St. Xavier's College (Autonomous), Mumbai
Department of Chemistry

Programme: B.Sc. Chemistry

Programme Specific Outcomes (PSOs) for B.Sc. Chemistry

Sr. No.	A student completing B.Sc. Chemistry will be able to:
PSO 1	Have sound knowledge, strong foundation and the ability to understand essential facts, concepts, principles, phenomena and current scientific theories in different branches of chemistry.
PSO 2	Apply the knowledge acquired to understand, interpret, analyse mathematical derivations, numericals and solve qualitative and quantitative problems.
PSO 3	Demonstrate skills in the evaluation and interpretation of chemical information and data.
PSO 4	Know the properties and behavior of matter, elements in the periodic table, commonly used chemicals in industry and laboratories, speciality materials and their uses.
PSO 5	Predict the structures of compounds, separate and characterize them; understand the mechanism of reactions of chemical compounds and their synthesis.
PSO 6	Have knowledge of working of various instruments used in chemical analysis and the skills in the operation of standard instruments used in chemistry.
PSO 7	Understand the causes of environmental pollution and methods for environmental pollution control.
PSO 8	Possess skills in the safe-handling of chemical materials, taking into account their physical and chemical properties including specific hazards associated with their use and the ability to conduct risk assessments.
PSO 9	Have the capabality of monitoring, by observation and measurement, chemical properties, events or changes, and demonstrate the ability of systematic and reliable recording of data and carry out documentation thereof in a clear scientific format.
PSO 10	Acquire the laboratory skills needed to design and interpret chemical research in laboratories and industries.
PSO 11	Analyse the chemistry of various biomolecules, natural products and their functioning and roles in the living system.
PSO 12	Understand and analyse the biological systems and the chemical interactions of neurons, neurotransmitters and salts.
PSO 13	Demonstrate an understanding of the applications of electrical potential signals in biological systems and the instrumental methods of to identify them.

Course Outcomes (COs): B.Sc. Chemistry

Semester I

Course Title: Concepts of Physical and Analytical Chemistry – I
Course Code: SCHE0101

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Comprehend the concentration terms such as molarity, normality, formality, molality, mole fraction and ppm as well as be able to interconvert them; calculate the mass percent of different elements constituting the compound; determine empirical formula and molecular formula for a compound from the given experimental data; and perform stoichiometric calculations.	2	Ap
CO 2	Differentiate between precision and accuracy.	3	U
CO 3	Determine the purity of commercial samples.	2	Ap
CO 4	Calibrate various glassware used for gravimetric and volumetric analysis.	6	R
CO 5	Explain the behavior of real gases; recognize the continuity in gaseous and liquid state; describe the conditions required for liquefaction of gases; and explain properties of liquids in terms of intermolecular attractions.	4, 1	R, U
CO 6	Define the average and instantaneous rate of a reaction; express the rate of a reaction in terms of change in concentration of either of the reactants or products with time; differentiate between molecularity and order of a reaction; define rate constant; and derive integrated rate equations for the zero, first and second order reactions.	1, 2, 9	R, U, Ap
CO 7	Appreciate the role of catalysis in the chemical industry.	4	U

Course Title: Fundamentals of Inorganic and Organic Chemistry – I
Course Code: SCHE0102

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Predict the reactivity of an organic compound from its structure.	1, 5	U
CO 2	Deduce the mechanism of electrophilic addition to carbon-carbon double bond and of elimination reactions.	5	U
CO 3	Justify a reasonable mechanism for a chemical reaction.	5	U
CO 4	Illustrate the explanation of atomic structure.	1	R
CO 5	Solve problems related to screening constant, effective nuclear charge, identification of group, block and period.	2	Ap
CO 6	Write condensed and elaborates electronic configurations of elements.	1, 4	R, U
CO 7	Describe the trends in variation in periodic properties of elements.	4	R
CO 8	Outline the various steps involved in qualitative analysis of cation and anion.	1, 3, 8, 10	U, Ap, An

Course Title: Chemistry Practicals – I
Course Code: SCHE01PR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Learn basic laboratory rules and basic principles of laboratory safety.	1, 8
CO 2	Perform stoichiometry calculations, make standard solutions, perform titrations and determine concentration and amount of substances.	1, 2
CO 3	Distinguish the relation between molecularity and order, determine rate law of a chemical reaction and identify the reaction order.	1, 2, 3, 9

