Holy Cross College (Autonomous), Nagercoil
Kanyakumari District, Tamil Nadu.
Accredited with A^{++} by NAAC - V Cycle (CGPA 3.53)

Affiliated to
Manonmaniam Sundaranar University, Tirunelveli

DEPARTMENT OF CHEMISTRY

TEACHING PLAN (UG)
ODD SEMESTER
2025-2026

Vision

Impart quality education, scientific skills, academic excellence, research attitude and skills to face global challenges.

Mission

- To develop intellectual and professional skills of the students
- To provide a firm foundation in chemical concepts, laws and theories
- To sharpen the scientific knowledge
- To enhance critical thinking, problem solving ability, scientific temper and innovation
- To apply chemistry in medicine, biology, industry and environment

Programme Educational Objectives (PEOs)

PEOs	Upon completion of B.A/B.Sc. Degree Programme, the graduates will be able to	Mapping with Mission
PEO1	apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	**M1& M2**
PEO2	use practical knowledge for developing professional empowerment and entrepreneurship and societal services.	**M2, M3, M4 & M5**
PEO3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	**M3, M4, M5 & M6**

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	Mapping with PEOs
PO1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	**PEO1**
PO2	create innovative ideas to enhance entrepreneurial skills for economic independence.	**PEO2**
PO3	reflect upon green initiatives and take responsible steps to build a sustainable environment.	**PEO2**
PO4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	**PEO1 & PEO3**
PO5	communicate effectively and collaborate successfully with peers to become competent professionals.	**PEO2 & PEO3**
PO6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	**PEO2 & PEO3**
PO7	participate in learning activities throughout life, through self-paced and self-directed learning to improve knowledge and skills.	**PEO1 & PEO3**

Programme Specific Outcomes (PSOs)

PSOs	Upon completion of B.Sc Chemistry programme, the graduates will be able to:	Mapping with POs
PSO1	understand the fundamentals, theories and principles of organic, inorganic and physical chemistry.	**PO1**
PSO2	analyze physical and chemical properties of chemical compounds and their uses.	**PO1& PO7**
PSO3	interpret the mechanism of various chemical reactions.	**PO3 &PO4**
PSO4	synthesize organic and inorganic compounds using classical and modern methods.	**PO2**
PSO5	design and carry out scientific experiments, record and interpret the results with accuracy	**PO1& PO4**
PSO6	use concepts, tools and techniques related to chemistry to other branches of science.	**PO5**
PSO7	develop skills in the safe-handling of chemicals and their usage in day today life.	**PO1&PO7**
PSO8	develop entrepreneurial skills, empowered to fulfil the professional requirement and become self-dependent.	**PO2& PO6**

Department : Chemistry
Class : I B.Sc. Chemistry
Title of the Course : Core Course I: General Chemistry-I
Semester : I
Course Code : CU231CC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU231CC1	5	-	-	-	5	5	75	25	75	100

Learning Objectives:

1. To acquire knowledge about atomic structure, dual nature of electron and the periodic properties.
2. To assimilate the concepts of chemical bonding and Organic Chemistry.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	remember the atomic structure, periodic properties, bonding, electronic configuration and properties of compounds.	**K1**
2	understand and classify the elements in the periodic table, types of bonds, reaction intermediates, electroniceffects in organic compounds and types of reagents.	**K2**
3	apply the theories to calculate energy of spectral transition,electronegativity, percentage ionic character and bond order.	**K3**
4	analyse the relationship existing between electronic configuration, bonding, geometry of molecules, structure reactivity and electronic effects	**K4**
5	evaluate the trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.	**K5**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** - Analyse; **K5-** Evaluate

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Atomic structure and Periodic trends**								
	1	History of atom (J.J.Thomson, Rutherford); Moseley's Experiment and Atomic number.	2	1	K1(R) & K3 (Ap)	Lecture with Visual Aids such as PPT, Conceptual Demonstration.	Think-Pair-Share, Concept Mapping.	*Video Lectures,* Notes/Slides.	Formative Quiz using Kahoot, Written Assignment-
	2	Atomic Spectra; Black-Body Radiation and Planck's quantum theory.	2		K2(U)	Lecture using visual aids like PPT.	Guided Inquiry Worksheets.	Video Lecture.	Conceptual Quiz, Group Presentation, CIA I.
	3	Bohr's model of atom;The Franck-Hertz Experiment; Interpretation of H-spectrum; Photoelectric effect.	2	1	K2(U)	Lecture with visualization, Concept-based discussion, examples from real-world experiences.	Collaborative Learning.	PowerPoint with videos showing atom model.	Construction of models for Bohr's atom model, CIA I.
	4	Compton effect; Dual nature of Matter- De- Broglie wavelength-	2		K3(Ap)	Lecture with visual aids like videos.	Problem solving method, peer group teaching.	Youtube Videos of dual nature of matter and Davisson and	Open-book test, CIA I.

		Davisson and Germer experiment.						Germer experiment.	
	5	Heisenberg's Uncertainty Principle; Electronic Configuration of Atoms and ions.	2	1	K3(Ap)	Flipped classroom.	Peer Learning, Real-World examples.	Online Tutorials and Notes.	Problem-Solving Assignments, CIA I.
	6.	Hund's rule, Pauli's exclusion principle and Aufbau principle. Numerical problems involving the core concepts**.**	2		K3(Ap)	Conceptual demonstration.	Problem solving method.	You tube videos and notes.	Group assignment, CIA 1.
II	**Introduction to Quantum mechanics**								
	1	Classical mechanics, Wave mechanical model of atom, distinction between a Bohr orbit and orbital.	3	1	K1(R) & K3(Ap)	Illustrations using models.	Blended Learning.	Simulations, YouTube Lectures.	Question answering, CIA I.
	2	Postulates of quantum mechanics; probability interpretation of wavefunctions, Formulation of Schrodinger wave equation -	3		K2(U)	Lecture using interactive PPT.	Group discussion, blended learning.	NPTEL video lectures.	Peer discussions, CIA I.

		Probability and electron density- visualizing the orbitals.							
	3	Probability density and significance of Ψ and Ψ^2. Modern Periodic Table Cause of periodicity; Features of the periodic table; classification of elements.	2	1	K3(Ap)	Lecture using periodic table, Application-Based approach.	Memorizing the elements of periodic table.	NPTEL Video Lectures.	Open Book Test, Exam Questions, CIA I.
	4	Periodic trends for atomic size- atomic radii, ionic and covalent radii; ionization energy, electron affinity, electronegativity.	2	1	K3(Ap)	Collaborative approach.	Peer Teaching.	PhET Interactive Simulations.	Creation of concept map, CIA II.
	5	Electronegativity scales - Mulliken and Pauling's scales of electronegativity, applications of electronegativity. Problems involving the core concepts.	2		K3(Ap)	Applying the principle to calculate the electronegativity of atoms.	Group discussion.	You tube videos.	Short test on electronegativity scales, .CIA II.

III	**Structure and bonding – I**								
	1	**Ionic bond** Ionic bond-definition; properties of ionic compounds; Energy involved in ionic compounds; Born Haber cycle – lattice energies-applications of lattice energy.	2	1	K1(R) & K3 (Ap)	Mathematical Derivations, Concept Mapping.	Flipped Classroom, Peer Teaching.	Video Lectures.	Conceptual MCQs, problem solving session on lattice energy calculation, CIA II.
	2	Ion polarisation– polarising power and polarizability; Fajans' rules - effects of polarisation on properties of compounds; problems involving the core concepts.	3		K2(U)	Core Conceptual Approach, Application-Based Teaching.	Socratic Questioning, Analogies.	NPTEL video lectrures	Numerical problems on polarising power, CIA II.
	3	**Covalent bond** Shapes of orbitals, overlap of orbitals – σ and Π bonds.	3	1	K2(U)	Lecture using models.	Interactive Simulation.	NPTEL Lectures.	Quiz using kahoot, CIA II.
	4	Hybridization-types-sp,sp^2,sp^3-examples. VSEPR theory - shapes of molecules of the	3		K3(Ap)	Participatory method using models.	Peer group teaching.	Open CourseWare.	Quick quizzes , CIA II.

		type AB_2, AB_3, AB_4, AB_5, AB_6 and AB_7							
	5	Partial ionic character of covalent bond- dipole moment, percentage ionic character.	1	1	K3(Ap)	Core Conceptual Approach.	Problem solving approach.	You- tube videos.	Short test, CIA II.
IV	**Structure and bonding – II**								
	1	VB theory – application to hydrogen molecule; concept of resonance - resonance structures of some inorganic species – CO_2, NO_2, CO_3^{2-}, NO_3, limitations of VBT.	3	1	K1(R) & K3 (Ap)	Inquiry-Based approach.	Think-Pair-Share, Simulation-Based Learning.	You tube videos on VB theory.	Conceptual Quiz on writing the resonance structures, Assignment, CIA II.
	2	MO theory - bonding, antibonding and nonbonding orbitals, bond order.	2		K3(Ap)	Conceptual approach with examples.	Application based questions.	NPTEL lecture " Atomic Structure and Chemical Bonding" Prof K. Mangala	Assignments, Open Book Test on construction of MO diagrams, CIA II.

								Sundar, IIT Madras.	
	3	MO diagrams of H_2, C_2, O_2, O^+ O^{2-}, O^{2-} N_2 NO, HF, CO; Magnetic characteristics, comparison of VB and MO theories.	3		K3(Ap)	Conceptual Pedagogy, Problem solving.	Application-based questions on construction of MO diagrams.	You tube videos: Drawing Molecular Orbital Diagrams: Bruin Academy.	Peer review of constructed MO diagrams, CIA II.
	4	Coordinate bond: Definition, Formation of BF_3, NH_3 molecules Metallic bond-electron sea model, VB model.	2	1	K3(Ap)	Flipped Classroom.	Think-Pair-Share to explain the formation of BF_3 and NH_3 molecules.	You tube video : Organic Chemistry Tutor.	Construction of models for coordinate bond formation, CIA II.
	5	Band theory-mechanism of conduction in solids; conductors, insulator, semiconductor – types, applications of semiconductors. numerical problems based on calculation of percentage ionic character.	2	1	K4(An)	Application-Oriented approach. Problem solving.	Problem solving	NPTEL: Concepts in magnetism and superconductivity.	Peer group discussion on applications of semiconductors, II CIA.

V	Basic concepts in Organic Chemistry and Electronic effects								
	1	Types of bond cleavage – heterolytic and homolytic; arrow pushing in organic reactions; reagents and substrates.	2	1	K1(R)	Core Conceptual Approach.	Think-Pair-Share – students differentiate between homolytic and heterolytic cleavage.	YouTube: Types of bonds – GCSE Chemistry.	Open Book Test, CIA II
	2	Types of reagents - electrophiles, nucleophiles, free radicals; reaction intermediates – carbanions, carbocations, carbenes, arynes and nitrynes. Inductive effect - reactivity of alkyl halides, acidity of halo acids.	2		K2(U)	Visual Pedagogy.	Differentiating between types of reagents, intermediates and electronic effects.	You tube videos : Organic Chemistry reactions Byjus : Akash JEE.	Open book test, CIA II
	3	Basicity of amines; inductive and electromeric effects. Resonance – resonance energy, conditions for resonance - acidity of phenols, basicity of aromatic amines.	2		K3(Ap)	Lecture using visual aids like PPT.	Group discussion on the reasons for acidity and basicity of organic compounds.	NPTEL: You tube : Organic Chemistry with Victor.	Conceptual MCQs , CIA II.

	4	Stability of carbonium ions, carbanions and free radicals, reactivity of vinyl chloride, dipole moment of vinyl chloride and nitrobenzene, steric inhibition to resonance.	2	1	K3(Ap)	Collaborative method.	Peer group teaching on reasons for stability of organic reagents.	You tube videos on Formation of carbonium ions and reaction intermediates .	Quiz on Kahoot, Assignment.
	5	Hyperconjugation - stability of alkenes, orienting effect of methyl group, dipole moment of aldehydes and nitromethane.	2	1	K2(U)	Lecture using videos.	Group discussion on Hyperconjugation.	YouTube videos on Hyperconjugation.	Slip test, CIA II.
	6	Types of organic reactions- addition, substitution, elimination and rearrangements.	2		K2 (U)	Flipped classroom.	Interactive lecture using PPT.	You tube : Types of organic reactions.	Quiz using khoot, CIA II.

Courses Focussing on Employability/ Entrepreneurship/ Skill Development: Employability, Skill Development
Activities (Em / En /SD): Hands on Training on writing resonance structures, MO diagrams
Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): Professional Ethics

Assignment: Model making on Types of hybridisation, (Last date to submit – 01-09-2025)

Sample questions

Part - A (1 mark)

1. Photo electric effect supports……._nature of light. (K1 - R, CO -1)
   a) atom b) particle c) ion d) wave
2. Ionisation energy of atoms decreases along a group. State true or false. (K2 – U, CO - 2)
3. Assertion A : Ionic bond is otherwise called as electrovalent bond. (K4 – An, CO -2)
   Reasoning B : It is formed by the transfer of electrons from one atom to another.
   a) Both A and B are correct b) A is correct, B is wrong
   c)Ais wrong but B is correct d) Both A and B are wrong
4. Match the following with the respective type of bonding: (k1 – R, CO - 2)
   a) Ammonium ion - Hydrogen bond
   b) Methane - Co-ordinate bond
   c) Sodium Chloride - Covalent bond
   d) Water - Ionic bond
5. Pick out the electrophile from the following: (K1 – R, CO – 4)
   a) Cl^- b) NO_2^+ c) Br^- d) H_2O

Part - B (6 marks)

1. What is Compton effect? Give its significance. (K1 – R, CO – 1)
2. Differentiate between orbit and orbital. (K2 – U, CO – 2)
3. List the general characteristics of ionic compounds. (K3 – A3, CO – 4)
4. What are bonding, antibonding and non bonding orbitals? (K4 – R, CO – 4)
5. What is Inductive effect? Explain the types. (K4 – An, CO – 4)

Part - C (12 marks)

1. How will you prove the wave nature of electrons using Davisson and Germer Experiment? (K5 – E, CO – 1)
2. Explain the periodic variation of ionisation energy, electron affinity and electronegativity. (K2 – U, CO – 3)
3. Explain Born – Haber cycle and give its applications. (K2 – U, CO – 4)
4. Explain the conducting property of a conductor and a semi conductor using band theory. (K2 – U, CO – 3)
5. Explain the stability of reaction intermediates. (K2 – U, CO – 2)

Head of the Department : Dr. R. Gladis Latha **Course Instructor :** Dr. L. Deva Vijila.

