Department of Chemistry (UG)

PROGRAM OUTCOME

- This program provides well trained professionals for the industries, banking sectors, pharmaceuticals, insurance companies 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

PROGRAM SPECIFIC OUTCOME

- The students will be better prepared to understand the new environment-friendly systems and new initiatives adopted by the chemical industry.
- With a graduate degree in B.Sc Chemistry, the students can choose various fields for post graduation courses like M.Sc in general, analytical, drug, organic, pharmaceutical, physical chemistry, material sciences and Biochemistry.
- The employment area for chemistry graduates include pharmaceutical industries, chemical manufacturers, forensic science department, plastic industries, agro chemical industries, teaching etc.
- They are also recruited in fields such as gas, power and even defense services.

COURSE OUTCOME

CHEMISTRY I

- We teach :

(a) basic mathematical concepts required for chemistry.

(b) Gaseous state : Maxwell – Boltzmann distribution law, velocity distribution law, Andrew's isotherm, Linde's process of liquification with numericals.

(c) Photo chemistry : Grotthus-Draper law, Stark-Einstein law, flourescence, phosphorescence, luminiscence, bio luminiscence and chemical sensors.

(d) Liquids and solutions : Viscosity, surface tension, Raoult's law, critical solution temperature, T-C curves, etc

(e) Periodic table : Trends in periodic properties in terms of atomic and ionic radii, IE, EA, electronegativity, diagonal relationship and study of Ist and IInd groups of periodic table

(f) Analytical Chemistry : Errors, accuracy and precision, significant figures, equivalent weights and methods of expressing concentration

(g) Basic concepts in organic chemistry : electrophiles, nucleophiles, reactive intermediates ; types of reactions, concept of isomerism, alkanes, cycloalkanes, alkenes, dienes and alkynes

(h) Practicals : Quantitative analysis in terms of redox titrations involving internal, external and self indicators are taught in the practicals.

(i) They learn to estimate the amount of chlorine in bleaching powder.

CHEMISTRY II

- We teach :

(a) Quantum Mechanics : Expression for radius energy and IE of atoms, wave particle duality, uncertainty principle, sinusoidal wave and Schrodinger wave equation derivation, quantum numbers, orbits and orbitals.

(b) Chemical bonding : Ionic bond, Born-Haber cycle, Born-Lande, covalent bond, hybridisation VSEPR Theory, Fajan's rule, dipole moment, weak interactions and metallic bonds.

(c) Silicates and noble gases : Definition, classification of silicates, zeolites, preparation and properties of noble gases, transition elements and inner transition elements.

(d) Aromatic hydrocarbons : Structure of benzene, Huckel's Rule, mechanism of electrophilic substitution reactions, nucelophilic reactions, Diels-Alder reaction, biphenyls and alkenyl benzenes

(e) Organic halogen compounds : Alkyl halides and aryl halides – preparation, properties and reaction mechanisms.

(f) Practicals : They learn to determine physical constants like density, viscosity, surface tension and molecular mass.

CHEMISTRY III

- We teach :

(a) Chemical kinetics : Rate, order and molecularity , expression for rate constant of second order reaction, half life period and mean life period, theories of reaction rates and experimental determination of kinetics.

(b) Thermodynamics : First law of thermodynamics and Kirchoff's equation, spontaneous and non spontaneous processes, second law of thermodynamics, heat engine using Carnot's cycle, entropy in processes.

(c) Thermodynamics II : Gibb's free energy, Van't Hoff reaction isochore and Clausius-Clapeyron equation are derived ; Nernst equation.

(d) Surface Chemistry : Theories of adsorption, indicators heterogenious catalysis and auto catalysis.

(e) Organic and inorganic polymers : Polymerisation – preparation and application; boron, halogens – manufacture and applications.

(f) Metallurgy : Ellingham's diagrams; extraction of nickel, thorium, uranium and plutonium.

(g) Alcohols and thiols : Introduction, classification, preparation and properties of alcohols and Thiols.

(h) Phenols : Extraction and properties of phenols; mechanisms of reactions and industrial applications of phenols.

(i) Ethers and epoxides : Preparation, properties and uses of ethers, epoxides and fertilizers

(j) Organo metallic compounds : preparation and applications

(k) Practicals : They learn to prepare organic compounds and simple drugs in the laboratory.

CHEMISTRY IV

- We teach :

(a) 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

(b) Water technology – physical, chemical and biological impurities; treatment of water

(c) Nuclear and radio chemistry – types of radiation, properties, atomic and mass numbers, isotopes and isobars; radio active decay, group displacement law; artificial radioactivity and carbon dating

(d) Powder metallurgy

(e) Steel – phase diagram, alloys of steel and heat treatment of steels.

