

Department of Chemistry

PROGRAMME OUTCOME, PROGRAMME SPECIFIC OUTCOME, LEARNING OUTCOME AND COURSE OUTCOME.

B.Sc(Chemistry)

PROGRAMME OUTCOMES

- It provides well skilled professionals for the chemical industries, banking sector, pharmaceuticals etc.
- Chemistry in B.sc helps the students in improving their diverse skills in areas such as laboratory skills, numerical and computing skills and ability to approach the problems both analytically and logically, time management skills etc.
- It helps to develop scientific temper and thus can prove to be more beneficial for the society as the scientific developments can make a nation or society to grow at a rapid pace.

PROGRAMME SPECIFIC OUTCOMES

- The students will be better prepared to understand new environment friendly systems and new initiatives adopted by the chemical industry.
- After graduation in B.sc degree, the students can opt various fields for post graduation courses like M.sc in general, analytical, drug ,organic ,pharmaceutical ,physical chemistry ,material sciences and biochemistry.
- Chemistry graduates can be employed at both Private and Government sectors such as pharmaceutical industries, chemical manufacturers, forensic science department, agro-chemical industries, teaching etc.

COURSE OUTCOMES (8 THEORY AND 8 PRACTICAL COURSES)

CHEMISTRY-I	<p>Students will learn:</p> <p>PART-A</p> <p>UNIT-I</p> <p>Atomic structure:Bohr's theory,dual behavior of matter and radiation,deBroglie's relation,Hiesenberg Uncertainty principle,limitations of classical mechanics,quantum mechanics,operators ,significance of quantum numbers,rules for filling electrons in various orbitals.</p> <p>UNIT-II</p> <p>Chemical bonding and molecular structure: ionic bonding,Born-Lande equation,Born-Haber cycle,Covalent character of ionic bonding,Fajan's rules,covalent bond-MO approach,Rules for filling MOs. Metallic bonding:Band theory.</p> <p>PART-B</p> <p>UNIT-III</p> <p>Fundamentals of organic chemistry:reactive intermediates,types of reactions- addition,elimination and substitution reactions.</p> <p>Isomerism: structural and stereoisomerism,optical isomerism.</p> <p>UNIT-IV</p> <p>Aliphatic hydrocarbons:preparation and reactions of alkanes,alkenes,alkynes.</p> <p>UNIT-V</p> <p>Aromatic hydrocarbons: Nomenclature ,aromaticity,electrophilic substitution reactions.</p>
CHEMISTRY PRACTICAL-I	Students learn to perform- Quantitative analysis in terms of redox titrations

	involving internal, external and self indicators are taught in the Practicals.
CHEMISTRY-II	<p>Students will learn:</p> <p>PART-A</p> <p>UNIT-I Chemical Energetics. First law of thermodynamics:basic terms,important principles and and definitions of Thermochemistry, I and II law of thermodynamics.</p> <p>UNIT-II Chemical Equilibrium: free energy change in a chemical reaction.relation between K_p, K_c and K_x for reactions involving ideal gases. Ionic Equilibrium:strong,moderate and weak electrolytes,degree of ionization,Ph scale,common ion effect,solubility and solubility product.</p> <p>PART-B</p> <p>UNIT-III Alkyl and Aryl halides:Nomenclature,preparation. Substitution and elimination reactions. Aryl halides:preparation of chloro,bromo and iodo benzene-sandmeyers reacton. Organometallic compounds: Grignard reagent preparation,synthetic applications.</p> <p>UNIT-IV Alcohols,phenols,ethers and epoxides:classification and preparations.</p>

<p>CHEMISTRY PRACTICAL-II</p>	<ol style="list-style-type: none"> 1. Purification of compounds - recrystallization and distillation. 2. Criteria of purity - determination of melting point and boiling point. 3. Preparation of 7-hydroxy-4-methyl coumarin from resorcinol. 4. Preparation of dibenzal acetone from benzaldehyde. 5. Nitration - Preparation of m-nitrobenzoic acid from benzoic acid. 6. Nitration - Preparation of meta-dinitro benzene from nitro benzene. 7. Preparation of Nerolin or beta-Naphthyl methyl ether from beta-naphthol. 8. Preparation of 2,4-dinitrophenyl hydrazone derivative of benzaldehyde. 9. Acetylation - Preparation of acetanilide from aniline. 10. Bromination - Preparation of tribromophenol from phenol.
<p>CHEMISTRY-III</p>	<p>Students learn:</p> <p>UNIT-I</p> <p>Chemical kinetics: review of terms –order, rate & molecularity.</p> <p>II Order reactions, definitions with examples, derivation.</p> <p>Theories of reaction rates, experimental determination of kinetics.</p> <p>Thermodynamics:</p> <p>Review of terms, I law of thermodynamics, II law</p>

