

Program: B.Sc. Honors Chemistry

Program Specific Outcome

PO1: The purpose of the B.Sc. (Honors) Chemistry program is to provide the key knowledge base and laboratory resources to prepare students for careers as professionals in the field of chemistry

PO2: On completing degree in B.Sc. (Honors) Chemistry, students will have foundation in the fundamentals and application of current chemical and scientific theories including those in Inorganic, Organic, Physical and Analytical Chemistries.

PO3: Students will be able to design and carry out scientific experiments as well as analyze the results of such experiments.

PO4: Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.

PO5: Students will be able to explore new areas of research in all branches of chemistry. They will be able to function as a member of an interdisciplinary problem solving team.

PO6: Students will appreciate the central role of chemistry in our society and use this as a basis for ethical behaviour in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.

PO7: Students will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems.

Course Outcomes

Semester I

Course: Inorganic Chemistry-I

- CO1: Students will be provided the knowledge about the Bohr's theory, de Broglie equation, Heisenberg's Uncertainty Principle.
- CO2: Student will learn about Schrödinger's wave equation and deduce Shapes of s, p, d and f orbitals.
- CO3: Students will learn to apply Schrodinger wave equation to find Quantum numbers
- CO4: Students will learn to compare normalized and orthogonal wave functions, Radial and angular wave functions.
- CO5: They will gain knowledge what are Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau's principle and to relate them.
- CO6: Periodicity which means how elements are arranged in the lucid manner and students gains the information about each element, its use in different fields along with it.
- CO7: Students will learn and know about what are Slater Rule, Ionization enthalpy, Electron Gain enthalpy, Electronegativity.
- CO8: Bonding is also the main topic of this course which describes the ionic and chemical bonding, metallic bond and weak molecular forces that how the bond between two elements formed and by this combination a suitable molecule is formed. Knowledge about ionic solids would be given to students.
- CO9: Students will understand about the various application of oxidation and reduction reactions.

Course: Physical Chemistry-I

- CO1: This course will aware students about Maxwell distribution of molecular speeds and viscosity of gasses, Deviation of real gases from ideal behaviour, derivation of vander Waal's equation and virial equation.
- CO2: They will learn about cleansing action of soaps and variation of viscosity and surface tension of liquids with temp and pressure.
- CO3: This course impart knowledge of the students about Classification of solids, laws of crystallography Student also got aware diffraction process , X-rays The student will able to find out a detailed knowledge of applicability of different states of matter in our day to day life
- CO4: To educate the students about dissociation of various acids and bases, salt hydrolysis, buffer solutions, solubility and solubility products of sparingly soluble salts. They will learn about the role of indicators in various acid-base titrations

Semester II

Course: Organic Chemistry I

- CO1: The main outcome of this course is to provide knowledge of carbocations & carbanions and their relative stability
- CO2: Students will be able to imagine 3-D structure of molecules.
- CO3: Students will learn about the application of C-C sigma bond in various reactions.
- CO4: Students will be provided with basis of application of C-C pi bonds in various reactions.
- CO5: Students will understand to know about differences in 2-D & 3-D structures of molecules
- CO6: This will help students to learn about the application in providing knowledge of aromatic nature of various molecules and various reactions carried out with them.

Course: Physical Chemistry-II

- CO1: To students make capable of understanding the basis terms heat, work, enthalpy, entropy, work function and internal energy. They will learn various laws of thermodynamics and their applications. To make students understand the role of thermochemistry in calculating bond enthalpy of reactions.
- CO2: Various partial molar quantities and the variation of partial molar quantities on ideal mixing will be learnt by the students.
- CO3: To enable the students to understand about chemical equilibrium, various equilibrium constants and the applications of Le Chatelier principle.
- CO4: They will learn about the dilute solutions and the dependence of amount of solute on colligative properties

Semester III

Course: Inorganic Chemistry-II

- CO1: Students will get the knowledge of s & p block elements which is a very vast topic of inorganic chemistry.
- CO2: Students will learn to know about various metallurgical processes.
- CO3: Various theories of classification of acids and bases and Pearson's Concept of Hard and soft acids and bases will help students to gain knowledge about the acid and base concept.
- CO4: Students will learn to know about chemistry of noble gases; their molecular shapes and nature of bonding.
- CO5: Students will be provided with knowledge of classification of inorganic polymers and their applications.

Course: Organic Chemistry-II

- CO1: This course imparts knowledge to the students about the mechanisms of reactions of some selected functional groups in organic compounds.
- CO2: It imparts an outline of applied organic chemistry and the applications of organic chemistry in various spheres of chemical sciences.
- CO3: On the completion of the course students will develop proper aptitude towards the study of organic compounds and their reactions.
- CO4: Through the structure and classification of the compounds containing functional groups, they would be able to make comparison between the reactivity of these compounds.
- CO5: They would be able to grab the knowledge about various naming reactions and they will learn about their applications in field of chemistry.

