

B.Sc (P) LIFE SCIENCES

Course Outcomes

Paper No	Paper Name
CORE - 1	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons (Theory)
CO-1	<ul style="list-style-type: none">Solving the conceptual questions by applying the learnt concepts about the quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves, s, p, and d orbital shapes, and periodicity in atomic radii, ionic radii, ionisation energy, and electron affinity of elements
CO-2	<ul style="list-style-type: none">Constructing viable molecular shapes and geometries (homo- & hetero-nuclear diatomic molecules)
CO-3	<ul style="list-style-type: none">To understand how to Solve the conceptual questions using the knowledge gained by studying the quantum mechanical model of the atom, quantum numbers, electronic configuration, radial and angular distribution curves, shapes of s, p, and d orbitals, and periodicity in atomic radii, ionic radii, ionization energy and electron affinity of elements.
CO-4	<ul style="list-style-type: none">Understand the Shapes of s, p and d atomic orbitals, nodal planes, discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms).
CO-5	<ul style="list-style-type: none">Rules for filling electrons in various orbitals, electronic configurations of the atoms, stability of half-filled and completely filled orbitals, concept of exchange energy, relative energies of atomic orbitals, anomalous electronic configurations.
CO-6	<ul style="list-style-type: none">Know about the Draw the plausible structures and geometries of molecules using radius ratio rules, VSEPR theory and MO diagrams (homo- & hetero-nuclear diatomic molecules).
CO-7	<ul style="list-style-type: none">Understand about the hybridization in inorganic complex with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements.
CO-8	<ul style="list-style-type: none">Understand the concept of resonance and resonating structures in various inorganic and organic compounds.
CO-9	<ul style="list-style-type: none">Learn and understand the fundamental concepts of organic chemistry
CO-10	<ul style="list-style-type: none">To write mechanism of different organic reactions
CO-11	<ul style="list-style-type: none">To understand the stereochemistry of organic compounds
CO-12	<ul style="list-style-type: none">Understand and explain the preparation, Physical properties and chemical reactions associated with Aliphatic hydrocarbons
CORE - 1	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons (Practical)
CO-1	<ul style="list-style-type: none">Understanding the basic concept of titrimetric analysis
CO-2	<ul style="list-style-type: none">Carrying out redox, acid base titrations for understanding the principles of the above titrations.

CO-3	<ul style="list-style-type: none"> Carry out purification via crystallization and distillation of organic compound and confirm same using melting point and boiling point
CO-4	<ul style="list-style-type: none"> Carry out chromatography for separation of mixtures and sugars
CO-5	<ul style="list-style-type: none"> Separate the components in a mixture of two amino acids
CORE - 2	Chemical Energetics, Equilibrium and Functional Group Organic Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Understanding of the laws of thermodynamics, thermochemistry and chemical equilibria.
CO-2	<ul style="list-style-type: none"> Understand concept of pH and its effect on the various physical and chemical properties of the compounds.
CO-3	<ul style="list-style-type: none"> Use the concepts learnt to predict feasibility of chemical reactions and to study the behaviour of reactions in equilibrium.
CO-4	<ul style="list-style-type: none"> Understand the fundamentals of functional group chemistry
CO-5	<ul style="list-style-type: none"> Understand the concepts of stereochemistry
CO-6	<ul style="list-style-type: none"> Able to design new synthetic routes for organic compounds
CORE - 2	Chemical Energetics, Equilibrium and Functional Group Organic Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Use calorimeter to find heat capacity, Enthalpy of neutralization, Enthalpy of solution, enthalpy of hydration
CO-2	<ul style="list-style-type: none"> Use pH meter to find pH of unknown solutions, prepare buffer solutions (acidic and basic buffer solutions)
CO-3	<ul style="list-style-type: none"> Prepare of various compounds like bromination of phenol/aniline, benzylation of amines/phenols, oxime, 2,4 dinitrophenyl hydrazone and semicarbazone of -CHO/-CO.
CORE - 3	Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Understanding thermodynamic aspects of equilibria between phases.
CO-2	<ul style="list-style-type: none"> Learning the concept of conductance and its variation with dilution, migration of ions in solutions and applications of conductance measurement.
CO-3	<ul style="list-style-type: none"> Understanding the applications of thermodynamic principles to solutions.
CO-4	<ul style="list-style-type: none"> Illustration of Nernst distribution law and its applications.
CO-5	<ul style="list-style-type: none"> Understanding the concept of EMF and calculating thermodynamic properties and other parameters from the EMF measurements.
CO-6	<ul style="list-style-type: none"> Understanding the relevance of structure of biomolecules and to determine chemical properties, reactivity and biological uses.
CO-7	<ul style="list-style-type: none"> Designing synthetic routes for various organic compounds
CORE - 3	Solutions, Phase Equilibrium, Conductance, Electrochemistry & Functional Group Organic Chemistry II (Practical)
CO-1	<ul style="list-style-type: none"> To construct phase diagram of simple eutectic systems
CO-2	<ul style="list-style-type: none"> To determine CST of Phenol-water impurities and study the effect of impurities on CST
CO-3	<ul style="list-style-type: none"> To perform conductometric titrations
CO-4	<ul style="list-style-type: none"> To perform potentiometric titrations

