

# Chemistry

## Programme Specific Outcomes (PSOs):

PSO-1: Students will demonstrate an understanding of major concepts in all disciplines of chemistry.

PSO-2: Students will employ critical thinking and the scientific method to design, carry out, record and analyze the results of chemical experiments and get an awareness of the impact of chemistry on the environment, society, and other cultures outside the scientific community.

PSO-3: To enable students to develop an understanding of the principals of chemical safety and to enable them to apply these concepts when working in a laboratory.

PSO-4: The principle, design, observations, procedures and calculations of the experiment results should demonstrate an understanding of practical's and its applications in different chemical industries and R&D laboratories.

**B.Sc. Semester-I**  
**Paper-II (CH: 101)**  
**Inorganic Chemistry**

**Course Outcomes (COs)**

- CO-1: Details about quantum numbers Also factors affecting and trends in chemical properties like Ionization Potential, Electron affinity and Electronegativity.
- CO-2: Learn, Lattice energy and Born- Haber cycle and Formation of Hydrogen molecule with Potential energy diagram by of VBT.
- CO-3: Should learn,s- block elements, Ionization potential, reducing properties. Application of s-block elements (Na, K, Ca) in biosystem. And structures, bonding and applications of Xenon fluorides ( $\text{XeF}_2$ ,  $\text{XeF}_4$ ,  $\text{XeF}_6$ ). Structure and bonding in  $\text{XeOF}_2$  and  $\text{XeOF}_4$ .
- CO-4: Students Practice of p-block elements Oxides: Structure of  $\text{P}_2\text{O}_3$ ,  $\text{P}_2\text{O}_5$  Oxyacids of Phosphorous: Structure of  $\text{H}_3\text{PO}_3$  and  $\text{H}_3\text{PO}_4$  And Simple tests for the detection of food adulteration in tea leaves and coffee, spices (turmeric and chili powder) and, milk.

**B.Sc. Semester-I**  
**Paper-II (CH: 102)**  
**Physical Chemistry**

**Course Outcomes (COs)**

- CO-1: To impart the students' concepts of thermodynamics and thermochemistry.
- CO-2: To understand the basics of Gaseous state, ideal gas and real gas.
- CO-3: To provide an insight into the liquid state and properties of liquid state.
- CO-4: To get an overview about the adsorption and colloidal state.

**B.Sc. Semester-II**  
**Paper-I (CH: 201)**  
**Organic Chemistry**

**Course Outcomes (COs)**

- CO-1: Describe in details, Structure and Bonding: Hybridization in case of Methane, Ethane, Ethylene and Acetylene. And Reactive intermediates: Carbocations, carbanions, free radicals and carbenes (Definition, formation, geometry, stability).
- CO-2: Should learn Stereochemistry of Organic Compounds: Elements of symmetry, Optical activity, D & L and R & S system of nomenclature. And Geometrical isomerism, maleic acid, fumaric acid, Conformational analysis of ethane and n-butane.
- CO-3: Students learn, methods of formation (Ethane and Propane): Wurtz reaction, Kolbe's reaction and decarboxylation of carboxylic acid. Baeyer's strain theory and its limitations. formation (ethylene and propylene):. Markownikoff's rule and Peroxide effect. And
- CO-4: Students prepare, Details of Classification of dienes. Methods of formation of 1,3- butadiene. And Methods of formation of acetylene from: Calcium carbide and dehydrohalogenation of dihalides, Chemical reaction: and MO picture, Huckel rule and aromaticity, Aromatic electrophilic substitution mechanism with energy profile diagram (e.g., nitration and sulphonation) And LPG, CNG, LNG, and Bio-Gas (definition, calorific value, composition, properties and uses). Octane number. Lubricants: Definition, classification

**B.Sc. Semester-II**  
**Paper-II (CH: 202)**  
**Physical Chemistry**

**Course Outcomes (COs)**

- CO-1: To learn the basics of second law of thermodynamics, Carnot cycle and partial molar properties.
- CO-2: To learn and understand Phase equilibria and Solutions of Liquids in Liquids.
- CO-3: To understand the concept of chemical kinetics and theories of reaction rate.
- CO-4: To get an overview about the nuclear chemistry, pollution and its control.

**B.Sc. Semester-III**  
**Paper-I (CH: 301)**  
**Inorganic Chemistry**

**Course Outcomes (COs)**

- CO-01:** Able to write structure and bonding of Inter-halogen and poly-halogen compound on the basis of VSEPR and MO theory.
- CO-02:** Able to write electronic configuration and periodic properties of Transition element.
- CO-03:** Able to understand the types of error in chemical analysis and types of solvent.
- CO-04:** Able to understand the chemistry of inner transition element.

