Rayat Shikshan Sanstha's

Annasaheb Awate Arts, Commerce and Hutatma Babu Genu Science College

Manchar, Tal. Ambegaon, Dist. Pune

DEPARTMENT OF CHEMISTRY

Course Outcomes (COs)

M.Sc. I Organic and Analytical Chemistry 2024-25

Semester-I

Sr. No.	Course	Course Outcomes
1	CHE-501 Physical Chemistry I	After completion of this course, the student will student will be able to: **CO-1:** Students should be able to remember the concepts of thermodynamic parameters, quantum mechanical postulates, rate laws of chemical reactions and computation of macroscopic properties of matter. CO-2: Students should understand the basics like state function and path function, Schrodinger wave equation, kinetics of fast reactions, partition functions and ensembles. **CO-3:** Students should be able to apply the knowledge of various quantum mechanical methods to determine the different molecular properties and built the concept of the relation between thermodynamics and quantum mechanics. **CO-4:** Students should be able to analyze the rates of various chemical reactions both theoretically and experimentally and also observe the effect of catalyst and determine energies of activation of such reactions. **CO-5:** Students should be able to evaluate variation of thermodynamic parameters for multicomponent systems and their variation with other extensive properties, Schrodinger wave equation and its application to hydrogen and hydrogen like atoms.

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2	CHOD-502 MJ: Inorganic Chemistry I	After completion of this course, the student will student will be able to: **CO-1**: Define symmetry elements and symmetry operations, classes, properties of a group,group multiplication table, etc.Classify symmetry elements, point group, Group, sub-group and classes.Use wave function as basis for determination of irreducible representations and the GreatOrthogonality theorem and its consequence.Solve problem based on point group, matrix representation and character tableConstruct character table of various point groupJustify which can take part in bonding on the basis of SALCs and point group of molecules. **CO-2:** Classify symmetry elements, point group, Group, sub-group and classes **CO-3:** Use wave function as basis for determination of irreducible representations and the GreatOrthogonality theorem and its consequence **CO-4:** Solve problem based on point group, matrix representation and character table CO-5: Construct character table of various point group **CO-6:** Justify which can take part in bonding on the basis of SALCs and point group of molecules

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3	CHE- 503 Organic Chemistry	After completion of this course, the student will student will be able to: **CO-1:** Understand the concepts of chemical bonding, various structural effects, acids and bases, intermediates and aromaticity. **CO-2:** Learn the concepts of stereochemistry. **CO-3:** Understand and identify the types of organic reactions. **CO-4:** Advanced knowledge of various stereochemical aspects. **CO-5:** Establish mechanistic knowledge of aliphatic and aromatic substitutions, and oxidationreduction reactions. **CO-6:** Develop problem solving ability of the students.
4	CHE-504 Physical Chemistry Practical I	After completion of this course, the student will student will be able to: **CO-1:** Students will grasp the concept of reaction rate and its significance in Chemical Kinetics. **CO-2:** Students will learn how to use experimental data to deduce rate laws and rate constants. **CO-3:** Students will be familiar with the fundamental principles of colorimetry and spectrophotometry including Beer's law, Lambert- Beer's law and the relationship between absorbance and concentration. **CO-4:** Students will be able to operate the instruments like spectrophotometer and colorimeter. **CO-5:** Students will be able to determine the densities of the solutions and can calculate molar volumes.

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5	CHE-505 Inorganic Chemistry Practical I	After completion of this course, the student will student will be able to: **CO-1:** Prepare solution of required conc. and the handle laboratory equipment properly. **CO-2:** Perform experiment accurately and able to perform calculation. **CO-3**: Explain experiment and principal of experiment in detail. **CO-4:** Perform calculations and discuss results and write conclusions of the experiment. **CO-5:** Apply knowledge to a) design experiment for given aim or modify experiment to enhance results. b) to find out lacuna in experimental procedure. **CO-6:** Solve problem/ numerical depending on given experimental data / information.
6	CHE-506 Organic Chemistry Practical I	After completion of this course, the student will student will be able to: **CO-1:** Understand the theoretical aspects behind separation, purification, and synthesis of organic compounds. **CO-2:** Acquire the experimental skills for separation, purification, identification and synthesis of organic compounds. **CO-3:** Design experimental set up for performing the organic reactions. **CO-4:** Monitor the organic reactions. **CO-5:** Describe the mechanistic aspects of organic reactions. **CO-6:** Develop problem solving ability.