CO-5	<ul style="list-style-type: none"> To find the functional group present in a organic compound using systematic analysis
CORE - 4	Chemistry of s- and p-block elements, states of matter and Chemical Kinetics (Theory)
CO-1	<ul style="list-style-type: none"> Understanding the most common modes of metal occurrence based on typical electrode potentials
CO-2	<ul style="list-style-type: none"> Developing a thorough understanding Ellingham diagrams for metal oxide reduction with carbon as the reducing agent.
CO-3	<ul style="list-style-type: none"> Understanding of the metallurgical processes like cyanide method for silver and gold. Electrolytic, oxidative refining, van Arkel-de Boer procedure, and Mond's process and all methods for purifying metals (Al, Pb, Ti, Fe, Cu, Ni, Zn)
CO-4	<ul style="list-style-type: none"> Critical thinking skills for understanding the concepts of Electronic configuration, atomic and ionic size, ionisation enthalpy, electronegativity (Pauling, Winker, and Allred-Rochow scales) all such aspects of periodicity in s- and p-block elements.
CO-5	<ul style="list-style-type: none"> Understanding of concepts of Inert pair effect, diagonal relationship, and anomalous behaviour of the first member of each group), oxidation states with reference to elements in unusual and rare oxidation states like carbides and nitrides), inert pair effect, diagonal relationship, and anomalous behaviour of the first member of each group s- and p-Block Elements Compounds Diborane and the multicentre bonding idea
CO-6	<ul style="list-style-type: none"> Understanding following compounds' structure, bonding, and essential features such as oxidation/reduction, acidic/basic nature, and uses in industrial and environmental chemistry : Nitrogen hydrides, Phosphorous and Sulphur halides and oxohalides
CO-7	<ul style="list-style-type: none"> Understanding and deriving the mathematical expressions for ideal gas law, real gas law and comment on deviation from ideal behaviour
CO-8	<ul style="list-style-type: none"> Derive and explain the Maxwell Boltzman distribution, critical constants and viscosity of gases
CO-9	<ul style="list-style-type: none"> Explain and derive mathematical equations to explain properties of liquids
CO-10	<ul style="list-style-type: none"> Understand symmetry elements in Solid state
CO-11	<ul style="list-style-type: none"> Understand rate of reaction and derive different rate of equation, theories of reaction rates and explain experimental observations
CORE - 4	Chemistry of s- and p-block elements, states of matter and Chemical Kinetics (Practicals)
CO-1	<ul style="list-style-type: none"> To perform semi-micro qualitative analysis to determine the anion and cation in a mixture
CO-2	<ul style="list-style-type: none"> To use stalagmometer to determine the surface tension of unknown liquids
CO-3	<ul style="list-style-type: none"> To use viscometers to determine the viscometer of unknown liquids
CO-4	<ul style="list-style-type: none"> To study the kinetics of reaction using different methods

DISCIPLINE SPECIFIC ELECTIVE COURSES (DSE)

