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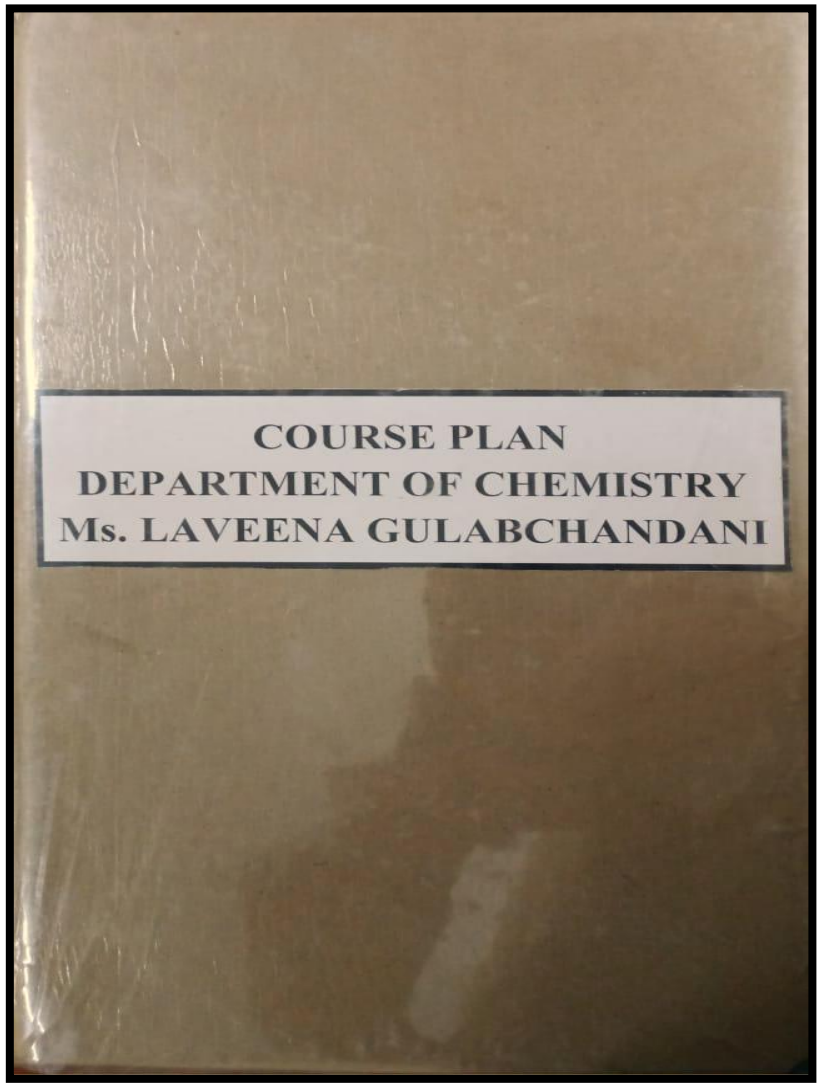
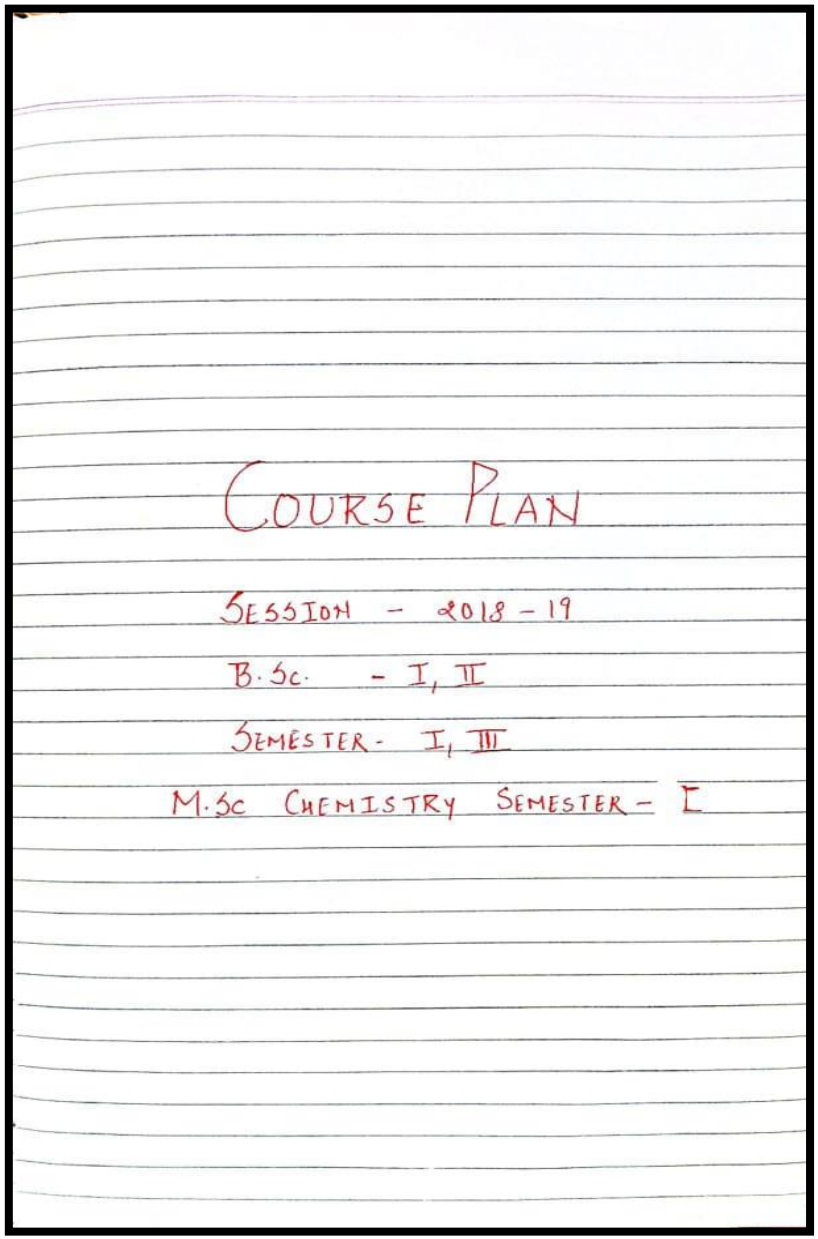


