

## Course Outcomes of Programmes Offered by the Department Of Chemistry

The main areas of Chemistry such as Organic, Inorganic and Physical are included in the chemistry course curriculum for the undergraduate and postgraduate students. The purpose of the curriculum is to provide and enhance the basic knowledge platform that supports an inventive culture. The course curriculum educates future leaders of the nation about how chemistry underlies in the nature and in all natural processes.

The experiments set for laboratory work are designed such that they both instruct and inspire the students to develop a firm foundation in the fundamentals and application of principles of chemistry. The students are taught how to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. The course is so designed that the students understand the pivotal role of chemistry in our society and become potent enough to explore new areas of research both in chemistry and in allied fields of research and technology.

**Name of the Programme** : **B.Sc. Chemistry**

<b>SEMESTER</b>	<b>COURSE CODE/TITLE</b>	<b>COURSE OUTCOMES</b>
<b>Semester-I</b>	Paper-I Inorganic Chemistry (Theory CH-101)	<b>CO1:</b> States the postulates of quantum mechanics and Schrodinger equation to explain the structure of hydrogen atom. <b>CO2:</b> To study and explain the Radial and angular nodes and their significance in describing shapes of s,p and d orbitals. <b>CO3:</b> Know about Spin quantum numbers and magnetic quantum numbers and their significance. <b>CO4:</b> Have knowledge about Electronic configuration, Effective nuclear charge and Slater's rule.

		<p><b>CO5:</b> To learn about Ionic bonding and energy consideration in ionic bonding to Explain Lattice energy and solvation energy.</p> <p><b>CO6:</b> To study Born-Lande equation and Born-Haber cycle, polarizing power and polarizability.</p> <p><b>CO7:</b> To apply VSEPR theory in explaining shapes of some inorganic molecules and ions.</p> <p><b>CO8:</b> Know about Rules of LCAO method, Bonding and antibonding molecular orbitals.</p>
	<p>Paper-II Physical Chemistry (Theory CH-102)</p>	<p><b>CO1:</b> To learn about Role of temperature and pressure to establish the state of gases and describe the Concept of critical temperature, pressure and volume of real gases</p> <p><b>CO2:</b> To understand the Maxwell distribution law and various parameters associated with collisions ideal gas molecules</p> <p><b>CO3:</b> To study the Physical properties of liquids like surface tension, viscosity and their measurements</p> <p><b>CO4:</b> To understand the morphology of</p>

		<p>crystalline solids and have knowledge about various types of symmetries present in different solids</p> <p><b>CO5:</b> To be able to describe X-rays diffraction and Bragg's law</p>
	Paper-III Organic Chemistry (Theory CH-103)	<p><b>CO1:</b> Have sound knowledge of the basic organic chemistry like electron displacement effects with suitable examples.</p> <p><b>CO2:</b> Get information about the types of structural and stereoisomers, optical isomerism, and different nomenclature like D/L, RScis/trans, E/Z etc. of various organic compounds.</p> <p><b>CO2:</b> Learn nomenclature of various type of alkanes and cycloalkanes, preparation and their chemical reactions.</p>
<b>Semster-II</b>	Paper-IV Inorganic Chemistry (Theory CH-104)	<p><b>CO1:</b> To know the concept and able to explain types and effect of hydrogen bonding and van der waals forces on properties of substances.</p> <p><b>CO2:</b> To learn about the various theories of metallic bonding with reference to conductors, insulators and</p>

		<p>semiconductors and their applications.</p> <p><b>CO3:</b> To know about the diagonal relationship among S- block elements and about hydrides, oxides, hydroxides and halides of S-block elements.</p> <p><b>CO4:</b> Learn about chemistry of noble gases with special reference to xenon.</p> <p><b>CO5:</b> To know about the physical and chemical properties of p-block elements.</p> <p><b>CO6:</b> Have knowledge about the boron family elements their structure, preparation and properties of diborane and borazine.</p> <p><b>CO7:</b> To learn about the elements of carbon and nitrogen family and concept of catenation, carbides and fluorocarbons.</p> <p><b>CO8:</b> To know about the elements of oxygen family and have knowledge about the chemical properties of oxides of sulphur.</p>
	<p>Paper-V Physical Chemistry (Theory CH-105)</p>	<p><b>CO1:</b> To have the knowledge about the concepts of rates of chemical reactions and its applications in derivation of reactions</p>