Paper No	Paper Name
DSE - 1	Chemistry of d-block elements, Quantum Chemistry and Spectroscopy (Theory)
CO-1	<ul style="list-style-type: none"> Understand the chemistry of d & f block elements, Latimer diagrams, VBT and CFT
CO-2	<ul style="list-style-type: none"> Understanding the basic principles of quantum mechanics: operators
CO-3	<ul style="list-style-type: none"> Provides understanding of basic concepts of microwave
CO-4	<ul style="list-style-type: none"> Illustration of Lambert-Beer's law
DSE - 1	Chemistry of d-block elements, Quantum Chemistry and Spectroscopy (Practical)
CO-1	<ul style="list-style-type: none"> Learn about the Estimation of the amount of nickel present in a given solution as bis - (dimethylglyoximato) nickel(II) or aluminium as oxinate in a given solution gravimetrically.
CO-2	<ul style="list-style-type: none"> Understand about the Estimation of (i) Mg^{2+} or (ii) Zn^{2+} by complexometric titrations using EDTA.
CO-3	<ul style="list-style-type: none"> Learn about the Estimation of total hardness of a given sample of water by complexometric titration.
CO-4	<ul style="list-style-type: none"> Determination of the composition of the Fe^{3+} - salicylic acid complex / Fe^{2+} - phenanthroline complex in solution by Job's method.
CO-5	<ul style="list-style-type: none"> Verify Lambert-Beer's law and determine the concentration of $CuSO_4/KMnO_4/K_2Cr_2O_7/CoSO_4$ in a solution of unknown concentration
CO-6	<ul style="list-style-type: none"> Know about the chemical Kinetics; Study the kinetics of the following reactions. 1. Initial rate method: Iodide-persulphate reaction 2. Integrated rate method: Saponification of ethyl acetate.
DSE - 2	Organometallic, Bioinorganic chemistry, Polynuclear hydrocarbons and UV, IR Spectroscopy (Theory)
CO-1	<ul style="list-style-type: none"> Inorganic chemistry topics, organometallics and bioinorganic chemistry were discussed in detail, and students accomplished better insights about basic terminology involved.
CO-2	<ul style="list-style-type: none"> Students were excited and curiously learned about basic concepts on structure elucidation of various polynuclear aromatic compounds and their important reactions.
CO-3	<ul style="list-style-type: none"> They were explained about active methylene compounds, particularly ethylacetoacetate.
CO-4	<ul style="list-style-type: none"> An extensive discussions were made on the basic spectroscopic techniques and their usage in structure elucidation of known compounds.
CO-5	<ul style="list-style-type: none"> Based on the discussion and assignments attempted by the students, the course played an important role to obtain better insight about polynuclear, heteronuclear aromatic compounds, and spectral analysis.
DSE - 2	Organometallic, Bioinorganic chemistry, Polynuclear hydrocarbons and UV, IR Spectroscopy (Practical)
CO-1	<ul style="list-style-type: none"> Students were exposed to the basic/preliminary separation technique, paper chromatography, which plays an important role while isolation or divorce

	of metal ions or organic compounds.
CO-2	<ul style="list-style-type: none"> A few inorganic preparations were dictated and discussed in detail, in turn students revealed their insightful questions, which were further elaborated with appropriate responses by the class teachers.
CO-3	<ul style="list-style-type: none"> An extensive discussions were made on the basic spectroscopic techniques and their usage in structure elucidation of known compounds.
CO-4	<ul style="list-style-type: none"> Separately, systematic qualitative analysis of organic compounds was explained, performed and demonstrated to the students.
CO-5	<ul style="list-style-type: none"> Students were exposed to the basic/preliminary separation technique, paper chromatography, which plays an important role while isolation or divorce of metal ions or organic compounds.