COURSE_PLAN_2018-19_MS_LAVEENA_GULABCHANDANI


COURSE PLAN
SESSION - 2018 - 19
B.Sc. - I, II
SEMESTER - I, III
M.Sc CHEMISTRY SEMESTER - I

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

INORGANIC CHEMISTRY (PAPER I) (CHE-101)

Max. Marks: 75 (50 Ext; 25 Int) Min. Marks: 30(20 Ext; 10 Int) Credit: 03

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JULY	**UNIT I** **Atomic Structure** Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of φ and φ^2, quantum numbers, shapes of s, p, d orbitals. Electronic configurations of the atoms	Principles related to atomic structure	PPT, Chart, Visual 3- D Models	Interpret atomic structure and nature of covalent bonds.	*Knowledge Based* -Define Dipole Moment. -Illustrate hybridization in ammonia molecule. *Understanding Based* -Compare VB and MO approach of bonding. -Classify different compounds of p-block elements *Higher Order Thinking Skills Based* -Explain function of s- block elements in	Knowledge--60 Understanding-30 Higher Order-10
	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, multicentre bonding, dipole	Nature of Bonding according to VBT and MOT	Match the following, Visual 3- D Models			

	moment				biosystems. -Explain electronegativity and its periodic variation.	
AUGUST	**UNIT II** **Periodic Properties** Atomic and ionic radii, ionization enthalpy, electron gain enthalpy and electronegativity	Periodic trends of various properties	Diagrams, Quiz,	Compare various periodic properties and discuss ionic solids.		
	Ionic Solids Ionic structures, radius ratio and coordination number, 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. Metallic bond- free electron, valence bond and band theories	Ionic structure of solids	Diagrams, Models, PPT			
SEPTEMBER-OCTOBER	**UNIT III** **s-Block Elements** Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems.	Properties and functions of s- block elements	PPT, Chart, Diagrams.	Summarize properties of s- and p- block		
	p-Block Elements Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides and halides of	Comparative study of p-block elements and compounds	PPT, Quiz, Diagrams.			

	groups 13-16, hydrides of boron- diborane and higher boranes, borazine, borohydrides.					

