

RISHI BANKIM CHANDRA COLLEGE FOR WOMEN

Program Outcomes Department of CHEMISTRY

SI No.	PO Master Name
1	Preparing for Industry and Higher Education
2	Building a Strong Foundation
3	Problem Solving Skills
4	Individual and Team Work
5	Advanced Instrumentation
6	Communication Skills
7	Interdisciplinary Collaboration
8	Scientific Temperament

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Course Outcomes

Department of CHEMISTRY

SI No.	Semester	Course Name	Course Outcome
1	1st Semester	Cemacor01t: organic chemistry-i	On completion of the course, students will be able to understand basic concept of hybridisation, shapes of molecules, resonance, calculation of formal charges and double bond equivalent (dbe); orbital pictures of bonding using valence bond theory; inductive effect, field effect, mesomeric effect, resonance energy; bond polarization and bond polarizability; electromeric effect; steric effect, steric inhibition of resonance; qualitative idea about molecular orbitals, bonding and antibonding interactions using mo theory; influence of hybridization on bond properties; mechanistic classification and reactive intermediates of general organic reaction; bonding geometries of carbon compounds and representation of molecules, concept of chirality and symmetry, relative and absolute configuration and optical activity of chiral compounds.
2	1st Semester	Cemacor01p: organic chemistry-i lab	On completion of the course, students will be able to separate components of a binary solid mixture and their purification; determine the boiling point of common organic liquid compounds and identify pure organic solid and/or pure organic liquid compounds.
3	1st Semester	Cemacor02t: physical chemistry-i	On completion of the course, students will be able to learn kinetic model of an ideal gas; the variation of speed of the gas molecules and; theoretical treatment of this by maxwell distribution formula, to determine various physical parameters such as pressure, kinetic energy, root mean square velocity, kinetic energy distribution, etc.; learn the theoretical basis of equipartition principle and its limitation; get an idea about the deviation of ideal behavior of the real gas, formulation of different equation of states (viz. van der waals equation, dieterici equation, barthelot equation) to explain the behavior of real gases under different condition and also their limitations; know that any system in the universe is governed by the laws of thermodynamics, be it a living cell or be it the solar system, get ideas about the principles/laws governing the physicochemical behavior of a system, know the application of thermodynamic principles for a system performing mechanical work and determination of change in internal energy, enthalpy, entropy, gibbs free energy, helmholtz free energy, etc. acquire knowledge about the application of laws of thermodynamics in case of chemical reactions and learn fundamental laws governing thermo-chemistry; know how fast a chemical reaction can occur under certain physical conditions and what are the specific roles of different parameters affecting the speed or rate of any chemical reaction, understand the role of catalysts and biocatalyst (e.g. enzymes, etc.) in a catalyzed reaction, solve numerical problems and experimentally determine the order, rate and activation energy of a chemical reaction.
4	1st Semester	Cemacor02p: physical chemistry-i lab	On completion of the course, students will be able to perform experiments like determination of ph of unknown solution (buffer), by color matching method, determination of heat of neutralization of a strong acid by a strong base, study of kinetics of acid-catalyzed hydrolysis of methyl acetate, study of kinetics of decomposition of

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			hydrogen peroxide and determination of heat of solution of oxalic acid from solubility measurement.
5	2nd Semester	Cemacor03t: inorganic chemistry-i	On completion of the course, students will be able to understand extra nuclear structure of atom, quantum numbers and their significance, Pauli's exclusion principle, Hund's rules and multiplicity, exchange energy, Aufbau principle and its limitations, modern IUPAC periodic table, group trends and periodic trends, secondary periodicity, relativistic effect, inert pair effect, the acid-base behaviours of different organic and inorganic compounds and will acquire the knowledge of pH in solution of compounds and hence the application in different fields also will understand the redox phenomenon of redox active substances and its applications in different fields.
6	2nd Semester	Cemacor04t: organic chemistry-ii	On completion of the course, students will be able to understand chirality arising out of stereocenter, concept of protomerism, conformation and conformational nomenclature like eclipsed, staggered, gauche, syn and anti and conformation of conjugated systems (s-cis and s-trans); reaction thermodynamics, concept of organic acids and bases, tautomerism, reaction kinetics of organic reactions; concept of substitution and elimination reactions, free-radical substitution reaction, nucleophilic substitution reactions and elimination reactions.
7	2nd Semester	Cemacor03p: inorganic chemistry-i lab	On completion of the course, students will be able to perform various acid-base and oxidation-reduction titrations successfully.
8	2nd Semester	Cemacor04p: organic chemistry-ii lab	On completion of the course, students will be able to perform the nitration of aromatic compounds, condensation reactions, hydrolysis of amides/imides/esters, acetylation of phenols/aromatic amines, benzylation of phenols/aromatic amines, side chain oxidation of aromatic compounds, diazo coupling reactions of aromatic amines, bromination of anilines using green approach, redox reaction including solid-phase method, green multi-component-coupling reaction, selective reduction of m-dinitrobenzene to m-nitroaniline, students also will be able to calculate percentage yield, based upon isolated yield (crude) and theoretical yield.
9	3rd Semester	Cemacor05t: physical chemistry-ii	On completion of the course, students will be able to understand transport processes, different examples of transport properties, viscosity of liquids and comparison with that of gases, conductance and transport number; partial properties and chemical potential, thermodynamic conditions for equilibrium, chemical potential and other properties of ideal substances- pure and mixtures; black-body radiation and Planck's theory of radiation, wave function, elementary concepts of operators, particle in a box, simple harmonic oscillator.
10	3rd Semester	Cemacor05p: physical chemistry-ii lab	On completion of the course, students will be able to study of viscosity of unknown liquid, determine the partition coefficient, determine of K_{eq} , conductometric titration, saponification reaction conductometrically, verification of Ostwald dilution law.
11	3rd Semester	Cemacor06t: inorganic chemistry-ii	On completion of the course, students will be able to understand the chemical bonding with special emphasis on ionic and covalent bonding, the concepts of molecular orbital theory, metallic bonding and concepts of semi-conductors, concepts of weak bonds like hydrogen bond, van der Waals bond; radioactivity and related phenomena of radioactive atoms, know the versatile applications of

