

**Post Graduate Department of Chemistry**  
**Name of Programme: B. Sc. (Med/Non-Med/C.Sc.)**

**Programme Outcomes**

**PO 1 Critical Thinking:** The programme aims to give knowledge with facts and figures related to various subjects in pure sciences such as Physics, Chemistry, Botany, Zoology, Mathematics, Computer Science, Economics, Quantitative Techniques, Bio-informatics, Bio-technology etc.

**PO 2 Lifelong learning:** Enable the students to understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevance in the day-to-day life.

**PO 3 Logical experimentation:** The learners acquire the abilities in handling scientific instruments, scheduling and executing the experiments in laboratories and to draw logical inferences from the scientific experiments.

**PO 4 Creative thinking:** They become capable of thinking creatively, to propose innovative ideas in clarifying facts and figures and providing new solution to the problems.

**PO 5 Interdisciplinary approach:** To give them knowledge about developments in any science subject and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments.

**PO 6 Scientific aptitude:** The programme targets to develop scientific aptitude among the students to make them open- minded, critical and curious in order to deal with all aspects related to life.

**PO 7 Self-reliant:** To make them capable of applying their acquired knowledge and able to work on their own hence make themselves self-reliant and self-sufficient.

**Programme Specific Outcomes**

The Programme enables the students

PSO 1: To understand concepts, basic facts and laws in chemistry.

PSO 2: Different aspects of chemistry develop interest in the study of chemistry as a discipline.

PSO 3: Programme develops skills to solve subject related problems.

PSO 4: Programme enables the students to know the role of chemistry in daily life and effect of chemicals on nature and society.

PSO 5: To develop ability to apply the principles of chemistry.

PSO 6: To develop skills in safe handling of chemicals and apparatus.

PSO 7: To develop skills to know the working of instruments and their further applications in research projects.

PSO 8: Waste water management, sustainability, green house emission and green chemistry experiments impart knowledge regarding environmental protection.

PSO 9: Programme imparts basic and fundamental knowledge to the students to continue higher studies, to prepare for various competitive examinations and to pursue a research career or to serve industries like – glass, cement textile, soap and detergents, paper, pharmaceuticals and food industry.

PSO 10: This programme enables the students to go for forensic studies also.

## Mapping of Course Outcomes

**B.Sc. Sem-1 (M/NM/C. Sc.)**

**Paper: Inorganic Chemistry-I**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Illustrate Quantum mechanical approach to Atomic Structure, Periodic Properties, General characteristics of all the elements, Their compounds with structure and preparation methods, chemical bonding,	Understand	PO1 PO2	L2	Quiz assignment
CO2: How to predict the geometries of different compounds	Apply	PO1 PO4	L3	Assignment Class Test
CO.: Explain concepts of ionic solids and weak interactions	Understand	PO1 PO2	L2	Assignment Class Test

**Paper: Organic Chemistry-I**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Understanding of nomenclature and classification of organic compounds	Understand	PO1, PO2	L2	Assignment
CO2: Illustrate concepts of Organic chemistry like – Reaction Mechanism, intermediates and attacking reagents etc.	Understand	PO1, PO2	L2	Test/quiz
CO3: Discuss preparation and properties of different functional Groups like Hydrocarbons, haloalkanes and Aromatic compounds.	Understand	PO1, PO2	L2	Assignment

**Paper: Chemistry Practical**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Course develops the skills to determine Physical constants like Melting points and Boiling points.	Apply	PO3	L3	Project/lab work
CO2: Develop skills for separation and identification of ions	Apply	PO3, PO4	L3	Project/lab work
CO3: Learn apparatus handling and chemical hazards	Apply	PO3, PO7	L3	Project/lab work

**B.Sc. Sem-II (M/NM/C. Sc.)****Paper: Inorganic Chemistry-II**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Understanding concepts of acids and bases.	Understand	PO1, PO2	L2	Quiz
CO2: Explain s/p/d-block elements	Understand	PO1, PO2	L2	Assignment/Quiz
CO3: Understanding of structure and properties of compounds of s/p/d-block	Understand	PO1, PO2	L2	Test/Quiz

**Paper: Physical Chemistry-I**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: This course enables the students to explain about the various states of matter (Colloids, Gaseous, Liquid and solutions)	Understand	PO1, PO2, PO4	L2	Test/Assignment
CO2: Illustrate solutions and colligative properties.	Understand	PO2, PO4	L2	Assignment/Quiz
CO3: Discuss types of colloids and their properties and applications	Understand	PO2, PO4	L2	Quiz/Test

