



Rayat Shikshan Sanstha's

Mahatma Phule Mahavidyalaya, Pimpri, Pune

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Affiliated to Savitribai Phule Pune University, Pune (PU/PN/ACS/053)*

Department of Chemistry

B.Sc Chemistry

B.Sc.

UG Course outcome

Name of the department	Class	Course name	Course code	Course outcome
Department of Chemistry	F.Y.B.Sc. <u>Sem-I</u>	Physical Chemistry	<u>CH 101</u>	CO 1. Describe the laws of thermodynamics CO 2. Calculate enthalpy, bond energy, bond dissociation energy, resonance energy CO 3. Relate free energy and equilibrium CO 4. Compare exergonic and endergonic reaction CO 5. Differentiate strong, moderate and weak electrolytes CO 6. Analyse factors affecting degree of ionization
	F.Y.B.Sc.	Organic Chemistry	<u>CH 102</u>	CO 1. Describe inductive effect, electromeric effect, resonance and hyperconjugation CO 2. Compare homolysis and heterolysis CO 3. Differentiate between geometrical and optical isomerism CO 4. Apply E/Z nomenclature to various organic compound CO 5. Explain alkanes, alkenes and alkynes

				CO 6. Interpret preparation methods for alkanes, alkenes and alkynes
	F.Y.B.Sc.	Chemistry Practical Course I	<u>CH 103</u>	<p>CO 1. Recognize the importance of chemical safety and lab safety</p> <p>CO 2. Determine the thermochemical parameters and related concepts</p> <p>CO 3. Measure pH of various solutions by using pH meter</p> <p>CO 4. Prepare various buffer solutions</p> <p>CO 5. Analyze various elements from the given organic compound</p> <p>CO 6. Apply chromatographic techniques for separation of constituents of mixtures</p>
	F.Y.B.Sc. <u>Sem-II</u>	Inorganic Chemistry	<u>CH 201</u>	<p>CO 1. Define origin of quantum mechanics and its need</p> <p>CO 2. Describe various theories and principles related atomic structure</p> <p>CO 3. Illustrate Schrodinger equation for hydrogen atom</p> <p>CO 4. Discuss periodic table and periodicity of elements</p> <p>CO 5. Explain characteristics of various chemical bonds</p> <p>CO 6. Summarize Born-Lande equation and Born-Haber cycle</p>
	F.Y.B.Sc.	Analytical Chemistry	<u>CH 202</u>	CO 1. Define analytical chemistry and common analytical problems

				<p>CO 2. Describe various calculations used in analytical chemistry</p> <p>CO 3. Differentiate between mass and weight</p> <p>CO 4. Explain qualitative analysis of organic compounds</p> <p>CO 5. Compare between paper and thin layer chromatography</p> <p>CO 6. Illustrate pH measurement</p>
	F.Y.B.Sc.	Chemistry Practical Course II	<u>CH 203</u>	<p>CO 1. Synthesize commercially important inorganic compounds</p> <p>CO 2. Apply volumetric analysis for various inorganic compound estimation</p> <p>CO 3. Analyze commercial products containing inorganic substances</p> <p>CO 4. Draw polar plots of s and p orbitals</p> <p>CO 5. Use various purification techniques for organic compounds</p> <p>CO 6. Prepare derivatives of various organic compounds</p>

Name of the department	Class	Course name	Course code	Course outcome
Department of Chemistry	S.Y.B.Sc. <u>Sem-III</u>	Physical & Analytical Chemistry	<u>CH 301</u>	CO 1. Define kinetics, rate laws and rate constants CO 2. Explain factors affecting rate of reaction CO 3. Apply adsorption process to real life problem CO 4. Illustrate different terms related to errors in quantitative analysis CO 5. Interpret calculations involved in volumetric analysis CO 6. Compare various titrations
		Inorganic & Organic Chemistry	<u>CH 302</u>	CO 1. Define the terms related to molecular orbital theory CO 2. Distinguish between atomic and molecular orbital CO 3. Apply IUPAC nomenclature to coordination compound CO 4. Correlate reagent and reactions CO 5. Compare nucleophilic substitution (SN^1 , SN^2 and SN^i) reactions CO 6. Differentiate between alcohols, phenols and ethers