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			radiochemistry in different fields like in determination of age of an ancient species, hazards of radiations and the safety measures.
12	3rd Semester	Cemacor06p: inorganic chemistry-ii lab	On completion of the course, students will be able to do estimation of cu(ii), estimation of vitamin c, estimation of (i) arsenite and (ii) antimony, estimation of available chlorine in bleaching powder and also estimation of metal content in some selective samples like estimation of cu in brass, estimation of cr and mn in steel, estimation of fe in cement.
13	3rd Semester	Cemacor07t: organic chemistry-iii	On completion of the course, students will be able to learn in detail about the synthesis, properties, chemical reactions and reaction mechanisms of alkenes and alkynes, understand about different types of electrophilic and nucleophilic aromatic substitution reactions, reaction intermediates and their mechanisms, study the properties and reactions of carbonyl compounds and corresponding reaction mechanisms, learn preparations, reactions and corresponding reaction mechanisms of organometallic compounds.
14	3rd Semester	Cemacor07p: organic chemistry-iii lab	On completion of the course, students will be able to study experimentally the qualitative detection solid organic compounds through detection of the functional groups by systematic chemical tests and to identify the compound through literature survey after measuring the melting point.
15	4th Semester	Cemacor08t: physical chemistry-iii	On completion of the course, students will be able to understand about the applications of thermodynamics in colligative properties and phase equilibrium; electrical properties of molecules like ionic equilibria, electromotive force, dipole moment and polarizability; study the fundamentals of quantum mechanics.
16	4th Semester	Cemacor08p: physical chemistry-iii lab	On completion of the course, students will be able to determine solubility of sparingly soluble salt in water, in electrolyte with common ions and in neutral electrolyte, perform potentiometric titration of mohr's salt solution against standard $K_2Cr_2O_7$ solution, determine K_{sp} for $AgCl$ by potentiometric titration of $AgNO_3$ solution against standard KCl solution, find the effect of ionic strength on the rate of persulphate – iodide reaction, know experimentally how to study phase diagram of a phenol-water system and to measure the ph of an unknown solution and ph metric titration of an acid against strong base.
17	4th Semester	Cemacor09t: inorganic chemistry-iii	On completion of the course, students will be able to understand the basic principles of metallurgy, gain detailed knowledge of s- and p-block elements, noble gases and inorganic polymers; understand coordination chemistry, isomerism of inorganic compounds and iupac nomenclature of inorganic compounds.
18	4th Semester	Cemacor09p: inorganic chemistry-iii lab	On completion of the course, students will be able to perform complexometric titrations and inorganic preparations.
19	4th Semester	Cemacor010t: organic chemistry-iv	On completion of the course, students will be enriched in detailed study of organic nitrogenous compounds, rearrangement reactions and their mechanism, development of logic of organic synthesis, understanding of asymmetric synthesis and understanding of organic spectroscopy with special emphasis to uv-vis, ir, nmr spectroscopy and their applications.
20	4th Semester	Cemacor010p: organic chemistry-iv lab	On completion of the course, students will be able to perform quantitative estimations of glycine, glucose, sucrose, vitamin-c, aromatic amine, phenol, formaldehyde, acetic acid, urea and saponification value of oil/fat/ester.