**Paper: Chemistry Practical**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Develops skill of Crystallization.	Apply	PO3, PO4	L3	Project/lab work
CO2: Students learn and perform experiments related to physical chemistry i.e. Surface tension, viscosity, Chemical kinetics and Thermodynamics.	Apply	PO3, PO4, PO6	L3	Project/lab work
CO3: Apparatus handling	Apply	PO3	L3	Project/lab work

**B.Sc. Sem-3 (M/NM/C.Sc.)****Paper: Physical Chemistry B**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Application of mathematical tools for chemistry	Apply	PO1, PO2, PO5, PO7	L3	Assignment/Class Test
CO2: Explain basic concepts and Laws of Thermodynamics, Distribution Law, Chemical and Phase Equilibria	Understand	PO1, PO2, PO6	L2	Assignment/Quiz
CO3: Solving numerical problems of above topics	Apply	PO1, PO2	L3	Assignment/Class Test

**Paper: Organic Chemistry A**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Explain modern aspects of stereochemistry	Understand	PO1, PO2	L2	Assignment/Quiz
CO2: Illustrate synthesis and properties of some important class of organic compounds with mechanism.	Understand	PO1, PO2, PO3	L2	Test/Assignment
CO3: Explain organometallics and Heterocyclic compounds	Understand	PO1, PO2	L2	Assignment

**Paper: Chemistry Practical**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Techniques of Thin Layer Chromatography	Apply	PO1, PO2, PO3, PO5	L3	Project/Lab Work
CO2: Quantitative estimations of Different ionic species using different branches of Volumetric and Gravimetric Analysis	Apply	PO1, PO2, PO3, PO5	L3	Project/Lab Work
CO3: Apparatus handling and data analysis to reach appropriate conclusion	Analyze	PO1, PO2, PO3, PO5	L4	Project/Lab Work

**B.Sc. Sem-4 (M/NM/C.Sc.****Paper: Inorganic Chemistry A**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Explain advanced theories on coordination chemistry, structure, bonding and stereochemistry of important coordination compounds.	Understand	PO1, PO2	L2	Quiz/Assignment
CO2: Discuss redox behaviour of Elements.	Understand	PO1, PO2	L2	Quiz/Class Test
CO3: .Explain Non-Aqueous solvents. <ul style="list-style-type: none"> <li>• Chemistry of Lanthanides and actinides.</li> <li>• Bioinorganic Chemistry.</li> </ul>	Understand	PO1, PO2	L2	Assignment/Class Test

**Paper: Organic Chemistry B**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Discuss aspects of stereochemistry	Understand	PO1, PO2	L2	Assignment/Class Test
CO2: Explain important class of Organic compounds with mechanism	Understand	PO1, PO2	L2	Assignment/Class Test
CO3: Discuss organometallic compounds and their applications in organic synthesis.	Understand	PO1, PO2	L2	Assignment/Class Test

**Paper: Chemistry Practical**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Qualitative Analysis of Organic Compounds with Synthesis of their derivatives and physical constant determinations	Apply	PO3, PO4	L3	Project/lab work
CO2: Apparatus Handling	Apply	PO3, PO4, PO6	L3	Project/lab work
CO3: Knowledge of chemical hazard.	Understand	PO3	L2	Project/lab work

**Class: B.Sc. Sem-5 (M/NM/C.Sc.)**

**Paper: Inorganic Chemistry-IV**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Illustrate crystal field splitting in coordination complexes, their Stability, colour and magnetic properties and use of Magnetic moments for Interpretation of their structures.	Understand	PO1, PO3	L2	Quiz/assignment
CO2: Explain Electronic Transitions, Selection Rules and Term Symbols	Understand	PO1	L2	Assignment/Class Test
CO3: Explain basic concepts of Organometallic chemistry.	Understand	PO1, PO2	L2	Assignment/Class Test

**Paper: Physical chemistry- III**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Explain Various Forms of electrochemical cells, conductance and related laws.	Understand	PO2, PO3	L2	Assignment
CO2: Explain Nuclear reactions	Understand	PO2, PO3	L2	Test/quiz
CO3: Discuss Physical aspects of various branches of Spectroscopy.	Understand	PO2, PO3	L2	Assignment