Semester II

Course Title: Concepts of Physical and Analytical Chemistry – II
Course Code: SCHE0201

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Explain the terms system and surroundings; discriminate between close, open and isolated systems; and explain internal energy, work and heat.	1	R, U
CO 2	Interprete the first law of thermodynamics and express it mathematically; calculate energy changes as well as work and heat contributions in chemical systems; explain state functions U and H; correlate ΔU and ΔH; calculate enthalpy changes for various types of reactions; and apply Hess's law of constant heat summation.	1, 2	U, Ap
CO 3	Differentiate between extensive and intensive properties; define spontaneous and non-spontaneous processes; state the second law of thermodynamics and explain entropy as a thermodynamic state function; utilise the magnitude of Gibbs energy change in prediction behaviour of various processes; and establish relationship between ΔG and spontaneity, ΔG and equilibrium constant.	1, 2, 3	U, Ap
CO 4	Recognize the possible interaction of radiation with matter; apply spectroscopy concepts to elucidate structural characteristics of a molecule.	3, 4, 5	U, Ap
CO 5	Appreciate use of buffer solutions in analytical chemistry and biological systems.	1, 2	U, Ap
CO 6	Calculate solubility and solubility product to predict the formation of precipitates.	1, 2	U, Ap
CO 7	Classify various types of volumetric titrations; recognise the type of titration method suitable under given conditions; and predict the choice of indicator.	1, 4	U, Ap

Course Title: Fundamentals of Inorganic and Organic Chemistry – II
Course Code: SCHE0202

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Identify and recall the elements of group 13 and group 14 in p-block; and know the structures and properties of elements.	1, 4	R, U, Ap
CO 2	Understand manufacture of bulk chemicals and correlate the anomalous physical properties across the group 15 and 16; compare and distinguish between halogens, halides, pseudohalogens and pseudohalides.	1, 4	R, U, Ap
CO 3	Define isomerism and classification; explain the concept of chirality and configuration, chirality and enantiomers; represent configuration and interconversion of flying wedge formula and projection formulae - Fischer, Newmann and Sawhorse.	1, 5	R, U, Ap
CO 4	Define and assign geometrical isomerism, E and Z nomenclature; and compare the stabilities of conformations of alkanes.	1, 5	U, Ap
CO 5	Solve and infer the final products when alkanes, alkenes and alkynes undergo halogenation, hydrogenation, hydration and halohydrogenation reactions.	1, 5	R, U, Ap
CO 6	Solve, convert and infer the products formed by reactions of functional groups such as alkyl halides, alcohols, aldehydes, ketones, amines and carboxylic acids.	5	R, U, Ap
CO 7	Distinguish between primary, secondary and tertiary amines and alcohols.	5	R, U, Ap

Course Title: Chemistry Practicals – II
Course Code: SCHE02PR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Recognize basic chemical hazards and apply safety rules in the practice of laboratory investigations.	8
CO 2	Identify absence or presence of cations and anions in solutions, using tests based on acid-base, solubility and complexation equilibria.	1, 3
CO 3	Know basic techniques used in laboratory for preparation, purification and identification of organic compounds.	1, 5

Semester III

Course Title: Physical and Analytical Chemistry – I
Course Code: SCHE0301

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the significance of Gibbs Free energy and chemical potential; and forecast the nature of chemical reactions.	1, 3	U, Ap
CO 2	Be acquainted with methods used to attain low temperature, i.e., Joule-Thomson effect and adiabatic demagnetization.	1, 2, 3	R, U
CO 3	Derive Clapeyron equation, Clausius-Clapeyron equation; its integrated form; Gibbs-Duhem equation and solve associated numerical problems.	1, 2	U, R, Ap, An
CO 4	Elucidate the concept of fugacity, activity and activity coefficient; and illustrate the inter-relation between chemical potential, fugacity and activity.	1, 3	U, R, Ap
CO 5	Identify and study Understand Arrhenius theory, Ostwald's dilution law and Kohlarausch's law of independent migration of ions for weak electrolytes alongwith their various applications.	1, 2, 3	U, R
CO 6	Describe the Debye-Huckel theory for strong electrolytes; recognize the concept of transport number and enlist the factors affecting the same.	1, 2, 3	U, R, Ap
CO 7	Discuss the qualitative concept of Hittorf's method and moving boundary method for calculation of transport number.	1, 2	U, Ap
CO 8	Explicate the basic principles and experimental setup of various instrumental methods, i.e., conductometric and potentiometric titration and analyse various titration curves in conductometric titration; discuss different methods to locate the equivalence point in potentiometric titrations.	1, 2, 3, 6	U, R, An

