



**TELANGANA SOCIAL WELFARE RESIDENTIAL
DEGREE COLLEGE FOR WOMEN-NIRMAL
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Department of Chemistry

Programme Outcomes of B.Sc., Chemistry

On successful completion of 3 year B.Sc Chemistry course the students will be able to

- P01.** Know the fundamental concepts and practical applications of Chemistry
- P02.** Use the right methods for both qualitative and quantitative analytical laboratory and industries.
- P03.** Understand the various areas of chemistry viz., Organic, Inorganic, Physical, Biological and Medicinal Chemistry
- P04.** Understand the causes of environmental pollution and thereby applying environment friendly policies instead of environmentally hazard ones in every aspect.
- P05.** Develop critical thinking and to design, carry out, record and analyze the results of chemical reactions & to think and apply evidence based comparative chemistry approach to explain chemical synthesis and analysis.
- P06.** Learn how to synthesise, isolate and characterise substances using instrumental and chemical methods.
- P07.** Give a theoretical foundation and foster the development of practical abilities for material analysis utilising contemporary methods and instruments.
- P08.** Acquire in-depth information that enables to fulfil the demands of competitive exams for higher education and professional skills
- P09.** Act as team player by contributing in laboratory, field based situation and industry.

Course Outcomes of B.Sc., Chemistry

Semester I

Unit-I _ Inorganic Chemistry

- To learn about Chemical bonding and Molecular structure, draw the plausible structures and geometries of molecules using Radius Ratio Rules, VSEPR theory and molecular orbital energy diagrams.
- To understand the importance and application of chemical bonds, intermolecular and intramolecular weak chemical forces and their effect on melting points, boiling points, solubility and energetics of dissolution
- To study the compounds of p-block elements, their synthesis, classification, reactivity and their uses

Unit-II_ Organic Chemistry

- To be well versed with all the fundamental concepts of organic chemistry such as bond fission and various types of bond polarization like inductive effect, mesomeric effect, hyper conjugation and their applications.
- To learn the classification and preparation of Alkanes, Alkenes, Alkynes and Aromatic Hydrocarbons and their reactivity.
- To learn about Huckel's rule of Aromaticity.

Unit-III_Physical Chemistry

- To learn the elementary quantum mechanics, various laws associated with it.
- To own the ability to differentiate between real and ideal gases. Understand and deriving the mathematical expressions for ideal gas law, real gas law and comment on deviation from ideal behaviour.
- To understand the basics and advanced concepts related to state of matter i.e. Gaseous State, Liquid State.
- To derive the various mathematical expressions to define the physical properties of Liquids and Gases.
- To elaborate the chemistry of ideal and non-ideal solutions and apply the concept of phase equilibrium in various systems.

Unit-IV_General Chemistry

- To identify various anions and cations present in the given inorganic salt and understand the principle behind their separation and identification such as Sodium Carbonate extract preparation, understanding the interfering ions, solubility product and common ion effect
- To learn about the isomerism and types of isomerism. To understand constitutional and conformational isomerism
- To study the conformational analysis of various compounds and understand their stability

- To understand the laws of crystallography, various definitions of crystal systems, XRD by crystals, derive Bragg's equation and determine the structure of crystal systems.

Semester II

Unit-I _ Inorganic Chemistry

- To explore the chemistry of Oxides, Oxyacids, Interhalogen compounds, Poly halides and Pseudohalogen of non-metals.
- To study the chemistry of zero group elements viz., isolation, structure, bonding of Xenon compounds & anomalous behaviour of He
- To understand the chemistry of d-block elements and comparative study of Ti, Cr & Cu triads.

Unit-II_ Organic Chemistry

- To design the synthesis of molecules of synthetic utility by functional group transformation.
- To learn about the classification, synthesis and reactivity of halogen compounds, alcohol, phenol, ether and carbonyl compounds
- To study important named reactions.

