



LOYOLA COLLEGE OF ARTS AND SCIENCE (Co-Ed.)

(Affiliated to Periyar University – Salem)
Accredited by NAAC with 'B' Grade (1 Cycle)
Recognised under section 2(f) of the UGC Act 1956
Mettala, Oilpatty Village,
Rasipuram Taluk, Namakkal District – 636202.

Department of Chemistry

LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME	
Programme:	B.Sc. CHEMISTRY
Programme Code:	
Duration:	3 years [UG]
Programme Outcomes:	<p>PO1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.</p> <p>PO2: Communication Skills: Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.</p> <p>PO3: Critical thinking: Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.</p> <p>PO4: Problem solving: Capacity to extrapolate from what one has learned and applies their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.</p> <p>PO5: Analytical reasoning: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.</p>





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<p>PO6: Research-related skills: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.</p>
<p>PO7: Cooperation/Teamwork: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.</p>
<p>PO8: Scientific reasoning: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.</p>
<p>PO9: Reflective thinking: Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.</p>
<p>PO10: Information/digital literacy: Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.</p>
<p>PO11: Self-directed learning: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.</p>
<p>PO12: Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.</p>
<p>PO13: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.</p>





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	<p>PO14: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p>PO15: Lifelong learning: Ability to acquire knowledge and skills, including learning how to learn, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p>
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Programme Specific Outcomes:	<p>On successful completion of Bachelor of Chemistry programme, the student should be able to:</p> <p>PSO1: Disciplinary Knowledge: Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.</p> <p>PSO2: Critical Thinking: Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions, and communicate effectively.</p> <p>PSO3: Problem Solving: Employ theoretical concepts and critical reasoning ability with physical, mathematical, and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.</p> <p>PSO4: Analytical & Scientific Reasoning: Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.</p> <p>PSO5: Research related skills: Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.</p>
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Paper Code	Paper Title	Course Outcomes	
23UCHCC01	GENERAL CHEMISTRY-I	CO1	Explain the atomic structure, wave particle duality of matter, periodic properties bonding, and properties of compounds.
		CO2	Classify the elements in the periodic table, types of bonds, reaction

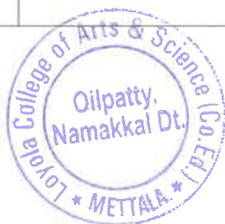




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			intermediates electronic effects in organic compounds. types of reagents.
		CO3	Apply the theories of atomic structure. bonding. to calculate energy of a spectral transition. Δx , Δp electro negativity. percentage ionic character and bond order.
		CO4	Evaluate the relationship existing between electronic configuration. bonding. geometry of molecules and reactions: structure reactivity and electronic effects
		CO5	Construct MO diagrams. predict trends in periodic properties. assess the properties of elements. and explain hybridization in molecules. nature of H – bonding and organic reaction mechanisms.
23UCHCC02	QUANTITATIVE INORGANIC ESTIMATIONS (TITRIMETRY) AND INORGANIC PREPARATIONS	CO1	Explain the basic principles involved in titrimetric analysis and inorganic preparations.
		CO2	Compare the methodologies of different titrimetric analysis.
		CO3	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.
		CO4	Assess the yield of different inorganic preparations and identify the end point of various titrations.
23UCHCC03	GENERAL CHEMISTRY - II	CO1	Explain the concept of acids. bases and ionic equilibria: periodic properties of s and p block elements. preparation and properties of aliphatic and aromatic hydrocarbons.
		CO2	Discuss the periodic properties of sand p- block elements. reactions of aliphatic and aromatic hydrocarbons and strength of acids