Course: Physical Chemistry -III

- CO1: To make students capable of understanding one, two and three components phase system on the basis of Gibbs phase rule and it will also give the information about the eutectic points, congruent and incongruent systems.
- CO2: To impart knowledge of binary miscible and partially miscible liquids to students. they will learn about the application of Nernst distribution to binary mixture
- CO3: Students will understand about the kinetic of all chemical Reaction. To teach rate of the reaction, what is the factor involves in the every chemical reactions
- CO4: They will learn about the importance of catalyst on chemical reaction and mechanism of enzyme catalysis and acid base- catalysis

CO5: To enable the students to understand and study the surface knowledge of solids when adsorption and desorption of adsorbate takes place, various types of adsorption isotherms

Course: Basic Analytical Chemistry

CO1: Students will have basic knowledge of analytical chemistry, techniques and apply knowledge of the statistical analysis of data.

CO2: They will learn the basic knowledge of soil testing

CO3: Students will have understanding about the water purification methods and quality of water

CO4: Basic knowledge of testing of adulterant in food is learned by students through this course.

CO5: Students will learn the basic knowledge of chromatography, both theoretically and practically.

CO6: Basic concept of High Pressure Liquid chromatography will be learned by students which help them to work later with the instrumentation.

CO7: They will be imparted with the basic knowledge of ion exchanger and its uses.

Semester IV

Course: Inorganic Chemistry-III

- CO1: To understand the key features of coordination compounds, including the variety of structures, oxidation numbers and electronic configurations, coordination numbers, ligands, chelates, bonding and stability of complexes.
- CO2: Students will understand and learn to identify the transition metals on the periodic table and describe the characteristic electron configuration of the transition elements.
- CO3: Basic knowledge of the electron configurations of the lanthanide and actinide elements will be imparted to students. They will learn to list uses for lanthanides and actinides.
- CO4: The students will be able to recognize the contribution of chemistry of metal molecules to the development of chemistry and other related fields.
- CO5: They will learn to evaluate the role of metal ions in biological systems, know the function of metalloporphyrins of hemoglobin in oxygen binding by metal ions and metalloenzymes and metalloproteins.

Course: Organic Chemistry-III

- CO1: Students will learn to describe the structure and properties of amines and amides and other nitrogen containing compounds.
- CO2: To learn the preparation of organic PAHs compounds and to understand the chemical reactions of basic PAHs organic compounds.
- CO3: Students will learn the different types of alkaloids, and terpenes and their chemistry and medicinal importance.
- CO4: Students will understand the fundamental theoretical understanding of heterocyclic chemistry, including alternative general methods for ring synthesis and application of such methods for the preparation of specific groups of heterocyclic systems.
- CO5: The student will get familiar with particular properties and reactions for the most important heterocycles as well as different systems of nomenclature.

Course: Physical Chemistry-IV

- CO1: To predict the electronic and magnetic properties of atoms and molecules based on different theories.
- CO2: Students will be able to analyze different solutions and classify them as being a strong electrolyte, weak electrolyte, or a non-electrolyte.
- CO3: Students will understand how to measure the conductivity of ionic solutions and determine the effect of molar concentration as well as the number of ions in solution on the conductivity.

- CO4: Students will be able to identify an oxidation – reduction (redox) reaction based on changes in oxidation numbers across the chemical change.
- CO5: They will learn to construct an electrochemical cell diagram, including identifying the anode, cathode, direction of electron flow, sign of the electrodes, direction of ion flow in salt bridge, from a redox reaction or from short hand cell notation.
- CO6: To apply standard reduction potential data to calculate the standard cell potential for an electrochemical cell and from the sign of the potential predict if the cell is voltaic or electrolytic.
- CO7: Students will understand the relationship between charge delivered or produced and the amount of reactant used or product formed for both galvanic and electrolytic cells.

Course: Fundamentals of Polymer Chemistry

- CO1: Students will learn to isolate and indicate how the properties of polymeric materials can be exploited by a product designer.
- CO2: To identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units
- CO3: To estimate the number- and weight-average molecular masses of polymer samples given the degree of polymerisation and mass fraction of chains present.
- CO4: To describe the role of rubber-toughening in improving the mechanical properties of polymers.
- CO5: Students will learn to evaluate the structure of polymers, recognizes bounds between polymer chains, interprets stereochemistry of polymers, debates thermal characters and affecting factors of thermal behaviour, explains intermolecular orders at polymers and solves the problems about polymer chemistry.