

Course Outcomes of All Courses of B.Sc. Chemistry

| Course Code | Course Title | Course Outcome1 | Course Outcome2 | Course Outcome3 | Course Outcome4 | Course Outcome5 |
|-------------|----------------------------|---|--|--|---|---|
| BSC I C1 | Chemistry - I (Inorganic) | Identify different types of metals and their chemical properties. | Understand the Concept of ionic bonding and how it forms. | Explain different types of weak interactions (hydrogen bonding, van der Waals forces). | Use VSEPR theory to predict the shapes of molecules. | Understand the basics of nuclear chemistry (isotopes, radioactivity). |
| BSC I C2 | Chemistry - II (Organic) | Explain mechanisms of organic reactions (bond cleavage, reagents, intermediates). | Identify and differentiate various types of isomerism. | Apply stereochemistry principles to chiral molecules (optical activity, diastereoisomers, resolution). | Analyze and interpret organic reaction mechanisms using various methods. | Understand fundamental Concepts of cycloalkanes, dienes, and alkynes. |
| BSC I C3 | Chemistry - III (Physical) | Explain fundamental principles of X-ray diffraction by crystals (unit cell, Bragg's equation, Laue and powder methods). | Differentiate characteristics of solid, liquid, and gaseous states (intermolecular forces, structural differences, liquid crystals). | Apply mathematical Concepts to solve problems in physics and chemistry (logarithmic relations, curve sketching, differentiation, integration). | Explain different types of Colloids, their properties, and factors affecting stability (sols, gels, emulsions, Hardy-Schulze law, emulsifiers). | Analyze and understand the kinetics of chemical reactions (order of reactions, half-life, mean-life, factors affecting rates, experimental methods, activation energy). |
| BSC II C1 | Chemistry - I (Inorganic) | d-block trends & properties (oxidation, magnetism, complex formation) | Predict structures & reactivities of 1st-row transition metal compounds | Compare properties of 2nd & 3rd row transition elements | Use inert pair effect to explain deviations in trends | Understand fundamental principles of coordination chemistry |
| BSC II C2 | Chemistry - II (Organic) | Explain UV & IR regions for studying organic molecules | Classify & name alcohols & phenols, understand hydrogen bonding & reactions | Identify & differentiate aldehydes, ketones, ethers & epoxides, predict nucleophilic addition reactions | Explain structure, bonding & acidity of carboxylic acids, understand reactions & derivatives | Describe preparation & reactions of nitroalkanes & amines |
| BSC II C3 | Chemistry - III (Physical) | Apply thermodynamics concepts to systems, states, processes, work & heat | Explain & apply 1st & 2nd laws of thermodynamics | Understand entropy & its relation to spontaneity & equilibrium | Apply thermodynamics to chemical & phase equilibria | Understand & apply electrochemical concepts to electrolyte solutions & cells |
| BSC III C1 | Chemistry - I (Inorganic) | Differentiate hard/soft acids & bases (HSAB), explain acid-base strength & symbiosis in complexes. | Analyze theoretical basis of hardness/softness & predict stability/reactivity of acid-base interactions. | Identify limitations of valence bond theory & understand crystal-field theory for predicting splitting in different geometries. | Explain factors affecting crystal-field parameters & their influence on complex stability/properties. | Classify magnetic behavior in complexes, use methods for determining magnetic susceptibility & analyze magnetic moments. |
| BSC III C2 | Chemistry - II (Organic) | Explain NMR principles & apply them to understand simple organic molecule structures. | Utilize enolates for various reactions, understand α -hydrogen acidity & apply alkylation techniques. | Analyze aromaticity, synthesis, & reactions of important heterocyclic compounds. | Identify & comprehend synthesis/reactions of specific five & six-membered heterocycles. | Classify & analyze carbohydrates (nomenclature, epimers, anomers, mutarotation, etc.) & understand structures of common sugars & polysaccharides. |
| BSC III C3 | Chemistry - III (Physical) | Explain quantum mechanics fundamentals using concepts like Planck's law, photoelectric effect, & Bohr model. | Analyze wave nature of particles using De Broglie's hypothesis & uncertainty principle. | Describe hydrogen atom structure using Schrödinger equation & identify quantum numbers. | Explain molecular orbital theory principles, including MO construction & bonding/antibonding orbitals. | Differentiate & understand applications of various types of spectroscopy (rotational, vibrational, electronic) for analyzing molecular structure. |

