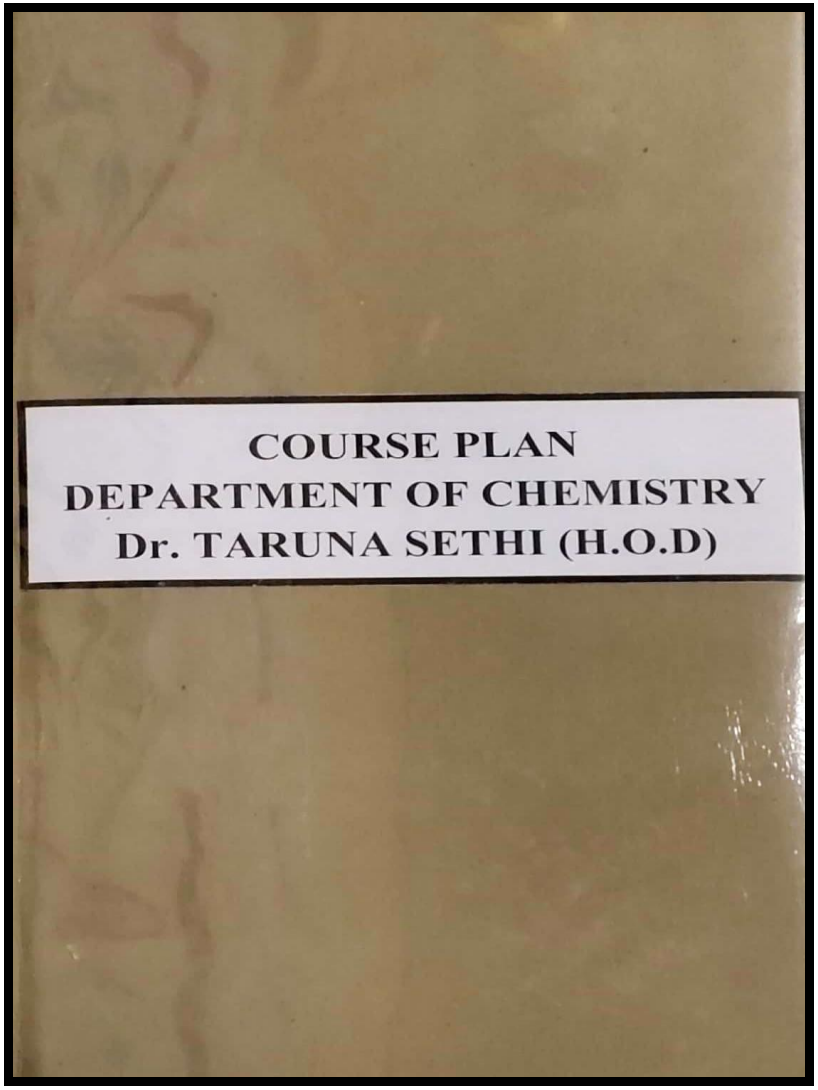
COURSE PLAN
DEPARTMENT OF CHEMISTRY
Dr. TARUNA SETHI (H.O.D)

COURSE PLAN

U.G. & P.G. Programs

2021-22

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 September October	**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 Periodic Properties.	*Knowledge Based* -Define ionic radii. -What is de-Broglie equation. *Understanding Based* - Give the significance of φ and φ^2. - Draw shapes of s, p, d orbitals. *Higher Order Thinking Skills Based* -Discuss Heisenberg uncertainty principle. -Explain electronegativity and its periodic variation.	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	Quiz, Visual 3- D Models, Demonstration, Problem Solving			

Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Tarun
Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

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

INORGANIC CHEMISTRY (CHEM-101)