Unit-III_ Physical Chemistry

- To understand the conductance, molar and equivalent conductance and its variation with dilution.
- To study the migration of ions under the influence of external potential, theories of electrolyte dissociation, transport number and its determination
- To study the conductometric titrations and their applications
- To study about different types of cells, representation of an electrochemical cell, types of electrodes, electrochemical series and its significance
- To understand the applications of EMF measurements and study about potentiometric titrations

Unit-IV_ General Chemistry

- To know about principle, definitions and procedure of volumetric analysis i.e., titrimetric analysis, various types of titrations and their applications
- To study the various steps involved in gravimetric analysis and determine Ni^{+2} in the given sample.
- To understand stereoisomerism, chiral molecules, criteria for chirality, optical activity, R,S - configuration - C.I.P rules, asymmetric and dissymmetric molecules.
- To study about dilute solutions and colligative properties

Semester III

Unit-I _ Inorganic Chemistry

- To study the chemistry of lanthanides and actinides and understand the general chemistry of inner transition elements with reference to electronic configuration, oxidation state, electrode potential, colour, electronic spectra. Complex formation tendency etc.
- To study the nomenclature of complexes, coordination number, various theories of bonding like Werner's theory, Sidgwick's theory, EAN rule, Valence Bond theory, isomerism and its types in coordination compounds
- To study the preparation and properties of metal carbonyls and understand their stability w.r.t. 18 valence electron rule
- To study the definition, nomenclature, classification, preparation methods, properties and applications of organometallic compounds

Unit-II_Organic Chemistry

- To study the preparation, physical and chemical properties of Carboxylic acids and their derivatives and named reactions involved.
- To study the preparation of nitroalkanes, their reactivity, physical and chemical properties.
- To understand the classification, preparation, physical and chemical properties of amines, preparation of diazonium salts and their synthetic applications.
- To learn the structure, preparation and properties of cyanides and isocyanides

Unit-III_Physical Chemistry

- To learn the terminology and definitions in thermodynamics, thermodynamic quantities-Intensive & Extensive properties, State Functions & Path Functions
- To understand the Laws of Thermodynamics, derive the various mathematical expressions of First Law, Second Law, cyclic process, Carnot's theorem, efficiency of heat engine, Third Law, ΔU , ΔH , ΔS , ΔG , ΔA for ideal and real gases under different conditions
- To be able to explain Enthalpies of reactions and derive the mathematical relations for these enthalpies of reaction.
- To be able to predict the spontaneous and non-spontaneous, reversible and irreversible reactions.
- To be able to write Gibbs equations and Maxwell relations

Unit-IV_General Chemistry

- To understand the significant figures, accuracy, precision, errors-classification of errors

- To be able to solve the problems related to mean, median, range and standard deviation.
- To understand the acidic nature of α -hydrogens, tautomerism in various compounds, stability of carbanions and synthetic applications of diethyl malonate and ethyl acetoacetate.
- To Learn the terminology in phase rule, Gibb's phase rule, phase equilibria of one component and two component systems .
- To learn the procedure to construct the phase diagram using cooling curves

Semester IV

Unit-I _ Inorganic Chemistry

- To understand the Crystal Field theory, splitting patterns in octahedral, tetrahedral and square planar complexes
- To calculate the CFSE for various configurations, understand high spin and low spin complexes and their stabilities.
- To study the colour and magnetic properties of metal complexes and calculate the magnetic moments.
- To learn the methods to detect the complex formation.
- To understand the HSAB principle and its application in determining the complex formation
- To understand the thermodynamic and kinetic stability, stepwise and overall stability constants and their relationship
- To determine the composition of complex by Job's method and mole ratio.
- To study the applications of Coordination compounds.
- To understand the biological significance of various elements, study about the toxic metal ions, Structure and functions of Hb, structure of chlorophyll and fixation of CO_2 in photosynthesis, Z-scheme

Unit-II _ Organic Chemistry

- To understand the classification and nomenclature of carbohydrates.
- To study the structural elucidation of (+) glucose and (-) fructose and various methods for the interconversion of monosaccharides.
- To study the classification, synthesis, physical and chemical properties of aminoacids.
- To understand the structure, nomenclature of peptides and synthesis of dipeptides.
- To learn about the aromatic character, nature of heterocyclic compounds, their synthesis and reactivity.

