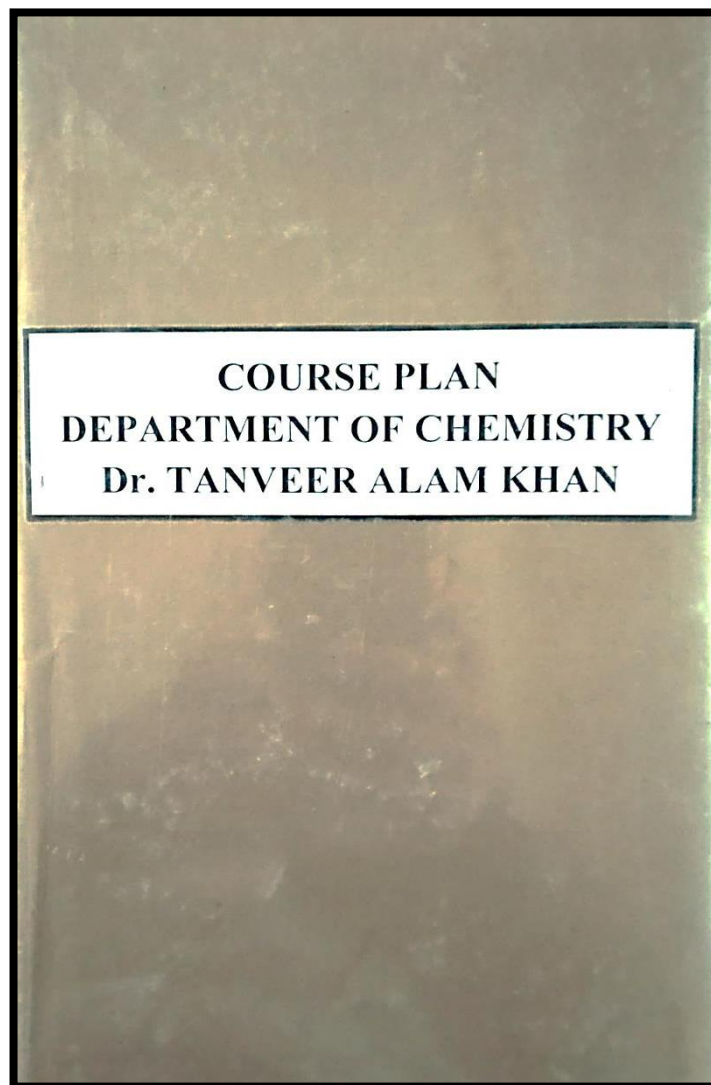




SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER





COURSE PLAN
U.G. & P.G Programs
2020-21
EVEN SEMESTER



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

PHYSICAL CHEMISTRY (PAPER I) (CHE-201)

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

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

Credit: 03

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II/ APRIL	UNIT I Solid State Definition of space lattice, unit cell, Laws of crystallography-(i) Law of constancy of interfacial angles (ii) Law of rational indices (iii) Law of symmetry, Symmetry elements in crystals, Weiss parameter system, Millar's indices, X-ray diffraction by crystals, Derivation of Bragg's equation.	Laws of crystallography, and symmetry elements.	PPT, Chart, Audio-visual tutorials, 3- D Models	Predict properties of solid state of matter.	<u>Knowledge Based</u> -Define Unit cell. -State law of rational Indices <u>Understanding Based</u> -Explain Miller and Weiss parameters. <u>Higher Order Thinking Skills Based</u> -Derive equation for the calculation of abnormal molecular mass.	Knowledge-60 Understanding-30 Higher Order-10



SEM II/ JULY	UNIT III Types of solution, Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient, Dilute solution, colligative properties, relative lowering of vapour pressure, molecular mass determination, Osmosis, law of osmotic pressure and its measurement, calculation of osmotic pressure, determination of molecular mass from osmotic pressure, Elevation of boiling point and depression in freezing point, Experimental methods for determining various colligative properties, Abnormal molar mass, degree of dissociation and association of solutes.	Solutions, Dilute Solutions and Colligative Properties	PPT, Chart, Diagrams, Quizzes	Summarize the properties of dilute solutions and explain colligative properties.	-Compare positive and negative deviation of dilute solutions from Raoult's Law.	
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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
B. Sc. I (SEMESTER II)

