

PROGRAM OUTCOME

B.Sc. (Hons.) in Chemistry

On successful completion of B.Sc (Hons.) in Chemistry, a student shall be able to :

- * Understand the basic concept of Chemistry.
- * Gain theoretical as well as practical knowledge to safely handle the Chemicals.
- * Understand the importance of the elements in the periodic table, their chemical and physical properties and their importance in everyday life.
- * Understand the importance of Chemistry relating to other field of physical as well as biological sciences.
- * Learn the working skill in the laboratory with modern techniques safely.
- * Gain the knowledge of impact of Chemistry on environment, society, within and outside the scientific community.
- * Work particularly in the field of food safety, industries, farms, health inspector and pharmacist etc.
- * Lead a life as entrepreneurs through the skill enhancement courses provided to them.

COURSE OUTCOME

Semester 1

Core Course I (Inorganic Chemistry) CHM501C :

(Atomic structure, periodicity of elements, chemical bonding, metallic bonding and weak chemical forces, oxidation - reduction reactions.)

Outcomes :

On completion of the course, the students should be able to understand:

- * Atomic theory and its evolution.
- * The atomic structure, chemical bonding, molecular geometry based on accepted model.
- * Atomic theory of matter, composition of atom, concept of wave function.
- * The elements in periodic table, physical and chemical characteristics, in various groups or periods according to ionic sizes and charge etc.
- * Identify of given element, relative sizes and charges of proton, neutron and electron and their assembly to form different atoms.
- * To characterize bonding between atoms, molecules interaction and energetics, hybridization, shapes of molecular orbitals. Valence bond theory.
- * Importance of hydrogen bonding, metallic bonding, the concept of oxidation-reduction reaction, standard electrode potential.

Core Course 2 (Organic Chemistry) CHM502C

(Basic organic chemistry, stereochemistry, chemistry of aliphatic hydrocarbons, aromatic hydrocarbons)

Outcomes :

On completion of this course, the student shall be able to understand :

- * The basic of organic molecules, structure, bonding, reactivity and mechanism.
- * The stereochemistry of organic molecules, conformation and configuration analysis, asymmetric molecules and nomenclature.
- * The aromatic compounds and aromaticity, mechanism of aromatic reactions.
- * Hybridization and geometry of atoms 3-D structure of organic molecules, identifying chiral centres.
- * The reactivity, stability of organic molecules and its stereochemistry.
- * The electrophile, nucleophile, free radicals, electronegativity, resonance and intermediates along the reaction pathways.
- * Mechanism of organic reaction : substitution vs elimination reaction.

Sec 1 (Skill enhancement course) CHM501S (C)

(Water remediation and conservation studies)

Outcomes :

On completion of this course, the student shall be able to understand :

- * The sources of water pollution, pollutants, industrial and human contribution, causes and effects of water pollution.
- * The recommendation of World Health Organisation about potable water, current scenario of drinking water.
- * The chemistry of toxicants like arsenic, fluoride, chromium, lead and mercury.
- * The techniques involved such as adsorption, coagulation, filtration, nalgonda techniques, activated charcoal detoxification.
- * The applications of non-toxic oxides, mixed oxides, recycling, bioremediation, need of green chemistry and future scope.
- * The water conservation, erosion of soil, forms of water erosion,
- * The mechanics of water erosion, control. Terraces for water erosion control.
- * The modeling of watershed processes, case study of watershed modeling for water conservation.

Semester 2

Core Course 3 (Analytical chemistry) CHM502C

(Qualitative and quantitative aspects of analysis, spectroscopy, thermal analysis, electroanalytical methods, separation techniques)

Outcomes :

After the completion of the course the students shall be able to understand :

- * The fundamentals of analytical chemistry.
- * Separation techniques, analytical tools, statistical method.

- * Principle of UV-V is spectoscopy and its applications.
- * Basics of electro-analytical techniques and its appications.
- * Thermo-gravimetric analysis.
- * Different kinds of chromatograms, calculation of R_f value.

Core course 4 (Physical chemistry) CHM503C
(Gaseous state, liquid state, solid state, ionic equilibria.)

Outcomes :

On completion of this course, the student shall be able to understand :

- * The various states of matter, physical properties, and laws related to describe the states.
- * Kinetic model of gas, Maxwell distribution, mean- free path and kinetic energies.
- * Behaviour of real gases, its deviation from ideal behaviour, equation of state and law of corresponding states.
- * Liquid state and its physical properties.
- * Caculation of lattice parametres of solids, application of symmetry, characteristics.
- * Numerical related to salt hydrolysis, ionic equilibria of electrolyte, ionisatiopn and dissociation.