Department : Chemistry
Class : I B.Sc. Chemistry
Title of the Course : Core Lab Course I : Quantitative Inorganic Estimation (Titrimetry) And Inorganic Preparations
Semester : I
Course Code : CU231CP1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								Internal	External	Total
CU231CP1	**-**	-	3	-	**3**	**3**	**45**	**25**	**75**	**100**

Learning Objectives:

1. To estimate Inorganic compounds by titrimetric methods.
2. To prepare Inorganic compounds.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	explain the basic principles involved in titrimetric analysis and inorganic preparations.	**K1**
2.	compare the methodologies of different titrimetric analysis.	**K2**
3.	calculate the concentrations of unknown solutions in different ways and develop the skill to estimate the amount of a substance present in a given solution.	**K3**
4.	assess the yield of different inorganic preparations and identify the end point of various titrations	**K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyse; **K5** - Evaluate

Teaching Plan

Total Contact hours: 45 (Including practical and assessment)

Unit	Topic	Practical Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Chemical Laboratory Safety in Academic Institutions**							
	Introduction - importance of safety education for students, common laboratory hazards, assessment and minimization of the risk of the hazards, prepare for emergencies from uncontrolled hazards; concept of MSDS; importance and care of PPE; proper use and operation of chemical hoods and ventilation system; fire extinguishers-types and uses of fire extinguishers, demonstration of operation; chemical waste and safe disposal.	1	1	K2(U)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation.
II	**Common Apparatus Used in Quantitative Estimation (Volumetric)**							
	Description and use of burette, pipette, standard flask, measuring cylinder, conical flask, beaker, funnel, dropper, clamp, stand, wash bottle, watch glass, wire gauge and tripod stand.	2	1	K3(Ap)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting

Principle of Quantitative Estimation (Volumetric)								
	Equivalent weight of an acid, base, salt, reducing agent, oxidizing agent; concept of mole, molality, molarity, normality; primary and secondary standards, preparation of standard solutions; theories of acid-base, redox, complexometric, iodimetric and iodometric titrations**;** indicators – types, theory of acid–base, redox, metal ion and adsorption indicators, choice of indicators.			K3(Ap)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting
Quantitative Estimation (Volumetric)								
	Quantitative Estimation(Volumetric) Preparation of standard solution, dilution from stock solution **Permanganometry** Estimation of oxalic acid using standard ferrous ammonium sulphate **Dichrometry** Estimation of Ferrous Ammonium Sulphate using standard dichromate **Complexometry** Estimation of hardness of water using EDTA Estimation of Zinc using EDTA Estimation of Magnesium using EDTA Estimation of Lead using EDTA	27	2	K3(Ap)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting

	Preparation of Inorganic compounds Potash alum Tetra ammine copper (II) sulphate Prussian Blue Mohr's Salt	10	1	K3(Ap)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting

Head of the Department: Dr. R. Gladis Latha

Course Instructor : Dr. L. Deva Vijila

Department : **Chemistry**
Class : **I B.Sc. Botany/Zoology**
Title of the Course : **Elective Course I: Chemistry for Biological Sciences - I**
Semester : **I**
Course Code : **CU231EC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU231EC1	4	–	–	–	3	4	60	25	75	100

Learning Objectives

1. To gain knowledge on the significance and shapes of atomic orbitals
2. To understand the basics of biophysical analysis and industrial chemistry
3. To recognize the role of drugs, separation and purification techniques.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	remember the atomic structure, the preparation and uses of various compounds	**K1**
2	understand the efficiencies and uses of various drugs,fertilizers and fuels.	**K2**
3	explain and apply various theories behind osmosis, catalysis and chromatography	**K3**
4	differentiate the structure and uses of antibiotics, anaesthetics, antipyretics and artificial sugars.	**K4**
5	analyse various methods to separate chemical compounds	**K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate;

Teaching plan

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

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation
I		**Atomic Structure**							
	1	Dual nature of electron, de-Broglie equation, Davisson and Germer experiment.	2	2	K1(R)	Conceptual lecture, Structure based explanation	Concept mapping	Video lectures, Interactive ppt	Formative Quiz using Quizizz, slip test, Conceptual questions, CIA I
	2	Heisenberg's uncertainty principle and its significance. Compton effect	2		K2(U)	Lecture with visual aids, Conceptual lecture	Think-Pair-Share	Video lectures, Interactive ppt	Quiz, slip test, Group discussion, CIA I
	3	Schrodinger's wave equation and its significance, eigen values and eigen functions, quantum numbers and their significance.	2		K3(Ap	Interactive lecture, Problem solving	Problem based learning, Group discussion, Peer teaching	Interactive videos and ppt	Quiz, slip test, Problem solving, CIA I
	4	Atomic orbitals , significance , shapes , difference between orbit and orbital.	2		K2(U) & K3(Ap)	Lecture with visual aids, Conceptual lecture	Inquiry-Based Learning	Video lectures, Interactive ppt	Quiz, slip test, Group discussion, CIA I

	5	Rules for filling up of orbitals , Pauli's exclusion principle , Aufbau principle , Hund's rule. Electronic configuration of elements up to 20.	2		K2(U) & K3(Ap)	Lecture with visual aids, Conceptual lecture	Think-Pair-Share, Concept mapping	Video lectures, Interactive ppt	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
II		**Industrial Chemistry**							
	1	Fuels, Fuel gases, Natural gas, water gas, semi water gas	2	2	K2(U)	Lecture with Visual Aids	Think-Pair-Share, Inquiry-Based Learning,	Video lectures and ppt.	Formative Quiz using Nearpod, Oral Presentation, Conceptual Questions, CIA I
	2	Carbureted water gas, producer gas, CNG, LPG and oil gas	2		K2(U) & K3(Ap)	Lecture with visual aids, Conceptual lecture	Think-Pair-Share, Concept mapping	Video lectures, Interactive ppt	Slip test, Group discussion, CIA I
	3	Silicones,Synthesis,properties and uses of silicones	3		K3(Ap) & K4(An)	Mechanism based teaching, Structure property mapping	Concept Mapping,Think-Pair-Share	Interactive videos and ppt	Short test, CIA I
	4	Fertilizers, Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate	3		K3(Ap)	Mechanism based teaching	Think-Pair-Share, Inquiry-Based	Video lectures, Interactive ppt	Formative Quiz using Quizizz, slip test, Quick

		and triple superphosphate.					Learning, Concept Mapping		quiz using Kahoot, Conceptual questions, CIA I
III		**Biophysical Analysis and Catalysis**							
	1	Osmosis, osmotic pressure and isotonic solutions	2	2	K1(R)	Lecture with Visual Aids such as PPT	Think-Pair-Share, Inquiry-Based Learning, Concept Mapping.	Video Lectures, Notes/Slides.	Formative Quiz using Nearpod / Oral Presentation, Conceptual Questions, CIA I
	2	Determination of molar mass by osmotic pressure measurement	2		K2(U)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quick quiz using Socrative, Conceptual questions, CIA II
	3	Reverse osmosis, adsorption , types and factors influencing adsorption and applications	3		K2(U) & K3(Ap)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Video lectures, Interactive ppt	Slip test, CIA II
	4	Catalysis , types , intermediate compound formation theory and adsorption theory	3		K3(Ap)	Mechanism based teaching, Structure property mapping	Concept mapping	Interactive ppt	Formative Quiz using Nearpod, slip test, Conceptual questions, CIA II

IV		**Drugs and Speciality Chemicals**							
	1	Definition and uses of antibiotics, Penicillin, chloramphenicol and streptomycin.	3	2	K2(U)	Mechanism based teaching, Structure property mapping	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Short test, Quiz, Conceptual questions, CIA II
	2	Anaesthetics , chloroform and ether. Antipyretics , aspirin, paracetamol and ibuprofen.	3		K4(An)	Mechanism based teaching, Structure property mapping	Inquiry based learning, Concept mapping	Interactive videos and ppt	Short test, Assignment, CIA II
	3	Artificial Sweeteners , saccharin, aspartame and cyclamate	2		K4(An)	Mechanism based teaching, Structure property mapping	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, Conceptual questions, CIA II
	4	Organic Halogen compounds , freon and teflon	2		K2(U)	Mechanism based teaching, Structure property mapping	Concept mapping, Group discussion	*Video Lectures,* Notes/Slides.	Formative Quiz using Nearpod, slip test, Conceptual questions, CIA II

V		**Analytical Chemistry**							
	1	Introduction qualitative and quantitative analysis. Principles of volumetric analysis	3	2	K2(U)	Interactive lecture, Problem solving	Problem based learning, Group discussion, Peer teaching	Interactive videos and ppt	Quiz, slip test, Problem solving, CIA I
	2	Separation and purification techniques, extraction, distillation and crystallization.	3		K3(Ap)	Lecture with visual aids	Concept mapping	Interactive videos and ppt	Slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
	3	Chromatography, principle and application of column, paper and thin layer chromatography.	4		K3(Ap)	Lecture with visual aids, Conceptual lecture	Think-Pair-Share, Group discussion	Video lectures, Interactive ppt	Quiz, slip test, Group discussion, CIA I

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Employability

Activities (Em/SD): Think-Pair-Share and Seminar

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Employability

Activities (Em): Group discussion and Seminar

Assignment:

1. Silicones, Synthesis, properties and uses of silicones
2. Chromatography, principle and application of column chromatography

Seminar:

1. Quantum numbers and their significance.
2. Factors influencing adsorption and applications
3. Separation and purification techniques

Sample questions

Part - A

1. The metal used in Davison and Germer Experiment is_____ . **(K1-R, CO-1)**
   a) Iron b) Manganese c) Nickel d) Zinc
2. Urea is a fertilizer primarily used to provide_____.**(K2-U, CO-2)**
   a) Sulphur b) Potassium c) Nitrogen d) Phosphorous
3. Van't Hoff equation is _____**(K3-An, CO-3)**
   a) P = cRT b) P = cVRT c) P = Crp d) P = cRV
4. Which was the first discovered antibiotic? **(K2-U, CO-2)**
   a) penicillin b) streptomycin
   c) chloramphenicol d) auromycin
5. Which of the following technique is used for separating a mixture of two volatile liquids with close boiling points? **(K3-Ap, CO-3)**
   a) Simple distillation b) Steam distillation
   c) Fractional distillation d) Vacuum filtration

Part - B

1. Explain the different types of quantum numbers. **(K2-U, CO-2)**
2. Compare water gas and carbureted water gas. **(K3-Ap, CO-3)**
3. Discuss the factors influencing adsorption. **(K2-U, CO-2)**
4. How will you prepare Teflon? Mention its uses. **(K3-Ap, CO-3)**
5. Explain the purification of substance by solvent extraction and its importance. **(K2-U, CO-2)**

Part - C

1. Explain the different types of quantum numbers. **(K2-U, CO-2)**
2. Explain the synthesis and uses of NPK fertilizer, superphosphate and triple superphosphate. **(K3-Ap, CO-3)**
3. Explain the intermediate compound formation theory and adsorption theory. **(K2-U, CO-2)**
4. What are antibiotics? Give examples. Mention the uses of penicillin and streptomycin. **(K2-U, CO-2)**
5. Analyse the steps involved in the crystallization process for purifying an impure solid organic compound. **(K4-An, CO-4)**

Head of the Department: Dr. R.Gladis Latha **Course Instructor:** Dr.Y.Christabel Shaji

Department : Chemistry
Class : I B.Sc Botany/Zoology
Title of the Course : Elective Lab Course I: Volumetric Analysis
Course Code : CU231EP1
Semester : I

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								Internal	External	Total
CU231EP1	-	-	2	-	2	2	30	25	75	100

Learning Objectives

1. To understand the basics of preparation of solutions.
2. To understand the principles and practical experience of volumetric analysis.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand the principles of titrimetric methods.	**K1**
2	gain knowledge on the usage of standard flask, pipette and burette.	**K2**
3	design, carry out, record and interpret the results of various titrations and apply their skill in the estimation of various compounds.	**K3**
4	analyze the suitable indicators for various titrations	**K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyse; **K5** - Evaluate

Teaching Plan
Total Contact hours: 30 (Including practical and assessment)

Unit	Topic	Practical Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Qualitative Organic Analysis**							
	VOLUMETRIC ANALYSIS 1. Estimation of sodium hydroxide using standard sodiumcarbonate. 2. Estimation of sulphuric acid using standard oxalic acid. 3. Estimation of ferrous sulphate using standard Mohr's salt. 4. Estimation of oxalic acid using standard ferrous sulphate. 5. Estimation of zinc using EDTA. 6. Estimation of magnesium using EDTA. 7. Estimation of ferrous ion using potassium dichromate.	25	5	K3(Ap) & K4(An)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting, Model examination

Head of the Department: Dr. R. Gladis Latha

Practical-in-Charge: Dr. Y. Christabel Shaji

Department : Chemistry
Class : I B.Sc. Chemistry
Title of the Course : Foundation Course – Basics of Chemistry
Semester : I
Course Code : CU231FC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU231FC1	2	–	–	–	2	2	30	25	75	100

Learning Objectives:

1. To understand the concepts of periodic classification, chemical bonding, nomenclature of organic compound, isomerism and state of matter.
2. To acquire knowledge on various spectroscopic techniques.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember the basic concepts of periodic classification, chemical bonding, nomenclature of organic compound, isomerism and state of matter.	**K1**
2.	understand the periodic properties, types of bonding, hybridization, stereo isomerism, properties of matter and spectroscopy.	**K2**
3.	apply the concepts of valence bond theory, hybridization, isomerism IUPAC nomenclature and spectroscopy to chemical compounds.	**K3**
4.	analyze the periodic properties of elements, magnetic properties, characteristic of solids and types of spectroscopic techniques.	**K4**
5.	evaluate quantum numbers and their significance and percentage of ionic character of compounds.	**K5**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** - Analyse; **K5-** Evaluate

