

B.Sc. Chemistry

Programme Outcomes

Sl. No.	At the time of graduation the students of BSc Degree programme in Chemistry will be able to develop	PO No.
1.	Ideal Citizen and Life Long Learner: To mould students as responsible citizen for nation building and lifelong learning of socio-cultural and technological changes.	PO1
2.	Strengthen Fundamental Concepts: To familiarize basic facts and concepts in Chemistry while retaining the exciting aspects of Chemistry so as to develop interest in the study of chemistry as a discipline.	PO2
3.	Broad and Balanced Knowledge: To develop the ability to apply the principles of Chemistry. Also to appreciate the achievements in Chemistry and to know the role of Chemistry in nature and in society. To develop problem solving skills.	PO3
4.	Advancement in Science: To be familiarised with the emerging areas of Chemistry and their applications in various spheres of Chemical sciences and to appraise the students of its relevance in future studies.	PO4
5.	Laboratory Skill and Industrial Experience: To develop skills in the proper handling of apparatus and chemicals. To be exposed to the different processes used in industries and their applications.	PO5
6.	Ethics: Identify different value systems including one's own, understand the moral principle that govern a person's behaviour, and accept responsibility for them.	PO6
7.	Critical Thinking: To enable the graduate students to frame their thinking and actions, checking out the degree to which these assumptions are accurate and valid. Also enhance their aptitude for critical thinking, evaluation and communication.	PO7
8.	Environment and Sustainability: Awareness about the environmental contexts and sustainable development.	PO8
9.	Competitive Examination and Digital Knowledge: Adequate training for the preparation of National as well as International competitive examinations and also the application of digital knowledge in higher education.	PO9
10.	Research and Oral Examination: Prepare students to present their views and finding with confidence and guide them about the possibilities of higher studies and inculcate the spirit of research.	PO10

Programme Specific Outcome

Sl. No.	Upon completion of BSc Degree programme in Chemistry, students	PSO No.
1.	Develop scientific outlook scientific attitude and scientific temper	PSO1
2.	Develop skill in experimenting , analysing and interpreting data	PSO2
3.	Develop research attitude and adopt scientific method of identifying, analysing and solving research problems in an innovative way	PSO3
4.	Apply physical and mathematical theories and principles in the context of chemical science	PSO4
5.	Use chemistry related soft wares for drawing structure and plotting graphs	PSO5
6.	Use instruments- potentiometer, conductometer, pH meter and Colorimeter	PSO6
7.	Acquire skill in safe handling of chemicals including hazardous materials	PSO7
8.	Identify the ingredients in household chemicals, use them in a critical way	PSO8
9.	Predict analytical procedures, compare experimental, theoretical and graphical methods of analysis	PSO9
10.	Predict reaction mechanism in organic reactions	PSO10
11.	Understand the terms, concepts, methods, principles and experimental techniques of physical, organic, inorganic and analytical chemistry	PSO11
12.	Develop critical thinking and adopt healthier attitudes towards individual, community and culture through the course of Chemistry	PSO12
13.	Become cautious about environmental aspects and impact of chemicals in soil, water and air and adopt eco-friendly approach in all frontiers of life	PSO13
14.	Become responsible in consumption of natural resources and adopt measures for sustainable development.	PSO14
15.	Visit Chemical factories and industries with scientific curiosity	PSO15
16.	Develop writing skills and presentation skills using audio visual aids	PSO16
17.	Compare and share knowledge in an interdisciplinary manner	PSO17
18.	Inculcate spirit of originality, novelty, and necessity in scientific research	PSO18
19.	Contribute to the academic and industrial requirements of the society	PSO19
20.	Get motivated to higher studies - PG Degree in different branches of Chemistry, BEd Degree in Physical Science, and job opportunities in industrial and non industrial sectors	PSO20
21.	Adopt safer life skills in a human friendly and eco-friendly way	PSO21