BSc Chemistry Program Summary Sheet

| S.NO. | Program Outcomes (POs): | Program Specific Outcomes (PSOs): | Program Educational Objectives (PEOs): |
|----------------------|---|--|--|
| PO1/PSO1/PEO1 | Fundamental chemical knowledge (atomic structure, bonding, thermodynamics, kinetics, spectroscopy, nuclear chemistry) | Leverage chemical knowledge for innovation: Graduates will apply their deep chemical understanding and practical skills to develop innovative solutions across diverse fields, including materials science, pharmaceuticals, environmental science, and energy technology. | Recognized professionals: Within three years of graduation, BSc Chemistry graduates will be recognized as well-equipped professionals in their chosen field, contributing meaningfully to scientific advancement and technological innovation through their work. |
| PO2/PSO2/PEO2 | Organic chemistry skills (reaction mechanisms, isomerism, stereochemistry, aromatic chemistry) | Translate science into practice: Graduates will be proficient in translating scientific knowledge into tangible applications, working effectively in interdisciplinary teams, and communicating complex scientific concepts to various audiences, both technical and non-technical. | Continuous learning: Graduates will demonstrate a commitment to continuous learning and professional development, actively seeking opportunities to expand their knowledge and skills throughout their careers. |
| PO3/PSO3/PEO3 | Physical chemistry understanding (thermodynamics, kinetics, electrochemistry, colloids, crystallography) | Ethical and sustainable impact: Graduates will demonstrate a strong commitment to applying their knowledge for the betterment of society, incorporating ethical considerations, environmental awareness, and sustainable practices into their work. | Ethical and responsible conduct: Graduates will uphold the highest ethical standards within the scientific community, promoting sustainable practices, safety awareness, and responsible conduct in their field. |
| PO4/PSO4/PEO4 | Inorganic chemistry proficiency (transition metals, periodic trends, d-block elements, complex formation) | Lifelong learning and adaptability: Graduates will be equipped and motivated to continuously learn and adapt to evolving needs, actively seeking opportunities to expand their knowledge and skills throughout their careers. | Societal impact: Graduates will be committed to using their knowledge and skills to address real-world challenges and contribute to the betterment of society. |

| S.NO. | Program Outcomes (POs): | Program Specific Outcomes (PSOs): | Program Educational Objectives (PEOs): |
|----------------------|--|--|---|
| PO5/PSO5/PEO5 | Analytical skills and instrumental techniques (UV-IR, NMR, mass spectrometry) | Professional conduct and responsibility: Graduates will uphold the highest ethical standards within the scientific community, promoting safety awareness, responsible conduct, and integrity in their chosen field. | Adaptability and resilience: Graduates will be adaptable and resilient, able to navigate changes in the workforce and technology landscape with a positive and proactive approach. |
| PO6/PSO6/PEO6 | Quantitative and mathematical skills (data analysis, problem solving, scientific interpretation) | Leadership and teamwork: Graduates will be able to effectively lead and collaborate within diverse teams, fostering a positive and inclusive work environment while achieving shared goals. | Effective communication and collaboration: Graduates will be able to communicate effectively and collaborate with diverse stakeholders, fostering a culture of inclusivity and shared understanding. |
| PO7/PSO7/PEO7 | Communication and critical thinking skills (effective communication, diverse audiences) | Global citizenship and cultural awareness: Graduates will demonstrate an understanding of global challenges and cultural perspectives, contributing to solutions that benefit diverse communities and promote a sustainable future. | Global perspective and leadership: Graduates will possess a global perspective and demonstrate leadership qualities, contributing to solutions that address global challenges and promote positive change. |