	<p>of thermodynamics Carnot cycle, entropy, reversible and irreversible process.</p> <p>UNIT-II Gibb's free energy, criterion for equilibrium, Nernst heat theorem and III law of thermodynamics. Surface chemistry: Theories of adsorption, adsorption isotherm Catalysis: types and theories with example, heterogeneous catalysis. Organic and inorganic polymers: Polymerization – preparation and applications. Compounds of some non-metals.</p> <p>UNIT-III Metallurgy: Ellingham's diagrams and extraction of some metals. Alcohols and thiols: Introduction & classification, some of naming reactions, reactions of alcohols, glycols and glycerols. Thiols: nomenclature and classification and reactions methods of preparation.</p> <p>Unit-IV Phenols- Classification, reactions and conversions Ethers and epoxides: Methods of preparations and reactions. Fertilizers: Introduction and functions of essential plant nutrients. Organo metallic compounds : preparation and applications.</p>
CHEMISTRY PRACTICAL-III	Students learn-

	To prepare different organic compounds in the laboratory.
CHEMISTRY-IV	<p>UNIT-I Phase equilibria – degrees of freedom, phase rule, two component systems, effect of temperature on solubility of compounds; Crystalline and amorphous solids, anisotropy, types of crystalline solids, space lattice and unit cell; liquid crystals; super conducting solids</p> <p>UNIT-II Water technology – physical, chemical and biological impurities; treatment of water for domestic and industrial purposes. Nuclear and radio chemistry – types of radiation, properties, atomic and mass numbers; radioactive decay, group displacement law; artificial radioactivity and carbon dating. Powder metallurgy-advantages and applications.</p> <p>UNIT-III Steel – phase diagram, composition. alloys of steel and heat treatment of steels. Aldehydes and ketones : Preparation and properties ; mechanisms of some important reactions.</p> <p>UNIT-IV Carboxylic acids: preparation, acidic strength, reactions and a few mechanisms of important reactions Tautomerism and Enolates – introduction, types and preparation. Environmental chemistry- different layers in atmosphere and green house effect.</p>
CHEMISTRY PRACTICAL-IV	Students will come to know, how to perform-

	Qualitative analysis of inorganic salt mixtures.
CHEMISTRY-V (ORGANIC CHEMISTRY)	<p>UNIT-I Stereo chemistry: elements of symmetry, isomerisms due free rotation, meso compounds, diastereomers, racemisation, resolution, geometric isomerism in alkenes and oximes; alicyclic compounds and bicyclic systems.</p> <p>UNIT-II Amines: classification, preparation, properties and strengths. Heterocyclic compounds: classification, structure, preparation and properties.</p> <p>UNIT-III Natural products: 1. carbohydrates introduction, classification, monosaccharides, epimers and anomers, mutarotation, elucidation of structure of glucose , disachcharides, conversions of glucose to fructose and vise versa, glycosidic bond. 2. Terpenes and terpenoids. Classification, structural elucidation of citral and zingiberene, structures of terpenes and their uses; 3. Alkaloids - classification, structures of few alkaloids and uses, structural elucidation of nicotine.</p> <p>UNIT-IV Spectroscopy: introduction, UV – visible spectroscopy, IR spectroscopy and NMR spectroscopy Industrial organic chemistry: introduction, classification, synthesis and uses of synthetic dyes and drugs, ; introduction green chemistry- principle and synrthesis of ibuprofen.</p>