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ORGANIC CHEMISTRY (PAPER II) (CHE-302)

SEM III Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JULY	**Unit – III** **Phenols** 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-Hooesch reaction, Lederer-Manasse reaction and Reimeer-Tiemann reaction. **Ethers and Epoxides** Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions-cleavage and autoxidation, Ziesel's method. Synthesis of epoxides.	Structure and reactivity of Phenols and ethers	PPT, Demonstration, Flipped Classroom, Group discussion	Illustrate the preparation and Chemical Reactions of Phenols, ethers and Epoxides	*Knowledge Based* -What is finger print region in IR spectroscopy? -Discuss the effect of conjugation in UV spectrum *Understanding Based* -Compare the chemical behaviour of monohydric alcohols and dihydric alcohols. - Compare the acidic strength of phenol and cresol. *Higher Order*	Knowledge--50 Understanding-35 Higher Order-15

	Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides				*Thinking Skills Based* -Discuss the orientation of ring opening of ethers. -How we can differentiate between the pair of CH_3CH_2CHO and CH_3COCH_3 with the help of IR spectral data ?	
AUGUST	**Unit – I** **Spectroscopy Electromagnetic Spectrum: Absorption Spectra** 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 λ max of conjugated dienes and α, β – unsaturated carbonyl compounds. **Infrared (IR) absorption spectroscopy**-molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic	Interpretation of UV and IR spectra and their role in structural elucidation.	PPT, Demonstration, Flipped Classroom	Assess the molecular structure using UV and IR Spectroscopy		

	absorption of various functional groups and interpretation of IR spectra of simple organic compounds.					
SEPTEMBER-OCTOBER	**Unit – II** **Alcohols** Classification and nomenclature. Monohydric alcohols-nomenclature, methods of formation , Chemical reactions of alcohols. Dihydric alcohols and trihydric alcohols-nomenclature, methods of formation, chemical reactions of vicinal glycols and pinacol-pinacolone rearrangement. Trihydric alcohols- nomenclature and methods of formation, chemical reactions of glycerol	Structure and reactivity Of monohydric , dihydric and trihydric alcohols.	PPT, Demonstration, Group discussion	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 I JULY	**Inorganic Chemistry** • Calibration of fractional weights, pipettes and burettes. -Preparation of standard solutions. • Dilution 0.1 M to 0.001 M solutions.	Preparation of solutions	Exercises with Use of different Apparatus and glasswares	Understand the practical applications of various aspects of chemistry	*Knowledge Based* Practical File Work *Understanding Based* -To determine acetic acid in commercial vinegar using NaOH. -To determine alkali content in antacid tablet. *Higher Order Thinking Skills Based* Viva Voce	Knowledge--30 Understanding-50 Higher Order-20
AUGUST	**Volumetric Analysis** • Determination of acetic acid in commercial vinegar using NaOH. • Determination of alkali content-antacid tablet using HCl. • Estimation of calcium content in chalk as calcium	Volumetric Analysis	Demonstration of the exercise			

	oxalate by potassium permanganate. • Estimation of hardness of water by EDTA. • Estimation of ferrous and ferric dichromate method. • Estimation of copper using thiosulphate					
SEPTEMBER-OCTOBER	**Gravimetric Analysis.** • Analysis of Cu as CuSCN • Ni as Ni-dimethylglyoxime.	Gravimetric Analysis.	Exercises with Use of different Apparatus like oven, decicator, suction pump and crucible.			

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

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 Schrodinger equation, harmonic oscillator, the rigid rotor, the hydrogen atom. Applications of variation method and perturbation theory to the Helium atom.	Quantum Chemistry	Demonstration, PPT	-Predict aspects of Quantum Chemistry	*Knowledge Based* -What do you mean by Ionic Strength? Give suitable Example. - Define Activity. *Understanding Based* -Discuss generalized method for	Knowledge--25 Understanding-45 Higher Order-30
	Huckel theory of conjugated systems, bond order and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical, cyclobutadiene etc.	Molecular Orbital Theory				
AUGUST	Concept and determination of fugacity Non-ideal	Thermodynamics	PPT , Diagrams	Summarize		

	systems, Excess functions, Activity, Activity coefficient and their determinations, Debye Huckel theory; ionic strength. Application of phase rule to three component system – acetic acid + chloroform + water.			various concepts of thermodynamics and phase rule.	determination of Fugacity? - State Phase rule. *Higher Order Thinking Skills Based*	
SEPTEMBER-OCTOBER	**UNIT III** Collision theory of reaction rates, activated complex theory, ionic reactions, kinetic salt effects, kinetic and thermodynamic control of reactions, methods of determining mechanism, isotope effects. Dynamic chain , photochemical reactions, acid base catalysis, kinetics of enzyme reactions, fast reactions, , dynamics of unimolecular reactions (Lindemann Theory, Hinshelwood Modifications).	Kinetics of various chemical reactions	Diagrams ,Charts	Assess the kinetics of various chemical reactions.	- Explain Lindemann theory of unimolecular reactions. - Elaborate the kinetics of photochemical hydrogen-bromine reaction.	