Teaching plan

Total Contact hours: 30 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Structure of atom and periodic classification of Elements and properties**								
	1	Atomic structure - fundamental particles - atomic mass - atomic number - isotopes - isobars - isotones	1	1	K1(R) & K2 (U)	Lecture with Visual Aids such as PPT	Think-Pair-Share.	Video Lectures, Notes/Slides.	Written Assignment
	2	Orbitals - quantum number and their significance.	1		K2(U)	Visual Lecture using PPT	Training on predicting the orbital	Video Lecture, Problem Bank	Group Presentation CIA 1
	3	Shapes of s, p and d orbitals - rules governing electronic configuration in various its atomic orbitals.	1	1	K3(Ap)	Concept-based discussion, Problem-solving sessions using real-world applications.	Collaborative Learning	PowerPoint with graphical representations of shapes of orbitals	Quizzes on electronic configuration Problem-solving worksheets on writing electronic configuration
	4	Periodic table - periodic laws (Mendeleev and Mosley) -	1		K3(Ap)	Training on classifying elements based	Hands-On Demonstration on periodic classification	You tube Videos on periodic table.	Project based Presentation, CIA I.

		classification of elements into s, p, d and f-blocks.				on electronic configuration			
	5	Metals - non-metals - periodic properties - concept, variation and factors affecting various periodic properties - inert pair effect.	1		K4(An)	Concept-based discussion, relating position	Peer Learning, construction of periodic table	Online Tutorials and Notes	Reasoning - out questions, CIA I
II	**Chemical Bonding**								
	1	Definition - types of chemical bond - ionic bond - ion polarization - dipole moment and percentage of ionic character.	1	1	K1(R) & K3(Ap)	Demonstration -based Learning, problem solving	Peer Instruction, Blended Learning,	NPTEL Lectures, Simulations, YouTube Lectures	Poster Presentation, Practical Evaluation, Oral Viva, CIA I
	2	Ion polarization - dipole moment and percentage of ionic character.	1		K3(Ap)	Problem Solving: Calculation of dipole moment and ionic character	Group discussion	Video lectures	Peer discussions, CIA I
	3	Covalent bond - definition - postulates of valence bond theory	2		K3(Ap)	Visual Demonstration	Model Making, Project/Activity,	NPTEL Video Lectures	Problem-Solving Assignments, Open Book Exam Questions, CIA I

	4	Concept of hybridization (sp, sp^2, sp^3, sp^3d, sp^3d^2, dsp^2, d^2sp^3). Magnetic properties - paramagnetic - diamagnetic - ferromagnetic.	1		K3(Ap)	Lecture using demonstration	Model Making, Project/Activity,	PhET Interactive Simulations	Quizzes on types of hybridisation, group discussion on magnetic properties, CIA II
	5	Co-ordinate covalent bond - definition - examples - Co-ordination compounds (basic concepts only).	1		K4(An)	Interactive session using PPT	Collaborative learning	Interactive tools for dipole interactions.	Oral viva, test on nomenclature of coordination compounds,. CIA II
III	**Nomenclature and Isomerism in Organic compounds**								
	1	Carbon compounds - uniqueness of carbons - classification of hydrocarbons	1	1	K1(R) & K3 (Ap)	Lecture using videos.	Flipped Classroom, Peer Teaching	Video Lectures	Slip test on nomenclature of carbon compounds, CIA II
	2	IUPAC nomenclature of organic compounds.	3		K2(U)	Application-Based Teaching	Socratic Questioning, Analogies	You – tube videos on nomenclature of organic compounds	Quiz on nomenclature of Organic Chemistry, CIA II
	3	Structural Isomerism: Chain isomerism, functional isomerism,	3	1	K3(Ap)	Illustrations using examples and real world experiences	Peer group teaching	NPTEL Lectures on “Introductory Organic Chemistry” Prof. Harinath	Short test on isomerism, CIA II

		positional isomerism and meta isomerism.						Chakrapani, Prof. Neera Dashaputre.	
	4	Stereoisomerism: Geometrical and optical isomerism	3		K3(Ap)	Lecture using demonstration	Model making	You – tube videos on stereoisomerism	Quiz using khoot- Concept check MCQs, CIA II
	5	Chiral molecule - enantiomers - diastereomers - meso compounds - racemic mixture.	1	1	K4(An)	Lecture using demonstration	Group discussion	NPTEL video on isomerism	Oral/Viva Test CIA II
IV	**States of Matter**								
	1	Gaseous state: Kinetic theory of gases - ideal and non-ideal gases - Ideal gas equation - deviation of ideal gas from ideal behavior	3	1	K1(R) & K3 (Ap)	Inquiry-Based approach.	Think-Pair-Share, collaborative learning	Coordination Chemistry, States of Matters and Chemical Kinetics By Dr. R. N. Jadeja	Conceptual Quiz on derivation CIA II
	2	Vander Waal's equation and liquification of gases. Vander Waal's equation and liquification of gases.	2		K2(U)	Flipped classroom Visual/Graphical Pedagogy	Participatory learning	You tube videos on Liquefaction of Gases	Slip test, CIA II
	3	Liquids: Intermolecular forces, vapour	3		K3(Ap)	Conceptual Pedagogy,	Group discussion on inter	"Chemistry and Physics of Surfaces and	Test on derivations of intermolecula

		pressure and boiling point of liquid				Problem-solving	molecular forces	Interfaces" By Prof. Thiruvancheril G. Gopakumar IIT Kanpur	r forces, CIA II
	4	Surface tension - viscosity - factors affecting surface tension and viscosity.	2	1	K3(Ap)	Flipped classroom	Participatory learning	You tube videos "Surface Tension, How is it, how does it form"	MCQ quiz on Surface Tension, CIA II
	5	Solids: Definition - characteristics of solids- amorphous and crystalline solids - space lattice and unit cells - close packed structure of solids- radius ratio rule.	2	1	K4(An)	Lecture using examples, models and real- world experiences.	Application oriented models	NPTEL: Chemistry and Physics of Surfaces and Interfaces By Prof. Thiruvancheril G. Gopakumar IIT Kanpur	Peer-assessed derivation and graphs, CIA II
V	**Introduction to Spectroscopy**								
	1	Electromagnetic radiation - general characteristics of wave - wavelength - frequency - amplitude - wavenumber -	1	1	K1(R)	Core Conceptual Approach	Blended learning	You tube videos on "Understanding Electromagnetic radiation"	Conceptual quiz on electromagnetic radiation using quizzzes, CIA II

		electromagnetic spectrum.							
	2	Absorption and emission spectrum - quantization of Energy level - selection rule	1		K2(U)	Visual Pedagogy	Collaborative learning	You tube video on “Emission and Absorption Spectra”	Slip test, CIA II
	3	Intensity of the spectral lines - width of spectral lines.	1		K3(Ap)	Constructivist approach.	Interactive simulations	NPTEL: Quantum Chemistry, Spectroscopy & Photochemistry By Prof. Amar Ballabh, Prof. Prasanna Ghalsasi. |The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat.	Derivation-based short questions, CIA II
	4	Types of spectroscopy - Microwave spectroscopy, Infrared spectroscopy.	1		K3(Ap)	Demonstration	Think – pair – Share	You tube videos on Spectroscopy	Open book test, CIA II

	5	UV-Visible spectroscopy, Nuclear Magnetic Resonance spectroscopy, Electron spin resonance spectroscopy	1		K4(An)	Demonstration	Group Discussion on Spectroscopic Principles	Flipped classroom	Slip test, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability, Skill Development

Activities (Em / En /SD): Exhibition on Model Making

Course Focusing on Cross Cutting Issues (Professional Ethics/ Human Values/Environment Sustainability/ Gender Equity): - Professional Ethics

Assignment: Construction of periodic table

Sample Questions

Part - A (5 x 2 = 10)

1. State Pauli's exclusion principle. **(K1-R, CO-1)**
2. Calculate the oxidation number of Fe in the complex [Fe(en) 2 (SCN) 2]Cl **(K1-R, CO-2)**
3. Differentiate between homocyclic and heterocylic compounds. **(K4-An, CO-2)**
4. Give Vanderwaal's equation and expand the terms. **(K3-Ap, CO-1)**
5. Define wave number. **(K1-R, CO-1)**

Part - B (5 x 5 = 25 marks)

1. "Atomic and ionic radii of elements decreases as we move from left to right in a period and increases from top to bottom in a group". Give reason. **(K4-An, CO-1)**
2. Calculate the percentage ionic character of HCl. The bond angle is 1.275A° and the observed dipole moment is 1.03D. **(K3-Ap, CO-2)**

3. Differentiate between racemic mixture and mesoform. **(K4-An, CO-3)**
4. Explain Linde's method of liquefaction of gases. **(K3-Ap, CO-3)**
5. Differentiate between amorphous and crystalline solids. **(K4-An, CO-4)**

Part - C (5 x 8 = 40 marks)

1. Classify elements on the basis of their electronic configuration. **(K2-U, CO-2)**
2. Explain the different types of magnetic forces that exist in substances. **(K2-U, CO-2)**
3. Apply the concept of hybridisation and predict the shapes of PCl_5 and SF_6 molecules. **(K3-Ap, CO-3)**
4. Explain the structural isomerism exhibited by organic compounds. **(K2-U, CO-2)**
5. Explain the different types of inter-molecular forces. **(K3-Ap, CO-3)**

Head of the Department: Dr. R. Gladis Latha

Course Instructor: Dr. L. Deva Vijila

Department : Chemistry
Class : I Year
Title of the Course : Non Major Elective NME I : Food Chemistry
Semester : I
Course Code : CU231NM1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU231NM1	**2**	–	–	–	**2**	**2**	**30**	**25**	**75**	**100**

Learning Objectives:

1. To know about adulterations used in food and their impact on health.
2. To learn the different types of additives used in food.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	remember and recall the different types of adulterants in food, edible oils used in foods and beverages.	**K1**
2	understand the effect of chemicals in common food and their adverse impact on health.	**K2**
3	apply various methods to detect various adulterants in food and to determine the values of oils and fats.	**K3**
4	analyze the effects of contaminants and additives in food.	**K4**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate;

Teaching plan
Total Contact hours: 30 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation
I		**Food Adulteration**							
	1	Sources of food, types, advantages and disadvantages.	1	1	K1(R) & K2(U)	Lecture with PPT	Think-Pair-Share, Inquiry-Based Learning,	Video lectures, Interactive ppt	Formative Quiz using Quizizz, slip test, CIA I
	2	Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals.	2		K2(U) & K3(Ap)	Lecture with PPT, Experiential Learning	Collaborative Learning, Concept Mapping	Interactive videos and ppt	Quiz, slip test, Problem solving, CIA I
	3	Common adulterants, Ghee adulterants and their detection. Detection of adulterated foods by simple analytical techniques.	2		K2(U)& K4(An)	Lecture with visualization, Concept-based discussion , Interactive lecture	Think-Pair-Share, Inquiry-Based Learning	Video Lecture, PPT	Slip test, Quick quiz using Kahoot, CIA I
II		**Food Poison**							
	1	Food poisons - natural poisons (alkaloids - nephrotoxin).	2	1	K2(U)	Lecture with PPT	Think-Pair-Share, Inquiry-Based Learning, Peer Teaching, Gamified	*Video Lectures,* Simulations, Notes/Slides,	Quiz, slip test, Group discussion, CIA I

							Quiz, Concept Mapping.		
	2	Pesticides, (DDT, BHC, Malathion) - Chemical poisons.	1		K2(U)	Mechanism based teaching, Structure property mapping	Gamified Quiz, Concept Mapping.	Video Lecture, PPT	Formative Quiz using Quizizz, slip test, Conceptual questions, CIA I
	3	First aid for poison consumed victims	2		K3(Ap)	Lecture with visualization, Concept-based discussion	Think-Pair-Share, Group discussion	Video lectures, Interactive ppt	Quiz, slip test, CIA I
III		**Food Additives**							
	1	Food additives - artificial sweeteners- Saccharin-Cyclomate and Aspartate	1	1	K2(U)	Lecture with Visual Aids **such as PPT,** Flipped Classroom**.**	Think-Pair-Share, Group discussion	*Video Lectures,* Notes/Slides,	Quiz, slip test, Group discussion, CIA I
	2	Food flavours - esters, aldehydes and heterocyclic compounds – Food colours – Emulsifying agents.	2		K2(U)&K 4(An)	Interactive lecture	Inquiry based learning, Concept mapping	Video lectures, Interactive ppt	Formative Worksheet, Conceptual Quiz, Group Presentation, CIA I
	3	Preservatives - leavening agents. Baking powder – yeast – tastemakers – MSG - vinegar.	2		K3(Ap)	Lecture with visualization, Concept-based discussion	Think-Pair-Share Concept Mapping	Video lectures and ppt	Slip test, Conceptual questions, CIA II

IV		**Beverages**							
	1	Beverages-soft drinks-soda-fruit juices-alcoholic beverages-examples	2	1	K2(U)	Lecture with Visual Aids such as PPT	Think-Pair-Share, Inquiry-Based Learning,	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II
	2	Carbonation-addiction to alcohol– diseases of liver and social problems.	3		K2(U)&K 4(An)	Conceptual lecture, Interactive lecture, Structure based explanation	Think-Pair-Share, Inquiry-Based Learning and Concept mapping	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II
V		**Edible Oils**							
	1	Fats and oils - Sources of oils - production of refined vegetable oils - preservation	2	1	K2(U)& K3(Ap)	Lecture with visual aids, Conceptual lecture	Think-Pair-Share, Inquiry-Based Learning and Concept mapping	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II

	2	Saturated and unsaturated fats and oils-examples - iodine value - determination of iodine value, acid value.	1		K2(U)	Interactive lecture, Problem solving	Think-Pair-Share, Inquiry-Concept mapping	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II
	3	RM value, saponification values and their significance-Role of MUFA and PUFA in preventing heart diseases.	2		K3(Ap)& K5(E)	Interactive lecture, Problem solving and Conceptual lecture	Think-Pair-Share, Inquiry-Based Learning,	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Employability

Activities (Em/SD): Think-Pair-Share and Seminar

Assignment:

Disadvantages of Food colours

Seminar:

1.Sources of lipids and protiens

2. Disadvantages of alcohol beverages

Sample questions

Part - A

1. Which of the following is a common adulterant used in milk? **(K2-U, CO-2)**
a) Starch b). Alum c). Turmeric d). Lead chromate
2.What is the first aid to be given in case of chemical food poisoning? **(K2-U, CO-2)**
a)Give strong acid b) Induce vomiting using warm salt water c) Apply ice packs d) Drink alcohol
3. Esters are used in food as_____.**(K2-U, CO-2)**
a). Preservatives b). Leavening agents c). Flavouring agents d). Sweeteners
4. What is the health effect of long-term alcohol consumption? **(K2-U, CO-2)**
a) Improved digestion b) Stronger immunity c) Liver damage d) Weight loss
5. The iodine value of an oil indicates its_____.**(K4-An, CO-4)**
a). Saponification ability b) Level of rancidity c) Degree of unsaturation d) Caloric content

Part - B

1. How will you detect the adulterants present in ghee? **(K3-Ap, CO-3)**
2. Explain the action of DDT and BHC against pesticides. **(K4-An, CO-4)**
3. Write a note on artificial sweeteners. **(K2-U, CO-2)**
4. Explain the methods of carbonation. **(K2-U, CO-2)**
5. How will you determine the RM value in fats and oil? **(K4-An, CO-4)**

Part - C

1. How will you detect the adulterated foods by simple analytical techniques. **(K3-Ap, CO-3)**
2. Discuss about the first aid for poison consumed victims. **(K2-U, CO-2)**
3. Differentiate between saccharin and aspartame based on structure and sweetness. **(K4-An, CO-4)**
4. Discuss the social problems due to alcoholism. **(K2-U, CO-2)**
5. How will you manufacture refined cotton seed oil? **(K3-Ap, CO-3)**

Head of the Department: Dr. R.Gladis Latha **Course Instructor:** Dr.Y.Christabel Shaji

Department : Chemistry
Class : II B.Sc Chemistry
Title of the Course : General Chemistry - III
Semester : III
Course Code : CU233CC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU233CC1	5	-	-	-	5	5	75	25	75	100

Learning Objectives:

1. To know the properties and applications of chemical compounds
2. To analyse the kinetics of gases, crystal systems, nuclear radioactivity and chemical reactions

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember the classification and properties of chemical compounds	**K1**
2.	understand the basic concepts of states of matter, nuclear radioactivity and organic reactions	**K2**
3.	apply the concepts and mechanism in gases, liquids, solids, radioactivity and organic reactions	**K3**
4.	analyze the properties of gases, liquids, solids and mechanisms of chemical reactions	**K4**
5.	evaluate the kinetics of gases, crystal structure, nuclear reactions and properties of organic reactions	**K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyse; **K5** - Evaluate

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Gaseous state**								
	1	General characteristics of gases - postulates and derivation from the kinetic gas equation.	2	1	K1(R) & K2(U)	Lecture with visual aids, Conceptual lecture	Concept mapping	Video lectures, Interactive ppt	Formative Quiz using Quizizz, slip test, Conceptual questions, CIA I
	2	The Maxwell-Boltzmann distribution of speed of molecules - average, root mean square and most probable velocity and average kinetic energy.	3		K3(Ap) & K4(An)	Interactive lecture, Problem solving	Problem based learning, Group discussion, Peer teaching	Interactive videos and ppt	Quiz, slip test, Problem solving, CIA I
	3	Collision frequency - collision diameter - mean free path and viscosity of gases.	2	1	K2(U)	Lecture with visual aids	Concept mapping	Interactive videos and ppt	Slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
	4	Real gases - deviations from ideal gas behaviour compressibility factor - Z and its variation with pressure for different gases.	3		K2(U) & K3(Ap)	Lecture with visual aids, Conceptual lecture	Think-Pair-Share	Video lectures, Interactive ppt	Quiz, slip test, Group discussion, CIA I
	5	Equations of states for real gases - Virial equation and van der waal's equation	2	1	K4(An)	Visual concept lecture, Rule based teaching	Problem based learning, Group discussion	Video lectures, Interactive ppt	Quiz, slip test, Group discussion, CIA I

II	**Liquid and Solid State**								
	1	Properties of liquids - surface tension and viscosity. Crystalline and amorphous - isotropy and anisotropy - isomorphism and polymorphism	2	1	K1(R) & K2(U)	Conceptual lecture, Model based explanation	Think-Pair-Share, Concept mapping	Video lectures and ppt	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
	2	Crystals - size and shape - symmetry elements - plane, centre and axis - Miller indices - unit cells and space lattices. Classification of crystal systems - Bravais lattices	3		K3(Ap) & K4(An)	Lecture with visual aids and models, Demonstration	Inquiry based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Short test, Conceptual questions, Group discussion, CIA I
	3	X - ray diffraction and Bragg's equation. Packing in atomic solids - simple cubic - body centered cubic - face centered and hexagonal close packing	3	2	K2(U)	Interactive lecture, Visual demonstration, Mechanism based explanation	Think-Pair-Share, Concept mapping	Interactive videos and ppt	Quiz, slip test, Structure identification task, Group discussion, CIA I
	4	Co-ordination number in typical structures - NaCl - CsCl - ZnS and TiO_2.	2		K3(Ap)	Structure based teaching, Visual demonstration	Inquiry based learning	Video lectures and ppt	Short test, Conceptual questions, Group discussion, CIA I
	5	Structure and properties of diamond and graphite. Defects in solids - stoichiometric and nonstoichiometric defects.	2		K5(E)	Conceptual lecture, Interactive lecture, Structure based explanation, Demonstration	Think-Pair-Share, Concept mapping		Short test, CIA I

III	**Nuclear Chemistry**								
	1	Natural radioactivity - α, β and γ rays - half-life period - Fajan-Soddy group displacement law - Geiger-Nattal rule - isotopes - isobars - isotones - nuclear isomerism - radioactive decay series - magic numbers - units	3	2	K1(R) & K2(U)	Concept based explanation, Numerical illustration	Concept mapping, Think-Pair-Share	Video lectures and ppt	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
	2	Curie - Rutherford - Roentgen - nuclear stability - neutron-proton ratio - binding energy - packing fraction and mass defect.	2		K3(Ap)	Lecture with visual aids, Mechanism based teaching, Problem solving	Problem based learning, Think-Pair-Share	Interactive videos and ppt	Short test, CIA I
	3	Derivation of decay constant - half-life period and radiocarbon dating. Nuclear energy - nuclear fission and fusion - major nuclear reactors in India	3		K3(Ap) & K4(An)	Conceptual lecture, Mechanism based teaching, Problem solving	Concept mapping, Group discussion	Interactive videos and ppt	Quick quiz using Nearpod, Conceptual questions, CIA II
	4	Radiation hazards - disposal of radioactive waste and safety measures.	2	1	K2(U)	Mechanism based teaching, Conceptual lecture	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Slip test, Conceptual questions, CIA II
	5	Applications of radioactivity in medicine, agriculture and industry.	2		K2(U) & K3(Ap)	Conceptual lecture, Case based teaching	Concept mapping, Group discussion	Interactive videos and ppt	Short test, Assignment, Conceptual questions, CIA II

IV	**Halogen Compounds**								
	1	Aliphatic halogen compounds - General methods of preparation - physical and chemical properties.	2	2	K2(U)	Interactive lecture	Think-Pair-Share	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II
	2	Mechanism and stereochemistry of aliphatic S_N^1 and S_N^2 reactions. Difference between S_N^1 and S_N^2 mechanism. Factors influencing the rate of aliphatic nucleophilic substitution reaction.	3		K3(Ap) & K4(An)	Mechanism based teaching, Conceptual lecture	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Short test, Quiz, Conceptual questions, CIA II
	3	Preparation - properties and uses of chloroform - iodoform and carbon tetrachloride	2		K3(Ap) & K4(An)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quick quiz using Socrative, Conceptual questions, CIA II
	4	Aromatic halogen compounds General methods of preparation - physical and chemical properties. properties of aryl halides	2	1	K2(U) & K3(Ap)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Slip test, CIA II
	5	Mechanism of aromatic S_N^1, S_N^{Ar} and benzyne reactions. Preparation - properties and uses of D.D.T and B.H.C	3		K3(Ap) & K4(An)	Mechanism based teaching, Structure property mapping	Think-Pair-Share	Interactive videos and ppt	Short test, CIA II

V	**Alcohols and Phenols**								
	1	General methods of preparation - physical and chemical properties. Ascent and descent series.	2	2	K2(U)	Interactive lecture	Think-Pair-Share	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II
	2	Preparation - properties and uses of allyl alcohol, ethylene glycol and glycerol. Estimation of number of hydroxyl groups in polyhydroxy alcohols	3		K3(Ap) & K5(E)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Short test, Quiz, Conceptual questions, CIA II
	3	General methods of preparation - physical and chemical properties. Acidic character of phenol and effect of substituent on the acidity of phenol.	2		K2(U)	Mechanism based teaching, Structure property mapping	Inquiry based learning, Concept mapping	Interactive videos and ppt	Short test, Assignment, CIA II
	4	Electrophilic substitution reactions - Reimer-Tiemann - Kolbe-Schmidt - Gatermann synthesis	2	1	K2(U)	Mechanism based teaching, Structure property mapping	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, Conceptual questions, CIA II
	5	Libermann nitroso and phthalein reactions. Preparation, properties and uses of catechol - resorcinol - quinol and pyrogallol	3		K2(U) & K5(E)	Mechanism based teaching, Structure property mapping	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Quick Quiz with Kahoot, Short test, CIA II

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Employability and Skill Development
Activities (Em/SD): Model making on crystals and crystal lattice

Assignment: Applications of radioactivity (Last date to submit: 01-09-2025)

Sample Questions

PART - A

1. What is the compressibility factor (Z) of an ideal gas? **(K1-R, CO-1)**
   a) 0 b) 1 c) -1 d) 2
2. Identify the co-ordination number in a body-centered cubic (BCC) structure. **(K2-U, CO-2)**
   a) 4 b) 6 c) 8 d) 12
3. Which unit measures the activity of a radioactive substance? **(K2-U, CO-2)**
   a) Curie b) Rutherford c) Roentgen d) Becquerel
4. Which of the following statement is incorrect? **(K4-An, CO-4)**
   a) No intermediate is always involved in the S_N2 mechanism
   b) S_N2 reaction is a two step reaction
   c) S_N2 reaction gives inverted products
   d) S_N2 reaction is favoured by aprotic solvents
5. Which of the following is 1,2-dihydroxybenzene? **(K2-U, CO-2)**
   a) Catechol b) Resorcinol c) Quinol d) Pyrrogallol

PART - B

1. Derive kinetic gas equation. **(K4-An, CO-4)**
2. Compare the packing efficiency of simple cubic, body-centered cubic, and face-centered cubic lattices. **(K4-An, CO-4)**
3. Mention the applications of radioactivity in medicine and industry. **(K3-Ap, CO-3)**
4. Differentiate S_N1 and S_N2 reaction mechanisms with examples. **(K4-An, CO-4)**
5. Explain the preparation, properties and uses of pyrogallol. **(K2-U, CO-2)**

PART - C

1. Analyze the effect of temperature on the mean free path of gas molecule. **(K4-An, CO-4)**
2. Compare the structural differences between diamond and graphite. **(K4-An, CO-4)**
3. Describe the process of nuclear fission and its application in nuclear reactors. **(K3-Ap, CO-3)**
4. Compare the preparation and properties of chloroform and iodoform. **(K4-An, CO-4)**
5. How will you estimate the number of hydroxyl group in polyhydroxy compounds. **(K5-E, CO5)**

Head of the Department: Dr. R. Gladis Latha **Course Instructor:** Dr. Sheeba Daniel

Department : Chemistry
Class : II B.Sc Chemistry
Title of the Course : Core Lab Course III: Organic Analysis and Determination of Physical Constants
Semester : III
Course Code : CU233CP1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								Internal	External	Total
CU233CP1	**-**	-	3	-	**3**	**3**	**45**	**25**	**75**	**100**

Learning Objectives:

1. To identify the functional groups in organic compounds through qualitative tests
2. To determine the physical constants of organic compounds

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	remember the basic concepts of organic analysis	**K1**
2.	understand the methods to identify the functional groups	**K2**
3.	apply the procedure for identifying the functional groups	**K3**
4.	analyse the functional groups and physical constants of organic compounds	**K4**
5.	evaluate the melting and boiling points of organic compounds	**K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyse; **K5** - Evaluate

Teaching Plan

Total Contact hours: 45 (Including practical and assessment)

Unit	Topic	Practical Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Qualitative Organic Analysis**							
	Preliminary examination - detection of special elements. Aromatic and aliphatic nature. Test for saturation and unsaturation - identification of functional groups using solubility tests. Confirmation of functional groups. Preparation of derivatives for functional groups.	35	6	K3(Ap) & K4(An)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting, Model examination
II	**Determination of melting and boiling**							
	Determination of melting and boiling point of organic compounds	3	1	K5(E)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting

Head of the Department: Dr. R. Gladis Latha

Practical-in-Charge: Dr. Sheeba Daniel

Department : Chemistry
Class : II B.Sc Physics
Title of the Course : Elective Course III: Chemistry For Physical Sciences – I

Semester : III
Course Code : CU233EC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU233EC1	4	-	-	-	3	4	60	25	75	100

Learning Objectives

1. To know the basics of atomic orbitals, chemical bonds and hybridization
2. To understand the concepts of thermodynamics, phase rule, nuclear chemistry and its applications.