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7	CHEOD-507 (D) Organic Reaction and Reagents. Optinal Paper for Org, Chemistry	After completion of this course, the student will student will be able to: **CO-1:** Understand the concepts of named organic reactions and reagents. **CO-2:** Identify the type of named organic reaction and uses of reagents. **CO-3:** Predict the reaction conditions of organic reaction. **CO-4:** Write the reaction mechanism. **CO-5**: Design appropriate synthetic route. **CO-6:** Develop problem solving ability of the students.
	CHE-507(C), Analytical Chemistry Optinal Paper for Analytical Chemistry	After completion of this course, the student will student will be able to **CO1:** Define/memorize GLP, Lab Safety, Quality assurance **CO2:** Discuss good laboratory practices, laboratory emergencies, and mass spectrometry **CO3:** Apply their knowledge to prepare quality assurance reports, emergencies in the laboratory **CO4:** Differentiate between different ionization technique, compare hazardous and nonhazardous material handling **CO5**: Explain the Quality Assurance, Laboratory Accreditation, Laboratory Emergencies, different ionization technique **CO6**: Applications of GLP, Lab Safety, mass spectrometry
8	CHE-508 Research Methodology	After completion of this course, the student will student will be able to: **CO-1:** Develop a comprehensive understanding of different research methodologies and their applications in mathematics.

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Course Outcomes (COs)

		CO-2: Cultivate critical thinking and analytical skills necessary for identifying research problems and formulating research questions. **CO-3:** Provide practical experience in designing experiments, collecting and analyzing data, and interpreting research results. **CO-4:** Foster effective communication skills for presenting research findings orally and in written form. **CO-5:** Promote ethical research practices and awareness of responsible conduct in mathematical research CO5; Develop problem solving ability.

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Course Outcomes (COs)

Semester-II

Sr. No.	Course	Course Outcomes
1	CHEOD-551: Physical Chemistry II	After the completion of this course, students will be able to **CO-1:** Remember basic concepts of molecular spectroscopy, selection rules, intensity of spectral lines and width of spectral transition. **CO-2:** Understand principles and applications of rotational, vibrational, raman, electronic and mossbauer spectroscopy. **CO-3:** Apply various spectroscopic techniques for gaining insights into molecular structure **CO-4:** Analyse vibrating diatomic molecule, simple harmonic and anharmonic oscillator, Scattering of light and Raman Spectrum. **CO-5:** Evaluate bond length, vibrational frequency, force constant and dissociation energy using spectral data. **CO-6:** Create awareness about rotational fine structure, vibrational coarse structure, Quadrupole effects.
2	CHE-552 Inorganic Chemistry II	After the completion of this course, students will be able to- **CO-1:** Define R. S. term, configuration, microstate, paramagnetic, diamagnetic ferromagnetic, antiferromagnetic, Curie and Neel temperature.

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		CO-2: Identify complex ions showing same R.S. terms, degeneracy of ground state terms ofmetal ions, and spin multiplicities of different configurations. **CO-3:** Interpret electronic spectra for spin allowed Oh and Td complexes using Orgel diagram,Magnetic properties of A, E and T ground terms in complexes and selection rules. **CO-4:** Calculate frequencies of absorption spectrum, 10Dq, Racah and nepholauxetic parameter for a complex, and magnetic moments of complexes **CO-5:** Construct microstate table for various configuration and prepare correlations diagram and Tanabe-Sugano diagram for various configurations in Td an Oh ligand field. **CO-6:** Assess appropriate full spectroscopic terms for various configuration/ion/term. Section II: Bioinorganic Chemistry **CO-1:** Define metalloproteins, metallo-eznymes, photosynthesis, HSAB concept, nucleic acids, metalloregulation, Biopolymer effects and acetylcholine receptor. **CO-2:** Explain chelate effect and Irving-William series, pKa values of coordinated ligands,Tuning of redox potential, and Reactions of coordinated ligands. **CO-3:** Describe Fe-S clusters, model compounds and spontaneous self-assembly, metals inmedicine, blue copper proteins, and cytochromes, and Na/K pumps.

