COURSE PLAN

U.G. and P.G. Programs

2022-23

ODD SEMESTER

SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER

B. Sc. II (SEMESTER III)

ORGANIC CHEMISTRY (CHE-302)

Max. Marks: 75 (50 Ext; 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 I AUG	**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	Interpretation of UV and IR spectra and their role in structural elucidation.	PPT, Demonstration, Group discussion, Questionnaire sessions, Animations	Assess the molecular structure using UV and IR Spectroscopy	*Knowledge Based* -What is finger print region in IR spectroscopy? -Compare the acidic strength of different Alcohols. -What are the types of alcohols and their preparation. - Basic difference between	Knowledge--50 Understanding-35 Higher Order-15

	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 absorption of various functional groups and interpretation of IR spectra of simple organic compounds.				phenol,ethers and Epoxide? *Understanding Based* -Applications of UV IR spectroscopy. -Compare the chemical behaviour of monohydric alcohols and dihydric alcohols - Compare the acidic strength of phenol and cresol. *Higher Order Thinking Skills Based* -How we can differentiate between the pair of CH_3CH_2CHO and CH_3COCH_3 with the help of IR spectral data ?	
SEPT	**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	Structure and reactivity Of monohydric , dihydric and trihydric alcohols.	PPT, Flow Chart, Group discussion Questionnaire session.	Summarize the reactivity of primary, Secondary and tertiary alcohols		

	formation, chemical reactions of glycerol				-Determine IR spectra of alcohols.	
OCT-NOV	**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.	Structure and reactivity of Phenols and ethers	PPT, Questionnaire session, quiz	Illustrate the preparation and Chemical Reactions of Phenols, ethers and Epoxides		

	Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides					

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

PHYSICAL CHEMISTRY- I (CHEM-103)

MAX MARKS: 100(70EXT; 30 INT) **MIN. MARKS: 40(28 EXT;12 INT)** **CREDITS:06**

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I	**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, Discussions, Animations	Predict aspects of Quantum Chemistry	*Knowledge Based* -Define Activity - State Phase rule. *Understanding Based* -Discuss graphical method for determination of Fugacity.	Knowledge--25 Understanding-45 Higher Order-30
	UNIT-II Concept and determination of fugacity Non-ideal systems, Excess functions, Activity, Activity coefficient and their determinations, Debye Huckel theory; ionic	Thermodynamics	PPT , Diagrams, Questionnaire session	Summarize various concepts of thermodynamics and phase rule.		

	strength. Application of phase rule to three component system – acetic acid + chloroform + water.				-Determine activity coefficient. *Higher Order Thinking Skills Based* - Explain perturbation theory giving example of He atom	

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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)** **CREDITS:06**

COURSE PLAN

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III	**Unit-III** UV-Visible, IR, ^{1}H- NMR, ^{13}C-NMR, MASS-interpretation of common organic compounds	Applications of spectroscopy	. PPT, Flow charts, Discussions, Flip classroom	Determine the structure of different organic compounds with the help of spectroscopic data.	*Knowledge Based* - What is shielding and deshielding effect. *Understanding Based* - Aniline absorbs at 280 nm, however in acidic medium the main absorption band is seen at 253 nm, why?	Knowledge--25 Understanding-45 Higher Order-30

					Higher Order Thinking Skills Based -Acetylene protons are more shielded than ethylenic protons. Explain. -Explain Woodward Fieser's rules for conjugated dienes	

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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)** **CREDITS:06**

COURSE PLAN

SEM/ Month	UNIT/TOPIC		Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III	**Unit-II** Interaction of electromagnetic radiation with matter, type of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometry.	Photochemical Reactions	Quiz, PPT, Flow charts , Questionnaire session.	Elaborate the photochemistry of various organic compounds.	*Knowledge Based*. -What is actinometry? *Understanding Based* - Discuss mechanism of 1,2-alkyl shift in photochemical isomerisation of aromatic compounds. *Higher Order Thinking Skills Based*	Knowledge-25 Understanding-45 Higher Order-30
	Classification, rate constants and life time of reactive energy state- determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Type	Determination of Reaction Mechanism	Flow charts, PPT, Discussions			