Course Title: Inorganic and Industrial Chemistry – I
Course Code: SCHE0302

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Construct and interpret Born-Haber cycle; calculate and compare lattice enthalpy using the Born-Mayer equation and Born-Haber cycles; and use both to explain aspects of behaviour in ionic systems.	1, 3	U, An
CO 2	Evaluate Lewis structures with the octet rule, formal charge and electronegativity to select the resonance structure that contributes the most to the resonance hybrid.	3	Ap
CO 3	Predict the hybridization of the central atom, parent structure, approximate bond angles, and molecular shape of a molecule or polyatomic ion.	5	Ap
CO 4	Evaluate the shape of the molecule and the contributions of the polar bonds or nonbonding electron pairs to determine if a molecule is polar, thus having a dipole moment.	5	Ap
CO 5	Interpret a given MO diagram as well as fill in electrons into an MO diagram to predict bond order for a compound, and predict whether it is paramagnetic or diamagnetic.	5	Ap
CO 6	Predict products of acid-base reactions; compare strong and weak acids and bases using the concept of equilibrium.	2, 5	Ap
CO 7	Recognise and identify likely forms of corrosion that a system could be susceptible to, and describe methods for controlling corrosion.	1	U

Course Title: Organic and Industrial Chemistry – I
Course Code: SCHE0303

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Deduce the mechanism of reactions involving reactive intermediates; and compare the stability of reactive intermediates.	5	R, U
CO 2	Compare the stabilities of aromatic compounds; identify the aromaticity of compounds; draw the resonance structures of mono-substituted benzenes - activated and deactivated aromatic rings.	5	R, U
CO 3	Infer the type of isomer of product due to effect of electron-withdrawing and electron-donating substituents on the orientation of an incoming group.	5	R, U, Ap
CO 4	Convert alkyl arenes into their derivatives; understand the mechanism of reactions of alkyl arenes showing the effect of substituents on of aromatic nucleophilic substitution reaction with energy profile diagram; and predict the isomers of disubstituted benzene.	5	R, U, Ap
CO 5	Analyse the reactions of epoxides and ethers, and apply the synthesized macrocyclic ethers in the field of synthetic, green and medicinal chemistry.	5	R, U, Ap
CO 6	Introduce aspects and parameters involved in a chemical plant; draw and distinguish between types of unit processes, operations; and design flowcharts.	5, 7	R, U, Ap
CO 7	Design the flowchart of manufacture of phenol, styrene and dodecylbenzene; and realise various sources of organic compounds.	5, 7	R, U, Ap

Course Title: Chemistry Practicals – III
Course Code: SCHE03PR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Perform qualitative analysis to determine the presence of cations and anions.	1, 8
CO 2	Synthesize different organic and inorganic compounds, and estimate organic substances in a given sample.	1, 5, 10
CO 3	Perform quantification experiments for analytes using instrumentation techniques such as pH-metry and conductometry; plot graphs involved in physico-chemical experiments to calculate the amount of analyte present in a given sample.	2, 3, 6