Sec. 2 (Skill enhancement course) CHM502S (C) (INSM)

Chemistry in everyday life :

(Respiration and energy production in human body, chemical aspects, vitamins and minerals, radical chemistry, chemistry of materials)

Outcomes :

After the completion of the course students shall be able to understand :

- * Respiration and energy production in human body.
- * Production of ATP, byproduct of respiration carbon-dioxide expell through lungs.
- * Heath hazards can lead to various negative impact such as respiratory issues like poisoning, infection from chronic diseases, cancer and mental heath effects.
- * Importance of vitamins and minerals, conversion of food into energy by vitamin-B-complex, vitamin-C as antioxidant.
- * Radical chemistry in iving system, free radicals.

Semester 3

Core course 5 (Green chemistry) CHM605C

(inrtoduction to green chemistry, principles of green chemistry and designing chemical synthesis, green synthesis, future trend in green chemistry)

Outcomes :

After the completion of the course students shall be able to understand :

- * Green chemistry and its principles.

- * Green synthesis and reactions.
- * Green chemistry for sustainable solution.
- * Atom economy and design of chemical reaction using green chemistry principles.

Core course 6 (Inorganic chemistry) CHM606C

(Acids and bases, general principle of metallurgy, chemistry of s and p-block elements, noble gases, inorganic polymers.)

Outcomes

After the completion of the course students shall be able to understand :

- * Oxidation and reduction reactions and their uses metallurgy.
- * Chemistry of s and p-block elements, structure and bonding in their compounds such as oxides.
- * Chemistry of noble gases and their compounds, application of VSEPR theory to explain their structure and bonding.
- * Chemistry of boron compounds and their structures.
- * Chemistry of inorganic polymers, their structure and uses.

Core course 7 (Physical chemistry) CHM607C

(introduction to thermodynamics, partial molar quantities, chemical equilibrium, solutions and colligative properties)

Outcomes :

After the completion of the course students shall be able to understand :

- * Laws of thermodynamics and concept of system, variables, heat, work etc.
- * The concept of entropy, reversible and irreversible processes, calculation of entropy.
- * The concept of heat of reaction and calculation of bond energy, calculation of enthalpy etc.
- * Partial molar quantities and its attributes.
- * Thermodynamics of dilute solution and its properties.

Semester 4

Core course 8 (Molecular spectroscopy and photochemistry) CHM608C

(Interaction of electromagnetic radiation with molecules, Raman spectroscopy, photochemical and photophysical process.)

Outcomes :

- * Understand the interaction of electromagnetic radiation with molecules
- * Understand the basic principles of spectroscopy.
- * Understand the Franck-Condon principles and electronic transitions.
- * Knowledge on the photochemical reactions.

Core Course 9 (Inorganic chemistry) CHM609C
(Coordination chemistry, transition elements, lanthanides and actinides, bio-inorganic chemistry)

Outcomes :

- * Understanding the nomenclature of coordination compounds/complexes and molecular orbital theory.
- * Understand about the lanthanides and actinides, its colour, spectra and magnetic behaviour.
- * Understand the bioinorganic chemistry of metals in biological systems.
- * Knowledge about hemoglobin and its importance biological systems.

Core course 10 (Organic chemistry) CHM610C
(Chemistry of halogenated hydrocarbon, alcohols, phenols, ethers, epoxides, carbonyl compounds, carboxylic acids and their derivatives, sulphur containing compounds)

Outcomes :

- * Understanding organic chemical reactions and their mechanism.
- * Familiarization about classes of organic compounds and their methods of preparation.
- * Understanding the named reactions, uses of various reagents and the mechanism of their action.
- * Knowledge of reagents in various organic transformation reactions.

Semester 5

Core course 11 (Introduction to quantum chemistry) CHM711C

Outcomes :

- * Understanding black body radiation, photoelectric effect, concept of quantization, de-Broglie law.
- * Understand basic idea about operators, eigen functions and eigen values.
- * Knowledge about Schrodinger wave equation and application to particle in a box.
- * Understanding quantitative treatment of simple harmonic oscillator model, rigid rotator model.
- * Knowledge about qualitative treatment of hydrogen atom and hydrogen like ions.

Core course 12 (Organic chemistry) CHM712C

Outcomes :

- * Knowledge about nitrogen containing functional groups and their reactions.

- * Understanding the reactions and reaction mechanism of diazonium compounds
- * Knowledge about Alkaloides and terpenes and their reactions and mechanism.
- * Understanding the structure, mechanism of reactions of selected heterocyclic compounds.

Discipline Specific Elective Course 1 :

DSE course 1 : (Electrochemistry) CHM701D(b)

After completion of the course, the learner shall be able to understand :

- * Basic principles of law of electrochemistry.
- * About chemical cells and their functioning.
- * About the electrodes and measuring of emf.
- * Applications and uses of potentiometric titrations.