Department of Chemistry
Teaching Plan
Even Semester 2019

Course Outcome

Semester **: VI** **Major Core VIII**
Name of the Course **: Organic Chemistry IV**
Course code **: CC1761**

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	recognize optical activity and the types of isomerism	PSO - 1	R
CO - 2	interpret the principles of spectroscopy and photochemistry	PSO - 3	Ap
CO - 3	apply spectral rules to calculate λ_{max} values	PSO - 6	Ap
CO - 4	evaluate different spectra	PSO - 5	E
CO - 5	apply ir spectra in functional group analysis	PSO - 6	C
CO - 6	know the medicinal importance and elucidate the structure of alkaloids	PSO - 8	C
CO - 7	classify, differentiate and synthesise various dyes	PSO - 2	An

Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Section	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Stereochemistry**					
	1.	Optical activity and Chirality	2	To understand the importance of optical isomerism	Lecture, Discussion	Evaluation through short test
	2.	R-S notation, enantiomers and diastereomers	3	To differentiate enantiomers and diastereomers	Lecture, Discussion	Formative assessment
	3.	Optical activity of compounds without asymmetric carbon atoms	2	To gain knowledge about optical activity	Lecture	Formative assessment
	4.	Methods of distinguishing geometrical isomers, determination of configuration of ketoximes	3	To get idea about geometrical isomerism	Lecture	Formative assessment, Short test
	5.	Conformational analysis of ethane, n-butane and cyclohexane energy diagrams.	2	To differentiate different energy diagrams	Question answer session, Lecture	Formative assessment, Assignment
II	**Spectroscopy-I**					
	1.	General principles, introduction to absorption and emission spectroscopy	2	To know about principles of spectroscopy	Lecture with PPT Illustration	Formative assessment
	2.	Types of electronic transitions- bathochromic and	2	To know the types of electronic transitions	Lecture, Illustration	Formative assessment

		hypsochromic shifts				
	3.	Application of Woodward Rules for calculation of λ_{max} for different molecules	2	To understand clearly about the calculation of λ_{max}	Lecture, Discussion	Formative assessment, Short test
	4.	Photochemical reactions of ketones, Norrish type I and type II reactions	4	To study about photochemical reactions	Lecture, Discussion	Formative assessment, Online Quiz
III	**Spectroscopy-II**					
	1.	Molecular vibrations and origin of IR spectra - IR absorption positions of O, N and S containing functional groups	2	To know about molecular vibrations	Lecture, Illustration	Formative assessment, Assignment
	2.	Hydrogen bonding, conjugation,. IR absorptions-fingerprint region	3	To learn about fingerprint region	Lecture, Illustration	Formative assessment
	3.	Basic principles of Proton Magnetic Resonance, chemical shift and factors influencing it	4	To analyse the factors influencing chemical shift	Lecture	Formative assessment Short test
	4.	Interpretation of NMR spectra of simple compounds	3	To recognise the various spectra compounds	Lecture with PPT Illustration	Seminar, Formative assessment

IV	**Alkaloids and Terpenoids**					
	1.	Natural occurrence, structural features and isolation of alkaloids	2	To know about different alkaloids	Lecture	Formative assessment
	2.	Structural elucidation and synthesis of coniine, piperine and nicotine.	1	To understand and differentiate different alkaloids	Lecture, Discussion	Formative assessment, Short test
	3.	Significance of number of peaks and peak area. Spin-spin coupling and coupling constant.	2	To acquire knowledge about peaks and coupling constant	Lecture	Short test
	4.	Occurrence and classification of Terpenoids, isoprene rule	3	To evaluate and classify terpenoids	Lecture, Discussion	Formative assessment
	5..	Elucidation of structure and synthesis of citral, geraniol, menthol and α-terpeniol.	2	To know about the structure of various terpenoids	Lecture	Formative assessment
V	**Dyes**					
	1.	Classification based on application and chemical structure with examples.	4	To know about the classification of dyes	Lecture, Discussion	Formative assessment
	2.	Colour and constitution of dyes. Chemistry of dyeing	3	To gather knowledge regarding thecolour and constitution of dyes	Lecture	Formative assessment
	3.	Triphenyl methane dyes -	1	To understand the synthesis	Lecture, Illustration	Formative assessment,