Course Outcome

Course Code	Course Title	Course Outcomes	
SEMESTER 1			
CH1141	Inorganic Chemistry I	CO1	Discuss the course of development of structure of atom.
		CO2	Apply rules for filling electrons in classifying elements into s, p,d and f blocks
		CO3	Define various scales of electronegativities and their applications
		CO4	Define Effective nuclear charge and Slater's rules
		CO5	Discuss about diagonal relationship and anomalous behaviour of hydrogen and other first element in each group.
		CO6	Correlate and predict general properties of s and p block elements based on their electronic configuration.
		CO7	Realise applications of s and p block elements in sustainable and renewable energy sources.
		CO8	Define various concepts of acids and bases.
		CO9	Understand reactions in non aqueous solvents.
		CO10	Realise various causes, effects and control measures of environmental pollution.
		CO11	Review national movements for environmental protection.
SEMESTER 2			
CH 1221	Methodology and Perspectives of Sciences and General Informatics	CO1	Appreciate the development of scientific theories through years with specific examples
		CO2	Develop curiosity and scientific attitude towards the application of chemistry in daily life
		CO3	Outline a procedure for experimentation
		CO4	Appraise the current development in Chemistry
		CO5	Identify the common ingredients of house hold synthetic products
		CO6	Discriminate and classify chemicals used as drugs,explosives

		CO7	Get motivated in visiting chemical Industries
		CO8	Adopt safety measures in handling chemicals
		CO9	Draw titration curves and explain theory of volumetric titrations
		CO10	Select suitable indicators for acid base titration knowing the theories of acid base titration and indicators
		CO11	Develop computational skills
		CO12	Discuss separation techniques of filtration and chromatographic techniques
CH 1221	Computer Laboratory	CO1	Get acquainted with Computer Lab based instruction on the use of computer and internet in learning
		CO2	Use of educational softwares, information mining from internet and using INFLIBNET/NICNET, NPTEL and VIRTUAL LABS OF MHRD.
		CO3	Learn Word processing and document preparation. Use of Spread sheets in Data handling and presentation
		CO4	Develop skill in chemical structure drawing and visualization of molecules using chemistry softwares
SEMESTER 3			
CH 1341	Inorganic Chemistry II	CO1	Understand various theories of chemical bonding and their limitations
		CO2	Predict stability of atoms and the nature of bonding between atoms
		CO3	Discuss various applications of intermolecular interactions
		CO4	Understand chemistry of glass, silicates and silicones
		CO5	Discuss chemistry of Boron compounds, oxyacids and oxides of Phosphorous
		CO6	Understand refractory carbides, nitrides, borides and silicides.
		CO7	Describe various types of halogen compounds.
		CO8	Understand chemistry of noble gas
		CO9	Understand inorganic polymers and their applications.
		CO10	Distinguish between types of nuclear reactions.
		CO11	Describe measurement of radioactivity.
		CO12	Discuss applications of radioactivity in various fields.
		CO13	Understand introductory concepts of nanochemistry

		CO14	Suggest methods of synthesizing nano materials.
		CO15	Appreciate the variety of applications of nanomaterials.
SEMESTER 4			
CH 1441	Organic Chemistry - I	CO1	Recall the fundamentals of organic chemistry.
		CO2	Apply the electron displacement effects to compare acidity, basicity and stability of organic compounds/intermediates.
		CO3	Judge the reaction mechanism of substitution and elimination on the basis of the structure of alkyl halides.
		CO4	Summarise the chemistry of reaction intermediates.
		CO5	Discuss optical, geometrical and conformational isomerism of organic compounds.
		CO6	Use CIP rules to predict the configuration of organic compounds
		CO7	Differentiate photochemical and thermal reactions.
		CO8	Discuss theory of colour and constitution and the method of synthesis of dyes
		CO9	Explain aromaticity, orientation effect and mechanism of aromatic electrophilic substitution.
		CO10	Demonstrate the method of determination of reaction mechanism.
CH1442	Inorganic Qualitative Analysis	CO1	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, out look and scientific temper (Good Lab Practices)
		CO2	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures
		CO3	Use glass wares ,electric oven, burners and weighing balance
		CO4	Develop skill in observation , prediction and interpretation of reactions
		CO5	Detect solubility, and classify compounds according to their solubility
		CO6	Apply the principle of common ion effect and solubility product in the identification and separation of ions
		CO7	Develop skill in preparing and purifying inorganic complex compounds
		CO8	Use filtration and chromatographic techniques, vacuum pump and centrifugal pumps

