Chemistry

Course contents offered by the school of chemistry

CH-101 : STOICHIOMETRY, SOLUTIONS AND GASSES – I-Sem - Theory

Prerequisite : None

Experimental evidence of the atomic hypothesis. Chemical compounds and their composition – introduction to nomenclature. Chemical reactions and stoichiometric calculations. (8 h)

Solution chemistry – electrolytes and non-electrolytes. Colligative properties. Ideal and non-ideal solutions. Reactions in solution - redox, acid-base, precipitation, ion-exchange. Colloids. (14 h)

Properties of gases – Avogadro's hypothesis, the ideal gas law. Kinetic molecular theory. Gas mixtures. Solubility of gases. Gases at high pressure and low temperatures – critical phenomena. (14 h)

CH-102 : QUALITATIVE ANALYSIS — I-Sem. Lab

Prerequisite : None

Reactions of common cations and anions. Semimicro analysis of mixtures.

CH–103 : ENERGETICS AND KINETICS — II-Sem. - Theory

Prerequisite : None

Thermochemistry – enthalpy and enthalpy change – calorimetry – enthalpies of formation and of reactions. Entropy and free energy. State functions. (8 h)

Chemical kinetics – reaction rates – effect of concentration and temperatures. Steady state approximation. Reaction mechanism from rate laws. (8 h)

Chemical equilibrium in the gas phase – equilibrium constants and their relation to free energy – temperature dependence. (6 h)

Equilibrium in the aqueous phase – pH, buffers and indicators – complex ions. Heterogeneous equilibria – adsorption. (6 h)

Electrochemistry – voltage and free energy – standard potentials Batteries, fuel cells. (8 h)

CH-104 : QUANTITATIVE ANALYSIS — II - Sem - Lab

Prerequisite : None

Titrimetry – acid-base, redox, complexometry.

Gravimetry – determination of water of hydration, estimation of sulphate, chloride, aluminium, manganese, iron, nickel.

Colorimetry – Beer's law, estimation of a metal ion (eg., manganese).

CH–201 : STRUCTURAL CHEMISTRY — III - Sem Theory

Prerequisite : None

Electrons in atoms – the orbital concept – shapes and size of atomic orbitals – electron configuration and the periodic table. (4 h)

The chemical bond – ionic and covalent bonding. MO and VB pictures - hybridization, resonance. Bond parameters – energy, polarity, length. (8 h)

Shapes of molecules – VSEPR theory. (4 h)

The hydrogen bond. Intermolecular forces and non-bonded intra-molecular interactions. Molecular conformations. Examples of different structures and their stabilities from tri-atomics to bio-molecules. (6 h)

The solid state – molecular, ionic and metallic crystals. Crystal lattices – unit cells. Common crystal structures. Factors influencing crystal structures in ionic/molecular solids. Allotropes (of carbon and sulphur). Network solids – silicates. (8 h)

X-ray diffraction and elementary treatment of Bragg's law – NaCl and KCl. (6 h)

CH-202 : PHYSICAL CHEMISTRY LAB — III Sem - Lab

Prerequisite : None

Equilibria in solution – phase diagrams. Colligative properties. Reaction rates. Electrochemistry – measurements and titrations

CH-203 : ORGANIC FUNCTIONAL GROUPS AND THEIR TRANSFORMATIONS — IV - Sem Theory

Prerequisite : None

Nomenclature of organic compounds. Major classes – aliphatic, aromatic, alicyclic and heterocyclic compounds. Isomerism. Stereochemistry. Conformational analysis. Strained molecules. (10 h)

Hydrocarbons (alkanes, alkenes, alkynes) – substitution and addition reactions. (5 h)

Alcohols and ethers. (3 h)

Carbonyl compounds – oxidation, reduction reactions. (5 h)

Compounds with conjugated double bonds – dienes and □, □-unsaturated compounds – tautomerism. (5 h)

Aromatic compounds – substitution reactions. (8 h)

CH-204 : IDENTIFICATION OF ORGANIC COMPOUNDS ← IV - Sem - Lab

Prerequisite : None

Separation and purification of organic compounds – melting point – boiling point. Characteristic reactions of functional groups. Identification of unknowns – chemical and spectral methods.

CH-301 : INORGANIC CHEMISTRY

Prerequisite : None

Origin of the elements – nuclear reactions. Electronic structure of atoms – periodic properties (10 h)

Descriptive chemistry of *s* block, *p* block, *d* block and *f* block elements (20 h)

Introduction to crystal field theory – elementary treatment of the electronic spectra and magnetic properties of 3*d* compounds (6 h)