		Chemistry Practical - III	<u>CH-303</u>	<p>CO 1. Examine chemical kinetics by various experiment</p> <p>CO 2. Analyze inorganic compounds by quantitative and qualitative analysis</p> <p>CO 3. Separate binary mixture of organic compounds</p> <p>CO 4. Prepare various organic compounds</p> <p>CO 5. Determine equivalence point of neutralization of acetic acid and sodium hydroxide</p> <p>CO 6. Estimate various compounds from given solution and find errors in quantitative analysis</p>
	S.Y.B.Sc. <u>Sem-IV</u>	Physical & Analytical Chemistry	<u>CH-401</u>	<p>CO 1. Define system, phase in system, degree of freedom, one /two component system</p> <p>CO 2. Explain Gibb's phase rule and its thermodynamic derivation</p> <p>CO 3. Derive distribution law and its thermodynamic proof</p> <p>CO 4. Apply conductometric methods of analysis to real problem in analytical laboratory</p> <p>CO 5. Illustrate Lambert-Beer's law and its derivation</p> <p>CO 6. Predict separation of ions using resins</p>
		Inorganic and Organic Chemistry	<u>CH-402</u>	<p>CO 1. Describe isomerism in coordination complexes</p> <p>CO 2. Identify inner and outer orbital complexes</p>

				<p>CO 3. Calculate field stabilization energy and magnetic moment for various complexes</p> <p>CO 4. Perform inter conversion of functional groups</p> <p>CO 5. Relate reagent and reactions of carboxylic acids and their derivatives</p> <p>CO 6. Explain stereochemistry of cyclohexane</p>
	S.Y.B.Sc.	Practical Chemistry IV	<u>CH-403</u>	<p>CO 1. Determine the cell constant by using conductometric titration</p> <p>CO 2. Separate binary mixture of cations by column chromatography</p> <p>CO 3. Analyze variation of mutual solubility temperature with % concentration for the phenol-water system</p> <p>CO 4. Verify the Freundlich and Langmuir adsorption isotherm for adsorption of acetic acid on activated charcoal</p> <p>CO 5. Synthesize various coordination compounds</p> <p>CO 6. Determine the unknown concentrations of various solutions</p>

Name of the department	Class	Course name	Course code	Course outcome
Department of Chemistry	T.Y.B.Sc. <u>Sem-V</u>	Physical Chemistry DSEC-I	<u>CH 501</u>	<p>CO 1. Describe the De Broglie hypothesis and uncertainty principle</p> <p>CO 2. Solve Schrodinger equation for 1D, 2D and 3D model</p> <p>CO 3. Differentiate between Rayleigh, Stokes and anti-stokes lines in a Raman spectrum</p> <p>CO 4. Classify molecules on the basis of moment of Inertia</p> <p>CO 5. Analyse quantum yield and explain reasons for high and low quantum yield</p> <p>CO 6. Categorize various photochemical reactions</p>
		Analytical Chemistry	<u>CH 502</u>	<p>CO 1. Define the terms- gravimetry, co-precipitation, post precipitation</p> <p>CO 2. Explain applications of gravimetry in determination of various ions</p> <p>CO 3. Classify basic radicals in groups</p> <p>CO 4. Illustrate factors affecting thermogravimetric analysis</p> <p>CO 5. Review various parts of spectrophotometer</p> <p>CO 6. Select a particular method of analysis of a sample</p>

		Physical Chemistry Practical I	<u>CH 503</u>	<p>CO 1. Determine the specific refractivity's of the given liquids and their mixture</p> <p>CO 2. Determine the refractive index of a series of salt solutions</p> <p>CO 3. Estimate various ions by colorimetry</p> <p>CO 4. Analyze acid vs base conductometrically</p> <p>CO 5. Evaluate the molecular weight of a high polymer by using viscometer</p> <p>CO 6. Determine the radius of glycerol molecule from viscosity measurement</p>
	DSEC-II	Inorganic Chemistry - I	<u>CH-504</u>	<p>CO 1. Describe the electroneutrality principle and different types of pi bonding</p> <p>CO 2. Explain MOT of octahedral complex</p> <p>CO 3. Classify reactions of coordination compounds</p> <p>CO 4. Justify position of d-block elements in periodic table</p> <p>CO 5. Differentiate between d-block and f-block elements</p> <p>CO 6. Illustrate metals, semiconductors and Insulators on the basis of band gap</p>
	DSEC-II:	Industrial Chemistry - I	<u>CH-505</u>	<p>CO 1. Describe the importance of chemical industry</p> <p>CO 2. Compare between batch and continuous process</p> <p>CO 3. Explain manufacturing process and uses of basic chemicals</p> <p>CO 4. Illustrate processes involved in sugar industry and fermentation</p>

