

Syllabus

M.Sc. (Chemistry) Programme

(SEMESTER – III)

Solid State Materials Chemistry
Programme Code- (MSCCH -21)
Course Code – (MSCCH -601)

Block I Solid-State

Unit 1 Recapitulation of fundamental principles of solid states

Characteristics of solids: Crystal Symmetry: Unit cell, c-axis, glide plane on unit cell, crystal lattice, space lattice, stereographic projectors. Examples of crystallographic planes, cubic planes, Miller indices, Bravais lattices.

Unit 2 Solid State Reactions, Crystal Defects and Non-stoichiometry

General principles, experimental procedures, co-precipitation as a precursor to solid state reactions, kinetics of solid state reactions, Perfect and imperfect crystals, intrinsic and extrinsic defects- point defects, line and plane defects, vacancies- Schottky defects and Frenkel defects.

Unit 3 Organic solids, fullerenes, molecular devices

Electrically conducting solids, organic charge transfer complexes, organic metals, new superconductors, magnetism in organic materials, fullerenes- doped fullerenes as superconductors. Molecular rectifiers and transistors, artificial photosynthetic devices, optical storage memory and switches, sensors.

Unit 4 Diffraction techniques

X-ray diffraction-Laue and Bragg method, Debye-Scherrer method of X-ray structure analysis of crystals index reflections, identification of unit cells from systematic absences in diffraction pattern. Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density.

Block II Soft Materials

Unit 5 Liquid Crystals

Mesomorphic behavior, thermotropic liquid crystals, positional order, bond orientational order, nematic and smectic mesophases, smectic-nematic transition and clearing temperature-homeotropic, planar and schlieren textures, twisted nematics, chiral nematics, molecular rearrangement in smectic A and smectic C phases, optical properties of liquid crystals. Dielectric susceptibility and dielectric constants, Lyotropic phases and their description of ordering in liquid crystals .

Unit 6 Surface Active Agents

Classification of surface active agents, micellization, hydrophobic interaction, critical micelle concentration (CMC), Kraft temperature, Factors affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization, solubilization, micro emulsions, reverse micelles, surface films (electrokinetic phenomena), catalytic activity at surfaces. Electrode/electrolyte interface; electrical double layer, electrode kinetics.