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21	4th Semester	Cemssec002– analytical clinical biochemistry	On completion of the course, students will be able to understand basic concept of carbohydrates, proteins, lipids, lipoproteins, dna, rna, enzymes, biochemistry of disease: a diagnostic approach by blood/ urine analysis. qualitative and quantitative analysis of carbohydrates and proteins
22	5th Semester	Cemacor011t: inorganic chemistry-iv	On completion of the course, students will be able to gain thorough understanding of co-ordination chemistry in the light of vbt, cft, lft, understanding of the colour and spectra of co-ordination compounds and their magnetic properties, detailed knowledge of d- and f- block elements, detailed knowledge of lanthanides and actinides.
23	5th Semester	Cemacor011p: inorganic chemistry-iv lab	On completion of the course, students will be able to perform principles involved in chromatographic separations. paper chromatographic separation of metal ions; gravimetric estimation and estimation using spectrophotometry.
24	5th Semester	Cemacor012t: organic chemistry-v	On completion of the course, students will be able to understand different polynuclear hydrocarbons like naphthalene, anthracene, phenanthrene; heterocyclic compounds 5- and 6-membered heterocycles; cyclic stereochemistry of alicyclic compounds; pericyclic reactions, fmo approach; carbohydrates including monosaccharides, disaccharides, polysaccharides; reactions and synthesis of biomolecules like amino acids, peptides and nucleic acids.
25	5th Semester	Cemacor012p:organic chemistry-v lab	On completion of the course, students will be able to separate mixture of two or three aminoacids/sugars by thin layer chromatography or paper chromatography; detailed knowledge about spectroscopic analysis of organic compounds using ir and proton nmr spectroscopy.
26	5th Semester	Cemadse01t: advanced physical chemistry	On completion of the course, students will be able to understand bravais lattice, laws of crystallography, crystal planes, determination of crystal structure using powder method; statistical thermodynamics, specific heat of solid, dulong –petit’s law, nernst heat theorem, molecular forces and chemical bonding in polymers.
27	5th Semester	Cemadse01p: advanced physical chemistry lab	On completion of the course, students will be able to solve computer programs based on numerical methods for roots of equations, numerical differentiation, numerical integration, matrix operations and simple exercises using molecular visualization software.
28	6th Semester	Cemacor13t: inorganic chemistry-v	On completion of the course, students will be able to understand concept of bioinorganic chemistry including role of metal ions, haemoglobin, myoglobin, hemocyanine and hemerythrin, organometallic chemistry, applications of 18-electron rule to metal carbonyls, nitrosyls, cyanides, zeise’s salt, catalysis by organometallic compounds like wacker process, ziegler-natta catalysis for olefin polymerization, reaction kinetics and mechanism of substitution reactions in square planar complexes and mechanism of substitution in octahedral complexes
29	6th Semester	Cemacor13p: inorganic chemistry-v lab	On completion of the course, students will be able to perform qualitative semimicro analysis of mixtures containing four radicals and to determine the most probable composition
30	6th Semester	Cemacor14t: physical chemistry- iv	On completion of the course, students will be able to understand the concept of different molecular spectroscopy, such as, rotation, vibration, raman, mass, uv-visible, nmr, esr etc. they can also be able to understand the basic knowledge of photochemistry and surface phenomena

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31	6th Semester	Cemacor14p: physical chemistry- iv lab	On completion of the course, students will be able to perform the experiments like determination of surface tension of a liquid, cmc, verification of beer and lambert's law, study of kinetics of $k_2s_2o_8 + ki$ reaction, determination of ph of unknown buffer, spectrophotometrically.
32	3rd Semester	Cemssec001– basic analytical chemistry	On completion of the course, students will be able to understand concept of analysis of soil, water, food products, chromatography, ion exchange, analysis of cosmetics. they also understand estimation of macro nutrients: potassium, calcium, magnesium in soil samples by flame photometry, spectrophotometric determination of iron in vitamin / dietary tablets, spectrophotometric identification and determination of caffeine and benzoic acid in soft drinks.
33	6th Semester	Cemadse04t: green chemistry	On completion of the course, students will be able to understand principles of green chemistry, atom economy, green solvents, use of alternative sources of energy, microwave, ultrasounds, catalytic reagents, inherent safer design, green synthesis of adipic acid, catechol, disodium iminodiacetate, surfactants for carbon dioxide, designing of environmentally safe marine antifoulant, rightfit pigment, healthier fats and oil, future trends in green chemistry, green chemistry in sustainable development.
34	6th Semester	Cemadse04t: green chemistry lab	On completion of the course, students will be able to perform the experiments using safer starting materials for the preparation of nanoparticles of gold, using renewable resources-preparation of biodiesel from vegetable/ waste cooking oil, use of enzymes as catalysts, use of alternative green solvents, solvent free synthesis, alternative sources of energy using sunlight.
35	6th Semester	Cemadse05t: inorganic materials of industrial importance	On completion of the course, students will be able to learn about silicate industries i.e., glass, ceramics, cements; fertilizers, surface coatings, paints and pigments-formulation, batteries, fuel cells-solar cell and polymer cells, alloys-ferrous and non-ferrous alloys, catalysis, chemical explosives.
36	6th Semester	Cemadse05p: inorganic materials of industrial importance lab	On completion of the course, students will be able to determine free acidity in ammonium sulphate fertilizer, composition of dolomite, estimate calcium in calcium ammonium nitrate fertilizer,, phosphoric acid in superphosphate fertilizer, alloy, cement; preparation of pigment.
37	1st Semester		
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