				<p>CO 5. Review the manufacturing of soaps and detergents</p> <p>CO 6. Explain synthesis, structures, properties and applications of dyes and pigments</p>
	DSEC-II	Inorganic Chemistry Practical - I	<u>CH-506</u>	<p>CO 1. Estimate various ions using gravimetric analysis</p> <p>CO 2. Analyze sodium bicarbonate from mixture by thermal decomposition</p> <p>CO 3. Determine water of crystallization by thermal decomposition</p> <p>CO 4. Synthesize various inorganic complexes</p> <p>CO 5. Separate ions by Inorganic qualitative analysis</p> <p>CO 6. Analyze iron, chloride and sulphate from pharmaceutical raw material by limit test</p>
	DSEC-III:	Organic Chemistry - I	<u>CH-507</u>	<p>CO 1. Define and classify polynuclear and heteronuclear aromatic hydrocarbons</p> <p>CO 2. Describe meaning of active methylene group, its preparation and applications</p> <p>CO 3. Explain various reactions and mechanisms</p> <p>CO 4. Illustrate different types of intermediates in rearrangement reaction</p> <p>CO 5. Differentiate between 1,1 and 1,2-elimination</p> <p>CO 6. Interpret mechanisms of E^1, E^2, E^{1cB} reactions</p>

	DSEC-III	Chemistry of Biomolecules	<u>CH-508</u>	<p>CO 1. Describe cell and differentiate between a bacterial cell, plant cell, and animal cell</p> <p>CO 2. Explain biological composition and organization of cell membrane</p> <p>CO 3. Discuss carbohydrates and their biochemical significance in living organisms</p> <p>CO 4. Illustrate the types of lipids, structure of lipids and properties of lipids</p> <p>CO 5. Recall amino acids and proteins</p> <p>CO 6. Infer the importance of enzymes and hormones</p>
	DSEC-III	Organic Chemistry Practical-I	<u>CH-509</u>	<p>CO 1. Separate, purify and analyse binary mixtures</p> <p>CO 2. Describe the techniques involved in drying and recrystallization method</p> <p>CO 3. Synthesize various organic compounds through greener approach</p> <p>CO 4. Predict alternative solvent media and energy sources for chemical processes</p> <p>CO 5. Expert in various techniques of preparation and analysis of organic substances</p> <p>CO 6. Plan to use the purification technique for chemical reaction</p>

		Introduction to Medicinal Chemistry	<u>CH-510</u> <u>(A)</u>	<p>CO 1. Describe the basics of drug chemistry</p> <p>CO 2. Explain bio-physicochemical properties in drug action and design</p> <p>CO 3. Illustrate drugs for infectious diseases</p> <p>CO 4. Recognize drugs for non-infectious diseases</p> <p>CO 5. Review biological activity parameters and importance of stereochemistry of drugs and receptors</p> <p>CO 6. Predict mechanism of action of drugs belonging to the classes of infectious and non-infectious diseases</p>
		Environmental Chemistry	<u>CH-511</u> <u>(A)</u>	<p>CO 1. Describe importance and conservation of environment</p> <p>CO 2. Explain biogeochemical cycles of C, N, P, S and O</p> <p>CO 3. Compare organic and inorganic pollutants</p> <p>CO 4. Interpret water quality parameters</p> <p>CO 5. Review water quality parameters and standards</p> <p>CO 6. Plan waste water treatment</p>
	T.Y.B.Sc. Semester-VI	DSEC-IV Physical Chemistry-II	<u>CH-601</u>	<p>CO 1. Describe the components of an electrochemical cell</p> <p>2. Determine the e.m.f. of an electrochemical cell</p> <p>3. Calculate the mass of a unit cell</p> <p>4. Explain the sign convention for electrode potentials</p> <p>5. Estimate the equilibrium constant of a cell reaction</p>

				6. Predict crystal structure of NaCl using Bragg's method
	DSEC-IV	Physical Chemistry-III	<u>CH-602</u>	<p>CO 1. Describe the principles and applications of colligative properties of dilute solutions</p> <p>CO 2. Understand the relation between Vant Hoff's factor and degree of dissociation of electrolyte</p> <p>CO 3. Calculate the molecular weight of nonelectrolytes using colligative properties</p> <p>CO 4. Evaluate the factors affecting the rate of reactions in solids</p> <p>CO 5. Compare the electronic structure of solids, conductors and insulators</p> <p>CO 6. Classify polymers in various types</p>
	DSEC-IV:	Physical Chemistry Practical-II	<u>CH-603</u>	<p>CO 1. Determine the pKa value of given monobasic weak acid by potentiometric titration</p> <p>CO 2. Calculate the formal redox potential of Fe⁺/Fe³⁺ system potentiometrically</p> <p>CO 3. Estimate the dissociation constant of oxalic acid by pH-metric titration with strong base</p> <p>CO 4. Evaluate pKa of given weak acid by pH metry titration</p> <p>CO 5. Determine the molecular weight of solute by depression in freezing point method</p> <p>CO 6. Estimate the molecular weight of agiven polymer by turbidometry</p>
	DSEC-V	Inorganic Chemistry - II	<u>CH-604</u>	<p>CO 1. Define the organometallic chemistrty</p> <p>CO 2. Understand M-C bonding in binary metal carbonyls</p> <p>CO 3. Differentiate homogeneous and heterogeneous catalysis</p> <p>CO 4. Illustrate the cycles of homogeneous catalysts like Wilkinson's catalyst,</p>