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M.Sc. CHEMISTRY (PREVIOUS) SEMESTER-I

PRACTICALS (CHEM-105)

SEPTEMBER-OCTOBER	PHYSICAL • Determination of solubility and solubility product of sparingly soluble salts (e.g. PbSO4, BaSO4) conductomerically. • Determination of the strength of strong and weak acids in a given mixture conductometrically. • To construct the phase diagram for three component system(e.g., chloroform-acetic acid-water). • Determination of the dissociation constant of	Instrumentation	Exercises with Use of different Apparatus, instruments like pH meter, conductivitymeter			
	acetic acid in DMSO,DMF acetone and dioxane by titrating it with KOH. • Determination of the dissociation constant of monobasic/dibasic acid					

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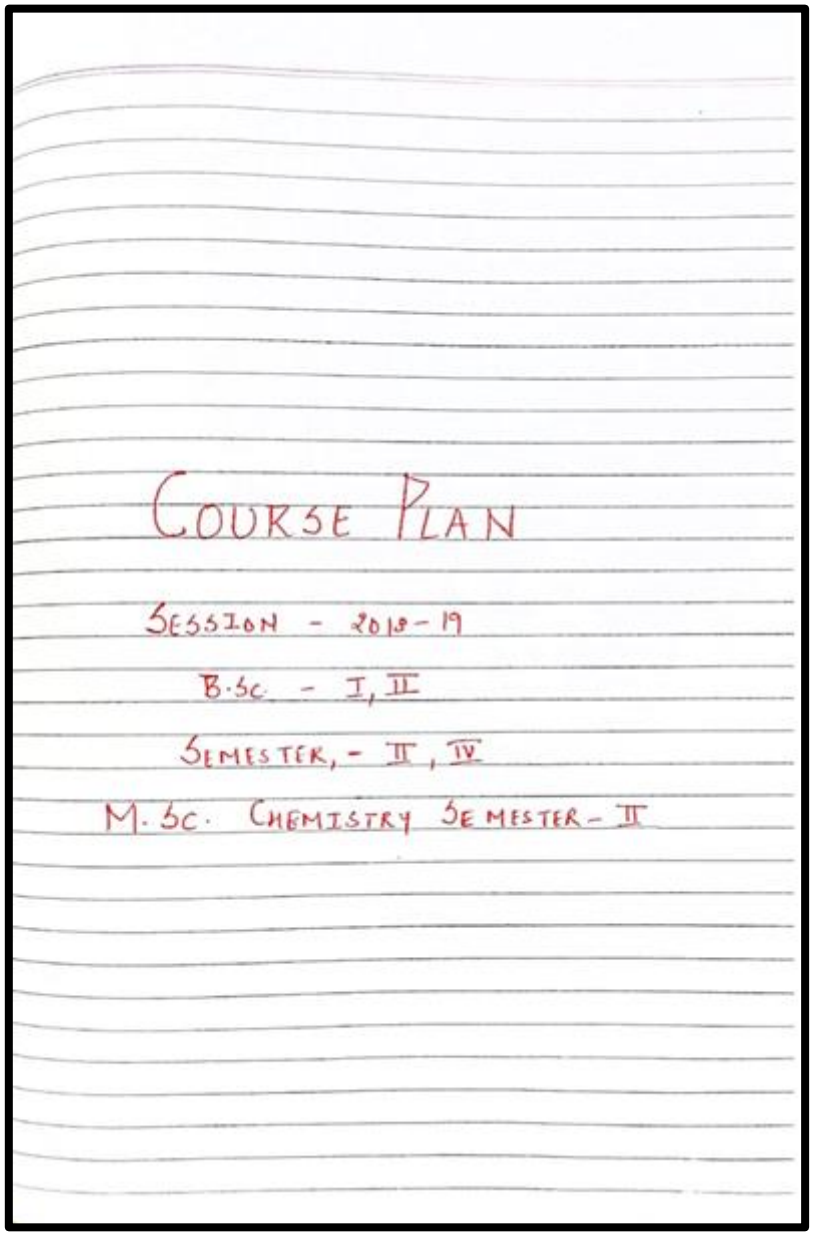
COURSE PLAN
SESSION - 2018-19
B.Sc - I, II
SEMESTER, - II, IV
M.Sc. CHEMISTRY SEMESTER - II