Semester IV

Course Title: Physical and Analytical Chemistry – II
Course Code: SCHE0401

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Identify different electrodes used in construction of electrochemical cell and construction of workable electrochemical cell; represent the cell-cell reactions.	1	R, U, Ap, C
CO 2	Derive Nernst equation for cell, electrode, and thermodynamic parameters associated with cell reaction; competently solve numerical problems related to these electrochemistry concepts by identifying the essential parts of a problem and formulating a strategy.	1, 2, 3	R, U, Ap, An
CO 3	Calculate the pH at different points of titration, and buffer solutions.	2	U, Ap
CO 4	Apply Raoult's law to find partial pressure of each component and total pressure, as well as the composition of either liquid or the vapour phase of binary mixture; explain the non-ideal behaviour of binary solution.	1, 2	U, Ap, An
CO 5	Describe the partially soluble and immiscible binary liquid mixture, and identify / calculate the composition of the system.	1, 2, 3	R, U, Ap
CO 6	Understand the principle and working of various instruments / components of instruments / techniques such as glass electrode, pH meter, colorimeter, chromatography, solvent extraction; and solve the numerical problem associated with these techniques.	1, 2, 3, 6	R, U, Ap, An
CO 7	List out the performance characteristics of a given analytical method and use the calibration curve method.	1, 2	R, U

Course Title: Inorganic and Industrial Chemistry – II
Course Code: SCHE0402

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Assign IUPAC names of coordination compounds; deduce the stereochemistry and identify types of isomerism in transition metal complexes.	1	Ap
CO 2	Apply 18-electron rule using the neutral atom and oxidation state method for electron counting.	5	Ap
CO 3	Describe the inorganic and biochemical relevance of metal ions in biological systems such as cytochromes, haemoglobin and chlorophyll.	11	U
CO 4	Analyse the properties of metal ions that make them suitable for specific biological functions; and understand why metal ions are both necessary and toxic.	11	U
CO 5	Apply concepts of gravimetry to problems in quantitative analysis.	2, 9	U, Ap
CO 6	Analyse chemical processes involved in different environmental problems using basic concepts of chemical thermodynamics, kinetics, and photochemistry.	7	U, Ap
CO 7	Identify environmental contaminants, and critically discuss local and global environmental issues based on scientific principles and data.	7	U, E

Course Title: Organic and Industrial Chemistry – II
Course Code: SCHE0403

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Design synthetic routes for novel organic compounds.	1, 5, 10	Ap
CO 2	Write mechanisms of the organic name reactions.	1, 5	U, R, An
CO 3	Understand the pharmaceutical applications of various organic compounds.	1, 3	R, U
CO 4	Predict the stereochemistry of chiral compounds.	5	U, An
CO 5	Plan and execute a multistep synthesis of a target organic compound.	1, 5, 10	An, Ap
CO 6	Apply various principles and concepts of green chemistry such as E-factor, atom economy, percentage yield etc., to?	7, 10	R, U

Course Title: Chemistry Practicals – IV
Course Code: SCHE04PR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Quantify various inorganic ions / compounds in the given sample by gravimetric and volumetric analyses.	1, 2, 9
CO 2	Detect and analyse the given organic compounds.	8, 10
CO 3	Understand the basic principles and experimental set up of various instrumental methods such as pH-metry, conductometry, colorimetry and potentiometry; plot graphs to interpret the results obtained.	3, 6, 10

Semester V

Course Title: Spectroscopy, Molecular and Nuclear Dynamics
Course Code: SCHE0501

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Describe molecular spectroscopy, vibrational spectroscopy, rotational spectroscopy, Raman spectroscopy and its nature, spectra, selection rule, energy; evaluate spectra shown by a species.	3, 5	Ap, An
CO 2	Interpret NMR spectra after acquiring knowledge of its functioning, principle, chemical shift; interpret ESR spectra, after acquiring knowledge of its principles and applications; and elucidate structures of molecules using mass spectra.	3, 5, 6	Ap, An
CO 3	Apply nuclear chemistry concepts of radioactive decay, radioactive isotopes, radioactive equilibrium etc.	1, 3	Ap
CO 4	Compare nuclear fission and nuclear fusion.	1, 4	R
CO 5	Utilize quantum chemistry concepts like blackbody radiation, photoelectric effect, Compton effect, Schrodinger equation etc., in deciphering molecular and particle behaviour.	2, 3, 4	U, Ap
CO 6	Apply the third law of thermodynamics in calculating the absolute entropy of a substance.	1, 3	Ap
CO 7	Calculate various parameters involved in photochemistry; apply laws governing photochemistry to various photochemical reactions and photochemical transitions.	1, 2, 4	U, Ap