		<p>of various orders and half-life</p> <p><b>CO2:</b> To be able to explain about the physical and magnetic properties associated with various molecular substances</p> <p><b>CO3:</b> To have information about conductance and its applications to deduce various parameters related to electrolytic solutions, to know about pH and conductometric titrations</p>
	Paper-VI Organic Chemistry (Theory CH-106)	<p><b>CO1:</b> Sound knowledge of alkenes, alkynes, dienes and their chemical reactions.</p> <p><b>CO2:</b> Know about Huckel's rule of aromaticity and various methods of preparation of aromatic Hydrocarbons.</p> <p><b>CO3:</b> Get knowledge about the mechanism of <math>S_N1</math> and <math>S_N2</math> reactions and other various chemical reactions of aryl and aryl halides.</p>
	Paper-VII Practicals (CH-107)	<p><b>CO1:</b> To gain knowledge about Preparation of standard solutions used in the lab.</p> <p><b>CO2:</b> Know about Redox ,</p>

		<p>iodometric titrations and complexometric titrations.</p> <p><b>CO3:</b> To study the concept of surface tension and its determination by various methods.</p> <p><b>CO4:</b> To know about viscosity and its measurements by using Ostwald's viscometer.</p> <p><b>CO5:</b> To learn about How to Purify organic compounds by crystallisation(with alcohol and water), sublimation and distillation.</p> <p><b>CO6:</b> Able to prepare various organic compounds and also their derivatives.</p> <p><b>CO7:</b> To study the process of sublimation and crystallization of camphor and phthalic acid.</p> <p><b>CO8:</b> Able to analyze qualitatively inorganic cations and anions using paper chromatography.</p>
<b>Semster-III</b>	Paper-VIII Inorganic Chemistry (Theory CH-201)	<p><b>CO1:</b> Have good knowledge about d-block elements particularly of transition elements.</p> <p><b>CO2:</b> To study the comparison between 3d elements with 4d and 5d elements</p>

		<p>with reference to ionic radii, oxidation state, magnetic properties and spectral properties some compounds of transition elements.</p> <p><b>CO3:</b> To apply the magnetic moment data for 3d metal complexes and study the selection rules for the d-d transitions.</p> <p><b>CO7:</b> To know about the basic concepts of coordination chemistry like EAN, Werner theory of coordination and isomerism in coordination complexes.</p> <p><b>CO6:</b> To know about the non-aqueous solvents and their reactions.</p>
	<p>Paper-IX Physical Chemistry (Theory CH-202)</p>	<p><b>CO1:</b> To know about the general terms of thermodynamics and concept of energy and enthalpy.</p> <p><b>CO2:</b> To understand the basic terms related to chemical equilibrium and derive the law thermodynamically, deduce relation between various equilibrium</p>

		<p>constants and determining partition coefficient of a solvent dissolved in two immiscible solvents.</p> <p><b>CO3:</b> To understand the basic terms related to distribution law and application of distribution law in determination of degree of hydrolysis and equilibrium constant.</p>
	Paper-X Organic Chemistry (Theory CH-203)	<p><b>CO1:</b> Know about alcohols, phenols, epoxides and their chemical reactions.</p> <p><b>CO2:</b> Knowledge about various methods for the preparation of carboxylic acid, carboxylic derivatives (ester, amide, acid chlorides, anhydrides) and their chemical reactions.</p> <p><b>CO3:</b> Have knowledge of various absorption laws (Beer-Lambert law), molar absorptivity, analysis UV spectra and application of UV spectroscopy in structure elucidation.</p>
<b>Semster-IV</b>	Paper-XI Inorganic Chemistry (Theory CH-204)	<p><b>CO1:</b> To know about position of f block elements in periodic table and their general</p>