**B.Sc. Semester-III**  
**Paper-II (CH: 302)**  
**Organic Chemistry**

**Course Outcomes (COs)**

- CO-1: Students should be able to identify the formation and identify chemical reactions of activating, deactivating substituents, alkyl halides and polyhalogen compounds.
- CO-2: Students should be able to classify and identify preparation methods, properties and analyse reaction mechanisms of alcohols and phenols
- CO-3: Students should be able to evaluate and compare synthesis methods and reactions related to Aldehydes and Ketones.
- CO-4: Students should be able to analyse structure and bonding, compare different methods of synthesis, identify reaction mechanisms of Carboxylic Acids and their derivatives.

**B.Sc. Semester-IV**  
**Paper-I (CH: 401)**  
**Inorganic Chemistry**

**Course Outcomes (COs)**

- CO-01:** Able to understand coordination chemistry –types, classification, nomenclature Werner theory, coordination number, EAN rule chelating complex.
- CO-02:** Able to understand the isomerism in coordination compound having 4 and 6, and oxidation reduction in EMF Series.
- CO-03:** Able to understand the Colorimetry and Spectrophotometry Method and Separation Techniques.
- CO-04:** Able to understand the Inorganic Polymers, Silicones chemistry, Phosphonitrilic halide polymers.

**B.Sc. Semester-IV**  
**Paper-II (CH: 402)**  
**Physical Chemistry**

**Course Outcomes (COs)**

- CO-1:** Students should be able to classify and explain different types of solids, crystals, crystal systems and should be able to characterize and interpret them
- CO-2:** Students should be able to explain and evaluate different concepts and theories related to electrochemistry and its applications
- CO-3:** Students should be able to discuss concepts and applications of Rotational and Vibrational Spectroscopy and examine different spectra.
- CO-4:** Students should be able to interpret different principles and concepts of Quantum chemistry and discuss about dielectric and magnetic properties of molecules.

**B.Sc. Semester-V**  
**Paper-I (CH: 501)**  
**Organic Chemistry**

**Course Outcomes (COs)**

- CO-01:** Able to understand classification, nomenclature, synthesis, mechanism of nitrogen containing organic compound.
- CO-02:** Able to understand classification, nomenclature, synthesis, mechanism of Heterocyclic compound like furan, thiophene, pyrrole and pyridine, Indole, Quinoline and Isoquinoline.
- CO-03:** Able to perform Quantitative Analysis of carbon, hydrogen, nitrogen, sulphur and halogens and preparation and chemical properties of Organometallic compounds.
- CO-04:** Ability to understand Spectroscopy technique like UV and IR.

**B.Sc. Semester-V**  
**Paper-II (CH: 502)**  
**Physical Chemistry**

**Course Outcomes (COs)**

- CO-1:** To acquaint knowledge on basics of Electrochemistry, Nernst equation, applications of EMF measurement in pH determination and potentiometric titration.
- CO-2:** Students to learn and understand about applications of Schrodinger equation in one and three dimensional box, concept and shapes of orbitals, radial distribution curves for different orbitals and molecular orbital theory
- CO-3:** To provide an insight into the photochemistry, laws of photochemistry, Quantum yield, Jablonskii diagram, Raman spectroscopy and rotational-vibrational spectra of diatomic molecules.
- CO-4:** To get an overview about the colligative properties, determination of molecular mass from relative lowering of vapour pressure and Macromolecules, determination of molecular mass of macromolecules using viscometry, osmometry and light scattering methods.

**B.Sc. Semester-VI**  
**Paper-I (CH: 601)**  
**Inorganic Chemistry**

**Course Outcomes (COs)**

- CO-01:** Able to understand Concept related VSEPR theory Calculation of CFSE and Electronic spectra of Transition Metal Complexes.
- CO-02:** Able to understanding the Magnetic Properties of Transition Metal Complexes and Thermodynamic and Kinetic aspect of metal complexes.
- CO-03:** Able to learn Nomenclature, Classification Preparation of Organometallic compound and metal carbonyl compound.
- CO-04:** Able to understanding the Essential and Trace elements in biological processes, Hard and Soft Acids and Bases, HSAB Concept for acid base.

**B.Sc. Semester-VI**  
**Paper-II (CH: 602)**  
**Organic Chemistry**

**Course Outcomes (COs)**

- CO-1:** To learn the basics of NMR spectroscopy, Infrared spectroscopy and to understand the interpretation of NMR spectra of organic molecules and Intensity and position of IR bands, applications of IR spectra.
- CO-2:** Students to learn and understand the synthesis, chemical properties of Malonic ester and acetocacetic ester, classifications and reaction of glucose, mechanism of osazone formation, chain lengthing and chain shortening of aldoses.
- CO-3:** To understand the basics of amino acids, peptides, proteins, nucleic acids, fats, oils, soaps and detergents.
- CO-4:** To get an overview about the synthetic dyes, synthetic polymers and green chemistry