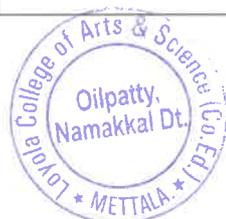




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		CO3	Classify hydrocarbons, types of reactions, acids and bases, examine the properties s and p-block elements, reaction mechanisms of aliphatic and aromatic hydrocarbons
		CO4	Explain theories of acids, bases and indicators, buffer action and important compounds of s-block elements
		CO5	Assess the application of hard and soft acids indicators, buffers, compounds of s and p block elements and hydrocarbons
23UCHCC04	QUALITATIVE ORGANIC ANALYSIS AND PREPARATION OF ORGANIC COMPOUNDS	CO1	Observe the physical state, odour, colour and solubility of the given organic compound.
		CO2	Identify the presence of special elements and functional group in an unknown organic compound performing a systematic analysis.
		CO3	Compare mono and dicarboxylic acids, primary, secondary and tertiary amines, mono and diamides, mono and polyhydric phenols, aldehyde and ketone, reducing and nonreducing sugars and explain the reactions behind it.
		CO4	Exhibit a solid derivative with respect to the identified functional group.
23UCHSE03	COSMETICS AND PERSONAL CARE PRODUCTS	CO1	know about the composition of various cosmetic products.
		CO2	Understand chemical aspects and applications of hair care and dental care and skin care products.
		CO3	Understand chemical aspects and applications of perfumes and skin care products.
		CO4	To understand the methods of beauty treatments their advantages and disadvantage
		CO5	Understand the hazards of cosmetic





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			products.
23UCHCC05	GENERAL CHEMISTRY - III	CO1	Explain the kinetic properties of gases by using mathematical concepts.
		CO2	Describe the physical properties of liquid and solids; identify various types of crystals with respect to its packing and apply the XRD method for crystal structure determinations.
		CO3	Investigate the radioactivity, nuclear energy and its production, also the nuclear waste management.
		CO4	Write the nomenclature, physical & chemical properties and basic mechanisms of halo-organic compounds and alcohols.
		CO5	Investigate the named organic reactions related to phenol; explain the preparation and properties of aromatic alcohol including thiol.
23UCHCC06	QUALITATIVE INORGANIC ANALYSIS	CO1	Acquire knowledge on the systematic analysis of Mixture of salts.
		CO2	Identify the cations and anions in the unknown substance.
		CO3	Identify the cations and anions in the soil and water and to test the quality of water.
		CO4	Assess the role of common ion effect and solubility product
23UCHCC08	PHYSICAL CHEMISTRY PRACTICAL – I	CO1	Describe the principles and methodology for the practical work.
		CO2	Explain the procedure, data and methodology for the practical work.
		CO3	Apply the principles of electrochemistry, kinetics for carrying out the practical work.
		CO4	Demonstrate laboratory skills for safe handling of the equipment and chemicals.
23UCHSE06	INSTRUMENTAL METHODS OF	CO1	Apply error analysis in the calibration and use of analytical instruments, explain theory, instrumentation and





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	CHEMICAL ANALYSIS		application of flame photometry and Atomic Absorption spectrometry.
		CO2	Explain theory, instrumentation and application of UV visible and Infrared spectroscopy.
		CO3	Able to discuss instrumentation, theory and applications of thermal and electrochemical techniques.
		CO4	Explain the use of chromatographic techniques in the separation and identification of mixtures.
		CO5	Explain preparation of solutions, stoichiometric calculations.
23UCHCC09	ORGANIC CHEMISTRY - I	CO1	Assign RS notations to chiral and EZ notations to olefins and explain conformations of ethane and butane.
		CO2	Explain preparation and properties of aromatic and aliphatic nitro compounds and amines.
		CO3	Explain colour and constitution of dyes and food additives.
		CO4	Discuss preparation and properties of five membered heterocycles like pyrrole, furan and thiophene.
		CO5	Discuss preparation and properties of six membered heterocycles like pyridine, quinoline and isoquinoline.
23UCHCC10	INORGANIC CHEMISTRY - I	CO1	Explain isomerism, Werner's Theory and stability of chelate complexes.
		CO2	Discuss crystal field theory, magnetic properties and spectral properties of complexes.
		CO3	Explain preparation and properties of metal carbonyls
		CO4	Give a comparative account of the characteristics of lanthanoids and actinoids
		CO5	Explain properties and uses of inorganic polymers of silicon, sulphur, boron and phosphorous