B.Sc. I (SEMESTER I)

ORGANIC CHEMISTRY (PAPER II) (CHE-202)

SEM II Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
DECEMBER-JANUARY	**Unit – I** Concept of isomerism. Types of isomerism. elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration. Geometric isomerism-determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism-ethane ,n-butane, cyclohexane, Qualitative treatment of stability of chair and boat conformations of cyclohexane. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.	Stereochemistry of Organic Compounds	PPT, Diagrams Visual 3- D Models	Identify the stereochemistry of organic compounds. Compare the reactivity of alkyls and aryl halides.	*Knowledge Based* - Define Geometric Isomerism. - What is retention of configuration. *Understanding Based* - Give the ortho-pra directing effect of Chlorine on Benzene. -Compare the stability of Chair and boat conformations of cyclohexane. *Higher Order Thinking Skills Based* - Discuss the relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.	Knowledge--60 Understanding-30 Higher Order-10

FEBRUARY	**Unit – II** **Arenes and aromaticity** Structure of benzene: molecular formula and Kekule structure. Stability of benzene, resonance structure, MO picture. Aromaticity: Huckle rule, aromatic ions. Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Side chain reactions of benzene derivatives. Birch reduction. Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl.	Structure , stability and reactivity of Benzene and its derivatives	Quiz, Flipped Classroom		- Explain Birch reduction.	
	Aromatic electrophilic substitution- general pattern of the mechanism, role of sigma and pi- Complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams, activating and deactivating substituents, orientation and ortho/para ratio.	Electrophilic substitution reaction of Aromatic Compounds	Demonstration, Diagrams			

	MARCH-APRIL	**Unit – III** **Alkyl and Aryl Halides** Nomenclature and classification of alkyl halides, Methods of preparation, chemical reaction. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN^2 and SN^1 reactions with energy profile diagrams. Polyhalogen compounds: chloroform, carbon tetrachloride. 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.	Group Discussions, Flow Chart	Compare the reactivity of alkyls and aryl halides.	

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B.Sc. II (SEMESTER IV)

PHYSICAL CHEMISTRY (PAPER I) (CHE-401)

Max. Marks : 75 (50Ext; 25 Int) Min. Marks: 30(20 Ext; 10 Int) Credit: 03

COURSE PLAN

SEM IV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV DECEMBER-JANUARY	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 of thermodynamics	PPT, Flow Charts, Quiz	To Compare and apply various concepts of Thermodynamics and electrochemistry	*Knowledge Based* - What is Arrhenius theory? - Define corrosion. *Understanding Based* - Derive Joule Thomson Coefficient. -Give the relationship between Cp and Cv. *Higher Order Thinking Skills Based* - Discuss	Knowledge--50 Understanding-35 Higher Order-15
	Thermochemistry standard state, standard enthalpy of formation-Hess's Law, Heat of reaction at constant pressure and at constant volume, Enthalpy of neutralization, Kirchhoff's equation.	Basic concepts of thermochemistry	PPT, Quiz Demonstration, Flipped Classroom.			
	Thermodynamics-II Second law of thermodynamics, Carnot cycle, Carnot theorem, Concept of entropy: entropy as a	Basic concepts of second and third laws of thermodynamics	Group Discussions, Flipped Classrooms			

	state function, Entropy change in ideal gases and mixing of gases. **Third law of thermodynamics:** Nernst heat theorem, Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, Variation of G with A with P, V and T.				Debye-Huckel-Onsager's equation for strong electrolytes. -Discuss transport number.	
FEBRUARY	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, Ka of acids, solubility product of a sparingly soluble salt, ionic product of water, hydrolysis constant of a salt,	Understanding of various types of conductances and laws	PPT, Models, Group Discussions	To summarize various types of conductances and laws of electrochemistry and their applications.		