		malachite green, rosaniline and crystal violet.		and application of dyes		Short test
	4	Phthalein dyes - Phenolphthalein and fluorescein. Anthraquinone dyes - Alizarin Indigo dyes- Indigo.	4	To learn the synthesis and applications of phthalein and anthraquinone dyes.	Lecture, Discussion	Formative assessment, Seminar

Course Instructor: G. Leema Rose

Course Outcome

Semester **: VI** **Major Core IX**
Name of the Course **: Inorganic Chemistry III**
Course code **: CC1762**

CO - No.	Course Outcome Upon completion of course students will be able to	PSO	CL
CO - 1	name the coordination compounds	PSO - 1	A
CO - 2	explain the theories of coordination compounds	PSO - 1	U
CO - 3	predict the colour, magnetic properties and geometry of coordination compounds	PSO - 2	C
CO - 4	analyse the nature of bonding in coordination compounds	PSO - 3	An
CO - 5	minimize the errors in chemical estimation	PSO - 5	An
CO - 6	employ the methods to separate the inner transition elements	PSO - 4	Ap
CO - 7	compare the properties of lanthanides and actinides	PSO - 2	An
CO - 8	explain the principles of gravimetric analysis	PSO - 1	U

Teaching Plan
Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Module	Topics	Lecture hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Co-ordination chemistry I**					
	1	Double salts – co-ordination compounds – difference, definition and terminology – co-ordination complexes and complex ions – central ion and ligands – co-ordination number – co-ordination sphere – charge on a complex ion.	3	Know the difference between double salts and coordination compounds.	Lecture, Showing available coordination compounds and double salts.	Evaluation through short test
	2	Types of ligands - examples for each. Nomenclature of co-ordination compounds	2	Name the coordination compounds.	Group discussion	Evaluation through short test
	3	Isomerism in co-ordination compounds, structural isomerism – ionisation, hydrate, co-ordination, linkage and co-ordination position isomerism.	2	Know the types of isomerism exhibited by coordination compounds.	llustration Lecture	Assignment on isomerism
	4	Stereoisomerism – geometrical isomerism in tetrahedral and octahedral complexes - optical isomerism in octahedral complexes.	2	Know the types of isomerism exhibited by tetrahedral and octahedral compounds.	Lecture, Seminar	Evaluation through short test
II	**Co- ordination Chemistry – II**					
	1	Theories of co-ordination compounds- Werner's theory- postulates – verification of Werner's theory- cobalt ammine complexes.	4	Know the theories of coordination compounds	Question answer session	Multiple choice questions

	2	EAN rule – calculation of EAN with reference	3	Predict the stability of metal complexes.	Lecture	Short test Formative assessment – I
	3	Pauling's theory (VBT) – postulates - application of VBT to square planar and tetrahedral complexes, inner and outer complexes – merits and demerits of VBT. Shapes of d-orbitals.	4	Predict the structure of complexes using VBT.	Lecture with ppt Group discussion	Short test Formative assessment – I
	4	Crystal field theory – Crystal field splitting of tetrahedral, square planar and octahedral systems. Factors affecting the value of CFSE – crystal field splitting energy values and its application in the stability of complexes.	5	Apply CFSE and predict the stability of complexes.	Assignment on CFSE	Multiple choice questions
III	**Co-ordination chemistry – III**					
	1	Molecular Orbital Theory (MOT)– MO diagrams of ML_6 type complexes – weak and strong field ligands – spectrochemical series.	3	Differentiate strong and weak field ligands.	Illustration, Seminar	Short test
	2	Stability of metal complexes – relation between stability constant and dissociation constant – factors affecting the stability of metal complexes from thermodynamic data. Irving William series – stabilization of unstable oxidation state.	3	Predict the stability of complexes.	Lecture, Group discussion	Assignment
	3	Substitution reactions of square planar	5	Understand the	Lecture with ppt	Assignment