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23UCHCC11	PHYSICAL CHEMISTRY - I	CO1	Explain Gibbs and Helmholtz free energy functions, partial molar quantities and Ellingham's.
		CO2	Apply the concepts of chemical kinetics to predict the rate of the reaction and order of the reaction, demonstrate the effect of temperature on reaction rate, and the significance of free energy and entropy of activation.
		CO3	Compare chemical and physical adsorption, Freundlich and Langmuir adsorption isotherms, and differentiate between homogenous and heterogeneous catalysis.
		CO4	Demonstrate the types and characteristics of colloids, preparation of sols and emulsions, and determine the molecular weights of macromolecules.
		CO5	Utilize the concepts of photochemistry in fluorescence, phosphorescence, chemiluminescence and color perception of vision
23UCHEC05	BIOCHEMISTRY	CO1	Explain molecular logic of living organisms, composition of blood and blood coagulation.
		CO2	Explain synthesis and properties of amino acids, determination of structure of peptides and proteins.
		CO3	Explain factors influencing enzyme activity and vitamins as coenzymes
		CO4	Explain RNA and DNA structure and functions.
		CO5	Explain biological significance of simple and compound lipids.
23UCHEC06	INDUSTRIAL CHEMISTRY	CO1	Summarize the properties of fuels which include petroleum, water gas, natural gas and propellants.
		CO2	Evaluate cosmetic products, soaps.





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			detergents.
		CO3	Explain manufacture of sugar, food spoilages and food additives.
		CO4	Explain . properties of abrasives, manufacture of leather and paper.
		CO5	Explain properties and manufacture of lubricants and cement. and intellectual property rights.
23UCHCC12	PHYSICAL CHEMISTRY PRACTICAL – II	CO1	Describe the principles and methodology for the practical work.
		CO2	Explain the procedure, data and methodology for the practical work.
		CO3	Apply the principles of phase rule and electrochemistry for carrying out the practical work.
		CO4	Demonstrate laboratory skills for safe handling of the equipment and chemicals.
23UCHCC14	ORGANIC CHEMISTRY - II	CO1	Explain isolation and properties of alkaloids and terpenes.
		CO2	Explain preparation and reactions of mono and disaccharides.
		CO3	Classify biomolecules and natural products based on their structure, properties, reactions and uses.
		CO4	Explain molecular rearrangements like benzidine, Hoffmann etc..
		CO5	Preparation and properties of organolithium compounds.
23UCHCC15	INORGANIC CHEMISTRY – II	CO1	Ability to explain the importance of tracer elements on biological system.
		CO2	Explain the metal ion transport, Bohr effect, Na, K, Ca pump.
		CO3	Explain the function of Vitamin B12, Zn-Cu enzyme, ferredoxin, cluster enzymes.
		CO4	Classification and structure of silicates.
		CO5	Explain the manufacture of refractories, explosives, paints and pigments.





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23UCHCC16	PHYSICAL CHEMISTRY- II	CO1	Construct the phase diagram for one component and two component systems. explain the properties of freezing mixture. component with congruent melting points and solid solutions.
		CO2	Apply the concepts of chemical equilibrium in dissociation of PCl_5 , N_2O_4 and formation of HI , NH_3 , SO_3 and decomposition of calcium carbonate. Demonstrate important principles such as Le chatelier principle, van't Hoff reaction isotherm and Clausius-Clayperon equation.
		CO3	Identify an appropriate distillation method for the separation of binary liquid mixtures such as azeotropic mixtures, partially miscible mixtures and immiscible liquids.
		CO4	Explain the significance of Arrhenius theory, Debye-Huckel theory, Onsager equation and Kohlrausch's law in conductance.
		CO5	Construct electrochemical cell with the help of electrochemical series and calculate cell EMF. Demonstrate the applications of EMF and significance of potentiometric titrations.
23UCHCC17	GRAVIMETRIC ESTIMATION PRACTICAL	CO1	Describe the principles and methodology for the practical work.
		CO2	Explain the procedure, data and methodology for the practical work.
		CO3	Apply the principles for carrying out the practical work
		CO4	Demonstrate laboratory skills for safe handling of the equipment and chemicals.
23UCHEC07	FUNDAMENTALS OF SPECTROSCOPY	CO1	Explain electrical and magnetic properties of materials and microwave spectroscopy.
		CO2	Explain theory, instrumentation and applications of Infrared and Raman