	of photochemical reactions.					
	Intermolecular reactions of the olefinic bond-geometrical isomerism cyclisation reaction, rearrangement of 1,4-and 1,5-dienes.	Photochemistry of Alkenes			- Explain Norrish Type –I photochemical reactions of carbonyl compounds. - Discuss the following reactions with mechanism and suitable examples- (i) Photo-Fries rearrangement (ii) Barton reaction	
	Unit-III Intermolecular reactions of the carbonyl compounds, Intermolecular cycloaddition reaction.	Photochemistry of Carbonyl Compounds	Quiz ,ppt Discussions	Analyze photochemical reactions.		
	Isomerisations, additions and substitutions.	Photochemistry of Aromatic Compounds	Diagrams, Flow charts			
	Photo-Fries reactions of anilides. Photo-Fries rearrangement. Barton reaction. Singlet molecular oxygen reactions. Photochemical formation of smog. Photo Degradation of polymers.	Miscellaneous Photochemical Reactions	Quiz, Flow charts, ppt			

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SOPHIA GIRLS' COLLEGE, AJMER (*AUTONOMOUS*)
M.SC CHEMISTRY (Final)
Practical (CHEM-305)

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III	**INORGANIC PREPARATIONS** • Prepare sodium amide • Prepare calcium oxalate • Prepare magnesium oxalate • Prepare sodium tetrathionate $Na_2S_4O_6$ • Prepare vanadyl acetylacetonate Vo $(acac)_2$ • Prepare Fe $(acac)_2$ • Prepare Cr$(acac)_2$ • Prepare Cu $(acac)_2 H_2O$ • Prepare Al$(acac)_3$ • Prepare tris (acetyl acetanato) manganese(II)	Methods of Synthesis of various inorganic compounds	Instruments like pH meter, Glassware, Diagrams	Understand the practical applications of various aspects of chemistry	*Knowledge Based* -- Practical File Work *Understanding Based* -Draw and explain structure of tris (acetyl acetanato) manganese (II) -To study the heat of neutralisation of HCl and CH_3COOH and determine their relative strength. - To prepare $Cu(acac)_2$ *Higher Order*	Knowledge--20 Understanding-40 Higher Order-40

	A. PHYSICAL • 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 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 KMnO4	Use of various instruments like colorimeter, pH meter.			*Thinking Skills Based* -Viva- Voce	

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COURSE PLAN

U.G. & P.G. Programs

EVEN SEMESTER

2022-23

SOPHIA GIRLS' COLLEGE(AUTONOMOUS), AJMER
B. Sc. II (SEMESTER IV)
ORGANIC CHEMISTRY (PAPER II) (CHE-402)

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	**Unit – I** **Aldehydes and Ketones** Nomenclature and structure of carbonyl group. Synthesis of aldehydes and ketones from acid chlorides , 1,3-dithianes and carboxylic acid. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Use of acetals	Structure and reactivity of Aldehydes and ketones	PPT, Demonstration, Quiz,Group discussion	Illustrate the preparation and Chemical Reactions of Aldehydes and ketones	*Knowledge Based* -What do you mean by Benzoin condensation?. -What is Blanc rule? -What is Ortho effect? *Understanding Based* -How will you prepare alkenes from carbonyl compounds using phosphorus ylide?	Knowledge--50 Understanding-35 Higher Order-15

	as protecting group, Oxidation of aldehydes and ketones, Baeyer-villiger oxidation of ketones, Cannizzaro reaction, reductions of aldehydes and ketones, Halogenation of enolizable ketones				-Write about the Sandmeyer reaction -Write a short note- (i) Biurette test (ii) Wholar synthesis	
	Unit – II **Organic Compounds of Nitrogen** Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes, Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid. Halonitroarenes: reactivity, Structure and nomenclature of amines, physical properties, Stereochemistry of amines, Amines salts as phase-transfer catalysts. Preparation of alkyl and aryl amines, Gabriel-phthalimide reaction, Hoffmann bromamide reaction. Reaction of amines, electrophilic aromatic	Synthesis and reactivity of various N containing compounds	PPT, Discussions Flow charts, Questionaire session	Summarize the reactivity of nitroalkanes, Amines, and diazonium salts.	*Higher Order Thinking Skills Based* -Explain benzene diozonuumchloride with mechanism. -Discuss the Hundsdiecker reaction of carboxylic acids. -Discuss the acidity order of Formic Acid, Acetic Acid and Benezoic Acid. -Discuss the Hinsberg method of separation of 1^0, 2^0 *and* 3^0 *Amines.*	