		<p>characteristics.</p> <p><b>CO2:</b> To study the occurrence and separation of lanthanides and lanthanide compounds.</p> <p><b>CO3:</b> Have knowledge of actinides their existence and general properties.</p> <p><b>CO4:</b> To compare the properties of Lanthanides and actinides with transition elements.</p> <p><b>CO4:</b> To more about Qualitative and Quantitative Inorganic Analysis.</p>
	<p>Paper-XII Physical Chemistry (Theory CH-205)</p>	<p><b>CO1:</b> To know about the laws and concepts of chemical thermodynamics and their applications in thermochemical calculations.</p> <p><b>CO2:</b> To have knowledge about electrolytic concentration cells with and without transference and their EMF calculation, applications of the concept to determine liquid junction potential, pH determination using</p>

		<p>potentiometry and potentiometric titrations.</p> <p><b>CO3:</b> Know about Concept of basics of cells their EMF determination by use of Nernst equation and thermodynamic properties</p>
	Paper-XIII Organic Chemistry (Theory CH-206)	<p><b>CO1:</b> Able To describe absorptions of various functional groups and applications of IR spectroscopy.</p> <p><b>CO2:</b> To synthesize and know reactions of amines.</p> <p><b>CO3:</b> To discuss synthetic application of diazonium salt.</p> <p><b>CO4:</b> Know about the preparation of aliphatic, aromatic aldehydes and ketones and various important name reactions of aldehydes and ketones.</p> <p><b>CO5:</b> Get knowledge about the acidity of <math>\alpha</math>-hydrogens of diethyl malonate, ethyl acetoacetate and the synthesis and Keto-enol tautomerism of ethyl acetoacetate.</p>
	Paper-XIV Practicals (CH-207)	<p><b>CO1:</b> To verify the Beer's lambert law using potassium permanganate and potassium dichromate</p>

		<p>and also quantitation of these analytes.</p> <p><b>CO2:</b> To prepare simple coordination complexes viz. Cuprous chloride, tetra-ammine cupric sulphate, chrome alum, potassium trioxalatochromate(III) and Nickel Hexamine chloride.</p> <p><b>CO3:</b> Able to find out critical solution temperature of phenol water system.</p> <p><b>CO4:</b> To determine the enthalpy of solution of calcium chloride enthalpy of neutralization and ionization using different combinations of acids and bases.</p> <p><b>CO5:</b> To perform hydrolysis of ethyl acetate and find out rate constant of the reaction.</p> <p><b>CO6:</b> To identify extra elements present in various solid organic compounds.</p> <p><b>CO7:</b> Able to identify functional group present in organic compounds.</p> <p><b>CO8:</b> Able to measure melting point, solubility behaviour, pH range, flame testing etc. of organic Compounds.</p>
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<b>Semster-V</b>	Paper-XV Inorganic Chemistry (Theory CH-301)	<p><b>CO1:</b> To recapitulate the concept of valence bond theory and know the concept of crystal field theory with reference to splitting of d orbital's in octahedral, tetrahedral and square planar complexes and factors affecting the crystal field parameters.</p> <p><b>CO2:</b> To explain the factors responsible for the stability of coordination complexes and various substitution reactions of square planar complexes with reference to trans effect.</p> <p><b>CO3:</b> To study the magnetic properties of transition metal complexes and various types of magnetic materials and their magnetic susceptibility.</p> <p><b>CO4:</b> To explain the methods for the determination of magnetic susceptibility.</p> <p><b>CO5:</b> To apply the magnetic</p>