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			spectroscopy.
		CO3	Apply selection rules to understand spectral transitions. explain Woodward – Fieser's rule for the calculation of wavelength maximum of conjugated dienes.
		CO4	Explain theory, instrumentation and applications of NMR spectroscopy.
		CO5	Explain theory, instrumentation and applications of Mass spectrometry.
23UCHEC08A	NANO SCIENCE	CO1	Explain the general concepts and physical phenomena of relevance within the field of nanoscience.
		CO2	Describe the properties, synthesis, characteristics of nanomaterials, special nanomaterials and applications.
		CO3	Examine the structure, properties, applicability and characterization of nanomaterials.
		CO4	Analyze various synthesis procedures, characterizations and uses of carbon nanotubes, fullerene and graphene.
		CO5	Discuss applications of nanomaterials of sensors and in optics and electronics.
23UCHGE01A	CHEMISTRY FOR PHYSICAL SCIENCES - I	CO1	Gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.
		CO2	Evaluate the efficiencies and uses of various fuels and fertilizers.
		CO3	Explain the type of hybridization, electronic effect and mechanism involved in the organic reactions.
		CO4	Apply various thermodynamic principles, systems and phase rule.
		CO5	Explain various methods to identify an appropriate method for the separation of chemical components.





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23UCHGE02A	CHEMISTRY FOR PHYSICAL SCIENCES - II	CO1	Write the IUPAC name for complex, different theories to explain the bonding in coordination compounds and water technology.
		CO2	Explain the preparation and property of carbohydrate, amino acids and nucleic acids.
		CO3	Apply / demonstrate the electrochemistry principles in corrosion, electroplating and fuel cells.
		CO4	Identify the reaction rate, order for chemical reaction and explain the purpose of a catalyst.
		CO5	outline the various type of photochemical process.
23UCHGE03	CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES - I	CO1	Gain an understanding of the use of standard flask and volumetric pipettes, burette.
		CO2	Design, carry out, record and interpret the results of volumetric titration.
		CO3	Apply their skill in the analysis of water/hardness.
		CO4	Analyze the chemical constituents in allied chemical products.
23UCHGE04	CHEMISTRY PRACTICAL FOR PHYSICAL AND BIOLOGICAL SCIENCES - II	CO1	CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.
		CO2	Design, carry out, record and interpret the results of volumetric titration.
		CO3	Apply their skill in the analysis of water/hardness.
		CO4	Analyze the chemical constituents in allied chemical products.





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DEPARTMENT OF CHEMISTRY

PROGRAMME SPECIFIC OUTCOMES

On successful completion of the programme the students will be able to

- PSO1:** Acquire in-depth knowledge of the fundamental concepts in all disciplines of chemistry.
- PSO2:** Disseminate the basics of chemistry and advanced topics and analytical skills in organic, inorganic and physical chemistry.
- PSO3:** Uphold ethical values in personal life, research and career.
- PSO4:** Demonstrate laboratory skills, analytical acumen, creatively in academics and research.
- PSO5:** Apply digital tools to collect, analyse and interpret data and presents scientific findings.
- PSO6:** Gain competence to pursue higher education and career opportunities in chemistry and allied fields.
- PSO7:** Exhibit leadership qualities to work individually and within a team in organizing curricular, co-curricular and extracurricular activities.
- PSO8:** Apply the concepts of chemistry to solve problems in the community, entrepreneurial and research pursuits.
- PSO9:** Exhibit competence in educational, industrial and research pursuits that contribute towards the holistic development of self and community.
- PSO10:** Display proactive approach towards sustainable environment through green laboratory practices.



J. Lovelace Princy
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