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

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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	UNIT I **Addition to Carbon-Hetero Multiple Bonds** Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acids and esters Addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Wittig reaction. Mechanism of condensation reaction involving enolates-Aldol, Knoevenagel. Claisen, Mannich, Benzoin, Perkin and Stobbe reactions. Hydrolysis of esters and amides.	Addition reactions and Condensation reaction mechanisms	E-content, Flipped Classroom, ppt, Assignments	Explain the mechanism of various types of condensation and elimination reactions.	*Knowledge Based* - Define sigmatropic rearramgement - Explain Mannich reaction. *Understanding Based* -Discuss aza – cope rearrangement: - Illustrate mechanism of Benzoin Condensation. - Explain thermal induced reaction for [4+2] cycloaddtion reactions.	Knowledge-25 Understanding-45 Higher Order-30

	Elimination reactions The E2, E1 and E1CB mechanism and their spectrum, Orientation of the double bond, reactivity effect of substrate structure, attacking base, leaving group and the medium, Mechanism and orientation in Pyrolytic elimination.	Mechanism of different types of Elimination reactions	Assignments, Group Discussion, Flipped Classroom, Flowcharts		*Higher Order Thinking Skills Based* - Discuss the mechanism of aldol and cross aldol condensation with mechanism. -Explain pyrolytic syn-elimination with special reference to esters. -With the help of correlation diagram and FMO method, show that Diel's Alder reaction is a thermally allowed process. -Depict Claisen rearrangement as examples of sigmatropic shift	
	UNIT II **Stereochemistry** 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 stereroselective 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, ppt	Analyse the stereochemistry of organic compounds.		

	Unit – III **Pericyclic Reactions** Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene,1,3,5-hexatriene and allyl system. Classification of pericyclic reaction. Woodward-Hoffmann correlation diagrams. FMO and PMO approach Electrocyclic reactions- conrotatory and disrotatory motions, 4n, 4n+2 and allyl systems. Cycloadditions-antarafacial and suprafacial additions, 4n, 4n+2 systems, 2+2 addition of ketenes, 1,3 dipolar cycloaddition and cheleotropic reactions. Sigmatropic rearrangements-suprafacial and antarafacial shifts of H, sigmatropic shifts involving carbon moieties, 3,3-and 5,5-sigmatropic rearrangements. Claisen, Cope and aza-Cope rearrangements, Ene reaction.	Concepts of Cycloaddition reactions and Sigmatropic rearrangements	E-content, Group Discussion,ppt, assignments	Review the various aspects of pericyclic reactions		Knowledge-25 Understanding-45 Higher Order-30

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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	**Organic Chemistry** **(a) Organic synthesis (any five)** (i)Acetylation: Acetylation of cholesterol and separation of cholesteryl acetate by column chromatography. (ii) Oxidation: Adipic acid by chromic acid oxidation of cyclohexanol. (iii) Aldol condensation: Dibenzal acetone from benzaldehyde. (iv) Sandmeyer reaction: p-chlorotoluene from p-toluidine. (v) Cannizzaro reaction: 4-chlorobenzaldehyde as substrate. (vi) Friedel Crafts Reaction: β-Benzoylpropionic acid from succinic anhydride and benzene. (vii) Aromatic electrophilic substitutions: Synthesis of p-	Organic synthesis and Quantitative Analysis	Demonstration of the organic synthesis reaction	Understand the practical applications of various aspects of chemistry	*Knowledge Based* - Practical File Work *Understanding Based* - To synthesize p-chlorotoluene from p-toluidine. -To analyse the concept of DO, BOD and COD. *Higher Order Thinking Skills Based* - 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 (FINAL)
GROUP-A INORGANIC CHEMISTRY
SEMESTER IV

SUPRAMOLECUALR AND BIOINORGANIC CHEMISTRY - CHEM-402(A)