		complexes – trans effect .		substitution reactions of complexes.		
	4	Metal carbonyls - classification – examples – structure and nature of M-L bond in metal carbonyls – structures of mono, di and polynuclear carbonyls of Ni, Cr, Fe, Co and Mn. Application of complexes in qualitative and quantitative analysis.	3	Apply coordination compounds in qualitative and quantitative analysis.	Lecture, Illustration	Assignment
IV	**Transition Elements:**					
	1	. Group discussion with special reference to electronic configuration, oxidation state, spectral and magnetic properties, colour, variable valency-polyvalency of Vanadium-magnetic and catalytic properties, ability to form complexes.	2	Know the general characteristics of transition elements.		Multiple choice questions
	2	Difference between the first, second and third transition series. Extraction, properties and uses of Cu, Co and Ni. Preparation and uses of titanium(II) oxide, vanadium (V) oxide, potassium dichromate, potassium permanganate,potassium ferrocyanide, Potassium ferricyanide, Vaska's compound, platinum	3	Differentiate the transition series.	Lecture with ppt	Formative assessment – II

		(IV) chloride, chloroplatinic acid and purple of Cassius.				
	3	**Inner transition Elements:** Electronic configuration, oxidation states, colour, spectral and magnetic properties. Causes and consequences of lanthanide contraction	3	Know the general characteristics of inner transition elements.	Lecture	Quiz
	4	Extraction of lanthanides from monazite sand - separation of lanthanides by ion-exchange method - uses of lanthanides. Comparison between lanthanides and actinides.	4	Compare lanthanides and actinides	Lecture	Quiz
	5	Extraction, properties and uses of thorium and uranium - zinc uranyl acetate ,Uranium hexafluroide.	2	Know the extraction of Th and U	Lecture with ppt	Quiz
V	**Analytical Chemistry**					
	1	Types of errors- determinate and indeterminate errors- minimization of errors. Precision and accuracy- Comparison of precision and accuracy with example	3	Gain knowledge about errors.	Group discussion	Short test
	2	Standard deviation- mean deviation – relative mean deviation and coefficient of variance. Accuracy- absolute error- relative error- confidence limit- Rejection of a doubtful	2	Calculate standard deviation and mean deviation	Lecture.	Assignment

		value – Q Test and student T test .				
	3	Principles and requirements of gravimetric analysis, gravimetric steps- digestion, filtration, washing, drying and ignition.	2	Apply the principles of gravimetric analysis.	Demonstration	Formative assessment – III
	4	Mechanism of precipitation – factors affecting solubility of precipitate - co-precipitation- different types – prevention- post precipitation – prevention and difference between co-precipitation and post precipitation, precipitation from homogenous solution with examples.	4	Apply the principles of gravimetric analysis.	Lecture using ppt	Formative assessment – III

Course Instructor: R.Gladis Latha

Course Outcome

Semester : VI
Name of the Course : Physical Chemistry III
Course code : CC1763

CO - No.	Course Outcome Upon completion of course students will be able to	PSO -	CL
CO - 1	Recall phase rule.	PSO - 1	R
CO - 2	Understand phase diagrams	PSO - 1	C
CO - 3	Differentiate various photochemical processes	PSO - 4	U
CO - 4	Interpret Jablonski diagram	PSO - 4	Ap
CO - 5	Apply the electrochemical principles in batteries	PSO - 3	Ap
CO - 6	To deduce the expressions of rate constant	PSO - 5	An
CO - 7	Evaluate pH using electrodes.	PSO - 5	E
CO - 8	Elucidate the structure of molecules using spectral data	PSO - 8	C

Teaching Plan
Total Contact hours : 60 (Including lectures, assignments and tests)