(f) Aldehydes and ketones : Preparation and properties ; mechanisms of reactions

(g) Carboxylic acids : preparation, acid strength, reactions and a few mechanisms of reactions

(h) Tautomerism and Enolates – introduction, types and preparation.

(i) Environmental chemistry.

(j) Practicals : Qualitative analysis of inorganic salt mixtures.

CHEMISTRY V

Organic Chemistry

- We teach :

(a) 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.

(b) Amines : classification, preparation, properties and strengths.

(c) Heterocyclic compounds : classification, structure, preparation and properties.

(d)Natural products : introduction, classification, elucidation of structure; terpenes and terpenoids – classification, stucture and uses; alkaloids - classification, stucture and uses

(e) Spectroscopy : UV – visible spectroscopy, IR spectroscopy and NMR spectroscopy

(f) Industrial organic chemistry : introduction, classification and uses of syntheic dyes and drugs; green chemistry

(g) Practicals : Qualitative analysis of organic compounds

CHEMISTRY VI

Physical Chemistry

- We teach :

(a) Electro chemistry : molar conductance, conductometric titrations, ionic mobility and transport number; molar and specific conductances; Kohlrausch's law, Arrhenius theory, Debye-Huckel-Onsagar reactions; types of cells, Nernst equation and numericals

(b) Electrochemistry II : Weston-Cadmium cell, Weston cell, liquid junction potentials, types of electrodes, determination of pH, solubility of salts and solubility products; potentio metric titrations with numerical examples

(c) Ionic equilibria : Hydrolysis of salts, effect of temperature and dilution; common-ion effect; buffer action, application of buffers; indicators and numericals.

(d) Physical properties and molecular structures : Dipole moment, induced dipole; structure of molecules; magnetic properties, electrical properties of solids, pyro electricity; Thomson effect, Seebec effect and Peltier effect

(e) Chemical spectroscopy 1 : Radiation and matter; born-Oppenheimer approximations; rotational spectra of diatomic molecules; rotaional energy of different quantum levels; selection rule and numericals.

(i) Practicals : they perform conductometric and potentio metric titrations, colorimetric experiments, application of Beer-Lambert law and determination of molar and specific conductance.

CHEMISTRY VII

Inorganic Chemistry

- We teach :

(a) Co-ordination and Oragano metallic 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 organo metallic compounds.

(b) Co-ordination and Oragano metallic compounds II : Metal carbonyls; eighteen electron rule and its deviations; application of co-ordination compounds and Monsanto acetic acid process.

(c) Industrial materials I : Refractories, abrasives, glass, ceramics and cement.

(d) Industrial materials II : Paints and varnishes, fuels, coal, explosives and propellants.

(e) Bio inorganic chemistry : essential and trace elements with their roles in biological systems; Metallo – porphyrins and role of cobalamin in living systems.

(f) Chemistry of newer materials : conducting polymers, super conductors, fullerenes, carbon nano tubes and nano materials.

(g) Practicals : quantitative estimations using gravimetric and back titration methods.

CHEMISTRY VIII

Biochemistry

- We teach :

(a) Carbohydrates : Amino sugars, sugar acids, sugar phosphates, structure and biological importance of oligo saccharides and polysaccharides.

(b) Lipids : Classification, fatty acids, triglycerides, phosphoglycerides, cholesterol and sphingo lipids

(c) Proteins : Amino acids, peptide bonds, levels of organistaion of proteins, denaturation and renaturation and classification of proteins.

(d) Nucleic acids : Types, components, Chargaff's rule, polynucelotides - DNA and RNA – structure and biological roles; protein – nucleic acid interaction, chromatin and viral nuclear capsid.

(e) Hormones : Definition, classification; roles of insulin and glucagon; mediators of hormone action.

(f) Enzymes : active site, specificity, classification, enzyme substrate interaction – Fischer and Koshland models, enzyme kinetics, allosteric enzymes and enzyme inhibitors.

(g) 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.

(h) Biochemical techniques : Principle and applications of paper chromatography and TLC; cellulose acetate, electrophoresis and PAGE.

(i) Metabolism : Catabolism and anabolism; carbohydrate metabolism – glyclosis, TCA cycle and energetics of cycle; gluconeogenesis; fatty acid metabolism; protein metabolism – amino acid degradation; urea cycle.

(j) Molecular biology : Central dogma, semi conservative replication and mechanism of DNA replication; genetic code; transcription and translation; DNA finger printing.

(k) Practicals : Quantitative estimations of micro quantities of substrate colorimetrically and titrimetrically.

The contents of the following papers help the students to choose the field of specialisation in M.Sc chemistry :

- Paper V : M.Sc in organic chemistry
- Paper VI : M.Sc in physical chemistry
- Paper VII : M.Sc in inorganic chemistry
- Paper VIII : M.Sc in biochemistry

It also prepares them for :

- Pharmaceuticals
- Lab technician courses
- Industries
- Research assistant posts.