MAX MARKS: 100 (70EXT; 30 INT) **MIN. MARKS: 40 (28 EXT;12 INT)** **CREDITS:06**

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV	**Unit I** 1. **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,	Supramolecular Host- Guest Chemistry	Diagrams, Flow Charts, Group Discussions,ppt	Analyse different aspects of supra molecular chemistry.	*Knowledge Based* - Define photosensitive molecular receptors. -Define nitrification. - What are porphines? -What are non heme proteins? *Understanding Based*	Knowledge--25 Understanding-45 Higher Order-30

	vander wall forces and Crystal Close packing, Closed shell Interactions.				- Discuss molecular and supramolecular electronic and ionc devices? - Explain the role of $mg2+$ in biological system and ATP. -Explain poisoning effect of CO and other ligands. -Write short note on Cytochrome P–450 *Higher Order Thinking Skills Based* - Elaborate photo-induced reactions in supramolecular devices. - Give structure, function and mechanism of hemoglobin and Myoglobin. - Describe metal	
	2. **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 coreceptor molecules.	Recognition of various substrates by receptors	Diagrams, Presentations, Live discussions.			
	3. **Supra molecular reactivity and catalysis**-Introduction, Catalysis by cation, anion and metalloreceptor molecules.	Catalytic aspects of Supramolecular Species.	Diagrams, Flow Charts , Effective interactions, visual aids			

	Unit-II **1. Metalloenzymes and their role in biological systems** Zinc enzymes- carboxypeptidase A and carbonic anhydrase, Iron enzyme- cytochrome P-450, catalase and peroxidase, Copper enzyme- superoxide dismutase, Molybdenum enzyme- xanthine oxidase, Vitamin B12. **2. Metals in Medicine** Metals deficiency and disease, toxic effects of metals, metals used for diagnosis and chemotherapy with particular reference to anticancer drugs based on Pt.	Metalloenzymes functioning in Body	Flow Charts , Discussions, ppt, Animations.	Discuss the role of metalloenzymes in biological processes and metals in medicine	deficiency and diseases. -Discuss $Hb - O_2$ binding curve for different partial pressure of O_2. -Discuss classification of supramolecular Host–Guest compounds.	
	Unit III **1. Nitrogen fixation:** Biological nitrogen fixation and its mechanism, nitrogenase, chemical nitrogen fixation and other nitrogenase model systems. **2. Oxygen transport and oxygen uptake proteins:** Metalloporphyrins, Role of Iron in	Summarize the structure and mechanism of oxygen transport proteins and concepts of nitrogen fixation	Discussions, ppt, Animation, Quiz	Analyse different aspects of supra molecular chemistry and supramolecular reactivity and catalysis. Discuss the role of metalloenzymes in biological		

	living systems, Structural feature of Heme group in Hb and Mb, Functions of Hb and Mb, Characteristics of oxygen binding interactions with Hb and Mb, Cooperativity, Bohr's Effect, Poisoning effect of CO and other Ligands, Genetic Defects, Non-heme proteins: hemerythrin and hemocyanin.			processes and metals in medicine.		

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SOPHIA GIRLS' COLLEGE(AUTONOMOUS), AJMER

M.Sc. CHEMISTRY (FINAL) SEMESTER -IV

PRACTICALS (CHEM-405)

SEM/ Month	UNIT/TOPIC Concepts/facts	Teaching	Pedagogy	Learning Outcomes	Questions	Marks Weightage%
	INORGANIC CHEMISTRY **a) Spectrophotometric Determination (Any Three)** 1. Manganese/Chromium/Vanadium in steel sample. 2.Nickel/molybdenum/tungsten/vanadium/uranium by extractive spectrophotometric method. 3. Fluoride/nitrite/phosphate. 4. Iron-phenanthroline complex; Job's method of continuous variations. 5. Zirconium-Alizarin Red-S Complex; Mole-ratio method. 6.	Separation of mixturesof metal ions	Demonstration ofthe Exercise	Understand the practical applications of various aspects of chemistry	*Knowledge Based* - Practical File Work *Understanding Based* -To Separate and identify of Zn and Cd by Paper Chromatography and determination of Rf values. -To Isolate of caffeine from	Knowledge--20 Understanding-40 Higher Order-40

	Copper-ethylene diamine complex; Slope-ratio method. OR **b) Flame Photometric Determinations (Any Three).** 1. Sodium and potassium when present together. 2. Lithium/Calcium/barium/strontium 3. Cadmium and magnesium in tap water. 4. Sulphate 5. Phosphate 6. Silver. OR **c) Chromatographic Separations (Any Three)** 1. Cadmium and Zinc. 2. Zinc and Magnesium 3. Nickel and Cadmium 4. Thin-layer Chromatography-separation of nickel, manganese, cobalt and zinc. Determination of Rf values. 5. Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper Chromatography and determination of Rf values. 6. Separation and identification of Pb and Cd by Paper Chromatography and				tea leaves. *Higher Order Thinking Skills* Based -Viva- Voce	

	determination of Rf					

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