Unit-III_Physical Chemistry

- To understand the rate law, its expression, rate of reaction and factors affecting it.
- To know about the Order of reaction and derive integrated rate expressions for zero order, first order, pseudo first order and second order reactions, their half-life period, graphs and examples
- To understand the difference between thermal and photochemical reactions.
- To know about photochemistry, laws of photochemistry, quantum yield and its measurement
- To understand the photophysical and photochemical processes

Unit-IV_General Chemistry

- To understand the various theories of bonding in metals like Free Electron theory, VBT, MOT/Band theory.
- To learn about Mannich reaction, Michael addition, Knoevenagel condensation and the synthetic applications of EAA and Malonic ester
- To be able to define and classify colloids, learn the preparation and properties of different types of colloids viz., sols, emulsions, gels
- To understand various types of adsorption, factors influencing adsorption, adsorption isotherms and applications of adsorption.

Semester V

Spectroscopy and Separation Techniques

- To understand the Electromagnetic radiation, different regions of EMR, definition of spectroscopy and its types.
- To classify molecules based on moment of inertia and determine the bond length of rigid diatomic molecules
- To determine the force constant, modes of vibrations in polyatomic molecules.
- To understand the identification of functional groups with the help of characteristic absorption bands
- To know BMOs & ABMOs, electronic energy levels, types of electronic transitions, selection rules in electronic spectroscopy, Beer-Lambert's law and its limitations
- To understand the principle of ^1H NMR spectroscopy, terms such as chemical shift-factors affecting chemical shift, splitting of signals, coupling constant.
- To represent the ^1H NMR of various compounds and also determine the number of different types of protons from ^1H NMR spectral data
- To learn the principles of Mass Spectrometry, Nitrogen rule, Types of ions, types of peaks, representation of mass spectrum and determine the molecular formula of the compound from mass spectral data.

- To understand the principle of solvent extraction and study the methods of extraction and applications
- To define chromatography, study the classification of chromatographic methods, understand the principle of differential migration
- To be able to perform TLC by preparing the plates, development of chromatogram, detection of spots and factors affecting the R_f values and identify the compounds through TLC
- To understand the different types of paper chromatography, procedure and applications of PC
- To be able to know the principle of column chromatography, procedure and applications of CC
- To understand the principle of Ion-Exchange chromatography and its application in separation of ions and de-ionized water.
- To know the principle, theory, instrumentation and applications of Gas Chromatography and High Performance liquid Chromatography

Semester VI

Medicinal Chemistry:

- To know what a disease is and different types of diseases.
- To know the terminology in Medicinal Chemistry like drug, API, Pharmaceuticals, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, Metabolites, Anti metabolites and Therapeutic index.
- To study the nomenclature and classification of drugs based on structure and therapeutic activity.
- To learn and understand Absorption, Distribution, Metabolism and Excretion, Toxicity.
- To study the mechanism and factors affecting enzyme action, enzyme inhibition-types.
- To know what a receptor is, drug- receptor theory, Agonist and antagonist, understand the basic principles of drug-receptor interaction, binding roles of different functional groups and study the structural activity relationship of different classes of drugs.
- To understand the drug metabolic pathways, adverse effects and therapeutic value of drugs
- To study the synthesis and therapeutic activity of Chemotherapeutics, Drugs to treat metabolic disorders, drugs acting on nervous system.
- To learn about hormones and neurotransmitters, their functions
- To learn about vitamins and micronutrients- their sources, deficiency disorders and remedy for deficiency.