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.	**K1**
2.	understand the efficiencies and uses of various fuels and fertilizers.	**K2**
3.	explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.	**K2**
4.	apply various thermodynamic principles, systems and phase rule.	**K3**
5.	analyze various methods for the separation of chemical components	**K4**

K1 - Remember; K2 - Understand; K3 - Apply; K4 – Analyze

Teaching plan

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

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Chemical Bonding and Nuclear Chemistry**								
	1	Chemical Bonding: Molecular Orbital Theory- bonding, antibonding and non-bonding orbitals.	2	1	K2(U)	Interactive lecture, Demonstration, Problem solving	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures, Virtual lab simulations, Interactive ppt	Formative Quiz using Quizizz, Conceptual questions, CIA I
	2	Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.	2		K3(A)	Lecture with visual aids and models, Demonstration, Flipped classroom	Molecular diagram drawing practice, Group discussion.	Interactive videos and ppt	Quiz, Problem solving questions, CIA I
	3	Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers	2	1	K3(U)	Visual concept lecture, Structure based learning	Think-Pair-Share, Concept mapping	Interactive videos and ppt	Structural identification, Conceptual questions, CIA I
	4	Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations.	2		K3(A)	Model based teaching, Demonstration, Problem solving	Problem based learning, peer teaching.	Interactive videos and ppt	slip test, Problem solving questions, Group discussion, CIA I
	5	Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon	2	1	K4(An)	Visual concept lecture, Problem solving	Hands-on model building, Group discussion,	Video lectures, Virtual lab simulations,	slip test, Group discussion, CIA I

		dating, rock dating and medicinal applications.					Problem based learning	Interactive ppt	
II	**Industrial Chemistry**								
	1	Fuels: Fuel gases: Natural gas, water gas, semi water gas,	2	1	K2(U)	Conceptual lecture, Model based explanation	Think-Pair-Share, Concept mapping	Video lectures and ppt	slip test, Quick quiz using Kahoot, CIA I
	2	carbureted water gas, producer gas, CNG, LPG and oil gas	2		K2(U)	Mechanism based teaching, mind mapping	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Conceptual questions, Group discussion, CIA I
	3	Silicones: Synthesis, properties and uses of silicones.	2	1	K3(A)	Interactive lecture, Mechanism based explanation	Group discussion, Concept mapping	Interactive videos and ppt	Quiz, Group discussion, CIA I
	4	Fertilizers: Urea, ammonium sulphate, potassium nitrate,	2		K3(A)	Application based teaching, Reaction mapping,	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Short test, Conceptual questions, CIA I
	5	NPK fertilizer, superphosphate, triple superphosphate.	2		K4(An)	Interactive lecture, Structure based explanation	Think-Pair-Share, Concept mapping		Short test, CIA I
III	**Fundamental Concepts in Organic Chemistry**								
	1	Hybridization: Orbital overlap, hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6.	2	1	K4(An)	Interactive lecture, Model based explanation	Concept mapping, hands on model making	Lectures using models	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA I

	2	Electronic effects: Inductive effect and consequences on Ka and Kb of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples.	2		K3(A)	Mechanism based teaching, Problem solving	Think-Pair-Share	Interactive videos and ppt	Short test, CIA I
	3	Reaction mechanisms: Types of reactions– aromaticity (Huckel's rule)	2		K2(U)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quick quiz using Nearpod, Conceptual questions, CIA I
	4	Aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation.	2	1	K3(A)	Mechanism based teaching, Conceptual lecture,	Concept mapping, Think-Pair-Share	Interactive videos and ppt	slip test, problem based questions, CIA II
	5	Heterocyclic compounds: Preparation, properties of pyrrole and pyridine	2		K3(A)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quiz using Nearpod, short test, Conceptual questions, CIA II
IV	**Thermodynamics and Phase Equilibria**								
	1	Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes.	2	1	K2(U)	Interactive lecture, Conceptual lecture, Mechanism based teaching	Think-Pair-Share, Concept mapping	Video lectures and ppt	slip test, Quick quiz using Kahoot, CIA II

	2	Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine.	2		K3(A)	Mechanism based teaching	Iniquiry based learning	Interactive videos and ppt	Short test, CIA II
	3	Entropy and its significance. Free energy change and its importance. Conditions for spontaneity in terms of entropy and Gibbs free energy.	2		K2(U)	Conceptual lecture, Structure property mapping	Concept mapping, problem based learning	Interactive videos and ppt	Conceptual questions, CIA II
	4	Relationship between Gibbs free energy and entropy. Phase Equilibria: Phase rule - definition of terms in it	2	1	K3(A)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Slip test, CIA II
	5	Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).	2		K3(A)	Mechanism based teaching	Concept mapping	Interactive videos and ppt	Short test, CIA II
V	**Analytical Chemistry**								
	1	Introduction to qualitative and quantitative analysis. Principles of volumetric analysis.	2	1	K2(U)	Lecture with visualization, Demonstration, Flipped classroom	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, CIA II

	2	Separation and purification techniques – extraction, distillation and crystallization.	2		K4(An)	Interactive lecture, Demonstration, Problem solving	Problem based learning, Group discussion, , Peer teaching	Interactive ppt	Slip test, Problem solving, CIA II
	3	Chromatography: principle and application of column chromatography	2		K3(A)	Lecture with visualization, Demonstration	Inquiry based learning, Hands-on model building	Interactive videos and ppt	Short test, Assignment, CIA II
	4	Principle and application of paper chromatography.	2	1	K3(A)	Lecture with visualization, Demonstration	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, CIA II
	5	Principle and application of thin layer chromatography.	2		K3 (A)	Mechanism based teaching	Think-Pair-Share, Peer teaching	Interactive videos and ppt	Short test, CIA II

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Employability
Activities (Em/SD): Group Discussion on fertilizers
Assignment: Applications of radioisotopes and carbon dating (Last date to submit: 01-09-2025)

Sample Questions
Part – A (1 mark)

1. Match the following:
   a) Isotope - $_{6}C^{10}$
   b) Isobar - $_{91}Pa^{234}$
   c) Isotone - $_{1}H^{2}$
   d) Isomer - $_{2}He^{4}$
2. Producer gas is a mixture of
   c) CO and N_2 b) CO_2 and N_2 c) CO and H_2 d) Propane and butane

3. The order of reactivity of tertiary alkyl halides in the S_N1 reaction is high. Say true or false.
4. The mathematical statement of the first law of thermodynamics is
   a) $\Delta E = q+w$ b) $\Delta E = q-w$ c) $\Delta E = q^2-w$ d) $\Delta E = q^2+w$
5. The adsorbent used in Column chromatography is_____.
   a) Diethyl ether b) Hexane c) Chloroform d) Silica gel

Part – B (6 marks)

1. How will you apply radioisotopes in medicine.
2. Describe the synthesis and uses of silicones.
3. Define aromaticity and Huckel's rule. Give examples.
4. Illustrate simple eutectic system with an example.
5. Explain the principles and applications of column chromatography.

Part – C (12 marks)

1. Draw MO diagram of N_2 and He_2 and explain MO theory.
2. Describe the classification of the fuels.
3. Analyse the hybridization and geometry of CH_4 and C_6H_6.
4. Define entropy and write its physical significance.
5. Discuss any two techniques to separate substances from mixture.

Head of the Department- Dr.R.Gladis Latha

Course Instructor – Dr. Sr.K.Francy

Department : **Chemistry**
Class : **II B.Sc Chemistry**
Title of the Course : **Applied Chemistry**
Semester : **III**
Course Code : **CU233SE1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks	
								External	Total
CU233SE1	**2**	**-**	**-**	**-**	**2**	**2**	**30**	**75**	**100**

Learning Objectives

1. To transform the acquired theoretical knowledge to industry and vice-versa
2. To familiarize with synthesis of chemicals used in day today life and to develop entrepreneurship skills.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	remember the synthesis of chemicals used in day today life	K1
2	understand the effects of adulteration in food and hazards of chemicals	K2
3	illustrate the different processes of water softening and estimation of hardness of water and uses of chemicals	K3
4	analyze the action of chemicals and purity of water	K4
5	evaluate the composition of blood and validate the application of chemicals	K5

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** – Analyze; **K5**- Evaluate

Teaching plan
Total Contact hours: 30 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Soaps and Detergents**								
	1	Definition and classification of Soaps, raw materials used in the manufacture of soap manufacture of toilet soap.	2	1	K1(R) & K2(U)	Lecture with visual aids, Conceptual lecture	Concept mapping	Video lectures, Interactive ppt	Formative Quiz using Quizizz, slip test
	2	Definition, various types of soaps with examples	2	-	K2(U)	Interactive lecture, Problem solving	Problem based learning, Group discussion, Peer teaching	Interactive videos and ppt	Quiz, slip test, Problem solving
	3	Advantages of detergents over soaps , cleansing action of soap.	2	-	K2(U) & K3(Ap)	Lecture with visual aids	Concept mapping	Interactive videos and ppt	Slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
II	**Chemicals of everyday use**								
	1	Preparation and uses of the following articles. Tooth powder, tooth paste,	2	1	K2(U) & K3(Ap)	Interactive lecture, Visual demonstration	Think-Pair-Share, Concept mapping	Interactive videos and ppt	Quiz, slip test, Structure identification

		writing inks							task, Group discussion
	2	Preparation and uses of gum paste, boot polish, talcum powder, chalk crayons	2	-	K3(Ap) & K4(An)	Structure based teaching, Visual demonstration	Inquiry based learning	Video lectures and ppt	Short test, Conceptual questions, Group discussion, CIA I
	3	Preparation and uses of agar battis, phenyl and moth balls.	2	-	K2(U) & K3(Ap)	Interactive lecture, Demonstration	Concept mapping	*Video Lectures,* Simulations, Slides	Short test, CIA I
III	**Adulteration in Food**								
	1	Adulteration of Food, Simple methods to find adulteration of milk, food, oils (edible and-mineral) and honey	2	-	K2(U) & K4(An)	Visual Lecture, Mini-Lecture Segments	Problem-Solving, Inquiry Worksheets, Problem Solving	Video Lecture, Interactive Notes	Formative Worksheet, Conceptual Quiz, Group Presentation
	2	Food poisoning and its prevention , Antibodies, Food preservation, coloring, flavoring	2	1	K2(U) & K3(Ap)	Demonstration -based Learning, Simulations, Concept, Mapping, Flipped Classroom	Peer Instruction, Blended Learning,	NPTEL Lectures, Simulations, YouTube Lectures	Quick quizzes and Peer discussions

	3	Sweetening agents in catering technology - Carcinogens of food materials.	2	-	K3(Ap) & K4(An)	Conceptual lecture, Interactive lecture, Structure based explanation, Demonstration	Think-Pair-Share, Concept mapping	Video Lecture, Interactive Notes	Formative Worksheet, Conceptual Quiz, Group Presentation
IV	**Water Treatment**								
	1	Water treatment: hardness of water temporary and permanent hardness, disadvantages of hard water.	2	-	K1(R) & K2(U)	Concept based explanation, Numerical illustration	Concept mapping, Think-Pair-Share	Video lectures and ppt	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II
	2	Estimation of hardness by EDTA method. Water purification process , ion exchange, reverse osmosis,	2	1	K2(U) & K4(An)	Conceptual lecture, Case based teaching	Concept mapping, Group discussion	Interactive videos and ppt	Short test, Assignment, Conceptual questions, CIA II
	3	Activated charcoal treatment Desalination, Disinfection , ozone, UV, chlorination, BIS- specification of	2	-	K5(E)	Mechanism based teaching, Conceptual lecture	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Short test, Quiz, Conceptual questions, CIA II

		drinking water.							
V	**Clinical Chemistry**								
	1	Composition of blood - blood grouping - identification of blood groups and matching.	2	-	K1(R) & K2(U)	Conceptual lecture , Structure property mapping	Think-Pair-Share	Interactive videos and ppt	Short test, CIA II
	2	Determination of glucose in serum, estimation of glucose in urine	2	1	K2(U) & K4(An)	Mechanism based teaching, Structure property mapping	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, Conceptual questions, CIA II
	3	Tests for salts in serum and urine. Estimation of cholesterol in serum.	2	-	K5(E)	Interactive lecture	Think-Pair-Share	Video lectures and ppt	Formative Quiz using Nearpod, CIA II

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Entrepreneurship and Skill Development

Activities: Assignment, Seminar

Assignment :

1. Methods to find food adulteration
2. Hardness of water
3. Composition of blood

Seminar:
1. Types of soaps
2. Estimation of hardness of water

Sample questions

Part A

1. What are soaps?
2. How will you prepare gum paste?
3. What is adulteration of food?
4. Define hard water.
5. What is blood grouping?

Part B

1. Differentiate between soaps and detergents.
2. Give the preparation and uses of tooth powder and moth balls.
3. What is food poisoning? How will you prevent it?
4. Explain the different types of hardness of water.
5. How will you determine glucose in serum?

Part C

1. Explain the cleansing action of soap.
2. Write the preparation and uses of a) tooth paste b) phenyl and c) chalk crayons
3. What are the various methods adopted to find the adulteration in food?
4. How will you estimate the hardness of water?
5. Explain the composition of blood.

Head of the Department: Dr. R.Gladis Latha

Course Instructor: Dr. S.Ajith Sinthuja

Department : **Chemistry**
Class : **II B.Sc Physics**
Title of the Course : **Elective Course III: Chemistry For Physical Sciences – I**
Semester : **III**
Course Code : **CU233EC1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU233EC1	4	-	-	-	3	4	60	25	75	100

Learning Objectives

1.To know co-ordination Chemistry, Water Technology and catalysis
2.To understand Carbohydrates, Amino acids and electrochemistry

Course Outcomes

On the successful completion of the course, student will be able to:		
1	write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology	**K1**
2	explain the preparation and property of carbohydrate, amino acids and nucleic acids.	**K2**
3	apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.	**K3**
3	determine the reaction rate, order of chemical reaction	**K3**
4	analyze the various type of photochemical process and catalysis.	**K4**
5	evaluate the nature of carbohydrates, reaction rates and electroplating metals	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 – Analyze, K5 - Evaluate

Teaching plan

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

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Chemical Bonding and Nuclear Chemistry**								
	1	Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals.	2	1	K2(U)	Interactive lecture, Demonstration, Problem solving	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures, Virtual lab simulations, Interactive ppt	Formative Quiz using Quizizz, Conceptual questions, CIA I
	2	Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.	2		K3(A)	Lecture with visual aids and models, Demonstration, Flipped classroom	Molecular diagram drawing practice, Group discussion.	Interactive videos and ppt	Quiz, Problem solving questions, CIA I
	3	Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers	2	1	K3(U)	Visual concept lecture, Structure based learning	Think-Pair-Share, Concept mapping	Interactive videos and ppt	Structural identification, Conceptual questions, CIA I
	4	Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations.	2		K3(A)	Model based teaching, Demonstration, Problem solving	Problem based learning, peer teaching.	Interactive videos and ppt	slip test, Problem solving questions, Group discussion, CIA I
	5	Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon	2	1	K4(An)	Visual concept lecture, Problem solving	Hands-on model building, Group discussion,	Video lectures, Virtual lab simulations,	slip test, Group discussion, CIA I

		dating, rock dating and medicinal applications.					Problem based learning	Interactive ppt	
II	**Industrial Chemistry**								
	1	Fuels: Fuel gases: Natural gas, water gas, semi water gas,	2	1	K2(U)	Conceptual lecture, Model based explanation	Think-Pair-Share, Concept mapping	Video lectures and ppt	slip test, Quick quiz using Kahoot, CIA I
	2	carbureted water gas, producer gas, CNG, LPG and oil gas	2		K2(U)	Mechanism based teaching, mind mapping	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Conceptual questions, Group discussion, CIA I
	3	Silicones: Synthesis, properties and uses of silicones.	2	1	K3(A)	Interactive lecture, Mechanism based explanation	Group discussion, Concept mapping	Interactive videos and ppt	Quiz, Group discussion, CIA I
	4	Fertilizers: Urea, ammonium sulphate, potassium nitrate,	2		K3(A)	Application based teaching, Reaction mapping,	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Short test, Conceptual questions, CIA I
	5	NPK fertilizer, superphosphate, triple superphosphate.	2		K4(An)	Interactive lecture, Structure based explanation	Think-Pair-Share, Concept mapping		Short test, CIA I
III	**Fundamental Concepts in Organic Chemistry**								
	1	Hybridization: Orbital overlap, hybridization and geometry of CH_4, C_2H_4, C_2H_2 and C_6H_6.	2	1	K4(An)	Interactive lecture, Model based explanation	Concept mapping, hands on model making	Lectures using models	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA I