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		CO-4: Express nitrogen fixation, detoxification of mercury, structure of RNA, cis-platin, amino acids, siderophore,and calmoduline zinc finger proteins. **CO-5:** Distinguish between hemoglobin and myoglobin, transferrin and ferritin, photosystem-I and photosystem-II. **CO-6:** Decide role of metals in biological system, medicine, blood coagulation, oxygen storage and transport, photosynthesis and uptake and transport of iron.
3	CHE-553 Organic Chemistry II	After the completion of this course, students will be able to- **CO-1:** Understand the concepts of pericyclic and photochemical reactions, and molecular rearrangements **CO-2:** Learn concepts of Organic Spectroscopy. **CO-3:** Identify the type of pericyclic and photochemical reactions **CO-4**: Solve the problems based on pericyclic and photochemical reactions and molecular rearrangements **CO-5:** Deduce the structure from the spectral data and justify the findings. CO6: Develop problem solving ability of the students.

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4	CHE-554 Physical Chemistry Practical II	After the completion of this course, students will be able to **CO-1:** Students will grasp the fundamental principles of Conductometry, Polarography, Potentiometry and pH metry. **CO-2:** Students will familiar with the operation of Conductometer, Polarimeter, Potentiometer and pH meter. **CO-3:** Students will understand the concepts of conductance, resistance and learn how to calculate and interpret these values. **CO-4:** Students will learn to interpret polarographic waves and understand their significance in identifying electroactive species and determining their concentration. **CO-5:** Students will explore the applications of Potentiometry in various fields such as acidbase titrations, determination of pH and analysis of ionic concentration.
5	CHE-555 Inorganic Chemistry Practical II	After the completion of this course, students will be able to **CO-1:** Define coordination complex, cell constant, resistance, specific conductance, equilibrium constant, absorbance, Beer's law, solubility product, chromatography, etc.

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		CO-2: Discuss photochemistry of potassium trioxalatoferrate complex, kinetics of formation of Cr(III)-EDTA, Determination of Cu(II)and Fe (II) by solvent extraction technique. **CO-3:** Outline the flow-chart for synthesis of [Mn(acac)3], Chloropentaamminecobalt(III) chloride, Nitro pentaamminecobalt(III) chloride, Bis[TrisCu(I)thiourea complexes. **CO-4:** Estimate purity of the [Mn(acac)3], Chloropentaamminecobalt(III) chloride, Nitro pentaamminecobalt(III) chloride, Bis[TrisCu(I)thiourea complexes. **CO-5:** Determine equilibrium constant of M – L systems Fe(III)–Sulphosalicylic acid, magnetic susceptibility (χg and χm) of mercury tetracyanato cobalt or Fe(acac) and magnetic susceptibility (χg and χm) of mercury tetracyanato cobalt or Fe(acac). **CO-6:** Calculate the quantity from observation of the experiments and interpret the result obtained respective experiments.
6	CHE-556 Organic Chemistry Practical II	After the completion of this course, students will be able to- **CO-1:** Understand the theoretical concepts behind organic synthesis.

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Course Outcomes (COs)

		CO-2: Acquire the experimental skills for separation, purification, identification and synthesis of organic compounds. **CO-3:** Design experimental set up for performing the organic reactions. **CO-4:** Monitor the organic reactions and analyse the products using spectral results. **CO-5:** Describe the mechanistic aspects of organic reactions. **CO-6:** Develop problem solving ability.
7	CHE-557(C) Green Chemistry	After the completion of this course, students will be able to- **CO-1:** Apply the principles of green chemistry to chemical processes. **CO-2:** Apply the principles of green chemistry to reduce the cost of chemical processes. **CO-3**: Develop economical synthetic route involving principles of green chemistry. **CO-4:** Analyze chemical data and choose safer and renewable raw materials for chemical processes. **CO-5:** Develop processes in accordance with Sustainable Development Goals.