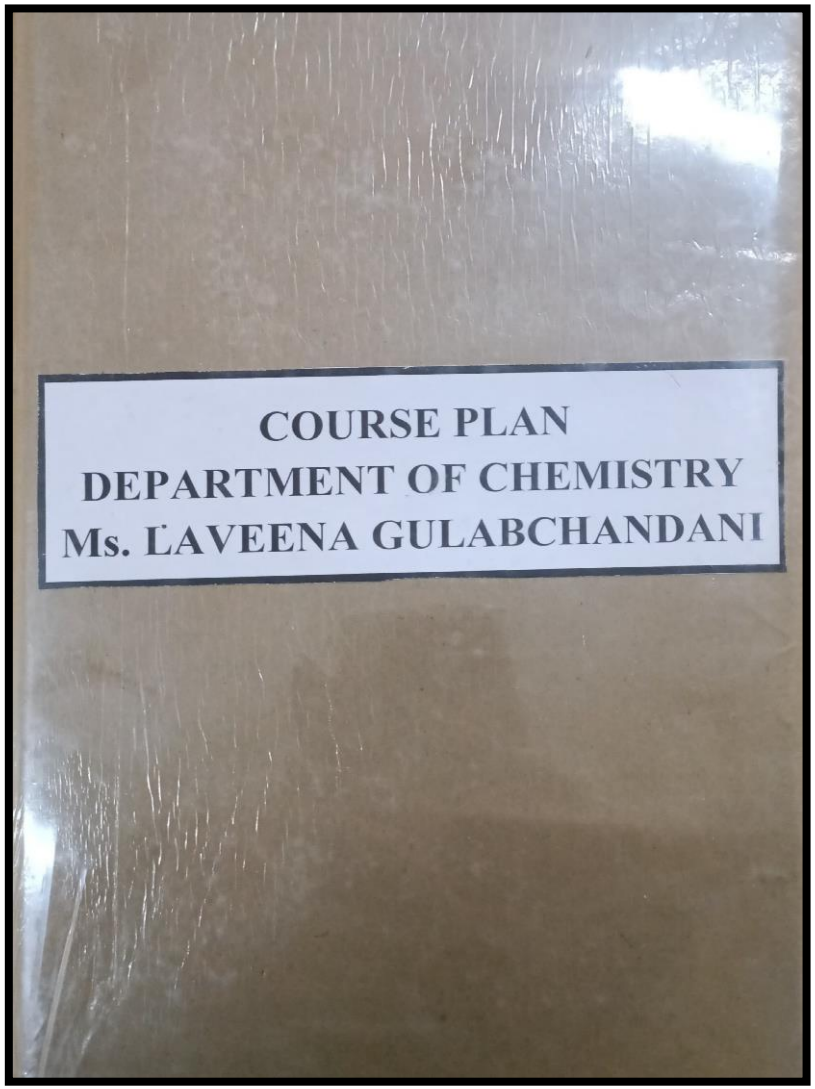
SOPHIA GIRLS' COLLEGE(AUTONOMOUS), AJMER



COURSE PLAN

U.G. & P.G. Programs

2020-21

ODD SEMESTER

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

INORGANIC CHEMISTRY (CHE-101)

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 I AUGUST- SEPTEMBER	**UNIT I** **Atomic Structure** Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of ψ and ψ^2, quantum numbers, shapes of s, p, d orbitals. Aufbau Principle, Pauli's Exclusion principle, Hund's rule of maximum multiplicity, (n+l) rule, Electronic configurations of the atoms	Principles related to atomic structure and Electron filling in atoms	PPT, Charts, Audio visual tutorials	Interpret atomic structure and discuss various periodic properties.	*Knowledge Based* -Define Electronegativity. -Illustrate hybridization in ammonia molecule. *Understanding Based* -Compare VB and MO approach of bonding. -Classify elements of periodic table on the basis of their valence shell electronic configuration. *Higher Order Thinking Skills Based* - Explain why Hg^{+1}	Knowledge--60 Understanding-30 Higher Order-10
	Periodic Properties Atomic and ionic radii, ionization enthalpy, electron gain enthalpy and electronegativity	Periodic trends of various properties	Diagrams, Quiz, Assignments			