	2	Electronic effects: Inductive effect and consequences on Ka and Kb of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples.	2		K3(A)	Mechanism based teaching, Problem solving	Think-Pair-Share	Interactive videos and ppt	Short test, CIA I
	3	Reaction mechanisms: Types of reactions– aromaticity (Huckel's rule)	2		K2(U)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quick quiz using Nearpod, Conceptual questions, CIA I
	4	Aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation.	2	1	K3(A)	Mechanism based teaching, Conceptual lecture,	Concept mapping, Think-Pair-Share	Interactive videos and ppt	slip test, problem based questions, CIA II
	5	Heterocyclic compounds: Preparation, properties of pyrrole and pyridine	2		K3(A)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quiz using Nearpod, short test, Conceptual questions, CIA II
IV	**Thermodynamics and Phase Equilibria**								
	1	Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes.	2	1	K2(U)	Interactive lecture, Conceptual lecture, Mechanism based teaching	Think-Pair-Share, Concept mapping	Video lectures and ppt	slip test, Quick quiz using Kahoot, CIA II

	2	Statements of first law and second law of thermodynamics. Carnot's cycle and efficiency of heat engine.	2		K3(A)	Mechanism based teaching	Iniquiry based learning	Interactive videos and ppt	Short test, CIA II
	3	Entropy and its significance. Free energy change and its importance. Conditions for spontaneity in terms of entropy and Gibbs free energy.	2		K2(U)	Conceptual lecture, Structure property mapping	Concept mapping, problem based learning	Interactive videos and ppt	Conceptual questions, CIA II
	4	Relationship between Gibbs free energy and entropy. Phase Equilibria: Phase rule - definition of terms in it	2	1	K3(A)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Slip test, CIA II
	5	Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).	2		K3(A)	Mechanism based teaching	Concept mapping	Interactive videos and ppt	Short test, CIA II
V	**Analytical Chemistry**								
	1	Introduction to qualitative and quantitative analysis. Principles of volumetric analysis.	2	1	K2(U)	Lecture with visualization, Demonstration, Flipped classroom	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, CIA II

	2	Separation and purification techniques – extraction, distillation and crystallization.	2		K4(An)	Interactive lecture, Demonstration, Problem solving	Problem based learning, Group discussion, , Peer teaching	Interactive ppt	Slip test, Problem solving, CIA II
	3	Chromatography: principle and application of column chromatography	2		K3(A)	Lecture with visualization, Demonstration	Inquiry based learning, Hands-on model building	Interactive videos and ppt	Short test, Assignment, CIA II
	4	Principle and application of paper chromatography.	2	1	K3(A)	Lecture with visualization, Demonstration	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, CIA II
	5	Principle and application of thin layer chromatography.	2		K3 (A)	Mechanism based teaching	Think-Pair-Share, Peer teaching	Interactive videos and ppt	Short test, CIA II

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Employability
Activities (Em/SD): Group Discussion on fertilizers
Assignment: Applications of radioisotopes and carbon dating (Last date to submit: 01-09-2025)

Sample Questions
Part – A (1 mark)

1. Match the following:
   a) Isotope - $_{6}C^{10}$
   b) Isobar - $_{91}Pa^{234}$
   c) Isotone - $_{1}H^{2}$
   d) Isomer - $_{2}He^{4}$
2. Producer gas is a mixture of
   d) CO and N_2 b) CO_2 and N_2 c) CO and H_2 d) Propane and butane

3. The order of reactivity of tertiary alkyl halides in the S_N1 reaction is high. Say true or false.
4. The mathematical statement of the first law of thermodynamics is

b) $\Delta E = q+w$ b) $\Delta E = q-w$ c) $\Delta E = q^2-w$ d) $\Delta E = q^2+w$

5. The adsorbent used in Column chromatography is_____.

b) Diethyl ether b) Hexane c) Chloroform d) Silica gel

Part – B (6 marks)

1. How will you apply radioisotopes in medicine.
2. Describe the synthesis and uses of silicones.
3. Define aromaticity and Huckel's rule. Give examples.
4. Illustrate simple eutectic system with an example.
5. Explain the principles and applications of column chromatography.

Part – C (12 marks)

1. Draw MO diagram of N_2 and He_2 and explain MO theory.
2. Describe the classification of the fuels.
3. Analyse the hybridization and geometry of CH_4 and C_6H_6.
4. Define entropy and write its physical significance.
5. Discuss any two techniques to separate substances from mixture.

Head of the Department- Dr. R. Gladis Latha **Course Instructor :** Dr. Sr. K. Francy

Department : Chemistry
Class : II B.Sc Physics
Title of the Course : Elective Lab Course III: Chemistry Practical For Physical Sciences - Volumetric Analysis
Semester : III
Course Code : CU233EP1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU233EP1	-	-	2	-	2	2	30	25	75	100

Learning Objectives

1.To understand the basics of preparation of solutions.
2.To understand the principles and practical experience of volumetric analysis.

Course Outcomes

On the successful completion of the course, student will be able to:		
1	understand the principles of titrimetric methods.	**K1**
2	gain knowledge on the usage of standard flask, pipette and burette.	**K2**
3	design, carry out, record and interpret the results of various titrations and apply their skill in the estimation of various compounds.	**K3**
4	analyze the suitable indicators for various titrations	**K4**
5	evaluate the end points of various titrations	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 – Analyze, K5 - Evaluate

Teaching Plan

Total Contact hours: 30(Including practical and assessment)

Unit	Topic	Practical Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I								
	VOLUMETRIC ANALYSIS **Acidimetry** 1. Estimation of sulphuric acid using standard oxalic acid. **Alkalimetry** 2. Estimation of sodium hydroxide using standard sodiumcarbonate. **Permanganometry** 3. Estimation of oxalic acid using standard ferrous sulphate. 4. Estimation of ferrous sulphate using $KMnO_4$. **Dichrometry** 5. Estimation of Ferrous Sulphate using standard dichromate 6. Estimation of Ferrous Ammonium Sulphate using standard dichromate	25	5	K3(Ap) & K4(An)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting, Model examination

	Complexometry 7. Estimation of zinc using EDTA. 8. Estimation of magnesium using EDTA.							

Head of the Department: Dr. R. Gladis Latha

Practical-in-Charge: Dr. Y.Christabel Shaji

Department : Chemistry
Class : III B.Sc Chemistry
Title of the Course : Organic Chemistry - I
Semester : V
Course Code : CU235CC1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU235CC1	5	-	-	-	4	5	75	25	75	100

Learning Objectives:

1. To understand the stereochemical concepts, chemical transformations and spectroscopic characterization of organic compounds.
2. To know the chemistry of nitro compounds, amines and heterocyclic compounds.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall the fundamental concepts of stereochemistry, nitrogen compounds, heterocyclic compounds, and spectroscopy.	**K1**
2.	explain the preparation and properties of organic compounds and interpret the principles of UV-Visible and IR spectroscopy for the identification of organic compounds.	**K2**
3.	apply the stereochemical notations, organic reaction outcomes, and spectroscopic rules to identify molecular properties.	**K3**
4.	analyze the properties, reactions and spectral data of organic compounds.	**K4**
5.	evaluate the significance of stereochemistry, synthetic methods, and spectroscopic data for understanding molecular interactions, synthesis, and structure determination.	**K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyse; **K5** - Evaluate

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Stereochemistry**								
	1	Optical Isomerism: Optical activity - elements of symmetry - specific rotation - asymmetry - enantiomers and diastereoisomers. Molecules with one and two chiral centres - lactic and tartaric acids.	2	1	K1(R) & K2(U)	Lecture with visual aids and models, Demonstration, Flipped classroom	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures, Virtual lab simulations, Interactive ppt	Formative Quiz using Quizizz, slip test, Conceptual questions, CIA I
	2	Racemisation - methods of racemization - resolution - methods of resolution. Cahn-Ingold and Prelog rules - R/S notations for one and two chiral centres.	2		K3(Ap) & K4(An)	Interactive lecture, Demonstration, Problem solving	Group discussion, Hands-on model building, Peer teaching	Interactive videos and ppt	Quiz, slip test, Problem solving, CIA I
	3	Optical activity of allenes and biphenyls. Chirality and stereochemical significance of Ayurvedic medicine - santalol - menthol and camphor	2	1	K3(Ap) & K4(An)	Visual concept lecture, Structure based learning	Think-Pair-Share, Concept mapping	Interactive videos and ppt	Slip test, Quick quiz using Kahoot, Structural identification, Conceptual questions, CIA I
	4	Projection Formula: Flying wedge, Fischer Projection, Newmann and Sawhorse representations and their interconversions.	2		K3(Ap)	Model based teaching, Demonstration, Problem solving	Molecular drawing practice, Problem based learning	Interactive videos and ppt	Quiz, slip test, Problem solving, Group discussion, CIA I

	5	**Geometrical isomerism:** Cis-trans isomerism - E/Z notations. Methods of distinguishing geometrical isomers.	2	1	K4(An)	Visual concept lecture, Rule based teaching, Demonstration, Problem solving	Hands-on model building, Group discussion, Problem based learning	Video lectures, Virtual lab simulations, Interactive ppt	Quiz, slip test, Problem solving, Group discussion, Structure sorting game, CIA I
	6	**Conformational isomerism:** Conformational analysis of ethane, butane and cyclohexane.	2		K3(Ap) & K4(An)	Lecture with visual aids and models, Demonstration, Flipped classroom	Think-Pair-Share, Concept mapping, Group discussion	Interactive videos and ppt	Formative Quiz using Quizizz, slip test, Conceptual questions, CIA I
II	**Chemistry of Nitrogen Compounds**								
	1	Nitroalkanes and nitroarenes: Preparation and chemical reactions. Pseudo acid character and nitro - aci nitro tautomerism.	2	1	K1(R) & K2(U)	Conceptual lecture, Model based explanation	Think-Pair-Share, Concept mapping	Video lectures and ppt	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
	2	**Alkyl and aryl amines:** Preparation of alkyl and aryl amines - Ritter reaction - Hofmann ammonolysis - Leuckart reaction - Ullmann reaction and Gabriel phthalimide reaction.	2		K3(Ap) & K4(An)	Mechanism based teaching, Reaction mapping, Concept mapping	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Short test, Quick quiz using Kahoot, Conceptual questions, Group discussion, CIA I
	3	Physical and chemical properties of alkyl and aryl amines. Basicity of amines.	2	2	K2(U)	Interactive lecture, Mechanism based explanation	Group discussion, Concept mapping	Interactive videos and ppt	Quiz, slip test, Group discussion, CIA I

	4	Distinction between primary, secondary and tertiary amines - Hinsberg's and Hofmann's method.	3		K3(Ap) & K4(An)	Mechanism based teaching, Reaction mapping, Concept mapping	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Short test, Conceptual questions, Group discussion, CIA I
	5	Diazonium compounds: Preparation and properties of diazomethane and benzene diazonium chloride.	3		K3(Ap) & K4(An)	Conceptual lecture, Interactive lecture, Structure based explanation	Think-Pair-Share, Concept mapping		Short test, CIA I
III	**Heterocyclic Compounds – I**								
	1	General characteristics - aromatic character and reactivity of pyrrole - furan and thiophene.	2	2	K1(R) & K2(U)	Interactive lecture, Conceptual lecture	Think-Pair-Share, Concept mapping	Video lectures and ppt	Formative Quiz using Quizizz, slip test, Quick quiz using Kahoot, Conceptual questions, CIA I
	2	**Pyrrole:** Preparation from succinimide and Paal Knorr synthesis.	2		K3(Ap)	Mechanism based teaching	Think-Pair-Share	Interactive videos and ppt	Short test, CIA I
	3	Reactions - reduction - basic character - acidic character - electrophilic substitution reactions and ring opening.	2		K3(Ap) & K4(An)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quick quiz using Nearpod, Conceptual questions, CIA I
	4	**Furan:** Preparation from mucic acid and pentosan. Reactions - hydrogenation - reaction with oxygen - Diels Alder reactions - formationof thiophene and pyrrole and electrophilic substitution reactions.	3	1	K3(Ap) & K4(An)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Formative quiz using Nearpod, slip test, Conceptual questions, CIA II

	5	**Thiophene:** Preparation from acetylene. Reactions - reduction - oxidation and electrophilic substitution reactions.	3		K3(Ap) & K4(An)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quiz using Nearpod, short test, Conceptual questions, CIA II
IV	**Heterocyclic Compounds – II**								
	1	Pyridine: Preparation from acetylene. Physical properties. Reactions - basic character - oxidation - reduction - electrophilic substitution and nucleophilic substitution reactions.	2	1	K2(U) & K3(Ap)	Interactive lecture, Conceptual lecture, Mechanism based teaching	Think-Pair-Share, Concept mapping	Video lectures and ppt	Formative Quiz using Nearpod, slip test, Quick quiz using Kahoot, Conceptual questions, CIA II
	2	Quinoline: Skraup synthesis and Friedlander's synthesis. Reactions - basic nature - reduction - oxidation -	3		K3(Ap)	Mechanism based teaching	Think-Pair-Share	Interactive videos and ppt	Short test, CIA II
	3	Electrophilic substitutions - nucleophilic substitutions and Chichibabin reaction.	2		K3(Ap) & K4(An)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Quick quiz using Socrative, Conceptual questions, CIA II
	4	Isoquinoline: Preparation from Bischler-Napieralski reaction. Reactions - reduction - oxidation and electrophilic substitution reaction.	2	2	K2(U) & K3(Ap)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Slip test, CIA II
	5	Indole: Fischer indole synthesis and reactions of indole.	3		K2(U) & K3(Ap)	Mechanism based teaching	Think-Pair-Share	Interactive videos and ppt	Short test, CIA II