				<p>hydroformulation reaction, Monsanto acetic acid synthesis, Heck reaction</p> <p>CO 5. Categorize various heterogeneous catalysts</p> <p>5. Explain catalytic reaction mechanism</p> <p>6. Elucidate the biological role of inorganic ions and compounds</p>
	DSEC-V	Inorganic Chemistry - III	<u>CH-605</u>	<p>CO 1. Describe the concept of acid-base and their theories</p> <p>CO 2. Compare the strength of different acids and bases</p> <p>CO 3. Identify the C.N. of an ionic solid</p> <p>CO 4. Solve problems based on Born-Haber cycle</p> <p>CO 5. Classify zeolites on the basis of building units</p> <p>CO 6. Plan the synthesis of various nanoparticles</p>
	DSEC-V:	Inorganic Chemistry Practical-II	<u>CH-606</u>	<p>CO 1. Estimate ions by using volumetric analysis</p> <p>CO 2. Determination of elements (e.g. Na, K) by flame photometry</p> <p>CO 3. Purify water using cation/anion exchange resin</p> <p>CO 4. Synthesize various nanoparticles</p> <p>CO 5. Verify periodic trends using solubility of alkaline earth metal</p> <p>CO 6. Analyze degradation of H₂O₂ using Fe catalyst</p>

	DSEC-VI:	Organic Chemistry-II	CH-607	<p>CO 1. Define the various regions of electromagnetic spectrum</p> <p>CO 2. Understand the principles of various spectroscopy like UV-Visible, IR and NMR</p> <p>CO 3. Calculate λ_{\max} value for various compounds</p> <p>CO 4. Interpret IR frequencies of various molecules</p> <p>CO 5. Estimate structure of organic compounds by using NMR spectroscopy</p> <p>CO 6. Predict the structure of organic compounds on the basis of spectral data such as λ_{\max}, IR frequencies and chemical shift</p>
	DSEC-VI:	Organic Chemistry-III	CH-608	<p>CO 1. Describe the terms used in retrosynthesis like disconnection, synthons, synthetic equivalence, FGI, TM</p> <p>CO 2. Apply retrosynthetic approach to various target molecules</p> <p>CO 3. Explain chemistry of reactive intermediates</p> <p>CO 4. Discuss various commonly used chemical reactions and rearrangements</p> <p>CO 5. Illustrate various oxidizing and reducing reagents</p> <p>CO 6. Predict synthesis of natural products such as terpenoids and alkaloids</p>
	DSEC-VI	Organic Chemistry Practical-II	CH-609	<p>CO 1. Explain 'fingerprint region' of an infrared spectrum</p> <p>CO 2. Identify the functional group or groups present in a compound</p> <p>CO 3. Calculate coupling constants from ^1H NMR spectra</p> <p>CO 4. Determine molecular weight of given tribasic acid</p>

				<p>CO 5. Apply the principles of extraction</p> <p>CO 6. Separate organic compounds by using column chromatography</p>
	SEC-III	Chemistry of Soil and Agrochemicals	CH-610 (A)	<p>CO 1. Describe the different components and properties of soil</p> <p>CO 2. Classify soil on the basis of pH</p> <p>CO 3. Identify the problematic soil and recommended method for their reclamation</p> <p>CO 4. Predict the plant nutrients and related functions</p> <p>CO 5. Relate the role of various fertilizers and manures required for plant growth</p> <p>CO 6. Apply various methods for soil analysis</p>
	SEC-IV	Analytical Chemistry-II	CH-611(A)	<p>CO 1. Describe the principle and application of solvent extraction</p> <p>CO 2. Explain instrumental methods of Chromatographic Analysis</p> <p>CO 3. Summarize high performance liquid chromatography</p> <p>CO 4. Illustrate basics of gas chromatography</p> <p>CO 5. Survey components of Atomic Absorption Spectroscopy</p> <p>CO 6. Apply Atomic Absorption Spectroscopy to determine trace elements.</p>