Mapping of Course Outcomes of Various Courses of B.Sc. Chemistry Program With Program Outcomes (Pos), Program Specific Outcomes (Psos) & Program Educational Objectives (Peos)

| Course Outcome | PO | PSO | PEO | Level |
|--|---------------|------------------|------------------|------------------------|
| BSC I INORGANIC CHEMISTRY | | | | |
| Identify different types of metals and their chemical properties. | PO1 | PSO1 | PEO1 | Remembering (Low) |
| Explain the concept of ionic bonding and how it forms. | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| Use VSEPR theory to predict the shapes of molecules. | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Applying (Medium) |
| Understand the basics of nuclear chemistry (isotopes, radioactivity). | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Analyzing (High) |
| Explain different types of weak interactions (hydrogen bonding, van der Waals forces). | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| BSC I ORGANIC CHEMISTRY | | | | |
| Identify functional groups in organic molecules. | PO1 | PSO1 | PEO1 | Remembering (Low) |
| Explain basic organic chemistry concepts (hybridization, bonding). | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| Use IUPAC nomenclature to name organic compounds. | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Applying (Medium) |
| Interpret organic spectra (IR, NMR) to determine functional groups. | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Analyzing (High) |
| Compare and contrast reaction mechanisms for the same transformation. | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Evaluating (High) |
| Design a multi-step synthesis of a simple organic molecule. | PO1, PO2, PO3 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Creating (High) |
| BSC I PHYSICAL CHEMISTRY | | | | |
| Explain fundamental principles of physical chemistry | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| Apply mathematical concepts to solve problems in physical chemistry | PO1, PO3, PO6 | PSO1, PSO2 | PEO1, PEO2 | Applying (High) |
| Explain different types of solids, liquids, and gases | PO1 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| Differentiate between different types of colloids | PO1 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| Analyze the kinetics of chemical reactions | PO1, PO2, PO3 | PSO1, PSO2 | PEO1, PEO2 | Analyzing (High) |

Mapping of Course Outcomes of Various Courses of B.Sc. Chemistry Program With Program Outcomes (Pos), Program Specific Outcomes (Psos) & Program Educational Objectives (Peos)

| Course Outcome | PO | PSO | PEO | Level |
|---|---------------|------------------|------------------|--|
| BSC II INORGANIC CHEMISTRY | | | | |
| Predict structures and reactivities of 1st-row transition metal compounds | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Analyzing (High) |
| Compare properties of 2nd and 3rd row transition elements | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Analyzing (High) |
| Use inert pair effect to explain deviations in trends | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Applying (High) |
| Understand fundamental principles of coordination chemistry | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| BSC II ORGANIC CHEMISTRY | | | | |
| Explain UV & IR regions for studying organic molecules | PO1, PO2, PO5 | PSO1, PSO2, PSO3 | PEO1, PEO2 | Understanding (Medium) |
| Classify & name alcohols & phenols, understand hydrogen bonding & reactions | PO1, PO2 | PSO1, PSO2, PSO3 | PEO1, PEO2 | Understanding (Medium), Applying (Medium) |
| Identify & differentiate aldehydes, ketones, ethers & epoxides, predict nucleophilic addition reactions | PO1, PO2 | PSO1, PSO2, PSO3 | PEO1, PEO2 | Understanding (Medium), Applying (High) |
| Explain structure, bonding & acidity of carboxylic acids, understand reactions & derivatives | PO1, PO2 | PSO1, PSO2, PSO3 | PEO1, PEO2 | Understanding (Medium), Applying (Medium) |
| Describe preparation & reactions of nitroalkanes & amines | PO1, PO2 | PSO1, PSO2, PSO3 | PEO1, PEO2 | Understanding (Medium), Applying (Medium) |
| BSC II PHYSICAL CHEMISTRY | | | | |
| Explain & apply 1st & 2nd laws of thermodynamics | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium), Applying (High) |
| Apply thermodynamics concepts to systems, states, processes, work & heat | PO1, PO2, PO3 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Applying (High), Analyzing (High) |
| Understand entropy & its relation to spontaneity & equilibrium | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium), Analyzing (High) |
| Apply thermodynamics to chemical & phase equilibria | PO1, PO2, PO3 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Applying (High), Analyzing (High) |
| Understand & apply electrochemical concepts to electrolyte solutions & cells | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium), Applying (High) |