V	**Spectroscopy – I**								
	1	UV-Visible spectroscopy: principle - instrumentation - types of electronic excitations - chromophore - auxochrome - bathochromic - hypsochromic - hypochromic and hyperchromic shifts.	2	2	K2(U)	Lecture with visualization, Demonstration, Flipped classroom	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, Conceptual questions, CIA II
	2	Woodward-Fieser rules to calculate λ_{max} values of conjugated dienes - α,β-unsaturated carbonyl compounds and aromatic compounds.	3		K3(Ap) & K5(E)	Interactive lecture, Demonstration, Problem solving	Problem based learning, Group discussion, Hands-on model building, Peer teaching	Interactive ppt	Quiz, slip test, Problem solving, CIA II
	3	UV-Visible spectroscopy of ancient dyes - indigo - alizarin red and curcumin.	2		K2(U)	Lecture with visualization, Flipped classroom	Inquiry based learning	Interactive videos and ppt	Short test, Assignment, CIA II
	4	**IR spectroscopy:** principle - instrumentation - Hooke's law - types of molecular vibrations - normal degrees of freedom and finger print region.	2	1	K2(U)	Lecture with visualization, Demonstration, Flipped classroom	Concept mapping	Virtual labs, Interactive ppt	Formative Quiz using Nearpod, slip test, Conceptual questions, CIA II
	5	Factors influencing the vibrational frequency. Identification of functional groups in organic compounds.	3		K2(U) & K5(E)	Mechanism based teaching	Think-Pair-Share	Interactive videos and ppt	Quick Quiz with Kahoot, Short test, CIA II

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability and Skill Development

Activities (SD): Group discussion and Problem solving on R,S nomenclature and Absorption of λ_{max} values

Assignment: UV-Visible spectroscopy of ancient dyes (Last date to submit: 01-09-2025)

Sample questions

PART A

1. Arrange the conformers of cyclohexane in the increasing order of stability. **(K2-U, CO-2)**

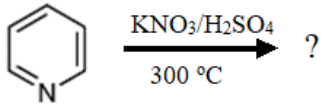
   a) Chair < Boat < Twist boat < Half-chair b) Half-chair < Boat < Twist boat < Chair

   c) Chair < Twist boat < Half-chair < Boat d) Chair < Twist boat < Boat < Half-chair

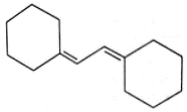
2. Carbylamine test is a diagnostic test for _____. **(K2-U, CO-2)**
3. Point out the hybridization of nitrogen in pyrrole. **(K2-U, CO-2)**

   a) sp b) sp^2 c) sp^3 d) sp^3d

4. Predict the product of the following reaction: **(K3-Ap, CO-3)**



5. Calculate the λ_{max} value of the following compound: **(K4-An, CO-4)**



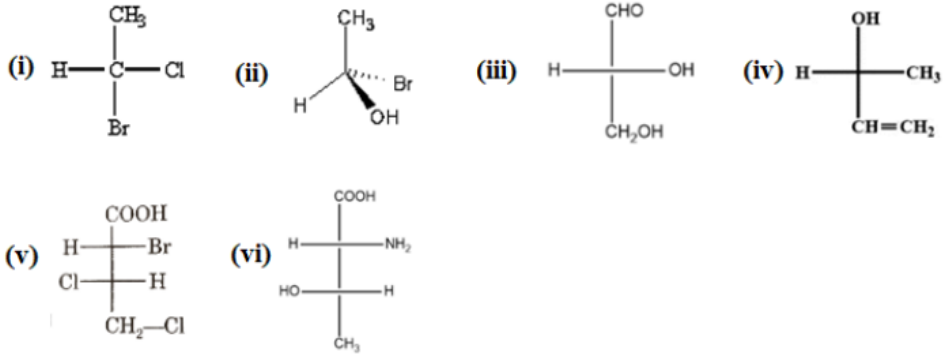
PART B

1. Biphenyls having small groups in the ortho- positions are optically inactive. Justify. **(K5-E, CO-5)**
2. How will you separate mixture of amines by Hofmann's method? **(K3-Ap, CO-3)**
3. How will you convert pyrrole to pyrrolidine, 2,5-dihydropyrrole? **(K3-Ap, CO-3)**

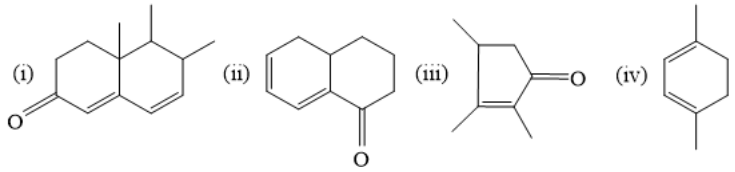
4. Prove that electrophilic substitution reaction of pyridine occurs at 3rd position. **(K5-E, CO-5)**
5. Discuss the types of molecular vibrations in IR spectroscopy. **(K2-U, CO-2)**

PART C

1. Assign R or S configuration for the following compounds: **(K4-An, CO-4)**



2. Deduce the mechanism of Ritter reaction and Hoffmann degradation. **(K4-An, CO-4)**
3. Correlate the electrophilic substitution reactions of pyrrole, furan and thiophene. **(K4-An, CO-4)**
4. Apply the mechanism of amination, arylation and halogenations on pyridine and give the nucleophilic substituted products. **(K3-Ap, CO-3)**
5. Calculate the λ_{max} for the following compounds: **(K4-An, CO-4)**



Head of the Department: Dr. R. Gladis Latha

Course Instructor: Dr. Sr. K. Francy

Department : Chemistry
Class : III B.Sc Chemistry
Title of the Course : Core Course VI : Physical Chemistry
Semester : V
Course Code : CU235CC2

Course Code	L	T	P	S	Credits	Inst. Hours	TotalHours	Marks		
								CIA	External	Total
CU235CC2	5	-	-	-	4	5	75	25	75	100

Learning Objectives:

1. To know the properties of solutions and kinetics of reactions.
2. To analyze the catalysis and point groups of compounds.

Course Outcomes

	On the successful completion of the course, students will be able to:	
1	define the basic terms in solutions, colligative properties, chemical kinetics, catalysis and adsorption	**K1**
2	understand the concepts of group theory and determine the point groups of molecules	**K2**
3	apply the concepts of chemical kinetics to predict the rate and order of the reaction and predict the effect of temperature on reaction rate	**K3**
4	analyze the colligative properties and characteristics of catalytic and photochemical reactions	**K4**
5	evaluate the rate of catalytic reactions and utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and colour perception of vision.	**K5**

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyse; **K5** – Evaluate

Teaching plan

Total Contact hours: 75 (Including lectures, assignments and tests)

Unit	Module	Topic	Teaching hours	Assessment hours	Cognitive level	Pedagogy	Student Centric Methods	E-resources	Assessment/ Evaluation
I	**Solutions and Colligative Properties**								
	1	Solutions of non-electrolytes – solutions of liquids in liquids – vapour pressure of non-ideal solutions - type I, type II and type III.	2	1	K1(R)	Lecture method	Think – pair - share	Lecture with videos	Oral test
	2	Vapour pressure - composition and boiling point - composition curves of completely miscible binary solutions - type I, type II and type III.	2		K2(U)	Interactive lecture	Inquiry based learning	Lecture with Ppt	Slip test , quiz – Nearpod and CIA I
	3	Theory of fractional, azeotropic and steam distillations/ Solubility of partially miscible liquids - phenol-water system, triethylamine – water system and nicotine water system.	2	1	K2(U)& K3(Ap)	Lecture with illustration	Formulating discussions	Lecture with ppt and videos	Short test & Assignment - I
	4	Colligative properties – definition and examples. Osmotic pressure, Laws of osmotic	2		K2(U)& K4(An)	Problem solving	Problem based learning	Lecture with videos	Quiz – Mentimeter and slip test

		pressure /van't Hoff theory of dilute solutions - isotonic solution.							
	5	Elevation of boiling point - molol boiling point elevation constant or ebullioscopic constant - determination of molar mass from elevation of boiling point.	2	1	K2(U) & K3(Ap)	Heuristic teaching	Active learning	Lecture with ppt and videos	Quiz - Quizizz and slip test
	6	Depression of freezing point - molol freezing point depression constant or cryoscopic constant - determination of molar mass by depression of freezing point. Abnormal results and van't Hoff factor.	2		K2(U)& K5(E)	Solving problem method	Problem based learning	Lecture with videos	Quiz - Quizizz , slip test and Formative assessment - I
II	**Chemical kinetics**								
	1	Rate of reaction – expression of rate – factors influencing rate of reaction – order and molecularity - definition and examples – differences between order and molecularity–zero, first and second order reaction – definition- examples.	3	1	K2(U)	Lecturing	Live demonstration of concepts	Videos and ppt	Quiz - Slido
	2	Derivation of rate constant and half life period. Methods of determining order of reaction –differential,	2		K2(U)	Problem solving	Solving complex problems	Video lessons	Quiz - Nearpod

		integral, half-life and Ostwald's isolation methods.							
	3	Temperature dependence of reaction rates (Arrhenius equation) –significance – temperature coefficient – energy of activation – effect of catalyst	3	1	K2(U) & K4(An)	Blended teaching	Self directed learning	Videos and ppt	Quiz – Slido and Formative assessment - I
	4	Calculation of energy of activation– theories of reaction rates – collision theory of bimolecular gaseous reactions, activated complex theory	2	1	K3(Ap) & K4(An)	Problem solving method	Solving complex problems	Lecture with videos	Slip test
	5	Comparison of collision theory and activated complex theory. Lindeman's theory of unimolecular reactions	2		K3(Ap)	Reflective pedagogical approach	Concept learning	Lecture lessons	Quiz – Mentimeter and Assignment - II
III	**Catalysis and Adsorption**								
	1	Catalysis- characteristics- different types - homogeneous, heterogeneous, acid-base catalysis and auto catalysis	2	1	K1(R)	Lecture method	Concept mapping	Lecture with ppt and videos	Group discussion
	2	Catalysis-theories of catalysis-intermediate compound formation theory and adsorption theory	2		K4 (An)	Lecture with illustration	Collaborative learning	Lecture with illustrations	Slip test and Formative assessment - II

	3	Kinetics of enzyme catalysis –Michaelis-Menten equation - derivation– applications of catalysis.	2	1	K1(R) & K4 (An)	Flipped classroom	Inquiry based learning	Lecture lessons	Group discussion
	4	Adsorption – definition- physisorption and chemisorption – differences – factors influencing adsorption of gases on solids	2		K1(R) & K4 (An)	Interactive lecture	Think- pair-share	Interactive videos and ppt	Quiz – Mentimeter and Formative assessment - II
	5	Adsorption isotherms –types - Freundlich and Langmuir monolayer adsorption isotherms	2	1	K4 (An)	Concept based teaching	Concept mapping	Lecture with ppt and videos	Quiz – google forms
	6	Gibbs adsorption isotherm - BET theory of multilayer adsorption – applications of adsorption . Adsorption indicators.	2		K1(R) & K4 (An)	Mechanism based teaching	Group discussion	Lecture lessons	Class test
IV	**Group theory**								
	1	Symmetry elements and symmetry operations – definition of identity (E), proper rotational axis (n) – mirror plane (σ) – inversion centre (i) and rotation reflection axis (Sn).	3	1	K2 (U)	Lecture with models	Inquiry based learning	Lecture lessons	Quiz - Nearpod

	2	Symmetry operations generated by symmetry elements- H_2O, NH_3, BF_3, $[PtCl_4]^{2-}$, H_2O_2 (cis and trans) and CH 4 as examples.	2		K2(U) & K5 (E)	Interactive lecture	Blended learning, Group discussion	Lecture with ppt	Group discussion and assignment II - Google classroom
	3	Matrix representation of symmetry operations. Comparison of molecular and crystallographic symmetry.	3	1	K2(U)	Structure based teaching	Reflective learning	Lecture with ppt and videos	MCQ - Mentimeter
	4	Group postulates – abelian and cyclic groups – group multiplication table	2		K2(U) & K5 (E)	Model based teaching & Structure based teaching	Collaborative learning	Lecture with ppt	Short test
	5	Molecular point groups – Point group assignment to simple molecules like H_2, HCl, CO, H_2O, NH_3 and CO_2. Determination of point groups.	2	1	K5 (E)	Lecture with ppt	Think-pair-share, Group discussion	Lecture with ppt and videos	Quiz - Kahoot and slip test
V	**Photochemistry**								
	1	Laws of photo chemistry – Lambert – Beer, Grothus – Draper and Stark – Einstein. Quantum efficiency. Photochemical reactions	2	1	K4 (An)	Lecture method	Concept mapping	Lecture lessons	MCQ - mentimeter

	2	rate law – Kinetics of H_2-Cl_2, H_2-Br_2 and H_2-I_2 reactions, comparison between thermal and photochemical reactions.	3		K4 (An)	Mechanism based teaching	Reflective learning	Lecture with video and ppt	Quiz – google forms
	3	Fluorescence – applications including fluorimetry – sensitised fluorescence, phosphorescence – applications	3	1	K5 (E)	Teaching with concepts	Concept mapping	Lecture lessons	Group discussion
	4	chemiluminescence and photosensitisation – examples	2		K4(An) & K5 (E)	Blended teaching	Self directed learning	Video lecture	Quiz – mentimeter
	5	Chemistry of Vision – 11 cis retinal – vitamin A as a precursor - colour perception of vision. (Problems wherever necessary).	2	1	K4(An) & K5 (E)	Lecture with illustration	Collaborative learning	Lecture with ppt and Videos	Slip test

Course Focusing on Employability/ Entrepreneurship/ Skill Development: Employability

Activities (Em):

Temperature coefficient and energy of activation - Group discussion.