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 November	**Unit - I** VSEPR, Walsh diagrams of tri atomic molecules, dπ-pπ bonds, bonds, Bent's rule, simple reactions of covalently bonded molecules	Stereochemistry and bonding in main group compounds	PPT, 3-D Models , Audio Visual Tutorials	Predict stereochemistry and bonding in main group compounds	*Knowledge Based* -What is VSEPR theory? -Define archaenoboranes *Understanding Based* -Compare the properties of boranes and carboranes. - Classify Labile and Inert Complexes. *Higher Order Thinking Skills*	Knowledge-25 Understanding-45 Higher Order-30
	Higher boranes, carboranes, metalloboranes and metallocarboranes	Metals Clusters	PPT, Diagrams			
December	**Unit - II** Energy profile of reaction, reactivity of metal complexes, inert and labile , kinetic applications of	Fundamentals of Transition Metal Complexes	PPT, Online Quiz , Problem Solving Activities	Assess the chemical behaviour of transition metal complexes.		

	valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, base hydrolysis, conjugate base mechanism				*Based* - Explain dπ-pπ bonding. - Elaborate SN^1CB mechanism.	
January February	**UNIT - III** Anation reaction, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of the substitution reaction, Redox reaction, electron transfer reactions, outer & inner sphere type reactions, cross reactions and Marcus-Hush theory.	Reaction Mechanism of Transition Metal Complexes	Assignments, 3-D Models, Online Quiz	Summarize the reaction mechanism of transition metal complexes.		

Sr. Pearl

PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Taru

Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

B.Sc. III (SEMESTER V)

INORGANIC CHEMISTRY (PAPER I) (CHE-501)

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

COURSE PLAN

SEMV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM V September October	**UNIT I** **Metal-ligand Bonding in Transition Metal Complexes** An elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields, Comparison of CFSE for octahedral and tetrahedral complexes.	Metal-ligand Bonding in Transition Metal Complexes	PPT, Flow charts, Audio – Visual Tutorials	Summarize Metal ligand bonding and various thermodynamic and kinetic aspects of transition metal complexes.	*Based* - Define Thermodynamic Stability - List any two roles of Ca in Body? *Understanding Based* - Compare paramagnetic and diamagnetic substances. - Give relationship between stepwise and overall formation	Knowledge--40 Understanding-40 Higher Order-20
	Thermodynamic and Kinetic Aspect of Metal Complexes A brief outline of thermodynamic stability of metal complexes and factors	Stability of metal complexes, Trans effect	Group discussions, Flow Chart			

	affecting the stability, Substitution reactions in square planar Trans effect, Trans effect series, theories of Trans effect, mechanism of substitution reactions, Factors affecting the rate of substitution reactions in square planar complexes.				constant. *Higher Order Thinking Skills Based* - Predict Structure and bonding in $(NPCl_2)_3$ - Explain the Pearson's HSAB Concept.	
November	**UNIT II** **Magnetic Properties of Transition Metal Complexes** Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d-metal complexes.	Magnetic Properties of Transition Metal Complexes	Flipped Classrooms, Quiz, Problem Solving	Explain magnetic properties and electronic spectra of transition metal complexes.		
	Electronic Spectra of Transition Metal Complexes Types of electronic transition, selection rules of d-d transitions, spectroscopic ground state, spectrochemical series. Orgel-energy level diagram for d^1 and d^9 states,	Electronic Spectra of Transition Metal Complexes	Diagrams, Charts			

	discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.						
December January	**UNIT III** **Basics of Bioinorganic Chemistry** Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Role of metal ions present in biological systems with special reference to Na^+, K^+, Mg^{2+} and Ca^{2+} ions: Na/K pump; Nitrogen fixation.	Role of metal ions in Biological Processes	PPT, Quiz, Assignments	Predict hard and soft acid base character of various compounds.			
	Hard and Soft Acids and Bases(HSAB) Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness, applications of HSAB concept.	Hard and soft acid base Character	Charts, Group discussions, Flipped Classroom				
	Silicones and Phosphazenes	Preparation and properties of Silicones	Quiz, Diagrams				

B.Sc. III (SEMESTER V)

PRACTICALS (CHE-503)

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 V October	**(A) Instrumentation** • Colorimetry-Job's method and Mole-ratio method • Adulteration- Food stuffs. • Effluent analysis, water analysis. • Solvent Extraction: Separation and estimation of Mg(II) and Fe(II) • Ion Exchange Method: Separation and estimation of Mg(II) and Zn(II)	Use of various instruments like colorimeter.	Demonstration by using different Apparatus and instruments	Understand the practical applications of various aspects of chemistry	*Knowledge Based* Practical File Work *Understanding Based* To detect the components of the organic mixture *Higher Order Thinking Skills Based* Viva Voce	Knowledge--30 Understanding-50 Higher Order-20

November	**Synthesis** • Sodium trioxalato ferrate (III), $Na_3[Fe(C_2O_4)_3]$ • Ni-DMG complex,$[Ni(DMG)_2]$ • Copper tetrammine complex $[Cu(NH_3)_4]SO_4$. • cis-and trans-bisoxalato diaqua chromate (III) ion.	Methods of Synthesis of various inorganic compounds	Demonstration of the exercise, Laboratory Experiments			
December January	**Organic Qualitative Analysis** Analysis of an organic mixture containing two solid components using water, $NaHCO_3$, NaOH for separation and preparation of Suitable Derivatives	Detection of organic compounds in binary mixture	Demonstration of the exercises, Flow Chart, Laboratory Experiments			

Sr. Pearl

PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Tary

Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

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

INORGANIC CHEMISTRY (CHEM-101)

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 November	**Unit - I** VSEPR, Walsh diagrams of tri atomic molecules, dπ-pπ bonds, bonds, Bent's rule, simple reactions of covalently bonded molecules	Stereochemistry and bonding in main group compounds	PPT, 3-D Models , Audio Visual Tutorials	Predict stereochemistry and bonding in main group compounds	*Knowledge Based* -What is VSEPR theory? -Define archaenoboranes *Understanding Based* -Compare the properties of boranes and carboranes. - Classify Labile and Inert Complexes. *Higher Order Thinking Skills*	Knowledge-25 Understanding-45 Higher Order-30
	Higher boranes, carboranes, metalloboranes and metallocarboranes	Metals Clusters	PPT, Diagrams			
December	**Unit - II** Energy profile of reaction, reactivity of metal complexes, inert and labile , kinetic applications of	Fundamentals of Transition Metal Complexes	PPT, Online Quiz , Problem Solving Activities	Assess the chemical behaviour of transition metal complexes.		

	valence bond and crystal field theories, kinetics of octahedral substitution, acid hydrolysis, base hydrolysis, conjugate base mechanism				*Based* - Explain dπ-pπ bonding. - Elaborate SN^1CB mechanism.	
January February	**UNIT - III** Anation reaction, reactions without metal ligand bond cleavage. Substitution reactions in square planar complexes, the trans effect, mechanism of the substitution reaction, Redox reaction, electron transfer reactions, outer & inner sphere type reactions, cross reactions and Marcus-Hush theory.	Reaction Mechanism of Transition Metal Complexes	Assignments, 3-D Models, Online Quiz	Summarize the reaction mechanism of transition metal complexes.		

Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Taru
Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

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

GREEN AND ENVIRONMENTAL CHEMISTRY (CHEM-303)

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 October November	**Unit-III** Sampling procedures and monitoring of water pollutants, determination of T.D.S. conductivity , acidity, alkalinity, hardness, chloride, FRC, sulphate, fluoride, phosphate, phenols, pesticides analysis, determination of DO, BOD, COD Water quality parameters, standards and laws. Effect on imposed lockdown due to COVID-19 on Water Quality of Rajasthan	Analysis of pollution	PPT, Models, Presentation by Students	Analyse the various aspects of pollution.	*Knowledge Based* -What is DO? *Understanding Based* -Distinguish between Chemical Oxygen Demand and Biological Oxygen Demand. *Higher Order Thinking Skills Based* - Discuss the Water quality parameters.	Knowledge-25 Understanding-45 Higher Order-30

Head
Department of Chemistry
Sophia Girls' College
(Autonomous) , Ajmer

SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER I
Practicals (CHEM-105)

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 November	**INORGANIC PREPARATIONS** • Cis –Potassium Diaquatrioxalatochromate(III) • Tris(acetylacetonato)manganese(II). • Potassium Trioxalatoferrate(III). • Purssian Blue. • Hexamminecobalt(III) • Hexanitro-N-cobaltate(III). • Hexamminenickle(II) chloride. • Bis(dimethylglyoximato)nickel (II). • Tetramminecopper(II) sulphate.	Methods of Synthesis of various inorganic compounds	Demonstration of the exercise	Understand the practical applications of various aspects of chemistry	*Knowledge Based* - Practical File Work *Understanding Based* -To prepare Tetramminecopper(II) sulphate. *Higher Order Thinking Skills Based* - Viva Voce	Knowledge--20 Understanding-40 Higher Order-40

PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

COURSE PLAN

U.G. & P.G. Programs

EVEN SEMESTER

2021-22

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

PHYSICAL CHEMISTRY (CHE-601)

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 VI February	**UNIT III** **Chemical Kinetics and Catalysis** Chemical kinetics and its scope, rate of reaction, factors influencing the rate of a reaction. Determination of the order of reaction, Radioactive decay as a first order phenomenon. Experimental methods of chemical kinetics, Theories of chemical kinetics- effect of temperature on rate	Kinetics of Enzyme catalyzed reactions	PPT, Quiz, Assignments	Assess the kinetics of various chemical reactions	*Knowledge Based* - Define Black Body Radiation. - Write Franck Condon principle. *Understanding Based* - Derive Schrodinger	Knowledge--40 Understanding-40 Higher Order-20

	of reaction, Arrhenius equation, concept of activation energy. Simple collision theory, Expression for the rate constant based on equilibrium constant and thermodynamic aspects. Complex reaction kinetics, parallel reaction, reversible reaction and conjugative reactions Catalysis, Characteristics, classification, miscellaneous examples, Kinetics of enzyme catalyzed reactions – Michaelis-Menten equation				Wave Equation. - Differentiate Stoke and Anti-stoke lines. *Higher Order Thinking Skills Based* - Describe Jablonski Diagram. - Explain kinetics of Enzyme Catalysis.	
March	**UNIT I** **Elementary Quantum Mechanics** Black-body radiation, Planck's radiation law, photoelectric effect, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect. de Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator,	Various aspects of Quantum Mechanics	Audio Visual Tutorials, Flow charts, Problem Solving Activity	Explain Quantum mechanics and Photochemistry		

	Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.					
	Photochemistry Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of Photochemistry: Grothus - Drapper law, Stark-Einstein law, Jablonski diagram Quantum efficiency and reasons for high and low quantum yields, photosensitized reactions- energy transfer processes.	Qualitative description of Photochemistry and Photosensitized reactions	Group discussions, PPT			
April-May	**UNIT II** **Spectroscopy** Spectroscopy and its importance in Chemistry, difference between atomic and molecular spectroscopy, Absorption and emission spectroscopy, electromagnetic radiation, regions of the spectrum, basic features of	Various spectroscopic techniques	Flipped classrooms, Quiz, Problem Solving Activity	Summarize the principles of various spectroscopic techniques.		

	different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.					
	Rotational Spectrum Diatomic molecules, Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity, Maxwell-Boltzmann distribution, determination of bond length, qualitative description of non-rigid rotor, isotope effect.	Qualitative description of rotational spectroscopy	Quiz, group discussions			
	Vibrational Spectrum Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups. Raman Spectrum concept of polarizability, pure rotational	Infrared and Raman spectrum	Quiz, group discussions			

	and pure vibrational Raman Spectra of diatomic molecules, selection rules.					
	Electronic Spectrum Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank-Condon principle. Qualitative description of σ, Π and n M.O., their energy levels and the respective transitions.	Concept of Electronic spectrum	Models, Diagrams			

Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Tary
Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

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

PRACTICALS (CHE-603)

Max. Marks: 50(40Ext; 10 Int) Min. Marks: 20(16 Ext; 4Int) Credit: 02

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM VI Feb	**A) Laboratory Techniques** **Column Chromatography** (i) Separation of fluorescene and methylene blue (ii) Separation of leaf pigments from spinach leaves (iii) Resolution of racemic mixture of (±) mandelic acid	Principle, phenomenon and applications of Column Chromatography	Demonstration by using different Apparatus and instruments	Understand the practical applications of various aspects of chemistry.	*Knowledge Based* Practical File Work *Understanding Based* To synthesize various organic compounds. *Higher Order Thinking Skills Based* Viva Voce	Knowledge--30 Understanding-50 Higher Order-20
March	**(B) Synthesis of organic compounds** (i) m-dinitrobenzene (ii) p-nitroacetanilide (iii) Methyl orange	Methods of Synthesis of various organic compounds	Demonstration of the exercise, Laboratory Experiments			

	(iv) Methyl red (v) p-bromoacetanilide (vi) 2,4,6- tribromophenol					
April-May	**(C) PHYSICAL CHEMISTRY** (i) To determine the strength of the given acid conductometrically using standard alkali solution. (ii) To verify Beer-Lambert law for $KMnO_4/K_2Cr_2O_7$ and determine the concentration of the given solution of the substance. (iii) To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically. (iv)To study the saponification of ethyl acetate conductometrically. (V)To determine the ionisation constant of a weak acid conductometrically.	Verification of Beer-Lambert Law	Demonstration by using different Apparatus and instruments			

Sr. Pearl

PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Tary

Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

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

COORDINATION CHEMISTRY (CHEM-201)

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	**Unit – I** **Metal-Ligand Equilibria in Solution** Stepwise and overall formation constants and their interaction, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by pH-metry and spectrophotometry.	Factors affecting the stability of metal complexes, nature of metal ion and ligand	Demostration, Diagrams, Chart.	Analyse the aspects of metal-ligand equilibria in solution and metal-ligand bonding.	*Knowledge Based* - Define thermodynamic Stability. - Write any two limitations of Crystal field theory. *Understanding Based* - Give relation	Knowledge-25 Understanding-45 Higher Order-30

	Metal Ligand Bonding Limitation of crystal field theory, molecular orbital theory- σ and π–bonding in octahedral, tetrahedral and square planar complexes.		Audio Visual Tutorials, Diagrams		between overall stability constant β and stepwise stability constant. - Write a note on Spin Crossover.	
May	**Unit - II** Spectroscopic ground state, Selection rules for electronic spectra – Laporte and Spin selection rule, relaxation in rules, luminescence, Orgel diagrams for transition metal complexes (d_1-d_9 States). Charge transfer spectra, anomalous magnetic moments, magnetic exchange coupling and spin crossover.	Electronic Spectra and Magnetic Properties of Transition Metal Complexes	PPT, Chart Online Quiz	Summarize various concepts of electronic spectra and magnetic properties of transition metal complexes.	*Higher Order Thinking Skills Based* - Draw the Orgel energy level diagram for d^2 electronic configuration in octahedral complexes.	
June-July	**UNIT - III** **Metal π-Complexes:** Metal carbonyls, structure and bonding. Vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls; preparation, bonding structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes; tertiary phosphine as ligand.	Structure and Bonding of Metal π-Complexes	3-D Models, MCQ	Summarize various metal π-complexes.	-Discuss important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes.	

Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Tary
Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer

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

GROUP-A INORGANIC CHEMISTRY
ORGANOMETALLIC CHEMISTRY- CHEM-401(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 February	**Unit-I** **An Introduction to Organometallic Compounds** Introduction, Classification and Nomenclature of Organometallic Compounds, Bonding: Stable electron Configuration, Electron Count	Introduction to Organometallic Compounds	Diagrams, PPT, Charts, Problem Solving Activity	Summarize the basic concepts of organo transition metal complexes.	*Knowledge Based* - What are sandwich compounds? - Define turn over frequency. *Understanding*	Knowledge--25 Understanding-45 Higher Order-30

	Preference, Electron Counting and Oxidation states, Reaction of Organometallic Compounds- Ligand Subsituition, Oxidative addition and Reductive elimination, σ bond metathesis, 1, 1- Migratory insertion, 1, 2- insertions and β hydride elimination and Cyclometallations. Concept of Isolability and Isolobal analogies.				*Based* - Describe σ bond metathesis with one example. - Discuss the energetics of catalytic cycle. *Higher Order Thinking Skills Based* - Elaborate Reductive elimination with one example. - Elaborate Wacker's process of synthesis of acetaldehyde.	
March	**Unit-III** **Catalysis** Catalytic Cycle, Homogenous Catalysis, Application of Organometallic Compounds as homogenous Catalysts- Hydrogenation of Alkene, Hydroformylation, Wacker process, Alkene Metathesis, Pd catalysed C-C Bond forming reactions, Methanol Carbonylation- ethanoic acid synthesis. Heterogenous Catalysis- the nature of Heterogenous catalysts, Hydrogenation catalysts, Ammonia synthesis, Sulphur dioxide oxidation, Fischer- Tropsch	Catalytic aspects of Organometallic compounds	Diagrams, PPT, Flipped Classroom	Illustrate application of organometallic compounds in homogenous catalysis and heterogenous Catalysis		

	synthesis, Alkene Polymerization					
April-May	**Unit-II** **Organometallic compounds of Transition metals** Preparation, Properties, Nature of Bonding and Structural features of σ bonded Transition metal complexes and Complexes with unsaturated organic molecules alkenes, alkynes, allyl and diene.	Preparation , properties and reactions of organotransition metal complexes	PPT, Flow charts, Demonstration	Elaborate the chemistry of organo transition metal complexes.		

Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Tary
Head
Department of Chemistry
Sophia Girls' College
(Autonomous) , Ajmer

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

SUPRAMOLECULAR AND BIOINORGANIC CHEMISTRY (CHEM-402 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 April	Metals deficiency and disease, toxic effects of metals, metals used for diagnosis and chemotherapy with particular reference to anticancer drugs based on Pt.	Metals In Medicine	Diagrams, PPT, Charts.	Discuss the role of metals in medicine.	*Knowledge Based* - Define Porphyrin. - Draw the structure of Haemoglobin. *Understanding Based* - Discuss the Cooperativity. - Compare the structure and reactivity of hemoglobin and myoglobin. *Higher Order*	Knowledge--25 Understanding-45 Higher Order-30
	Unit-III **Nitrogen Fixation-**Biological nitrogen Fixation and its mechanism, Nitrogenase, Chemical Nitrogen Fixation and other Nitrogenase model system					
May	**Oxygen transport and oxygen uptake proteins -** Haemoglobin	Haemoglobin and Myoglobin :	PPT, Flow charts, Diagrams	Analyse haemoglobin and		

	(Hb) and Myoglobin (Mb) in oxygen transport mechanism. 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, poising effect of CO and other Ligands, Genetic defects, Non-heme proteins: Hemerythrin and Hemocyanin	Structure, functions, mechanism		myoglobin in oxygen transport mechanism.	*Thinking Skills Based* - Elaborate the Metals deficiency and disease. - Explain in detail biological nitrogen fixation.	

Sr. Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Sr Pearl
PRINCIPAL
SOPHIA GIRLS' COLLEGE
(AUTONOMOUS)
AJMER

Tary
Head
Department of Chemistry
Sophia Girls' College
(Autonomous), Ajmer