Unit	Module	Topic	Lecture Hours	Learning Outcome	Pedagogy	Assessment/ Evaluation
I	**Phase Equilibria**					
	1.	Concept of phase , components and degrees of freedom (definitions and examples) Derivation of Gibb's phase rule.	2	To derive Gibb's phase rule	Lecture, Discussion	Formative assessment, Short test, Assignment, MCQ
	2.	Phase diagram for one component system – water and sulphur system	2	Construct phase diagram for water and sulphur system	Lecture	
	3.	Two component system	1	To construct phase diagram for two component system	Lecture, Discussion	
	4.	Reduced phase rule and simple eutectic systems.	1	Construct phase diagram for simple eutectic system	Ppt presentation	
	5.	Lead-silver system – Pattinson's process of de-silverisation of lead,freezing mixtures-KI-H_2O system	2	Understand de-silverisation and potassium iodide-water system	Lecture	
	6.	Formation of compounds with congruent melting point	1	Understand congruent melting point	Ppt presentation	
	7.	Zinc-magnesium system and $FeCl_3$-H_2O system. Formation of compounds with incongruent melting points	2	Understand $FeCl_3$-H_2O system and incongruent melting points	Lecture	
	8.	Na_2SO_4-H_2O system and Solid-	1	Construct Na_2SO_4-H_2O	Lecture	

		gas equilibria		system		
	9.	$CuSO_4$-H_2O system.	1	Construct $CuSO_4$-H_2O system	Question answer session Lecture	
	10.	Efflorescence, deliquescence and hygroscopy	1	Understand Efflorescence, deliquescence and hygroscopy	Lecture, Discussion	
II	**Chemical Kinetics**					
	1.	Rate of reaction, expression of rate, factors influencing rate of reaction and theories of reaction rates	2	To know factors influencing rate of reaction and theories of reaction rates	Lecture with PPT Illustration	Formative assessment, Short test, Assignment, MCQ
	2.	Order and molecularity of a reaction	1	Understand order and molecularity of a reaction	Lecture, Illustration	
	3.	Definition and examples, differences between order and molecularity of a reaction	1	Differentiate order and molecularity of a reaction	Lecture, Discussion	
	4.	Various orders of reaction and their derivation zero, first and second order reaction	2	Derive zero, first and second order reaction.	Ppt presentation	
	5.	Definition, examples and derivation of rate constant and half life period.	1	Know rate constant and half life period of a reaction	Lecture	
	6.	Methods of determining order of reaction, use of Differential, Integral, Half-life method and Ostwald's isolation	2	Determine order of reaction	Ppt presentation	

		methods.				
	7	Concept of activation energy, effect of catalyst and calculation of energy of activation (Arrhenius equation)	1	Derive Arrhenius equation	Lecture	
	8	Collision theory of bimolecular gaseous reactions(activated complex theory)	1	Derive activated complex theory	Lecture	
	9	Comparison of collision theory and activated complex theory.	1	Differentiate collision theory and activated complex theory	Question answer session Lecture	
	10	Lindeman's theoryofunimolecularreactions and solving problems	2	Derive Lindeman's theoryofunimolecularreactions and able to slove problems in this topic	Lecture, Discussion	
III	**Electrochemistry – I**					
	1.	Definition of conductance, specific conductance, equivalent conductance and molar conductance	1	Know conductance, specific conductance, equivalent conductance and molar conductance	Lecture, Illustration	Formative assessment, Short test, Assignment, MCQ
	2.	Factors affecting conductance of a solution	1	Understand factors affecting conductance of a solution	Lecture, Illustration	
	3.	Transport number , determination of transport number by Hittorf's method and moving boundary method	1	Able to determine transport number	Lecture	
	4.	Strong and weak electrolytes ,variation of	2	Able to derive Debye-Huckeltheory of	Lecture with PPT Illustration	