Course Title: Chemical Bonding and Coordination Chemistry
Course Code: SCHE0502

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Recognise rotational symmetry and identify the basic symmetry elements in different molecules.	1	U
CO 2	Construct molecular orbital diagram using symmetry.	3	Ap
CO 3	Use the properties of Lanthanides and Actinides to identify their real-world applications in domestic, medical, industrial and military uses.	5	Ap
CO 4	Describe bonding and stabilization energies in coordination complexes using molecular orbital theory and crystal field theory and compare the two.	1, 5	U, Ap
CO 5	Identify electronic transitions in various d^n systems and calculate electronic states and terms for atoms/ ions.	3	Ap
CO 6	Deduce the stability of metal complexes by the use of formation constants; and calculate thermodynamic parameters from them.	3, 5	U, Ap
CO 7	Calculate magnetic moments of transition metal complexes.	5	Ap

Course Title: Stereochemistry and Natural Products
Course Code: SCHE0503

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Identify the optical active/inactive compounds and assign (R, S) character and D- and L- nomenclature of various compounds; write open chain and ring structures of aldoses and ketoses.	1, 5	U, Ap, An
CO 2	Differentiate between enantioselective-diastereoselective reactions and entiotopic-disterotopic groups and faces.	1, 5	U, Ap, An
CO 3	Write mechanism of reactions of carbonyl compounds and D-glucose and D-fructose.	1, 5, 11	R, U, Ap
CO 4	Predict the effect of neighbouring group on organic reactions, and identify [2+2] and [4+2] cycloaddition reactions, and predict the product of such reactions.	5	U, Ap
CO 5	Classify amino acids, proteins and nucleic acids, and illustrate the chemistry behind their structural and functional aspects.	1, 5, 11	R, U
CO 6	Describe synthesis and separation techniques of amino acids and proteins; describe catabolism of amino acids.	1, 5, 11	R, U
CO 7	Elucidate the structure and synthesis of some terpenoids and alkaloids such as nicotine and citral.	5, 11	R, U, Ap

Course Title: General Analytical and Pharmaceutical Chemistry
Course Code: SCHE0504

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the concept of sources of errors in measurement.	1	U
CO 2	Know the classification of titrimetric analysis; identify the role of indicators in it; appreciate the role and significance of non-aqueous titrations.	1	U, R, Ap
CO 3	Understand the various techniques for sampling of solids, liquids and gases; discuss about elaborate on the collection, preservation and dissolution of samples.	1	U, R, Ap
CO 4	Identify and illustrate the importance of solvent extraction technique in analytical chemistry, and describe the role of complexing agents in solvent extraction.	1	U, Ap, E
CO 5	Distinguish between various chromatographic techniques; describe the working principles as well as applications of paper- and thin layer-chromatography.	16	U, Ap
CO 6	Comprehend the principles, instrumentation and applications of various chromatographic techniques, i.e., GC, HPLC and supercritical fluid chromatography; and differentiate between GC and HPLC techniques.	6	U, R, Ap
CO 7	Be familiar with pharma-related regulatory topics such as ISO, FDA, GLP, GMP and TQM.	1	U, R
CO 8	Unravel and solve various numerical problems in analytical chemistry.	2	U, Ap

Course Title: Chemistry Practicals – V
Course Code: SCHE05PR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Determine physical constants and parameters using multiple instruments such as a pH meter, conductometer, spectrophotometer, nephelometer, and potentiometer.	3, 6, 9, 10
CO 2	Quantify various inorganic ions / compounds in the given sample by gravimetric and volumetric analyses after removing common impurities.	1, 2
CO 3	Characterize organic molecules by chemical and spectroscopic means and perform common laboratory techniques such as reflux, distillation, steam distillation, recrystallization and vacuum filtration.	1, 5, 11