ORGANIC CHEMISTRY (PAPER II) (CHE-202)

Credit: 03

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

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

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II / APRIL	Unit – I Optical isomerism-elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization, Newmann projection and Sawhorse formulae, Fisher and flying wedge formulae, Differentiate between configuration and conformation, Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature, Geometric isomerism- determination of configuration of geometric isomers, E & Z system of	Stereochemistry of Organic Compounds	PPT, Diagrams Visual 3D Models, Quizzes	Identify the stereochemistry of organic compounds.	<u>Knowledge Based</u> - Define Geometric Isomerism. - What is retention of configuration? <u>Understanding Based</u> - Explain addition-elimination mechanism of nucleophilic aromatic substitution reactions.	Knowledge-60 Understanding-30 Higher Order-10



	nomenclature, geometric isomerism in oximes and alicyclic compounds, Conformational isomerism- conformational analysis of ethane and n-butane, conformations of cyclohexane, Qualitative treatment of stability of chair and boat conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives.				-Compare the stability of Chair and boat conformations of cyclohexane.	
SEM II/ JULY	Unit – III Alkyl and Aryl Halides Alkyl halides- Methods of preparation, chemical reactions, mechanisms of nucleophilic substitution reactions of alkyl halides, SN2 and SN1 reactions with energy profile diagrams, Polyhalogen compounds: chloroform, carbon tetra chloride. Aryl halides- Methods of preparation of aryl halides, nuclear and side chain reactions, The addition elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions, Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides, Synthesis and uses of DDT and BHC.	Preparation and reactivity of alkyl and aryl halides.	Audio-visual tutorials, Flow Chart, examples, quizzes	Compare the reactivity of alkyls and aryl halides.	- Compare the relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. - Elaborate R & S nomenclature system.	

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

PRACTICALS (CHE-203)

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

Min. Marks: 20 (16 Ext; 4 Int)

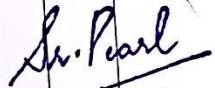
Credit: 02


COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II/ APRIL	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	<u>Knowledge Based</u> Practical File Work <u>Understanding Based</u> - To identify the functional group in the given organic compound.	Knowledge-30 Understanding-50 Higher Order-20
SEM II/ MAY-JUNE	Physical Chemistry: <ul style="list-style-type: none"> 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. To compare the strengths of 	Kinetics of Chemical reactions.	Exercises with Use of different Apparatus and glassware.		- To determine the specific reaction rate of the hydrolysis of methyl acetate/ ethyl acetate catalyzed by hydrogen ions at room temperature.	



	<p>HCl and H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate.</p> <ul style="list-style-type: none"> To study kinetically the reaction rate of decomposition of iodide by H_2O_2. To study the distribution of iodine between water and CCl_4. 				<p><u>Higher Order Thinking Skills Based</u></p> <p>Viva Voce</p>	
SEM II / JULY	<p>Physical Chemistry:</p> <ul style="list-style-type: none"> 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 viscosity of amyl alcohol in water at different concentrations and calculate the excess viscosity of these solutions. 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 glassware.			


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

ORGANIC CHEMISTRY (PAPER II) (CHE-402)
Min. Marks: 30 (20 Ext; 10 Int)

Credit: 03

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

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV/ MAY-JUNE	Unit – I Aldehydes and Ketones Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehyde from acid chlorides, synthesis of aldehyde and ketones using 1,3-dithianes, synthesis of ketone 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 ketones: with potassium permanganate and potassium dichromate. Oxidation of aldehydes with Tollen's	Structure and reactivity of aldehydes and ketones	PPT, Demonstration, Flipped Classroom, Examples, Quizzes	Illustrate the preparation and Chemical Reactions of Aldehydes and ketones	<u>Knowledge Based</u> -Write the structural formulas of 2- pentanone. <u>Understanding Based</u> -Differentiate between aldehydes and ketones. <u>Higher Order Thinking Skills Based</u> -Compare the reactivity of aldehydes and ketones.	Knowledge-50 Understanding-35 Higher Order-15



regent, Fehling solution and sodium hypohalite (haloform reaction), Baeyer-villiger oxidation of ketones, Cannizzaro reaction, reductions of aldehydes and ketones with LiAlH_4 and NaBH_4 , MPV, Clemmensen, Wolff-Kishner reductions, Halogenation of enolizable ketones.

