenes and 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.	Different stereochemical aspects of organic compounds	Audio Visual Tutorials, Flipped Classroom, Group Discussion	Analyse the stereochemistry of organic compounds.		

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

**PRACTICALS (CHEM-205)**

Max. Marks: 100 (70Ext; 30 Int)

Min. Marks: 40(28 Ext;12 Int)

Credit:06

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
MAY	<b>Organic Chemistry</b> <b>(a) Organic synthesis (any five)</b> (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: Dibenzal acetone from benzaldehyde. (iv) Sandmeyer reaction: p-chlorotoluene from p-toluidine. (v) Cannizzaro reaction: 4-chlorobenzaldehyde as substrate. (vi) Friedel Crafts Reaction: $\beta$ -Benzoylpropionic acid from succinic anhydride and benzene. (vii) Aromatic electrophilic substitutions: Synthesis of p-	Organic synthesis and Quantitative Analysis	Demonstration of the organic synthesis reaction	Understand the practical applications of various aspects of chemistry	<u>Knowledge Based</u> - Practical File Work  <u>Understanding Based</u>  - To synthesize dibenzalacetone from acetaldehyde.  -To analyse the concept of DO, BOD and COD.  <u>Higher Order Thinking Skills Based</u>  - Viva Voce	Knowledge--20 Understanding-40 Higher Order-40



	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					

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**SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER**  
**M.Sc. CHEMISTRY SEMESTER IV**  
**GROUP-B ORGANIC CHEMISTRY**  
**ORGANOMETALLICS AND DISCONNECTIONS -CHEM-401(B)**

Max. Marks: 100 (70Ext; 30 Int)

Min. Marks: 40(28 Ext;12 Int)

Credit:06

**COURSE PLAN**

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV FEBRUARY	<b>Unit- I</b>  <b>Organometallic Reagents</b> Principles, preparations, properties and applications of the following in organic synthesis with mechanistic details.  <b>Transition Metal organic compounds</b>  Cu, Pd, Ni, Fe, Co, Rh, Cr and Ti Compounds.  <b>Protecting Groups</b> Principle of Protection of alcohol, amine, carbonyl and carboxyl group.	Methods of preparations and properties of organometallic compounds of transition metal complexes Protection of specific organic compounds	PPT, Audio Visual Tutorials, Flipped Classroom Assignments, E-content,	Analyse organometallic reagents of transition metals.	<u>Knowledge Based</u> - Give structure and uses of Wilkinson's catalyst.  <u>Understanding Based</u> -Explain principle of protection of carbonyl compounds. <u>Higher Order Thinking Skills Based</u> -Elaborate Hack reaction with mechanistic details	Knowledge--25 Understanding-45 Higher Order-30

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**SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER**  
**M.Sc. CHEMISTRY SEMESTER IV**  
**GROUP-B ORGANIC CHEMISTRY**  
**HETEROCYCLIC CHEMISTRY - CHEM-402(B)**

Max. Marks: 100 (70Ext; 30 Int)

Min. Marks: 40(28 Ext;12 Int)

Credit:06


**COURSE PLAN**

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV FEB- MARCH	<b>Unit-I</b> <b>Nomenclature of Heterocycles</b> Replacement and systematic nomenclature (Hantzsch-Widman system) for monocyclic, fused and bridged heterocycles.	Structural Classification and nomenclature of heterocycles.	E-content, Problem Solving, Group Discussion	Interpret aromatic and non- aromatic heterocycles	<u>Knowledge Based</u> -What is Hockey stick effect?. - Give two synthesis of Oxirane. <u>Understanding Based</u>	Knowledge-25 Understanding-45 Higher Order-30

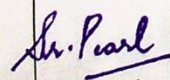






	<p><b>Aromatic Heterocycles</b> General chemical behaviour of aromatic heterocycles, classification (structural type), criteria of aromaticity (Bond lengths, ring current and chemical shifts in <math>^1\text{H}</math> NMR-spectra, empirical resonance energy, delocalization energy and Dewar resonance energy, diamagnetic susceptibility exaltations.) Heteroaromatic reactivity and tautomerism in aromatic heterocycles.</p> <p><b>Non Aromatic Heterocycles</b> Strain-bond angle and torsional strains and their consequences in small ring heterocycles. Conformation of six-membered heterocycles with reference to molecular geometry, barrier to ring inversion, pyramidal inversion and 1,3-diaxial interaction. Stereo-electronic effects-anomeric and related effects. Attractive interactions-hydrogen bonding and intramolecular nucleophilic-electrophilic interactions.</p>	General chemical behaviours of aromatic heterocycles and non aromatic heterocycles	<p>Audio Visual tutorials, Quiz, Peer group teaching</p> <p>E-content, Problem Solving, Group Discussion</p>		<p>- Explain briefly the structure and reactions of Quinolizinium salts.</p> <p>- Discuss attractive interactions through space</p> <p><u>Higher Order Thinking Skills Based</u></p> <p>- Illustrate torsional strain and their consequences in small ring heterocycles</p> <p>- Describe Meso-Ionic heterocycles.</p>	
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APRIL	<b>Unit-II</b> <b>Heterocyclic Synthesis</b> Principles of heterocyclic synthesis involving cyclization reaction and cycloaddition reactions. <b>Small Ring Heterocycles</b> Three - membered and four - membered heterocycles - synthesis and reactions of aziridines, oxiranes, azetidines, oxetanes.	Reactions and synthesis of small ring heterocycles.	E-content, Quiz, PPT, Peer Group Teaching Audio Visual Tutorials, Group Discussion	Elaborate the synthesis of various types of heterocyclic compounds.		
MAY	<b>Unit-III</b> <b>Benzo Fused Five-membered Heterocycles</b> Synthesis and reactions including medicinal applications of benzopyrroles, benzofurans and benzothiophenes. Meso-Ionic heterocycles. <b>Six Membered Heterocycles with one Heteroatom</b> Synthesis and reaction of quinolizinium and benzopyrilium salts, coumarins and chromones.	Applications and reactions of benzo fused heterocycles	E-content, Quiz, PPT, Peer Group Teaching	Illustrate benzo fused five-membered and six-membered heterocycles.		
		Characteristics of Six-Membered heterocycles with one Heteroatoms	Flipped classrooms, Audio Visual Tutorials			

  
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