Course Title: Introduction to Neuroscience
Course Code: SCHE05AC

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Demonstrate a broad foundation in the concepts and methodologies of the interdisciplinary field of neuroscience at the cellular, molecular, cognitive, systems, and behavioral levels.	1, 3, 12	U, C, R
CO 2	Demonstrate critical thinking skills in neuroscience primary literature.	1, 3	U, C, An, E
CO 3	Relate the properties of individual cells to their function in organized neural circuits and systems.	1, 13	U, R, Ap
CO 4	Analyse structure-function relationships in the brain and spinal cord across vertebrate phyla and among selected species of invertebrate with regard to evolutionary adaptation and resulting behavioural ecology.	1, 12, 13	An, E, U, R
CO 5	Understand the working of the CNS and the motor and sensory systems.	1, 12, 13	U, R, E
CO 6	Demonstrate an understanding of the future areas of neuroscientific research in genes, memory systems, sleep patterns and neuro-degenerative diseases of aging.	1, 3	U, Ap, An, C
CO 7	Perform Coglab experiments on various concepts encompassing attention, perception, neurocognition and memory.	1, 3	Ap, An, C, E

Course Title: Applied Component Practicals – I
Course Code: SCHE05ACPR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Perform laboratory techniques involving Artificial Intelligence used in neuroscience research and medical care.	12
CO 2	Use mathematical and statistical tools to evaluate scientific evidence and interpret graphs and tables.	2
CO 3	Apply the scientific process, including designing, conducting, and evaluating experiments and testing of hypotheses; develop an evolving attitude to appreciate scientific knowledge as something that is not static, but constantly expanding through the ongoing work of researchers.	1, 9, 10

Semester VI

Course Title: General Physical Chemistry
Course Code: SCHE0601

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Apply the concepts of activity and activity coefficient to solutions; calculate the mean ionic activity coefficient of the solution; and explain how the behavior of ions in solution contribute to this constant.	1, 2, 3	Ap
CO 2	Classify between chemical and concentration cells; utilize the concept of EMF measurements in industrial processes, and predict the extent of polarisation of a cell.	1, 2, 3	Ap, An
CO 3	Predict the irreversible behaviour of an electrode and the mechanism of electron transfer to an electrode.	1, 4	Ap, An
CO 4	Describe the objectives of electroplating; identify the various sources of renewable energy, the chemical processes underlying it and its application in day-to-day life.	1, 3, 7	Ap, An
CO 5	Enumerate the nature of colloidal state; list the uses of colloids in industry and in daily life; describe interfacial phenomenon and its significance.	1, 4	R, U, Ap
CO 6	Define adsorption; differentiate between physical and chemical adsorption; correlate adsorption results on the basis of various adsorption isotherms.	1, 4	R, U
CO 7	Apply the role of catalysis in industries; apply collision theory to predict reaction rate.	1, 4	Ap, An
CO 8	Analyse colligative properties of solutions and correlate these with molar masses of the solutes; decipher abnormal colligative properties exhibited by some solutes in solutions.	2, 4	An

Course Title: Solid State, Solution and Medicinal Chemistry
Course Code: SCHE0602

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Specify atomic planes, directions, and families of planes and directions within a given crystal structure using Miller indices.	3	Ap
CO 2	Analyse the structure of materials at different levels; understand the basic concepts of crystalline materials such as unit cell, FCC, BCC, HCP, atomic packing factor, coordination number, etc.	1	R
CO 3	Explain types of superconductors and their applications.	1	An
CO 4	Identify structure and bonding aspects of organometallic compounds.	3	Ap
CO 5	Use Latimer diagrams to predict the products of inorganic redox reactions; quantitatively predict enthalpies of acid-base reactions on the basis of Drago-Wayland equation.	2, 5	Ap
CO 6	Qualitatively describe how nanoparticle size affects its morphology, reactivity, and properties; evaluate applications of nanotechnology in sustainable development.	3, 4	U
CO 7	Apply principles of coordination chemistry to explain how nature tailors properties of metal centers for specific applications.	11	U

Course Title: Spectrometric Identification and Synthetic Chemistry
Course Code: SCHE0603