**Paper: Chemistry Practical**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1: Develop skills for preparation of transition metal complexes	Apply	PO2, PO3	L3	Project/lab work
CO2: Skills Conductometric titrations and Refractive Index measurement	Apply	PO2, PO3	L3	Project/lab work
CO3: Instrument handling	Apply	PO2, PO3	L3	Project/lab work

**Class: B.Sc. Sem-VI (M/NM/C.Sc.)****Paper: Organic Chemistry– 1V**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Discuss Different spectroscopic methods of Analysis which includes UV, IR & NMR techniques.	Understand	PO1, PO2, PO3	L2	Assignment/Quiz
CO2. Solving problems based on spectroscopy	Apply	PO1, PO2, PO3	L3	Assignment/Quiz
CO3. Illustrate basic concepts of carbohydrates, Polymers, Organosulphur compounds, Amino acids, Proteins, RNA and DNA.	Understand	PO2, PO3, PO4	L2	Test/Quiz

**Paper: Physical Chemistry–IV**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Explain basic concepts of Quantum Mechanics	Understand	PO2	L2	Test/Assignment
CO2. Explain solid states	Understand	PO1 PO2	L2	Assignment/Quiz
CO3. Illustrate basic concepts of Photochemistry	Remember	PO1 PO2	L1	Assignment/Test

**Paper: Chemistry Practical**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Develop skills for synthesis of Organic compounds	Apply	PO2, PO3, PO4	L3	Project/lab work
CO3. Column chromatography as separation technique for mixture of compounds	Apply	PO2, PO3	L3	Project/lab work
CO3. Learn Apparatus and Chemical handling	Apply	PO3	L3	Project/lab work

**Name of Programme: B.Sc. Biotechnology**

**Class: B.Sc. (Biotechnology) Sem-1**

**Paper: Inorganic Chemistry-A (BT-3)**

Course Outcome	Skills	POs	Bloom's	Assessment
<b>BT-3 Inorganic Chemistry-</b> CO1. Discuss Coordination compounds, co-ordination number, stereochemistry and isomerism	Understand	PO1, PO2	L2	Quiz/assignment
CO2. Discuss theories like VBT, CFT, high spin and low spin complexes.	Understand	PO1, PO2	L2	Assignment/Class Test
CO3. MOT explaining the bonding in these compounds.	Understand	PO1, PO2	L2	Assignment/Class Test

**Paper: Organic Chemistry-A (BT-4)**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Illustrates Stereochemistry of compounds	Understand	PO1, PO2	L2	Assignment
CO2. Illustrates Isomerism <i>i.e.</i> Conformational, Geometrical and Enantiomerism, Sequence rules for E, Z or S, Specification to the compounds,	Understand	PO1, PO2	L2	Test/quiz
CO3. Explain structures, nomenclature, preparation methods and properties with mechanism of different Functional groups.	Understand	PO1, PO2	L2	Assignment

**Paper: Chemistry Practical**

**BT-3 Inorganic Chemistry-A**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Develop skills for volumetric titrations.	Apply	PO3	L3	Project/lab work
CO2. Develop skills for complexometric titrations	Apply	PO3, PO4	L3	Project/lab work
CO3. Apparatus handling and data analysis	Apply	PO3, PO7	L3	Project/lab work

**Paper: Chemistry Practical****BT-4 Organic Chemistry-A**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Develop skill for identification of organic compounds and their derivation	Analyse	PO3, PO7	L4	Project/lab work
CO2. Apparatus and Chemical Handling	Apply	PO3, PO4	L3	Project/lab work
CO3. Understanding of chemical hazard	Understand	PO3, PO7	L2	Project/lab work

**B.Sc. (Biotechnology) Sem-II****Paper: Inorganic Chemistry-B (BT-3)**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Discuss Ligands, chelators, biochemical ligands their binding with alkali, alkaline earth metals and transition metals	Understand	PO1, PO2	L2	Quiz/assignment
CO2. Illustrates Stability of metal complexes	Understand	PO1, PO2	L2	Assignment/C lass Test
CO3. Explain role of metal ions in living systems.	Understand	PO1, PO2	L2	Assignment/C lass Test

**Paper: Organic Chemistry-B (BT-4)**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Illustrates conversion of functional groups into each other	Understand	PO1, PO2	L2	Assignment
CO2. Discuss various reaction Mechanisms	Understand	PO1, PO2	L2	Test/quiz
CO3. Explain acid-base catalysis and nucleophilic addition reactions	Understand	PO1, PO2	L2	Assignment