OCTOBER-NOVEMBER	**UNIT II** **Chemical Bonding** Valence bond theory and its limitations, various types of hybridization. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl^-_2, and H_2O. MO theory, homonuclear and heteronuclear diatomic molecules, Comparison of VB and MO approaches.	Nature of Bonding according to VBT and MOT	Match the following, Visual 3- D Models	Summarize nature of covalent bonds and properties of ionic solids.	ion are of larger size than Hg^{+2}ion. -Discuss application of VSEPR Theory for deciding the shape of ClF_3 molecule.	
	Ionic Solids Lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.	Characteristics of Ionic Solids	Diagrams, PPT			

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B.Sc. I (SEMESTER I)

PRACTICAL (CHE-103)

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 I Aug - Oct	**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.	Separation and identification of ions in Inorganic Mixture	Laboratory Experiments	Understand the practical applications of various aspects of chemistry	*Knowledge Based* Practical File Work *Understanding Based* - To Separate and identify cations and anions of an 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
Nov-Feb	• Calibration of Thermometer • Determination of Melting Point • Determination of boiling points	Laboratory Techniques	Demonstration using different apparatus and glasswares,			

	• Distillation • Crystallization • Decolorisation and crystallization using charcoal • Sublimation (Simple and Vacuum)					

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B.Sc. II (SEMESTER III)

INORGANIC CHEMISTRY (CHE-301)

Max. Marks: 75 (50Ext; 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 III JULY - AUG	**UNIT II** **Coordination Compounds** Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6), limitations of VBT	Werner's Theory and VBT	PPT, Visual 3D Models, Audio visual tutorials	Predict chemical properties of Coordination compounds, Lanthanides and Actinides.	*Knowledge Based* - Which element is the hardest transition metal? - List two ambidentate ligands. *Understanding Based* - Classify acids and bases according to Bronsted Lowry	Knowledge--50 Understanding-35 Higher Order-15
	Chemistry of Lanthanides Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, separation of lanthanides (ion-exchange method only).	Extraction and Properties of lanthanides	Flow Charts, Diagrams			

	Chemistry of Actinides General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides. Comparison of actinides with lanthanides.	General features of Actinides	Group discussions, E-Content		concept. -Compare ionic radii of 3d and 4d transition series. *Higher Order Thinking Skills Based* -Justify that tetrahedral complexes are high spin complexes. - Elaborate the Hybridization of Fe in $K_4[Fe(CN)_6]$.	
SEP – OCT	**UNIT I** **Chemistry of Elements of First Transition Series** Characteristic properties of d-block elements. General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states.	Characteristic properties of first and second transition series	PPT, Quiz	Assess the chemistry of the first, second and third transition series.		
	Chemistry of Elements of Second and Third Transition series General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry	Comparative Periodic trends in properties of 3d, 4d and 5d series.	PPT, Demonstration, Flipped Classroom.			

Nov – JAN	**UNIT III** **Acids and Bases** Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.	Classification of Acids and Bases	PPT, Flow Charts	Illustrate oxidation reduction behaviour and aqueous and non - aqueous solvents.		
	Non-aqueous Solvents Physical properties of a solvent, types of solvents and their general characteristics reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.	Chemical reactions in non aqueous solvents	Group discussions, Flipped Classroom			
	Oxidation and Reduction Use of redox potential data-analysis of redox cycle, redox stability in water-Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.	Analysis of Redox potential data	Diagrams, Flow Charts, Quiz			

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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
M.SC CHEMISTRY (PREVIOUS)
SEMESTER I
PHYSICAL CHEMISTRY- I (CHEM-103)

Max. Marks: 100 (70 Ext; 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 -DEC	**UNIT III** Collision theory of reaction rates, activated complex theory, ionic reactions, kinetic salt effects, steady state kinetics, kinetic and thermodynamic control of reactions, methods of determining mechanism, isotope effects, Dynamic chain, photochemical (hydrogen-bromine reaction), acid base catalysis, kinetics of enzyme reactions, general features of fast reactions,	Kinetics of various chemical reactions	Quizzes, PPT, Flipped Classroom	Assess the kinetics of various chemical reactions.	*Knowledge Based* -Define Kinetic isotope effect. - What are degrees of Freedom? *Understanding Based* -Discuss Vapour pressure method for	Knowledge--25 Understanding-45 Higher Order-30