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Analyse and justify the positioning of peaks in the interpretation of spectral data; elucidate the structure of organic compounds using individual or combination of spectral techniques, viz., UV, IR, MMR and mass spectra.	1, 3, 5	R, U, Ap, An
CO 2	Identify and illustrate the mechanism of different name reactions and rearrangements including the migratory aptitude of groups and stereochemical aspects of these reactions.	1, 5	R, U, Ap
CO 3	Define important terms in retero-synthesis and write the scheme for the synthesis of simple organic molecules using the 'one group disconnection' approach.	1, 5	R, U, Ap, C
CO 4	Identify the role of some organometallic compounds such as organolithium, lithium dialkyl cuprates and organozinc compounds and reagents used in oxidation, reduction, hydroxylation, hydroboration, bromination, etc.; predict the product of such reactions where these catalyst/ reagents are used.	5	R, U, Ap
CO 5	Classify various polymers and enlist their properties and uses.	5	R, Ap
CO 6	Explain the mechanism of various addition polymerization processes.	5	U, Ap
CO 7	Identify the monomers and repeating unit of a given polymer; write reactions for synthesis of various polymers.	5	U, Ap

Course Title: Instrumental Methods of Analysis
Course Code: SCHE0604

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand various analytical methods, e.g., optical, electroanalytical and thermal.	1	U, R
CO 2	Distinguish between the working principles and applications of flame photometry and AAS; explain the fundamental principles and differences between TGA and DTA.	1, 6	R, U, Ap
CO 3	Understand and differentiate between various methods used for sampling in IR spectroscopy; study nephelometric and turbidimetric methods and their utility.	1	U, An, R
CO 4	Understand the concepts of limit test, dissolution and disintegration techniques; their applications in the industry; be acquainted with bioavailability and bioequivalence studies.	1, 6	R, U, Ap
CO 5	Be familiar with the working principles and applications of ion-exchange and size-exclusion chromatography; describe the importance of HPTLC technique in the pharma industry.	1, 6	U, Ap
CO 6	Comprehend the concept of uncertainty in measurements; identify the difference between uncertainty and error; and solve numerical problems based on the same.	1, 2	U, R, An
CO 7	Illustrate the concept of sources of impurities in pharmaceutical preparations and predict the remedies for it.	1, 10	U, An
CO 8	Know the classification of ion-selective electrodes and their use in electroanalytical methods; know the principle and applications of amperometric titration.	1	U, An, Ap

Course Title: Chemistry Practicals – VI
Course Code: SCHE06PR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Carry out quantitative analyses using different instruments such as pH meter, conductometer, spectrophotometer, nephelometer and potentiometer.	2, 3, 6, 10
CO 2	Prepare organo-metallic complexes and carry out quantitative analysis of the same.	1, 4, 2
CO 3	Determine limiting reagent, calculate yield and percent yield and evaluate data to determine the identity, purity and yield of organic compounds.	1, 2, 10

Course Title: Drugs and Colour Chemistry
Course Code: SCHE06AC

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Classify drugs based on therapeutic action; identify drugs based on nomenclature; define and interpret some important medicinal terms.	1, 10	U, R, E
CO 2	Understand different routes of drug administration, dosage forms and formulations involved; write the synthesis of few important drugs.	1, 9	U, R, Ap, E
CO 3	Write about Describe different pharmacodynamic agents (analgesics, antipyretics, anti-inflammatory drugs, etc.) and assign their chemical class, chemical structure, uses and side-effects.	1, 11	U, Ap, E
CO 4	Elucidate drug metabolism and the various therapeutic changes involved in it.	1, 11	U, An
CO 5	Describe different chemotherapeutic agents (antibiotics, antitubercular and antiepileptic drugs, etc.) and assign their chemical class, chemical structure, uses and side-effects.	1, 11	U, Ap, E
CO 6	Understand the applications and the toxic effects of certain dyes; design the synthetic routes of different dyes.	1, 7	U, R, An, E
CO 7	Understand the nomenclature and characteristics of dyes; understand the concept of colour chemistry and its relation to chemical constitution.	1, 11	U, R, Ap, An
CO 8	Understand different types of fibres and forces involved in the interaction between dyes and fibres.	1	U, R, An

Course Title: Applied Component Practicals – II
Course Code: SCHE06ACPR

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Handle various apparatus and synthesize some drug and dye intermediates.	5, 8, 10
CO 2	Understand the theory and mechanisms involved in the organic synthesis experiments.	5, 10
CO 3	Estimate organic substances in a given sample, and purify the prepared compounds by sublimation / recrystallisation using different solvents.	1, 10