SKILL ENHANCEMENT ELECTIVE COURSES (SEC)

Paper No	Paper Name
SEC 1	IT Skills for Chemists (Theory)
CO-1	<ul style="list-style-type: none"> Understanding of mathematical techniques and basic computer skills in order to solve chemistry problems.
CO-2	<ul style="list-style-type: none"> Learning the concept of uncertainty and error in experimental data.
CO-3	<ul style="list-style-type: none"> Provides understanding of different software for data tabulation, calculation, graph plotting, data analysis and document preparation.
CO-4	<ul style="list-style-type: none"> Understanding of mathematical techniques and basic computer skills in order to solve chemistry problems.
SEC 1	IT Skills for Chemists (Practical)
CO-1	<ul style="list-style-type: none"> Hands on exercises on computers that helps in preparing a word processing document having tables, chemical structures and chemical equations.
CO-2	<ul style="list-style-type: none"> Solving chemistry problems and simulating graphs using basic computer skills.
CO-3	<ul style="list-style-type: none"> Usage of software for tabulating data, plotting graphs and charts, carry out statistical analysis of the data.
CO-4	<ul style="list-style-type: none"> Hands on exercises on computers that helps in preparing a word processing document having tables, chemical structures and chemical equations.
SEC 3	Chemical Technology and Society (Theory)
CO-1	<ul style="list-style-type: none"> To understand the basic concept of technology for societal benefits
CO-2	<ul style="list-style-type: none"> Prepare hypothesis for introduction clean technology
CO-3	<ul style="list-style-type: none"> Identify the consequences of technology to society and mitigate problems caused by technology
CO-4	<ul style="list-style-type: none"> To modernize aerospace using chemical technology.
CO-5	<ul style="list-style-type: none"> To understand the technology used in industries
CO-6	<ul style="list-style-type: none"> To know about various applications of chemical technology in medicinal chemistry
CO-7	<ul style="list-style-type: none"> The use of chemical technology in green chemistry
SEC 6	Intellectual Property Rights (Theory)
CO-1	<ul style="list-style-type: none"> Understand the theoretical concepts of Intellectual Property Laws, and to

	differentiate between the different kinds of IP.
CO-2	<ul style="list-style-type: none"> • They will come to know the existing legal framework relating to IP in India.
CO-3	<ul style="list-style-type: none"> • Comprehend the importance of IP and its significance in their respective domains.
CO-4	<ul style="list-style-type: none"> • This course will motivate the students to make their career in multifaceted field of intellectual Property.
CO-5	<ul style="list-style-type: none"> • The student learn the Basic concept of Intellectual Property.
CO-6	<ul style="list-style-type: none"> • The students will get familiar about The World Intellectual Property Organization (WIPO), WTO and TRIPS Agreement.
CO-7	<ul style="list-style-type: none"> • The students will have the brief Introduction and will understand the Criteria for obtaining patents.
CO-8	<ul style="list-style-type: none"> • The students will understand the meaning of mark and Trademark, the various Categories of Trademark.
CO-9	<ul style="list-style-type: none"> • The students will understand the concept of Geographical Indication.
CO-10	<ul style="list-style-type: none"> • The students with get knowledge about the Plant Variety Protection and Farmer's Right.
CO-11	<ul style="list-style-type: none"> • We will teach students the Enforcement of Intellectual Property Rights.
CO-12	<ul style="list-style-type: none"> • Understand the theoretical concepts of Intellectual Property Laws, and to differentiate between the different kinds of IP.
SEC 7	Analytical Clinical Biochemistry (Theory)
CO-1	<ul style="list-style-type: none"> • To understand the structure of biomolecules and determines their reactivity and biological uses.
CO-2	<ul style="list-style-type: none"> • Gain an insight into concept of heredity through biological processes like replication, transcription and translation
CO-3	<ul style="list-style-type: none"> • Understand the application of chemistry in biological systems
CO-4	<ul style="list-style-type: none"> • Demonstrate an understanding of the biochemistry of diseases.
CO-5	<ul style="list-style-type: none"> • Understand the basic principles of drug-receptor interaction and structure activity relation (SAR).
CO-6	<ul style="list-style-type: none"> • To understand in brief about the different forms of lipid in our body like membrane lipids, cholesterol, lipoproteins, liposomes etc.
SEC 7	Analytical Clinical Biochemistry (Practical)
CO-1	<ul style="list-style-type: none"> • Gain insight into qualitative analysis of lipids ad proteins
CO-2	<ul style="list-style-type: none"> • Understand the concept of saponification number, iodine number and acid value of different lipids sample
CO-3	<ul style="list-style-type: none"> • Estimation of DNA sample using diphenylamine method
CO-4	<ul style="list-style-type: none"> • Estimation of proteins by Lowry's method
CO-5	<ul style="list-style-type: none"> • Demonstrate the methods to determine the enzyme activity
SEC 8	Green Methods in Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> • Learn the concept of environmental pollution and its impact.
CO-2	<ul style="list-style-type: none"> • Role of chemistry in environment pollution
CO-3	<ul style="list-style-type: none"> • Need to develop good practices in chemistry to remove the negative aspects of conventional chemistry
CO-4	<ul style="list-style-type: none"> • Learn the positive, less hazardous and beneficial aspects of chemistry.