	study of fast reactions by flow method, flash photolysis, dynamics of unimolecular reactions (Lindemann Theory, Hinshelwood Modifications).				determination of activity. - Summarize postulates of Huckel theory of conjugated systems. *Higher Order Thinking Skills Based* - Deduce the Ionic Strength of a mixture of 0.2 M $AlCl_3$ and 0.1 NaCl. - Elaborate the kinetics of Thermal hydrogen-bromine reaction.	
JANUARY	**UNIT II** Concept of fugacity and determination of fugacity, Non-ideal systems, Excess functions for non-ideal solutions, Activity, Activity coefficient and their determinations, Debye Huckel theory for activity coefficient for electrolytic solution; ionic strength, Application of phase rule to three component system – acetic acid + chloroform + water.	Thermodynamics of non- ideal systems	PPT , Problem Solving activities	Summarize various concepts of thermodynamics and phase rule.		
FEBRUARY	**UNIT I** Schrodinger equation, harmonic oscillator, the rigid rotor, the hydrogen atom. Applications of	Quantum Chemistry	Presentations by Students, Assignments	Predict aspects of Quantum Chemistry		

	variation method and perturbation theory to the Helium atom.					
	Huckel theory of conjugated systems, bond order and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical, cyclobutadiene etc.	Application of Molecular Orbital Theory to Conjugated Systems	Quizzes, Problem Solving, Flipped Classroom			

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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
M.SC CHEMISTRY (FINAL)
SEMESTER III

SPECTROSCOPY (CHEM-301)

Max. Marks: 100 (70 Ext; 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 July – August	**UNIT- I** Difficulties and solution for recording ^{13}C -NMR spectra, ^{13}C -^{1}H coupling constant- proton coupled and decoupled, ^{13}C spectra- decoupling technique. Chemical shift calculations for alkanes, alkenes, alkynes and aromatic compounds. Nuclear Overhauser Effect, ^{13}C-DEPT Spectra.	Theoretical and practical aspects of ^{13}C –NMR Spectroscopy	3D models, PPT, Charts, Problem Solving Activities	Summarize the concepts of ^{13}C - NMR spectroscopy	*Knowledge Based* - Define Nuclear Overhauser effect - State Nitrogen rule. *Understanding Based* - Compare ^{13}C-NMR and ^{1}H-NMR spectroscopy. - Illustrate mass spectral fragmentation in 2 – hexanol.	Knowledge--25 Understanding-45 Higher Order-30

SEP- OCT	**UNIT- II** Introduction, ion production chambers, factors affecting fragmentation, ion analysis abundance. Mass spectral fragmentation of organic compounds and functional groups, molecular ion peak, metastable peak, Mc Lafferty rearrangement, Nitrogen rule, High Resolution Mass Spectrometry.	Instrumentation and application of Mass Spectroscopy to structure determination	Online Quiz, Diagrams, Charts, PPT	Analyse the mass spectral fragmentation of organic compounds for their structure determination.	*Higher Order Thinking Skills Based* - Elaborate Mc Lafferty Rearrangement in Hexanone and 2-Propyl Benzene. - Deduce the ^{13}C chemical shift value for C-2 carbon atom of 2-hexanol.	
NOV - FEB	**UNIT- III** UV-Visible, IR, ^{1}H- NMR, ^{13}C-NMR, MASS-interpretation of common organic compounds.	Applications of spectroscopy to interpretation of structure of organic compounds.	Problem Solving, Group Discussions, Flipped Classroom	Interpret the structure of different organic compounds with the help of spectroscopic data.		

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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 (70 Ext; 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	**Unit-I** Metals, insulators and semiconductors, electronic structure of solids- band theory. Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junction.	Mechanism of conduction in various solids	Diagrams, Quiz, Flipped Classroom	Illustrate solid state chemistry	*Knowledge Based* - Define Semiconductors. *Understanding Based* - Classify Superconductors on the basis of critical temperature. *Higher Order Thinking Skills Based* - Elaborate BCS theory of superconductivity.	Knowledge-25 Understanding-45 Higher Order-30
	Definition, types and BCS theory, Optical properties- photoconduction- photoelectric effects. Magnetic Properties- Classification of materials- magnetic domains, hysteresis.	Basics of Super conductors and magnetic properties of various materials.	PPT, Group Discussion, Quiz			

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M.Sc. CHEMISTRY (FINAL)
Practicals (CHEM-305)