SEMESTER 5			
CH 1541	Physical Chemistry - I	CO1	Identify, compare and explain the properties and behaviour of ideal and real gases, knowing kinetic theory of gases and different types of molecular velocities and collision properties.
		CO2	Perform numerical problems of gases under a set of conditions
		CO3	Differentiate between amorphous and crystalline solids, understand anisotropy, symmetry and types of crystals, X ray diffraction methods of study of crystal structure, identify the imperfections in crystals understand the physical aspects of surface tension and viscosity of liquids and the basics of liquid crystals and their applications
		CO4	Representation of lattice planes and calculation of interplanar spacing, draw the crystal structures of NaCl and CsCl
		CO5	Recalling the basic concepts of solutions, concentration terms, Raoult's law and colligative properties
		CO6	Determination of colligative properties and molecular mass of solute
		CO7	Understand the working principle Electro-Chemical cells
		CO8	Design and Determine the potentials of electrochemical Systems
		CO9	Assess the nature of electrolytes in terms of dissociation and ionic conductance of electrolytes in terms of mobility of ions
		CO10	Integrate the theory into practical applications of conductometric titrations
CH 1542	Inorganic Chemistry - III	CO1	Discuss the electronic configuration and related properties of transition elements and inner transition elements
		CO2	Understand preparation of selected transition metal compounds,lanthanides and actinides
		CO3	Compare lanthanide and actinide contraction and their Consequences
		CO4	Name coordination complexes, organometallics, discuss their properties and bonding
		CO5	Understand stability of complexes and factors affecting stability
		CO6	Describe isomerism in coordination compounds
		CO7	Discuss spectrochemical series, CFSE and their Consequences

		CO8	Correlate geometry , stability and Jahn Teller effect and its causes
		CO9	Discuss reaction mechanisms and applications of coordination compounds
		CO10	Name and Classify organometallic compounds
		CO11	Discuss preparation and properties and bonding of carbonyls
		CO12	Identify the role of organometallic compounds in organic synthesis
		CO13	Discuss the role of inorganic ions in biological systems and biochemistry of haemoglobin, myoglobin, cytochromes, iron sulphur proteins
		CO14	Discuss various bioinorganic processes like photosynthesis, working of sodium potassium pump, etc
		CO15	Describe various aspects of metallurgy, and instrumental methods of analyses viz., spectrophotometric methods, thermal methods and tools available to measure nanomaterials
CH 1543	Organic Chemistry - II	CO1	Describe the preparation of hydroxy, carbonyl & amino compounds, carboxylic acids and organo Mg, Li & Zn compounds.
		CO2	Distinguish primary, secondary & tertiary alcohols and amines.
		CO3	Write reaction steps in ascending & descending of alcohol and aliphatic acid series, interconversion of aldose and ketose, chain lengthening and shortening of aldoses.
		CO4	Explain the structure of glucose, fructose, sucrose, starch and cellulose.
		CO5	Predict the outcome and mechanism of simple organic reactions, using a basic understanding of the reactivity of functional groups
		CO6	Illustrate the use of organic reagents in synthesis.
		CO7	Discuss fundamental principles of supramolecular and green chemistry
CH 1551.1	Essentials of Chemistry (Open Course)	CO1	Develop curiosity and scientific attitude towards the application of chemistry in daily life.
		CO2	Identify the common ingredients of house hold synthetic products
		CO3	Develop an awareness about the Chemistry in life processes
		CO4	Critically choose cosmetics and cleansing agents for daily use

		CO5	Adopt safer and healthier life skills in harmony with nature
		CO6	Discuss the fundamental properties of atom, structure of atom, classification of elements in to a periodic table
		CO7	Explain different types of bonding and predict stability
CH 1551.2	Fundamentals of Chemistry and Its Application to Everyday Life (Open Course)	CO1	Appreciate the evolution of Science and Chemistry and the early form of chemistry
		CO2	Understand the development of Chemistry as a discipline and the role of chemistry as a central science
		CO3	Discuss the fundamental properties of atom, structure of atom, classification of elements in to a periodic table
		CO4	Differentiate between simple molecules and giant molecules and the bonding nature
		CO5	Explain different types of bonding and predict stability
		CO6	Compare properties of graphite and diamond and their structural differences
		CO7	Identify house hold chemicals, their advantages and disadvantages
		CO8	Become aware of chemical hazards and the precautions in handling chemicals
		CO9	Beware of food adulterants
		CO10	Critically select chemical fertilizers, artificial sweeteners, beverages, and food preservatives
CH 1551.3	Environmental Chemistry (Open Course)	CO1	Discuss the structure and composition of the atmosphere
		CO2	Identify, Realise and enlist the causes of pollution to water, soil and air
		CO3	Become aware of environmental issues and its effect to man and other living beings
		CO4	Review major environmental disasters and suggest controlling and preventive measures
		CO5	Discuss the laws of environmental protection