Mapping of Course Outcomes of Various Courses of B.Sc. Chemistry Program With Program Outcomes (Pos), Program Specific Outcomes (Psos) & Program Educational Objectives (Peos)

| Course Outcome | PO | PSO | PEO | Level |
|--|--------------------|------------------|------------------|---|
| BSC III INORGANIC CHEMISTRY | | | | |
| Differentiate hard/soft acids & bases (HSAB), explain acid-base strength & symbiosis in complexes | PO1, PO2, PO4 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium), Applying (Medium) |
| Analyze theoretical basis of hardness/softness & predict stability/reactivity of acid-base interactions | PO1, PO2, PO3, PO4 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Analyzing (High), Applying (High) |
| Identify limitations of valence bond theory & understand crystal-field theory for predicting splitting in different geometries | PO1, PO2, PO4 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| Explain factors affecting crystal-field parameters & their influence on complex stability/properties | PO1, PO2, PO3 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Analyzing (High), Applying (High) |
| Classify magnetic behavior in complexes, use methods for determining magnetic susceptibility & analyze magnetic moments | PO1, PO2, PO3, PO4 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Understanding (Medium), Applying (High), Analyzing (High) |
| BSC III ORGANIC CHEMISTRY | | | | |
| Explain NMR principles & apply them to understand simple organic molecule structures | PO1, PO2, PO5 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium), Applying (High) |
| Utilize enolates for various reactions, understand α -hydrogen acidity & apply alkylation techniques | PO1, PO2, PO3 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Applying (High), Analyzing (High) |
| Analyze aromaticity, synthesis, & reactions of important heterocyclic compounds | PO1, PO2, PO3 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Analyzing (High) |
| Identify & comprehend synthesis/reactions of specific five & six-membered heterocycles | PO1, PO2 | PSO1, PSO2, PSO4 | PEO1, PEO2 | Understanding (Medium), Applying (Medium) |
| Classify & analyze carbohydrates (nomenclature, epimers, anomers, mutarotation, etc.) & understand structures of common sugars & polysaccharides | PO1, PO2 | PSO1, PSO2, PSO3 | PEO1, PEO2 | Understanding (Medium), Analyzing (Medium) |
| BSC III PHYSICAL CHEMISTRY | | | | |
| Explain quantum mechanics fundamentals using concepts like Planck's law, photoelectric effect, & Bohr model | PO1, PO2 | PSO1, PSO2, PSO5 | PEO1, PEO2 | Understanding (Medium) |
| Analyze wave nature of particles using De Broglie's hypothesis & uncertainty principle | PO1, PO2, PO3 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Analyzing (High) |
| Describe hydrogen atom structure using Schrödinger equation & identify quantum numbers | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Applying (High) |
| Explain molecular orbital theory principles, including MO construction & bonding/antibonding orbitals | PO1, PO2 | PSO1, PSO2 | PEO1, PEO2 | Understanding (Medium) |
| Differentiate & understand applications of various types of spectroscopy (rotational, vibrational, electronic) for analyzing molecular structure | PO1, PO2, PO3, PO5 | PSO1, PSO2, PSO3 | PEO1, PEO2, PEO3 | Analyzing (High), Applying (High) |