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III Nov - JAN	A. PHYSICAL • Determine the partial molar volume of solute and solvent in a binary mixture • Study the effect of addition of an electrolyte on the solubility of an organic acid. • Determine the composition of binary mixture containing $K_2Cr_2O_7$ and $KMnO_4$ using spectrophotometer. • Determine the heat of neutralization of hydrochloric acid by sodium hydroxide. • Determine the heat neutralization of two acids eg HCl and CH_3COOH and hence their relative strengths. • Study the adsorption of iodine form alcoholic solution on charcoal • Determine the rate constant of a reaction between acetone and iodine in presence of mineral acid	Laboratory Techniques and Use of Various Instruments	Demonstration using different Apparatus and instruments like conductivity meter, Colorimeter	Understand the practical applications of various aspects of chemistry	*Knowledge Based* - Practical File Work *Understanding Based* -To study the effect of addition of an electrolyte on the solubility of an organic acid. -To Determine the heat neutralization of two acids eg HCl and CH_3COOH and hence their relative strengths. *Higher Order Thinking Skills*	Knowledge--20 Understanding-40 Higher Order-40

	and a catalyst and to show that this reaction is of zero order with respect to iodine. • Verify Beer's law for the solubility and determine the concentration of the given unknown aqueous solution of $KMnO_4$				*Based* -Viva- Voce	

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COURSE PLAN

U.G. & P.G Programs

2020-21

EVEN SEMESTER

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

PHYSICAL CHEMISTRY (CHE-401)

Max. Marks: 75 (50Ext; 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 IV MARCH	**UNIT I** **Thermodynamics-I** First Law of Thermodynamics: Statement, internal energy and enthalpy, heat capacities at constant volume and constant pressure and their relationship. Calculation of w, q, dU, & dH for the expansion of ideal gases.	Basic concepts and First law of Thermodynamics	PPT, Flipped Classroom, Quiz	Summarize the First, Second and third law of thermodynamics and their applications.	*Knowledge Based* - State First law of thermodynamics. - Define polarization *Understanding Based* - Discuss application of conductivity measurement in calculation dissociation constant of acids. - Apply Kohlrausch law for determining limiting conductivity of	Knowledge--50 Understanding-35 Higher Order-15
	Thermochemistry Standard state, standard enthalpy of formation-Hess's Law of Constant Heat summation, Heat of reaction at constant pressure and at constant volume, Enthalpy of neutralization, Bond Dissociation energy, Kirchhoff's equation.	Thermochemical changes during a chemical reaction	PPT, Flow Charts, E-Content			
	Thermodynamics-II Second law of thermodynamics, Carnot cycle, Carnot theorem, Concept of entropy: entropy as a state function, Entropy change in	Basic concepts of second and third laws of thermodynamics and their applications	Group Discussions, Assignments, Quiz			

	ideal gases and mixing of gases. **Third law of thermodynamics:** Nernst heat theorem, Statement and concept of Residual Entropy, Evaluation of absolute entropy, Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, Variation of G with A with P, V and T.				acetic acid. *Higher Order Thinking Skills Based* - Prove that Ostwald Dilution law is applicable to weak electrolytes only with the help of an illustration. -Elaborate the methods of determination of transport number.	
APRIL	**UNIT II** **Electrochemistry-I** Electrical transport, specific conductance and equivalent conductance and their measurement, Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes, Transport number, Applications of conductivity measurements in determination of degree of dissociation, K_a of acids, solubility product of a sparingly soluble salt, ionic product of water, hydrolysis constant of a salt, conductometric titrations.	Electrochemistry of solutions	Peer Group Teaching, Diagrams, Online Quiz, Audio Visual tutorials	Review the various types of conductance, factors affecting it and applications of Conductivity measurements.		

MAY- JULY	**UNIT III** **Electrochemistry-II** Types of reversible electrodes-gas-metal ion, metal-insoluble salt anion and redox electrodes. Electrode reactions, Nernst equation, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cells-reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Calculation of thermodynamic quantities of cell reactions, polarization, over potential. Concentration cells, liquid junction potential, application of concentration cells, pH determination using hydrogen electrode and quinhydrone electrode, glass electrode. Potentiometric titrations - qualitative treatment (acid-base and oxidation-reduction only). Corrosion- Types, theories & methods of combating it	Concepts related to various types of cells and their applications	PPT, Flow Charts, Group Discussions, E-Content	Discuss various phenomena related to cells and Corrosion.		