CH1544	Inorganic Volumetric Analysis	CO1	Develop skill in selecting, primary and secondary standards
		CO2	Develop skill in weight calculation of primary standards weighing by electronic balance, making of solutions of definite strength (standard solutions)
		CO3	Use sophisticated glass wares, calibrate apparatus and develop skill in keen observation , prediction and interpretation of results
		CO4	Perform volumetric titrations under acidimetryalkalimetry, permanganometry, dichrometry, iodimetryiodometry,cerimetry, argentometry and complexometry
		CO5	Compare the advantages and disadvantages of different volumetric techniques
		CO6	Practice Punctuality and regularity in doing experiments and submitting Lab records
CH1545	Physical Chemistry Experiments	CO1	Develop Scientific outlook and approach in applying principles of physical chemistry in chemical systems/reactions
		CO2	Use computational methods for plotting graph
		CO3	Describe systematic procedures for physical experiments
		CO4	Acquire Instrumentation skill in using conductometer, potentiometer, refractometer, stalagmometer and Ostwald's viscometer
		CO5	Compare theory with experimental findings
		CO6	Practice Punctuality and regularity in doing experiments and submitting Lab records
SEMESTER 6			
CH 1641	Physical Chemistry - II	CO1	Understand basic concepts of thermodynamics spectroscopy and group theory
		CO2	Apply laws of thermodynamics in physical and chemical processes and real system
		CO3	Classify processes, properties and systems on a thermodynamic basis
		CO4	Discuss the second law of thermodynamics and Assess thermodynamic applications using second law of thermodynamics.

		CO5	Discuss basic concepts of statistical thermodynamics
		CO6	Solve numerical problems based on thermodynamics and thermochemistry
		CO7	Understand the basics of spectroscopic techniques Rotational, Vibrational and Raman Spectroscopy
		CO8	Compare NMR and ESR spectroscopy and their applications
		CO9	Evaluate physical and chemical quantities using non-spectroscopic techniques.
		CO10	Identify the elements of symmetry and Determine the point groups of simple molecules
		CO11	Differentiate diamagnetism and paramagnetism, measurement of magnetic susceptibility
		CO12	Correlate dipole moment with geometry of molecules
CH 1642	Organic Chemistry - III	CO1	Outline the chemistry of simple heterocyclic compounds
		CO2	Classify amino acids, proteins, nucleic acids, drugs, terpenes, vitamins, lipids and polymers
		CO3	Discuss the synthesis of amino acids, peptides, drugs and polymers.
		CO4	Describe the isolation and structure of terpenes and alkaloids
		CO5	Explain the mechanism and techniques of polymerisation
		CO6	Discuss the principle of UV, IR, NMR and Mass spectroscopy
		CO7	Interpret spectroscopic data to elucidate the structure of simple organic compounds
		CO8	Use the simple organic reactions to elucidate the structure of quinoline, piperine and conine
CH 1643	Physical Chemistry - III	CO1	Recall the basic physical concepts in quantum mechanics, colloids, adsorption, Chemical Kinetics, catalysis, chemical and ionic equilibria, phase equilibria, binary liquid systems and photochemistry
		CO2	Understand the basic concepts involved in quantum mechanics, colloids, adsorption, Chemical Kinetics, catalysis, chemical and ionic equilibria, phase equilibria, binary liquid systems and photochemistry
		CO3	Derive and Interpret important theories and equations involved in physical chemistry

		CO4	Demonstrate the origin of quantum numbers by correlating the Cartesian and spherical polar coordinates of hydrogen atom.
		CO5	Identify and recognize the applications of various principles, equations and physical processes
		CO6	Perform calculations involving physical concepts and equations
		CO7	Analyze graphical representations (phase diagrams, two and three components, vapour pressure – composition and boiling point – composition, temperature-composition) present in physical chemistry.
		CO8	Understand the effects of external influence on various chemical processes
		CO9	Understand different laws and principles of physical chemistry
CH1651.1	Supramolecular, Nano Particles And Green Chemistry (Elective)	CO1	Become aware of pollution caused by industries
		CO2	Recognise the necessity of green approaches to protect nature
		CO3	Discuss about sustainable development and logical use of natural resources
		CO4	Motivated to more eco-friendly life style
		CO5	Realises the importance of micro scale approaches and nano material research
CH1651.2	Computational Combinatorial and Physical Organic Chemistry (Elective)	CO1	Understand the use of Chemistry related softwares
		CO2	Discuss computational methods and combinatorial synthesis
		CO3	Classify reaction mechanism with suitable examples
		CO4	Understand the role of Thermodynamic functions in the study of Kinetics
		CO5	Correlate structure with reactivity
CH1651.3	Polymer Chemistry (Elective)	CO1	Differentiate between Natural and synthetic polymers