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M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER II

GROUP THEORY AND SPECTROSCOPY (CHEM-204)

MAX. MARKS: 100 (70 EXT; 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 / MAY- JUNE	Unit - II Molecular spectroscopy: Energy levels, molecular orbitals, vibrational transitions, vibration progression and geometry of the excited states, Franck-Condon Principle, electronic spectra of polyatomic molecules, Emission spectra, radiative and non-radiative decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.	Concept of molecular spectroscopy and various processes in molecular spectroscopy	Diagrams, Tables, PPT, Quizzes.	Analyse the molecular spectroscopy.	<u>Knowledge Based</u> -What are the basic principles of ESR? -What is the difference between fluorescence and phosphorescence? <u>Understanding Based</u> -Explain Franck-Condon principle. -Summarize the	Knowledge-25 Understanding-45 Higher Order-30



SEM II/
JULY

UNIT - III

Electron Spin Resonance Spectroscopy

Basic principles, zero field splitting and Kramer's degeneracy, "g" value, factors affecting the "g" value Hyperfine splitting, Hyperfine coupling constant, Isotropic and anisotropic hyperfine coupling constants, application to study of free radicals, determination of oxidation state of metal and to study the transition metal complexes (having one unpaired electron) including biological systems.

Concept of electron spin resonance spectroscopy and its application in different systems

Diagrams, Audio-visual tutorials, Tables, Quizzes

Assess the electron spin resonance spectroscopy.

radiative and non-radiative decays.

Higher Order Thinking Skills Based

- Calculate the number of ESR signal for $\text{CH}_2\text{CH}_3^\bullet$ radical.

-Elaborate hyperfine splitting in ESR spectra.

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SEMESTER II

PRACTICAL (CHEM-205)

MAX. MARKS: 100 (70 EXT; 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 / APRIL	INORGANIC CHEMISTRY Separation and determination of two metal ions Cu-Ni, Ni- Mg, Cu-Fe, Cu-Ba etc. involving volumetric and gravimetric methods.	Methods of separation and determination of two metal ions.	Demonstration of the exercise, Quizzes.	Understand the practical applications of various aspects of chemistry.	<u>Knowledge Based</u> - Practical File Work <u>Understanding Based</u> - Explain the concept of gravimetric analyses. <u>Higher Order Thinking Skills Based</u> - Viva Voce	Knowledge-20 Understanding-40 Higher Order-40

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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
M.Sc. CHEMISTRY (FINAL)
GROUP-A INORGANIC CHEMISTRY
SEMESTER IV

SUPRAMOLECULAR CHEMISTRY - CHEM-402(A)

MAX MARKS: 100 (70 EXT; 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 IV / MARCH	Unit-I Introduction- Definition and development of Supramolecular Chemistry, Classification of Supramolecular Host- Guest Compounds. Nature of Supramolecular Interactions- Ion-Ion Interactions, Ion-dipole Interactions, Dipole- Dipole interaction, Hydrogen bonding, Cation- π interaction, Anion- π interactions, π - π interactions, vander wall forces and Crystal Close packing, Closed shell Interactions	Concept of Supramolecular Host-Guest interactions and various interactions possible in supramolecular chemistry	Diagrams, PPT, Audio-visual tutorials, Quizzes	Analyse different aspects of supra molecular chemistry.	<u>Knowledge Based</u> - Define halogen bonding interaction? - What is the significance of pre-organization and complementarity in molecular recognition?	Knowledge--25 Understanding-45 Higher Order-30