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M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER II

PHYSICAL CHEMISTRY- II (CHEM-203)

Max. Marks: 100 (70 Ext; 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-MAY	**UNIT I** **Electrochemistry** Electrochemistry of solutions, Debye-Huckel-Onsager treatment and its extension, ion solvent interactions. Debye-Huckel-Bjerrum model. Semiconductor interfaces-theory of double layer at semiconductor, structure of double layer interfaces. Effect of light at semiconductor solution	Concepts related to Double layer interfaces, Polarography, Over potential and Corrosion .	E- content, Group Discussion, Assignments	Explain the electrochemistry.	*Knowledge Based* - Define Corrosion. - What are reverse micelles? *Understanding Based* - Compare the effect of light on n type and p	Knowledge--25 Understanding-45 Higher Order-30

	interface. Overpotentials, exchange current density, derivation of Butler-Volmer equation, Tafel Plot. Polarography theory, Ilkovic equation; half wave potential and its significance. Corrosion – Types, mechanism and inhibition.				type semiconductor solution interface. -Describe the effect of nature of surfactant on Critical micelle concentration.	
MAY – JUNE	**UNIT II** **Adsorption** Pressure difference across curved surface (Laplace equation), vapour pressure of droplets (Kelvin equation), Gibbs adsorption isotherm, estimation of surface area (BET equation without derivation), mechanism of surface catalytic reactions.	Phenomenon of adsorption, Adsorption isotherms and pressure changes as result of curved interfaces.	PPT , Diagrams, Peer Group Teaching	Summarize the concepts of adsorption and micelles.	*Higher Order Thinking Skills Based* - Elaborate the low and high Overpotential cases of Butler-Volmer Equation. - Derive the equation for molar mass determination	

	Micelles Surface active agents, classification of surface active agents, micellization, hydrophobic interaction, critical micellar concentration (CMC), factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization, solubilization, microemulsion, reverse micelles.	Micellization and its applications	PPT, Diagrams, Audio Visual Tutorials		of polymers using sedimentation method.	
JULY	**UNIT III** **Macromolecules:** Polymer- definition, types of polymers, electrically conducting, fire resistant, liquid crystal polymers, kinetics of polymerisation, mechanism of polymerisation. Molecular mass, number and mass average molecular mass, molecular mass determination (osmometry,	Kinetics and Mechanism of Polymerisation and Molar mass determination of polymers.	Flow Charts, Flipped Classroom, Group Discussion	Assess the chemistry of macromolecules.		

	viscometry, diffusion), sedimentation, chain configuration of macro molecules, calculation of average dimensions of various chain structures.					

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M.Sc. CHEMISTRY (FINAL)
SEMESTER IV

GROUP-A INORGANIC CHEMISTRY
INORGANIC POLYMERS {CHEM– 403(A)}

Max. Marks: 100 (70 Ext; 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 MARCH	**Unit-I** 1. **Basic Concepts** Definition, Classifications by Connectivities, Classifications by Dimensionality, the Metal/Backbone Classification of Metal-Containing Polymers.	Introduction and Classification of Inorganic Polymers	Diagrams, Flow Charts, PPT	Elaborate basic concepts and synthesis of Inorganic polymers.	*Knowledge Based* -Define Inorganic Polymers. - Give an example of polymer showing connectivity of 4. *Understanding Based* - Differentiate between Type I Metal Backbone polymers and Type II Metal enmeshed	Knowledge--25 Understanding-45 Higher Order-30
APRIL	**Unit-II** **Inorganic Polymer Characterization** Average Molecular Mass and Degree of Polymerization, Methods of Characterizing Average	Methods of determination of Molecular weight of Inorganic Polymers	Problem Solving Activities, E- Content, Group Discussion	Analyse the Chemical nature of polymers		

	Molecular Mass- Gel Permeation Chromatography, Viscosity, Universal Calibration, Colligative Properties (Freezing point depression, boiling Point elevation and Osmotic Pressure), End-Group Analysis, Ultracentrifugation.				polymers. -Discuss application of IR spectroscopy to analysis of polymers. *Higher Order Thinking Skills Based* - Elaborate the method of Ultracentrifugation to determination of molar mass. - Discuss application of DTA to analysis of polymers	
	Analysis and. testing of polymers Chemical analysis of polymers, spectroscopic methods (IR and NMR), X-ray diffraction study, thermal analysis and physical testing-tensile strength, Fatigue, impact, tear resistance, hardness and abrasion resistance.	Various methods for analysis of Polymers	Diagrams, Audio Visual Tutorials, Flipped Classroom			

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SEMESTER IV

ELECTIVE II - ANALYTICAL CHEMISTRY- CHEM-404 (For Group A, B, C)