		CO2	Understand polymerization process of monomeric units
		CO3	Critically analyse the advantages and disadvantages of polymers
		CO4	Analyse different Applications of Polymers
		CO5	Identify the properties of polymers
		CO6	Realize the necessity of biodegradable substitutes for a sustainable development
CH1651.4	Bio Chemistry (Elective)	CO1	Recognise the constituents of blood and blood coagulation factors
		CO2	Become aware of the role of organs, in maintaining health
		CO3	Realise applications of Analytical techniques and instruments for biochemical studies
CH1644	Organic Chemistry Experiments	CO1	Develop curiosity in systematically analyzing organic compounds
		CO2	Differentiate and identify organic compounds by their characteristic reactions towards standard reagents
		CO3	Confirm their findings by preparing solid derivatives, and thus understand reliability of experimental results
		CO4	Determine physical constants of organic compounds
		CO5	Separate organic compounds by TLC/paper/column chromatographic techniques
		CO6	Prepare soaps
		CO7	Apply the principles and techniques in organic chemistry, thereby developing skill in designing an experiment to synthesize and purify organic compounds
		CO8	Practice systematic scientific procedure and prepare adequate report of them
		CO9	Understand the chemistry behind organic reactions
CH1645	Gravimetric Experiments	CO1	Understand precipitation techniques in quantitative context
		CO2	Appreciate the application of silica crucible and sintered crucible in gravimetry
		CO3	Practice technique of making, diluting solutions on quantitative basis
		CO4	Realise the factors affecting precipitation/crystallisation

		CO5	Take precautionary measures in filtration, drying and incineration of precipitates
		CO6	Understand the principle of colorimetry to estimate Fe ³⁺ and ammonia
		CO7	Practice Punctuality and regularity in doing experiments and submitting Lab records
CH1646	Project	CO1	Develop an aptitude for research in chemistry
		CO2	Practice research methodology and literature search
		CO3	Critically choose appropriate research topic and presentation

Complimentary Chemistry for Zoology Majors

Course Code	Course Title	Course Outcomes	
SEMESTER 1			
CH1131.4	Theoretical Chemistry I	CO1	Differentiate particle nature and wave nature of matter
		CO2	Associate wave concept with microscopic matter
		CO3	Understand the relevance of periodic classification of elements
		CO4	Describe the various types of chemical bonds
		CO5	Apply the VSEPR theory to explain the geometry of molecules
		CO6	Comprehend different segments of titrations
		CO7	Apply the principles of colorimetry to estimate ions and elements
		CO8	Recognize the factors affecting environment and solutions for it
SEMESTER 2			
CH1231.4	Inorganic Chemistry I	CO1	Understand the biological and environmental aspects of organic compounds
		CO2	Comprehend the meaning of stability of nucleus
		CO3	Summarise the applications of radioactivity

		CO4	Predict the properties of transition metal complexes
		CO5	Understand the applications of metal complexes
		CO6	Learn to appreciate biological processes like photosynthesis, respiration etc
		CO7	Discuss the biochemistry of trace elements
SEMESTER 3			
CH1331.4	Organic Chemistry	CO1	Classify carbohydrates, aminoacids, proteins, nucleic acids, lipids, polymers and drugs
		CO2	Summarize optical, geometrical and conformational isomerism Draw the structure of simple carbohydrates
		CO3	Discuss the structure of proteins
		CO4	Explain the synthesis of amino acids, peptide, drugs
		CO5	Predict absolute configuration of stereo centers
SEMESTER 4			
CH1431.4	Physical Chemistry	CO1	Classify reactions on the basis of order and molecularity.
		CO2	Discuss different concepts of acids and bases
		CO3	Understand different techniques used for the study of colloids
		CO4	Calculate rate and order of reactions
		CO5	Review the principles underlying the working of sophisticated instruments
CH 1432.4	Laboratory Course	CO1	Obey Lab safety instructions, develop qualities of punctuality, regularity and scientific attitude, outlook and scientific temper (Good Lab Practices)
		CO2	Develop skill in safe handling of chemicals, take precaution against accidents and follow safety measures
		CO3	Develop skill in observation, prediction and interpretation of reactions
		CO4	Prepare organic compounds, Purify and recrystallise
		CO5	Develop skill in weight calculation for preparing standard solutions

		CO6	Perform volumetric titrations under acidimetry-alkalimetry, permanganometry, dichrometry, iodimetryiodometry,cerimetry, argentometry and complexometry
		CO7	Conduct chromatographic separation of mixtures