**Paper: Chemistry Practical, BT-3 Inorganic Chemistry-B**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Develop skills for Acid radical analysis	Analyze	PO3, PO7	L4	Project/lab work
CO2. Develop skills for Basic radical analysis	Analyze	PO3, PO4, PO7	L4	Project/lab work
CO3. Apparatus and chemical handling	Apply	PO3, PO7	L3	Project/lab work

**Paper: Chemistry Practical****BT-3 Organic Chemistry-B**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Skill development for identification of organic compounds (Aromatic hydrocarbons, aldehydes, ketones, carbohydrates)	Analyze	PO3, PO4	L4	Project/lab work
CO2. Apparatus handling	Apply	PO3, PO7	L3	Project/lab work
CO3. Chemical handling	Apply	PO3, PO7	L3	Project/lab work

**B.Sc. (Biotechnology) Sem-III****Paper: Physical Chemistry B**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Illustrates chemical thermodynamics, solutions, various types of solutions, colligative properties, Van't Hoff factor	Understand	PO1, PO2, PO6	L2	Assignment Class Test
CO2. Explain phase equilibria, various phase diagrams.	Understand	PO1, PO2, PO6	L2	Assignment/Q uiz
CO3. Solving Numerical problems	Apply	PO1, PO2	L3	Assignment Class Test

**Paper: Physical Chemistry A (Practical)**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Develop skills to measure various physical properties like surface tension, viscosity etc.	Analyze	PO1, PO2, PO3, PO5	L4	Project/Lab Work
CO2. Develop skills for acid base titrations, percentage composition of solution using pH meter.	Apply	PO1, PO2, PO3, PO5	L3	Project/Lab Work
CO3. Instrument handling	Apply	PO1, PO2, PO3, PO5	L3	Project/Lab Work

**B.Sc. (Biotechnology) Sem-IV****Paper: Physical Chemistry B**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Discuss electrochemical cells their types, Nernst Equation.	Understand	PO1, PO2	L2	Quiz/Assignment
CO2. Illustrates chemical kinetics and rate order Equations.	Understand	PO1, PO2	L2	Quiz/Class Test
CO3. Solving numerical problems based on above concepts.	Apply	PO1, PO2	L3	Assignment/Class Test

**Paper: Physical Chemistry B (Practical)**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Develop skills for measurement of various physical properties	Apply	PO3, PO4	L3	Project/lab work
CO2. Instrument handling and operation	Apply	PO3, PO4, PO6	L3	Project/lab work
CO3. Data analysis to conclude results	Analyze	PO3	L4	Project/lab work

**B.Sc. (Biotechnology) Sem V****Paper: BT-7 Physical, Organic & Inorganic Aspects of Spectroscopy-A**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Explain UV visible spectroscopy	Understand	PO1, PO2	L2	Quiz/assignment
CO2. Explain Infrared Spectroscopy	Understand	PO2, PO3	L2	Assignment/class test
CO3. Problem on structure elucidation of newly synthesized compounds using spectroscopy.	Apply	PO1, PO2	L3	Assignment/Class test

**Paper: Physical, Organic & Inorganic Aspects of Spectroscopy-A (Practical)**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Develop skills for synthesis and electronic spectral studies of transition metal complexes.	Analyze	PO2, PO3	L4	Project/lab work
CO2. Record and Compare UV-Vis and IR spectra of reactants and products, transition metal complexes etc.	Analyze	PO1, PO2	L4	Project/lab work
CO3. Instrument operation, handling and data interpretation	Analyze	PO1, PO3	L4	Project/lab work

**B.Sc. (Biotechnology) Sem VI****Paper: BT-7 Physical, Organic & Inorganic Aspects of Spectroscopy-B**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. Illustrate Nuclear, Magnetic Resonance Spectroscopy	Understand	PO1, PO2	L2	Quiz/Assignment
CO2. Illustrate Mass spectrometer	Understand	PO2, PO3	L2	Assignment
CO3. Solving problems on structure elucidation of organic compounds using NMR and mass spectrometry.	Apply	PO2, PO3	L3	Assignment/Class test

**Paper: BT-7 Physical, Organic & Inorganic Aspects of Spectroscopy-B Practical**

Course Outcome	Skills	POs	Bloom's	Assessment
CO1. To record NMR spectra of organic compounds	Apply	PO1, PO2	L3	Project/lab work
CO2. Perform column chromatography	Apply	PO2, PO3	L3	Project/lab work
CO3. Instrument operation, handling and data interpretation.	Analyze	PO1, PO2, PO3	L4	Project/lab work