CO-5	<ul style="list-style-type: none"> Understand the concept of toxicity, hazard and risk of chemical substances, environmental law.
CO-6	<ul style="list-style-type: none"> Learn green methods that aid to design and develop materials and processes to reduce the use and generation of hazardous substances in industry.
CO-7	<ul style="list-style-type: none"> Understand various green chemistry concepts such as twelve principles of green chemistry
CO-8	<ul style="list-style-type: none"> Understand to utilize renewable resources for sustainable development.
CO-9	<ul style="list-style-type: none"> Learn to develop and utilize safer starting materials and synthetic routes for less hazardous substances
CO-10	<ul style="list-style-type: none"> Learn to develop biodegradable materials such as plastics, antifoulants etc.
CO-11	<ul style="list-style-type: none"> Learn to use green solvents as potential alternative of conventional solvents.
CO-12	<ul style="list-style-type: none"> Learn important energy efficient reactions using green methods.
CO-13	<ul style="list-style-type: none"> Learn to understand the role of different types of catalysts.
CO-14	<ul style="list-style-type: none"> Learn success stories and real world cases which motivate to practice green chemistry.
SEC 8	Green Methods in Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Learn to Prepare and characterize nanoparticles using plant extracts.
CO-2	<ul style="list-style-type: none"> Learn to Prepare biodiesel from vegetable oil.
CO-3	<ul style="list-style-type: none"> Learn to extract of D-limonene from orange peel using liquid CO₂ prepared from dry ice.
CO-4	<ul style="list-style-type: none"> Learn to perform mechanochemical solvent free, solid-solid synthesis of azomethine
CO-5	<ul style="list-style-type: none"> Learn to perform solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper(II).
CO-6	<ul style="list-style-type: none"> Also learn to perform design an experiment by utilizing the products and by-products obtained in above preparations which become waste otherwise if not used.
SEC 9	Pharmaceutical Chemistry (Theory)
CO-1	<ul style="list-style-type: none"> Gain insight into retro-synthesis approach in relation to drug design and drug discovery.
CO-2	<ul style="list-style-type: none"> Learn synthetic pathways of major drug classes
CO-3	<ul style="list-style-type: none"> Understand the fermentation process and production of ethanol, citric acids, antibiotics and some classes of vitamins
CO-4	<ul style="list-style-type: none"> Information about the sources of drugs like marine, biological, minerals and plant tissue culture
CO-5	<ul style="list-style-type: none"> Study of pharmaceutical aids like talc, diatomite, kaolin, bentonite, gelatin and natural colours
SEC 9	Pharmaceutical Chemistry (Practical)
CO-1	<ul style="list-style-type: none"> Understand the method of synthesis of drugs(Aspirin, Paracetamol, sulphacetamide, Ibuprofen)

CO-2	<ul style="list-style-type: none"> Gain insight into the methods of qualitative analysis of drugs and their properties
CO-3	<ul style="list-style-type: none"> Demonstrate the method for the determination of alcohol content in liquid drug
CO-4	<ul style="list-style-type: none"> Understand difference between the iodometric and iodimetric titrations
CO-5	<ul style="list-style-type: none"> Learn the steps for the analysis of Vitamin C tablet available commercially
SEC 10	Chemistry of Cosmetics & Perfumes (Theory & Practical)
CO-1	<ul style="list-style-type: none"> Learn basic of cosmetics, various cosmetic formulation, ingredients and their roles in cosmetic products.
CO-2	<ul style="list-style-type: none"> Learn the use of safe, economic and body-friendly cosmetics
CO-3	<ul style="list-style-type: none"> Prepare new innovative formulations.