	conductometric titrations.					
MARCH -APRIL	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. Computation of cell EMF. Calculation of thermodynamic quantities of cell reactions, polarization, over potential and hydrogen over voltage. Concentration cell with and without transport, liquid junction potential, application of concentration cells, pH determination using hydrogen electrode and quinhydrone electrode, glass electrode. Potentiometric titrations -	Understanding of various types of electrodes and electrolytic and galvanic cells and their applications and concept of corrosion	PPT, Flow Charts, Models, Group Discussions	Illustrate of various types of cells and application of concentration cells.		

	qualitative treatment (acid-base and oxidation-reduction only). Corrosion- Types, theories & methods of combating it					

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B.Sc. II (SEMESTER IV)

PRACTICALS (CHE-403)

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 DECEMBER-JANUARY	Organic Chemistry (A) Chromatography (i) Separation , Rf 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 exercise	Understand the practical applications of various aspects of chemistry	*Knowledge Based* Practical File Work *Understanding Based* -To identify the given organic compound. - To determine the transition temperature of the given substance by thermometric method ($MnCl_2.4H_2O$) *Higher Order*	Knowledge--30 Understanding-50 Higher Order-20

FEBRUARY	**(B) Qualitative Analysis** 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 exercise		*Thinking Skills Based* Viva Voce	
MARCH-APRIL	**Physical Chemistry (Any Four)** 1. Determination of the transition temperature of the given substance by thermometric method (e.g.$MnCl_2.4H_2O/SrBr_2.2H_2O$) 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)	Determination of the transition temperature, enthalpy of neutralization	Exercises with Use of different Apparatus and Demonstration of the exercise			

	system by cooling curve method. 4. To determine the solubility of benzoic acid at different temperatures and to determine DH of the dissolution process. 5. To determine the enthalpy of neutralization of a weak acid/weak 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, AJMER (*AUTONOMOUS*)
M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER II (M.Sc PREV)
PHYSICAL CHEMISTRY- II (CHEM-203)

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 **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 of Electrochemistry, Overpotential and Corrosion	Demonstration, PPT	Explain the electrochemistry.	*Knowledge Based* - Define Polarography. - What are micelles? *Understanding Based* - Discuss Tafel theory of Overpotential. -Describe the	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.				effect of nature of surfactant on Critical micelle concentration. *Higher Order Thinking Skills Based* - Elaborate the low and high Overpotential cases of Butler-Volmer Equation. - Explain the mechanism of Polymerisation.	
FEBRUARY	**Unit II** **Surface Chemistry** **1. 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 and Micelles	PPT , Diagrams	Summarize the concepts of adsorption and micelles.		

	2. 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, micro emulsion, reversemicelles.					
MARCH-APRIL	**Unit III** **Macromolecules:** Polymer- definition, types of polymers, electrically conducting , fire resitant, liquid crystal polymers, kinetics of polymerisation , mechanism of polymerisation. Molecular mass ,number and mass average molecular mass,	Mechanism of polymerisation and chain configuration of macromolecules	Diagrams, Charts	Assess the chemistry of macromolecules.		

	molecular mass determination (osmometry, viscometry, diffusion) , sedimentation, chain configuration of macro molecules, calculation of average dimensions of various chain structures.					

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M.Sc. CHEMISTRY (PREVIOUS) SEMESTER-II

GROUP THEORY AND SPECTROSCOPY (CHEM-204)

MARCH-APRIL	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 transition metal complexes(having one unpaired electron) including biological systems.	Concept of electron spin resonance spectroscopy	3-D Models, Match the following	Assess the electron spin resonance spectroscopy.		

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M.Sc. CHEMISTRY (PREVIOUS) SEMESTER - II

PRACTICALS (CHEM-205)

MARCH-APRIL	PHYSICAL CHEMISTRY (Students are required to perform at least five experiments from the following experiments.) (i) Determination of strengths of halides in a mixture potentiometrically. (ii) Determination of the strengths of strong and weak acids in a given mixture using a potentiometer/pH meter. (iii) Determination of partition coefficient of I_2 between water and CCl_4. (iv) Determination of equivalent conductance of a strong electrolyte such as KCl,AgNO3 etc. at several concentrations and hence verify the Onsagar's Equation. (v) To construct the phase diagram for three component system(e.g., chloroform-acetic acid-water).	Instrumentation	Exercises with Use of different Apparatus, instruments like pH meter, conductivity meter			

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