		equivalent conductance with dilution and Debye-Huckeltheory of strong electrolytes		strong electrolytes		
	5.	Debye-HuckelOnsagarequation.Kohlrausch'slaw and its applications	2	Derive Debye-HuckelOnsagar equation and Kohlrausch'slaw	Question answer session Lecture	
	6.	Applications of conductance measurements	2	Understand the applications of conductance measurements	Lecture, Discussion	
	7.	Determination of λ infinity of weak acid and weak base and degree of dissociation of weak electrolytes	1	Determine degree of dissociation of weak electrolytes	Lecture, Illustration	
	8.	Solubility and solubility products of sparingly soluble salts and conductometric titrations and solvingproblems.	3	Understand solubility and solubility products of sparingly soluble salts and conductometrictitrations. Able to solve problems in this topic	Lecture	
IV	**Electrochemistry – II**					
	1.	Electrochemical cells ,chemical cells ,reversible and irreversible cells and determinationof EMF of cells	2	Understand Electrochemical cells –chemical cells – reversible and irreversible cells -EMF of cells	Lecture	Formative assessment, Short test, Assignment, MCQ
	2.	Cell representation,single electrode	1	Know various types of electrodes	Lecture, Discussion	

		potential,types of electrodes, metal-metal ion electrodes, amalgam electrodes and gas electrodes.				
	3.	Insoluble metal salt electrodes and oxidation – reduction electrodes.Standard hydrogen electrode (SHE) and calomel electrode	2	Understand standard hydrogen electrode (SHE) and calomel electrode	Lecture	
	4.	Derivation of Nernst equation	1	Derive Nernst equation for emf of cells	Lecture, Discussion	
	5.	Standard electrode potential, electro chemical series, thermodynamics of galvanic cells, ΔG,ΔH,ΔS and equilibrium constant (K).	2	To know electro chemical series and thermodynamics of galvanic cells ΔG,ΔHandΔS and equilibrium constant (K)	Lecture with PPT Illustration	
	6.	Concentration cells –with transference and without transference ,liquid junction potential and its elimination.	1	Understand Concentration cells with transference and without transference and liquid junction potential and its elimination	Question answer session Lecture	
	7.	Applications of EMF measurements ,determination of transport number, valency of an ion, pH of a solution using hydrogen, quinhydrone and glass electrode.	2	Able to grasp Applications of EMF measurements,determination of transport number, valency of an ion, pH of a solution using	Lecture, Discussion	

				hydrogen, quinhydrone and glass electrode.		
	8	Potentiometric titrations - acid-base, oxidation reduction and precipitation titrations.	1	Understand Potentiometric titrations	Lecture, Illustration	
	9	Decomposition potential and overvoltageand solving Problems	2	Know decomposition potential and overvoltage. Can able to solve problems from this topic	Lecture	
V	**Spectroscopy**					
	1.	Different regions of EMR spectrum, Born-Openheimer approximation ,types of molecular spectra – microwave (rotational) spectra theoretical principle, selection rule and applications in the determination of bond distance in diatomic molecules	4	To classify different regions of EMR and know about microwave spectroscopy.	Lecture, Discussion	Formative assessment, Short test, Assignment, MCQ
	2.	Vibrational (IR) spectra – theoretical principle, harmonic oscillator and unharmonicity – selection rule, intensity, modes of vibrations and types , force constant , applications of IR– hydrogen bonding	3	To gather knowledge regarding Vibrational spectra(IR)	Lecture	

		,Inter and Intramolecular hydrogen bonding				
	3.	Fermi resonance, overtones and combination bands.	1	To understand Fermi resonance, over tones and combination bands	Lecture, Illustration	
	4	Electronic spectra - selection rules, Frank types of transitions and pplications. Raman spectra - theoretical principle ,stokes and antistokes lines	2	To know Electronic and Raman spectra	Lecture, Discussion	
	5.	Comparison of IR & Raman Spectroscopy.	1	Differentiate between Raman spectra and IR Spectra.	Lecture, Discussion	
	6.	ESR spectra-theory and principle and hyperfine splitting ESR spectra of methyl radical .	2	To understand ESR Spectra	Lecture, Illustration	

Course Instructor: M. Anitha Malbi