Catalysis and its characteristics - Group discussion.

Symmetry elements and symmetry operations - Group discussion.

Assignment:

1. Theory of fractional azeotropic and steam distillations – Assignment
2. Comparison of collision theory and activated complex theory – Assignment.

Sample questions

Part - A

1. When the rate of the reaction is equal to the rate constant, the order of the reaction is

a) zero order b) first order c) second order d) third order

2. Which one of the following is an example of adsorption?

a) ammonia in contact with water b) anhydrous $CaCl_2$ with water

c) silica gel in contact with water vapours d) all the above

3.Which of the following is not a colligative property?

a) Surface tension b) Osmotic pressure

c) Vapour pressure depression d) Boiling point elevation

4. Water molecule is an abelian group. Say True or False.?

5. The quantum yield of photochemical decomposition of HI is ----------

a) 1 b) 0 c) 2 d) 3

Part - B

1. Discuss the factors influencing the rate of the reaction.
2. Differentiate between physisorption and chemisorption.
3. How will you determine the molar mass from elevation of boiling point?
4. Compare molecular and crystallographic symmetry.
5. Discuss the kinetics of photochemical decomposition of hydrogen iodide

Part - C

1. Derive Arrhenius equation and write its significances.
2. Derive Michaelis-Menten equation.
3. What is depression of freezing point? How will you determine the molar mass by depression of freezing point?
4. Explain the symmetry elements of

a) CH_4 b) H_2O c) BF_3

5. Derive the quantum yield of the photochemical combination of hydrogen and chlorine.

Head of the Department: Dr. R. Gladis Latha **Course Instructor:** Dr. M. Anitha Malbi

Department : **Chemistry**
Class : **III B.Sc Chemistry**
Title of the Course : **Core Lab Course V: Physical Chemistry Practical - II**
Semester : **V**
Course Code : **CU235CP1**

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								Internal	External	Total
CU235CP1	-	-	5	-	4	5	75	-	75	100

Learning Objectives

1. To understand the basic concepts and principles of phase rule, chemical kinetics, molecular weight determination, adsorption and chromatography.
2. To determine the eutectic temperature, concentration, rate constant, molecular weight and adsorption isotherm of compounds.

Course Outcomes

On the successful completion of the course, students will be able to:		
1.	recall the theoretical concepts of physical chemistry.	**K1**
2.	explain the methodology for determining the physical constants and concentration of compounds.	**K2**
3.	apply the principles of phase rule, chemical kinetics, molecular weight determination, adsorption and chromatographic techniques for various experiments.	**K3**
4.	analyze the composition, rate constant and concentration of unknown solutions.	**K4**
5.	evaluate the physical and chemical parameters of compounds.	**K5**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** - Analyse; **K5-** Evaluate

Teaching plan
Total Contact hours: 75 (Including practical and assessment)

Unit	Topic	Practical Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Phase diagrams** 1. Determination of eutectic temperature and composition of naphthalene-diphenyl system. 2. Determination of Critical Solution Temperature (CST) of Phenol-Water system and determination of the concentration of the unknown NaCl solution.	18	2	K1(R) & K4(An)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting, Model examination
II	**Chemical Kinetics** 3. Determination of rate constant of acid catalyzed hydrolysis of an ester (methyl acetate). 4. Determination of order of reaction between iodide and persulphate (initial rate method). 5. Polarimetry: Determination of rate constant of acid catalyzed inversion of cane sugar	18	2	K3(Ap) & K4(An)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting, Model examination

III	**Molecular weight** 6. Determination of molecular weight by Rast macro method. 7. Determination of molecular weight by transition temperature method	18	2	K2(U) & K4(An)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting, Model examination
IV	**Adsorption** 1. Construction of Freundlich isotherm for the adsorption of acetic acid on activated charcoal 2. Chromatography (Course work) 3. Column chromatography 4. Thin Layer Chromatography	14	1	K3(Ap) & K5(E)	Demonstration	Experiential and lab based learning	Simulations and Virtual Labs	Performance, Observation, Reporting, Model examination

Head of the Department: Dr. R.Gladis Latha

Course Instructor- Dr.S.Ajith Sinthuja

Department : Chemistry
Class : III B.Sc. Chemistry
Title of the Course : Discipline Specific Elective-Inorganic Chemistry-I
Semester : V
Course Code : CU235DE1

Course Code	L	T	P	S	Credits	Inst. Hours	Total Hours	Marks		
								CIA	External	Total
CU235DE1	4	–	–	–	3	4	60	25	75	100

Learning Objectives:

1. To gain basic knowledge on nomenclature, isomerism, structure and applications of coordination complexes.
2. To recognize the importance of metalloenzymes, inorganic polymers and inner transition elements

Course Outcomes

On the successful completion of the course, student will be able to:		
1.	know the principles, characteristics, classification and applications of coordination chemistry, organometallic compounds, metalloenzymes and inorganic polymers	**K1**
2.	explain the principles, characteristics, classification, and applications of coordination chemistry, organometallic compounds, metalloenzymes and inorganic polymers	**K2**
3.	apply inorganic substances in scientific and industrial contexts.	**K3**
4.	analyze the chemistry and characteristics of coordination compounds, organometallic compounds, metalloenzymes, and inorganic polymers	**K4**
5.	assess properties of inorganic compounds	**K5**

K1 - Remember; **K2** - Understand; **K3**- Apply; **K4** - Analyse; **K5-** Evaluate

Teaching plan

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

Unit	Module	Topic	Teaching Hours	Assessment Hours	Cognitive level	Pedagogy	Student Centric Method	E-Resources	Assessment/ Evaluation Methods
I	**Co-ordination Chemistry – I**								
	1	IUPAC Nomenclature of coordination compounds, Isomerism in coordination compounds.	2	1	K1(R) & K3 (Ap)	Lecture with Visual Aids such as ppt	Inquiry-Based Learning, Peer Teaching,	PPT, E-Notes	Formative Quiz slip test, Conceptual questions, CIA I
	2	Werner's coordination theory – effective atomic number –interpretation of geometry and magnetic properties by Pauling's theory	2		K2(U)	Visual Lecture,Mini-Lecture Segments	Problem-Solving	Video Lecture	Quiz, slip test, Problem solving, CIA I
	3	Chelates – types of ligands forming chelates – stability of chelates, applications of chelates in qualitative and quantitative analysis–	2	1	K3(Ap)	Lecture with visualization, Concept-based discussion	Collaborative Learning, Concept Mapping	Interactive videos and ppt	Slip test, Conceptual questions, CIA I

	4	Application of DMG and oxine in gravimetric analysis – estimation of hardness of water using EDTA, metal ion indicators.	2	1	K3(Ap)	Lecture with ppt	Participatory learning	Video lectures, Virtual lab simulations, Interactive ppt	Group discussion, CIA I
	5	Role of metal chelates in living systems – haemoglobin and chlorophyll	1		K4(An)	Lecture with ppt	Peer Learning,	Interactive videos and ppt	Quiz, slip test, Group discussion, CIA I
II	**Co-ordination Chemistry – II**								
	1	Crystal field theory – Crystal field splitting of energy levels in octahedral and tetrahedral complexes,	2	1	K1(R) & K3(Ap)	Demonstration -based Learning: Simulations, Concept Mapping	Peer Instruction, Blended Learning	NPTEL Lectures, Simulations, YouTube Lectures	Formative Quiz, slip test, Conceptual questions, CIA I
	2	Crystal field stabilization energy (CFSE), spectrochemical series - calculation of CFSE in octahedral and tetrahedral complexes	2		K2(U)	Interactive lecture, Demonstration , Problem solving	Group discussion, Peer teaching	Interactive videos and ppt	Short test, Conceptual questions, Group discussion, CIA I
	3	Factors influencing the magnitude of crystal field splitting, crystal	2	1	K3(Ap)	Visual concept lecture,	Think-Pair-Share,	Interactive videos and ppt	Quiz, slip test, Group

		field effect on ionic radii, lattice energies				Structure based learning	Concept mapping		discussion, CIA I
	4	Interpretation of magnetic properties, - Jahn – Teller effect. Stability of complexes in aqueous solution	2		K3(Ap)	Model based teaching, Demonstration, Problem solving	Participatory learning	Interactive videos and ppt	Short test, Conceptual questions, Group discussion, CIA I
	5	Stability constants- factors affecting the stability of a complex ion, thermodynamic and kinetic stability (elementary idea). Comparison of VBT and CFT.	1	1	K4(An)	Visual concept lecture, Demonstration, Problem solving	Hands-on model building, Group discussion, Problem based learning	Video lectures, Virtual lab simulations, Interactive ppt	Short test, CIA I
III	**Organometallic compounds**								
	1	**Metal Carbonyls :** Mono and polynuclear carbonyls, General methods of preparation	2	1	K1(R) & K3 (Ap)	Interactive lecture, Demonstration, Problem solving	Group discussion, Hands-on model building, Peer teaching	Interactive videos and ppt	Formative Quiz, slip test, Conceptual questions, CIA I
	2	Properties of carbonyls - structure and bonding in carbonyls of Ni, Fe, Cr, Co, Mn, Ru and Os.	2		K2(U)	Visual concept lecture, Structure based learning	Think-Pair-Share, Concept mapping	Interactive videos and ppt	Short test, Conceptual questions, Group discussion, CIA I

	3	EAN rule as applied to metal carbonyls. Spectroscopic methods of characterization of metal carbonyls.	2	1	K3(Ap)	Model based teaching, Demonstration, Problem solving	Molecular drawing practice, Problem based learning	Interactive videos and ppt	Quiz, slip test, Group discussion, CIA I
	4	Applications of metal carbonyls in industry and as catalyst	2		K3(Ap)	Visual concept lecture, Rule based teaching, Demonstration, Problem solving	Hands-on model building, Group discussion, Problem based learning	Video lectures, Virtual lab simulations, Interactive ppt	Short test, Conceptual questions, Group discussion, CIA I
	5	Ferrocene-Methods of preparation, physical and chemical properties.	1	1	K4(An)	Interactive lecture, Demonstration, Problem solving	Group discussion, Hands-on model building, Peer teaching	Interactive videos and ppt	Short test, CIA I
IV	**Metallo enzymes**								
	1	Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond;	2	2	K1(R) & K3 (Ap)	Conceptual lecture, Model based explanation	Think-Pair-Share, Concept mapping	Video lectures and ppt	Formative Quiz, slip test, Conceptual questions, CIA II

	2	Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses	2		K2(U)	Mechanism based teaching, Reaction mapping, Concept mapping	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Short test, CIA II
	3	Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase	2		K3(Ap)	Interactive lecture, Mechanism based explanation	Group discussion, Concept mapping	Interactive videos and ppt	Conceptual questions, CIA II
	4	Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur cluster enzymes.	2	1	K3(Ap)	Mechanism based teaching, Reaction mapping, Concept mapping	Problem based learning, Think-Pair-Share, Concept mapping	Video lectures and ppt	Slip test, CIA II
	5	Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.	1		K4(An)	Conceptual lecture, Interactive lecture, Structure based explanation	Think-Pair-Share, Concept mapping		Short test, CIA II
V	**Inorganic polymers**								
	1	General properties – classification of inorganic polymers	2	2	K1(R)	Interactive lecture,	Think-Pair-Share,	Video lectures and ppt	Formative Quiz , slip test, Conceptual

		based on element in the backbone (Si, S, B and P)				Conceptual lecture	Concept mapping		questions, CIA II
	2	Preparation and properties of silicones (polydimethylsiloxane and polymethylhydrosiloxane)	2		K2(U)	Mechanism based teaching	Think-Pair-Share	Interactive videos and ppt	Quiz, slip test, Problem solving, CIA II
	3	Sulphur based polymer (polysulfide and polymeric sulphur nitride),	2		K3(Ap)	Conceptual lecture, Structure property mapping	Concept mapping, Group discussion	Interactive videos and ppt	Short test, Assignment, CIA II
	4	Sulphur based polymer (polysulfide and polymeric sulphur nitride),	2	1	K3(Ap)	Mechanism based teaching, Conceptual lecture, Structure property mapping	Concept mapping, Think-Pair-Share	Interactive videos and ppt	Formative Quiz, slip test, Conceptual questions, CIA II
	5	Boron based polymers (borazine polymers) – industrial applications of inorganic polymers	1		K4(An)	Interactive lecture, Conceptual lecture	Think-Pair-Share, Concept mapping	Video lectures and ppt	Quiz, Short test, CIA I

Course Focussing on Employability/ Entrepreneurship/ Skill Development: Employability

Activities (Em / En /SD): Group discussion and Problem solving

Assignment: Inorganic Polymers(Last date to submit: 01-09-2025)

Sample questions

Part A (1 mark)

1. Co-ordination theory is proposed by ----------. **(K1-R, CO-1)**

   a) Werner b)Aristotle c) Lavoisier d) Plato

2. Jahn Teller effect explains the stability of complexes. State True/False.(**K2-U, CO-2)**
3. Iron penta carbonyl is an example of ---------. **(K1-R, CO-1**)

   a) mono nuclear carbonyl b) ligand c) polarized waves d) unpolarized waves

4. Cyanocobalamin is an example for ----------**(K4-An,CO-4)**

5. Silicones are----------. (**K5-E, CO4)**

   a) Inorganic polymers b) polymers c) organic compounds d) biopolymers

Part B (6 marks)

1. Give the postulates of Werner's coordination theory. **(K1-R, CO-1)**
2. Account for Jahn Teller effect. **(K2-U, CO-2)**
3. Explain the structure and bonding in Ni(CO)4 (**K3-Ap,CO-3)**
4. Write the structure of vitamin B12. **(K4-An, CO-4)**
5. Give the preparation and properties of silicones. **(K5-E, CO-5)**

Part C (12 marks)

1. Explain the role of metal chelates in living systems.. (**K1-R, CO-1)**
2. Calculate the CFSE in octahedral and tetrahedral complexes. **(K3-Ap, CO-3)**
3. Give an account on the preparation and properties of ferrocene.**(K2-U, CO-2)**
4. Explain Invivo and Invitro nitrogen fixation**(K3-Ap, CO-3)**
5. Outline the industrial applications of inorganic polymers**(K4-An, CO-4)**

Head of the Department : Dr.R.Gladis Latha

Course Instructor: Dr.R.Gladis Latha