<p>CHEMISTRY PRACTICAL-V</p>	<p>Students learn how to perform- Qualitative analysis of organic compounds.</p>
<p>CHEMISTRY-VI (PHYSICAL CHEMISTRY)</p>	<p>UNIT-I Molar conductance, conductometric titration, transport number, Kohlrausch's law. Debye-Huckel-Onsager reactions; types of cells, Nernst equation and numerical problems and Arrhenius theory.</p> <p>UNIT-II Electrochemistry II : Weston-Cadmium cell, Weston cell, liquid junction potentials, types of electrodes, determination of pH, solubility of salts and solubility products; potentiometric titrations with numerical examples.</p> <p>Ionic equilibria : Hydrolysis of salts, effect of temperature and dilution; common-ion effect; buffer action, application of buffers; indicators and numeric problems.</p> <p>UNIT-III Physical properties and molecular structures: Dipole moment, induced dipole; structure of molecules; magnetic properties, electrical properties of solids, pyro electricity; Thomson effect, Seebeck effect and Peltier effect.</p> <p>Chemical spectroscopy 1 : Radiation and matter; Born-Oppenheimer approximations; rotational spectra of diatomic molecules; rotational energy of different quantum levels; selection rule and numericals.</p> <p>UNIT-IV</p>

	Vibrational spectroscopy, Raman spectroscopy, electronic spectroscopy, electroanalytical methods.
CHEMISTRY PRACTICAL-VI	Students will learn to perform - Conductometric and potentiometric titrations, colorimetric experiments, and determination of molar and specific conductance
CHEMISTRY-VII (INORGANIC CHEMISTRY)	<p>UNIT-I Co-ordination and Organometallic compounds I : Ligands – Definition, classification and nomenclature; Werner's theory, EAN Rule; Valence bond theory; Crystal field theory; Isomerism in complexes; Synthesis and structure of organometallic compounds.</p> <p>UNIT-II Co-ordination and Organometallic compounds II : Metal carbonyls; eighteen electron rule and its deviations; application of co-ordination compounds and Monsanto acetic acid process.</p> <p>Industrial materials I: Refractories, abrasives, glass, ceramics and cement.</p> <p>UNIT-III Industrial materials II: Paints and varnishes, fuels, coal, explosives and propellants.</p> <p>Bio inorganic chemistry: essential and trace elements with their roles in biological systems; Metallo – porphyrins and role of cobalamin in living systems.</p> <p>UNIT-IV Chemistry of newer materials: conducting polymers, superconductors, fullerenes, carbon nanotubes and nanomaterials.</p>
CHEMISTRY PRACTICAL-VII	Students will learn to do

	Quantitative estimations using volumetric , gravimetric and back titration methods.
CHEMISTRY-VIII (BIO-CHEMISTRY)	<p>UNIT-I Introduction to biochemistry Carbohydrates: Amino sugars, sugar acids, sugar phosphates, structure and biological importance of oligo saccharides and polysaccharides.</p> <p>Lipids: Classification, fatty acids, triglycerides, phosphoglycerides, cholesterol and sphingoLipids.</p> <p>UNIT-II Proteins: Amino acids, peptide bonds, levels of organization of proteins, denaturation and renaturation and classification of proteins.</p> <p>Nucleic acids: Types, components, Chargaff's rule, polynucleotides - DNA and RNA – structure and biological roles; protein – nucleic acid interaction, chromatin and viral nuclear capsid.</p> <p>Hormones: Definition, classification; roles of insulin and glucagon; mediators of hormone action.</p> <p>UNIT-III Enzymes: active site, specificity, classification, enzyme substrate interaction, enzyme kinetics, Allosteric enzymes and enzyme inhibitors. Biological oxidation : Bioenergetics; high energy phosphates, energy coupling in biological systems, redox potentials of important biological half reactions, calculation of energy yield from biological redox reaction, electron transport chain, oxidative and substrate level phosphorylation.</p>

	<p>Biochemical techniques: Principle and applications of paper chromatography and TLC; cellulose acetate, electrophoresis and PAGE.</p> <p>UNIT-IV</p> <p>Metabolism: Catabolism and anabolism; carbohydrate metabolism – glycolysis, TCA cycle and energetics of cycle; gluconeogenesis; fatty acid metabolism; protein metabolism – amino acid degradation; urea cycle.</p> <p>Molecular biology: Central dogma, semi conservative replication; genetic code; transcription and translation; DNA finger printing.</p>
CHEMISTRY PRACTICAL-VIII	<p>Students will learn to perform-</p> <p>Quantitative estimations of micro quantities of substrate calorimetrically and titrimetrically.</p>