Max. Marks: 100 (70 Ext; 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 MARCH	**Unit-I** **Data analysis and statistics** Types and sources of errors, Accuracy and precision, Significant figures; Mean ,Median and Standard Deviation, Rejection of results, Q-Test, Tests of significance, Comparison of the means of two samples, Analysis of Variance, Replicate determinations, Correlation, Regression, Uses of Statistics.	Errors and Application of Statistics to problems related to chemistry	Problem Solving activities, Group Discussion, Charts	Implement statistical methods of analysis to various problems and extraction techniques.	*Knowledge Based* - What is Accuracy? - Define Partition Coefficient. *Understanding Based* -Explain Theory and Mechanism of Solvent Extraction. - Discuss the	Knowledge-25 Understanding-45 Higher Order-30

	Solvent Extraction Partition: The theory of Extraction, Mechanism of solvent extraction, Extraction involving ion association complexes, Synergistic extraction, Solvent extraction by macromolecules, Techniques for solvent extraction, Applications, Solid phase extraction (SPE), Solid phase micro extraction (SPME).	Concepts and Techniques of Solvent extraction.	Audio Visual Tutorial, PPT, E-Content		factors affecting column efficiency and applications of Column Chromatography. *Higher Order Thinking Skills Based* - Calculate the range of the following set of results- 4.11, 4.15, 4.12, 4.13, 4.17 -Elaborate the application of TGA to analysis of thermal stability of polymers.	
APRIL	**Unit-II** **Thermal methods of analysis** **Thermogravimetric analysis** Introduction, instrumentation, TG – curves, factors affecting TGA, application of TGA	Concepts, Instrumentation and applications of TGA to chemical analysis	PPT, Diagrams	Apply various methods of thermal analysis to various materials		
	Differential thermal analysis- Differential scanning calorimetry, instrumentation, Factors affecting DTA and DSC curves.	DTA and DSC as methods of analysis	Diagrams, Group Discussion, E-content			
	Thermometric titrations Introduction, Instrumentation, Applications	Basic Concepts and applications of thermometric titrations	Flipped Classroom, Student Presentations			
MAY – JULY	**Unit-III** **Chromatographic Techniques** Introduction, classification	Basic concepts and use of different chromatographic techniques to separation of	PPT, Flow charts, Diagrams	Separate various mixtures with the help of different chromatographic techniques		

	instrumentation and applications of chromatographic techniques - Paper chromatography, Column Chromatography, Thin Layer Chromatography, Gas Chromatography.	mixture				

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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
M.Sc. CHEMISTRY (FINAL)
SEMESTER - IV
PRACTICALS (CHEM-405) (FOR GROUP –A, B, C)

Max. Marks: 100 (70 Ext; 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 APRIL	**ORGANIC CHEMISTRY** • Isolation of caffeine from tea leaves. • Isolation of casein from milk • Isolation of lactose from milk • Isolation of piperine from black pepper. • Isolation of lycopene from tomatoes. • Isolation of -carotene from carrots.	Extraction of various organic compounds from their natural sources	Laboratory Experiments	Understand the practical applications of various aspects of chemistry	*Knowledge Based* - Practical File Work *Understanding Based* -To Isolate of caffeine from tea leaves. - To determine pK_a of an	Knowledge--20 Understanding-40 Higher Order-40

	Spectroscopy Identification of organic compounds by the analysis of their spectral data (UV, IR, PMR).	Spectroscopic determination of Organic Compounds	Problem Solving, Demonstration		Indicator. *Higher Order Thinking Skills Based* -Viva- Voce	
MAY - JULY	**PHYSICAL CHEMISTRY** • Determination of pKa of indicator (e.g. Phenolpthalein). • Determination of stoichiometry and stability constant of inorganic (e.g.ferric- salicyclic acid) organic (e.g. amine and iodine) complexes. • Characterisation of complexes by electronic and IR spectral data. • To obtain solubility curve for a ternary system of liquids, water-acetic acid, acid-chloroform system. • To estimate oxalic acid by carrying out suitable conductometric titration in the following solutions. i. A solution of pure Oxalic acid.	Laboratory Techniques and Use of Various Instruments	Demonstration using different Apparatus and instruments like pH meter, conductivity meter			

	ii. A solution of Oxalic acid and HCl. iii. A solution of Oxalic acid and CH_3COOH					

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PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER