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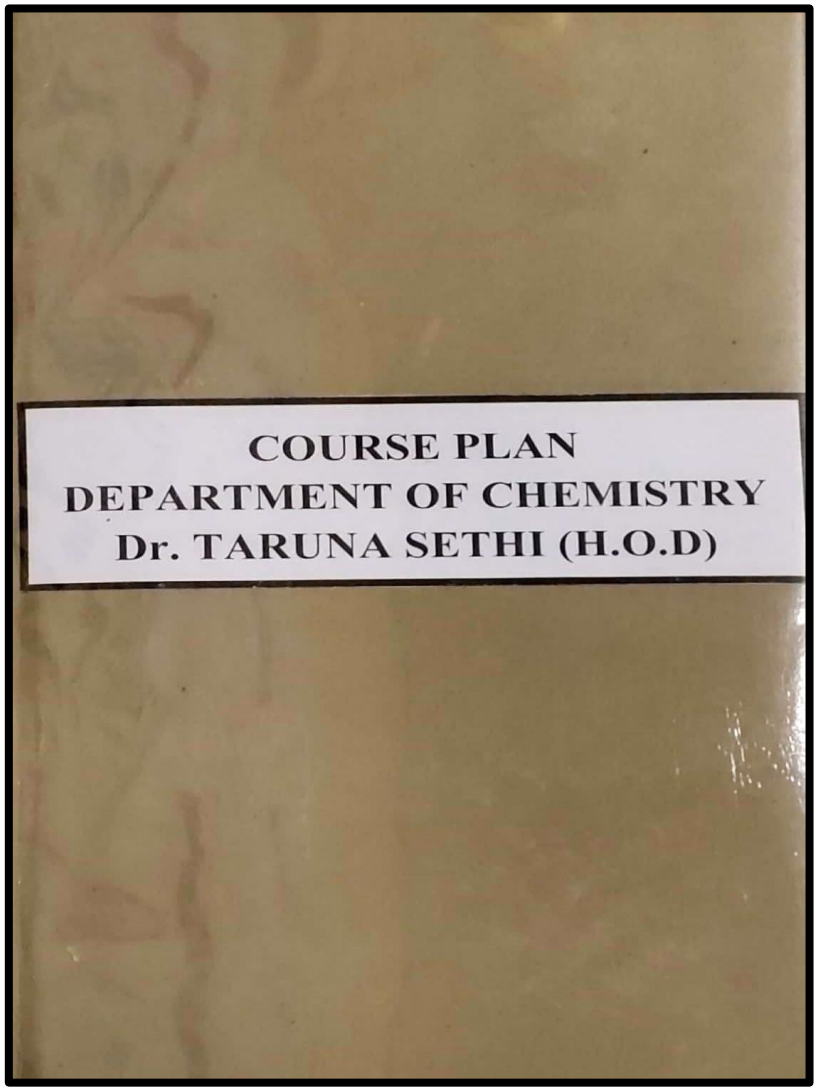

COURSE PLAN

U.G. & P.G. Programs

2020-21

ODD SEMESTER

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 JULY - AUGUST	**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 (NPCl2)3 - Explain the Pearson's HSAB Concept.	
SEP-OCT	**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.					
NOV – JAN	**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 Silicones and phosphazenes as examples of Inorganic polymers, preparation, Properties and applications of Silicones and Phossphazenes, nature of bonding in triphosphazenes	Preparation and properties of Silicones and Phosphazenes	Quiz, Diagrams			

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

ORGANIC CHEMISTRY (PAPER II) (CHE-102)

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 (%)
Aug-SEP	**Unit – I** **Structure and Bonding** Hybridization, bond characteristics, Vander Waals interactions, inclusion compounds, clatherates, charge transfer complexes, resonance, hyperconjugation, inductive and field effects, Hydrogen bonding.	Structure and electronic effects in reference to organic molecules.	PPT, Demonstration, Flipped Classroom, Audio Visual Tutorials.	Predict structure and bonding in common organic molecules and mechanism of organic reactions.	*Knowledge Based* - Define inductive effects. - Give the order of stability of primary, secondary and tertiary carbonium ion.	Knowledge--60 Understanding-30 Higher Order-10

	Mechanism of Organic Reactions Curved arrow notation, Types of reagents, Types of organic reactions. Energy considerations. Reactive intermediates, carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with example).	Reagents and Intermediate in various Organic reactions	Demonstration, Flipped Classroom, Audio Visual Tutorials.		*Understanding Based* - Arrange the following acids in the decreasing order of their stabilities explain with reason HCOOH, H_3CCOOH. -Compare the stability of cyclopropane and cyclohexane. *Higher Order Thinking Skills Based* -Discuss Mechanism of free radical halogenation of alkanes. - Discuss Bayer Strain theory.	
OCT-NOV	**Unit – II** **Alkanes** Methods of preparation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.	Structure and reactivity of alkanes	PPT, Demonstration, Flipped Classroom	Review the preparation and chemical reactions of alkanes and cycloalkanes		

	Cycloalkanes Nomenclature, methods of preparation. chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. cyclopropane ring: banana bonds.	Structure , stability and reactivity of cycloalkanes	PPT, Demonstration, Quiz			

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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 JULY- AUG	**(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

SEP-OCT	**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			
NOV-JAN	**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			

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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 NOV-DEC	**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 Based*	Knowledge-25 Understanding-45 Higher Order-30
	Higher boranes, carboranes, metalloboranes and metallocarboranes	Metals Clusters	PPT, Diagrams			
JAN	**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				- Explain dπ-pπ bonding. - Elaborate SN^1CB mechanism.	
FEB	**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.		

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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	**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

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M.SC CHEMISTRY (FINAL)
SEMESTER III

BIOINORGANIC CHEMISTRY (CHEM-304)

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 AUG-SEP	**Unit-I** Role of bulk and trace metals ions in biological processes with special reference to Ca, Mg, Mn, Fe, Co, Na and K. Na^+/K^+ Pump.	Role of metal ions in biological system	Diagrams, PPT, Charts.	Review of bioenergetics and nitrogen fixation.	*Knowledge Based* - Define Endergonic reactions. - Draw the structure of carbonic anhydrase. *Understanding Based* - Discuss the structural features of catalase enzyme.	Knowledge--25 Understanding-45 Higher Order-30
	Standard free energy change in biochemical reactions, exergonic, endergonic, Hydrolysis of ATP, synthesis of ATP from ADP.	Bioenergetics	Audio Visual Tutorials, Quiz			
	Biological nitrogen fixation and its mechanism, nitrogenase, chemical nitrogen fixation and	Biological and chemical nitrogen fixation	PPT, Flow charts			

	other nitrogenase model systems.				- Compare the structure and reactivity of hemoglobin and myoglobin. *Higher Order Thinking Skills Based* - Elaborate the structure and mechanism of oxidation of a substrate by Cytochrome P-450. - Explain in detail biological and chemical nitrogen fixation.	
OCT-NOV	**Unit-II** Zinc enzymes- carboxypeptidase A and carbonic anhydrase. Iron enzyme- oxygenases, cytochrome P-450, catalase and peroxidase. Copper enzyme- superoxide dismutase. Molybdenum enzyme- xanthine oxidase. Vitamin B_{12}.	Metalloenzymes and their role in biological systems	Quiz, Diagrams, Audio Visual Tutorials	Illustrate metalloenzymes and 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.	Metals In Medicine	Demonstration, PPT, charts			
DEC-JAN	**Unit-III** Oxygen transport and oxygen uptake proteins Metalloporphyrins, Role of Iron in 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	Haemoglobin and Myoglobin : Structure, functions, mechanism	Audio Visual Tutorials, Flow charts, Assignments	Analyse haemoglobin and myoglobin in oxygen transport mechanism.		

	Ligands, Genetic Defects, Non-heme proteins: hemerythrin and hemocyanin.					

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M.SC CHEMISTRY (FINAL)
SEMESTER III

Practicals (CHEM-305)

Max. Marks: 100 (70 Ext; 30 Int) Min. Marks: 40(28 Ext; 12 Int) Credit: 06

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III JULY-AUG	**INORGANIC PREPARATIONS** • 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) • Prepare Fe (II) chloride • Prepare ferrocene	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* -To prepare sodium tetrathionate $Na_2S_4O_6$. *Higher Order Thinking Skills Based* -Viva- Voce	Knowledge--20 Understanding-40 Higher Order-40

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COURSE PLAN

U.G. & P.G Programs

2020-21

EVEN SEMESTER

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

PHYSICAL CHEMISTRY (PAPER I) (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 March	**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	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 temperature on rate 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.	
April	**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,	Various aspects of Quantum Mechanics	Audio Visual Tutorials, Flow charts, Problem Solving Activity	Explain Quantum mechanics and Photochemistry		

	Hamiltonian operator, 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			
May-July	**UNIT II** **Spectroscopy** Spectroscopy and its importance in Chemistry, difference between atomic and molecular spectroscopy, Absorption and emission spectroscopy, electromagnetic radiation,	Various spectroscopic techniques	Flipped classrooms, Quiz, Problem Solving Activity	Summarize the principles of various spectroscopic techniques.		

	regions of the spectrum, basic features of 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	Infrared and Raman spectrum	Quiz, group discussions			

	frequencies of different functional groups. Raman Spectrum concept of polarizability, pure rotational 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			

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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 March	**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
April	**(B) Synthesis of organic compounds** (i) m-dinitrobenzene (ii) p-nitroacetanilide (iii) Methyl orange (iv) Methyl red (v) p-bromoacetanilide	Methods of Synthesis of various organic compounds	Demonstration of the exercise, Laboratory Experiments			

	(vi)2,4,6- tribromophenol					
May-July	**(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			

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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. *Higher Order Thinking Skills Based* - Draw the Orgel energy level diagram for d^2 electronic configuration in octahedral complexes. -Discuss important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes.	
May-June	**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.		
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.		

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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 March	**Unit-I** **An Introduction to Organometallic Compounds** Introduction, Classification and Nomenclature of Organometallic Compounds, Bonding: Stable electron Configuration, Electron	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 Based*	Knowledge--25 Understanding-45 Higher Order-30

	Count 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.				- 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.	
April	**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,	Catalytic aspects of Organometallic compounds	Diagrams, PPT, Flipped Classroom	Illustrate application of organometallic compounds in homogenous catalysis and heterogenous Catalysis		

	Hydrogenation catalysts, Ammonia synthesis, Sulphur dioxide oxidation, Fischer- Tropsch synthesis, Alkene Polymerization					
May - July	**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.		

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M.Sc. CHEMISTRY (FINAL)
SEMESTER IV

PRACTICALS (CHEM-405) (FOR GROUP –A,B,C)

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV March	**INORGANIC CHEMISTRY** **Chromatographic Separations (Any Three)** • Cadmium and Zinc. • Zinc and Magnesium • Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper Chromatography and determination of R_f values. • Separation and identification of Pb and Cd by Paper Chromatography and determination of R_f values.	Separation of mixtures of metal ions	Demonstration of the Exercise	Understand the practical applications of various aspects of chemistry	*Knowledge Based* -- Practical File Work *Understanding Based* -To Separate and identify Pb and Cd by Paper Chromatography and determination of R_f values. *Higher Order Thinking Skills Based* -Viva- Voce	Knowledge--20 Understanding-40 Higher Order-40

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