	Molecular recognition: Introduction to recognition, information and complementarity, Principle of molecular receptor designs, Spherical recognition, Tetrahedral recognition, Recognition of ammonium ions and neutral molecules, multiple recognition by co-receptor molecules.	Concept of molecular recognition and different types of recognition processes of various substrates by receptors	Diagrams, PPT, Flipped Classrooms, Quizzes		<u>Understanding Based</u> - Summarize proton Coupled transport in a pH gradient. - Explain π - π interactions in Supramolecular Species.	
SEM IV/ APRIL	Unit-II Supra molecular reactivity and catalysis- Introduction, Catalysis by cation, anion and metalloreceptor molecules, catalysis with Cyclophane type receptors, Co catalysis- synthetic reaction catalysis.	Catalytic aspects of Supramolecular chemistry.	Diagrams, Flow Charts, PPT	Assess supramolecular reactivity and catalysis.	<u>Higher Order Thinking Skills Based</u> - Elaborate Tetrahedral Recognition. - Illustrate catalysis by anion receptor molecules.	
	Transport processes and carrier design- Carrier mediated transport, cation, anion transport process, coupled transport process, electron coupled, proton coupled and light coupled transport.	Transport processes carried out by Supramolecules.	Diagrams, Demonstration, Audio-visual tutorials			



	Supramolecular assemblies- Introduction, Supramolecular solid materials, molecular recognition at surfaces, molecular and supramolecular morphogenesis.	Concept of supramolecular assemblies and it's applications	Flow Charts, PPT, Audio-visual tutorials			
SEM IV/ MAY - JULY	Unit-III Supra molecular photochemistry- Light conversion and energy transfer devices, photosensitive molecular receptors, photinduced electron transfer in photoactive devices, photinduced reactions in supramolecular devices, Non linear optical properties of supramolecular species, Supramolecular effects in photochemical hole burning.	Concept of photonic devices and various photochemical processes used in photonic devices	PPT, Diagrams, Demonstration, Audio-visual tutorials	Elaborate about various supramolecular devices.		
	Molecular and Supra molecular electronic and ionic devices, switching devices.	Concept of various supramolecular devices	PPT, Quizzes, Diagrams, Examples			

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M.Sc. CHEMISTRY (FINAL)
GROUP-A INORGANIC CHEMISTRY
SEMESTER IV

INORGANIC POLYMERS - CHEM – 403(A)

MAX MARKS: 100 (70 EXT; 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 IV APRIL	Unit-I Inorganic Polymer Synthesis Step Growth synthesis, Chain Polymerization, ring opening polymerization, Reductive coupling and other Redox Polymerisation reactions.	Various synthetic processes of Inorganic Polymers.	Diagrams, Flow Charts, Diagrams, PPT, Examples	Elaborate basic concepts and synthesis of Inorganic polymers.	<u>Knowledge Based</u> Define skeletal electron pairs (SEP) and its importance in boron chemistry. - Write number of 3c-2e bonds present in diborane.	Knowledge-25 Understanding-45 Higher Order-30



SEM IV
MAY-JULY

Unit-III

Polymers based on Boron –
Borides, Carborane Polymers,
Borazine, Boron Nitride

**Polymers based on Silicon-
Silicones-** Preparation and
properties of Silicones,
Modification of Silicones

**Polysilanes and related
polymers-** Structure, Synthesis,
Physical and electronic properties
of polysilanes, Chemical
modification of Polysilanes.

Chemistry of Boron
polymers

Preparation,
properties and
structure of Silicones
and Polysilanes

PPT, Diagrams,
Demonstration,
Audio-visual
tutorials

PPT, Diagrams,
Audio-visual
tutorials, Quizzes

Summarize the
Properties of
Inorganic
Polymers.

Understanding
Based
- Explain
Preparation and
properties of
Silicones.

-Discuss general
mechanism of
Anion and
Radical Ring
Opening
Polymerization.

Higher Order
Thinking Skills
Based

- Elaborate Step
Addition
synthesis of
Inorganic
Polymers.

- How to
distinguish
between closo,
nido and arachno
carboranes.

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