		<p>moment data for 3d metal complexes and study the selection rules for the d-d transitions.</p> <p><b>CO5:</b> Able to calculate the spectroscopic terms for various metal ions.</p> <p><b>CO6:</b> Have knowledge about Orgal level diagrams for d<sup>1</sup> and d<sup>9</sup> electronic states and the electronic spectrum of [Ti(H<sub>2</sub>O)<sub>6</sub>]<sup>+3</sup> complex ion.</p>
	<p>Paper-XVI Physical Chemistry (Theory CH-302)</p>	<p><b>CO1:</b> To know about dual characteristic of matter and extend this fact to obtain postulates of quantum mechanics and quantum-mechanical operators, apply Schrödinger equation to determine the physical observables for particle in a box.</p> <p><b>CO2:</b> To be able to explain about the physical and magnetic properties associated with various molecular substances</p> <p><b>CO3:</b> To have sound knowledge about the consequences of interaction of radiation with matter resulting into various types of spectra.</p>

		<p><b>CO4:</b> To be able to solve various numerical problems related to spectroscopy.</p>
	<p>Paper-XVII Organic Chemistry (Theory CH-303)</p>	<p><b>CO1:</b> Get knowledge about the principle of nuclear magnetic resonance and the PMR spectra of the various molecules.</p> <p><b>CO2:</b> Brief description of organometallic compounds.</p> <p><b>CO3:</b> To have knowledge about classification, structures and important reactions of carbohydrates and amino acids.</p>
<p><b>Semster-VI</b></p>	<p>Paper-XVIII Inorganic Chemistry (Theory CH-304)</p>	<p><b>CO1:</b> To study the nomenclature, classification, preparation and bonding in organometallic compounds and of metal carbonyls also.</p> <p><b>CO2:</b> Introduce the concept of acids and bases to the students and also able to explain the various theories associated with them.</p> <p><b>CO3:</b> To know about basic concepts of bioinorganic chemistry with reference to metal ions present in</p>

		<p>biological systems.</p> <p><b>CO4:</b> To study the biochemistry of dioxygen carriers especially hemoglobin and myoglobin.</p> <p><b>CO5:</b> To know about various inorganic clusters compounds with special reference to silicones and phosphazenes.</p>
	<p>Paper-XIX Physical Chemistry (Theory CH-305)</p>	<p><b>CO1:</b> To understand the need of statistical mechanics and Maxwell-Boltzmann distribution, partition function and its significance.</p> <p><b>CO2:</b> Basic information of photochemistry and laws of photochemistry.</p> <p><b>CO4:</b> To learn about Phosphorescence and fluorescence.</p> <p><b>CO5:</b> To have knowledge about solutions and colligative properties and their application in determining molar mass of solute.</p> <p><b>CO6:</b> To have good knowledge about fundamental concepts of phase equilibrium and their applications in studying one and</p>

		two-component systems including eutectics.
	Paper-XX Organic Chemistry (Theory CH-306)	<p><b>CO4:</b> Get knowledge aromatic behaviour and basicity of simple heterocyclic compounds.</p> <p><b>CO6:</b> Get knowledge about the acidity of <math>\alpha</math>-hydrogens of diethyl malonate, ethyl acetoacetate and the synthesis and Keto-enol tautomerism of ethyl acetoacetate.</p> <p><b>CO3:</b> To have knowledge about classification, structures and important reactions of amino acids.</p> <p><b>CO3:</b> To know about basics of Synthetic polymers and their applications.</p> <p><b>CO3:</b> To know about organosulphur compounds and their reactions.</p>
	Paper-XXI Practicals (CH-307)	<p><b>CO1:</b> Have basic knowledge about chemicals and instruments present in the chemistry lab and also their handling and maintenance.</p> <p><b>CO2:</b> Able to know about different concept of preparations of solution, indicators and buffer solutions in chemistry lab.</p> <p><b>CO2:</b> To know about various methods for</p>



		<p>the purification of various chemicals used in the lab.</p> <p><b>CO4:</b> Have knowledge about the calibration, handling and maintenance of various instruments used in the chemistry laboratory.</p>
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