Course Outcomes, Program Outcomes and Program Specific Outcomes

DEPARTMENT OF CHEMISTRY

M. L. K. PG. College, Balrampur

1. The Outcomes of UG Course, B. Sc. in Chemistry

After successful completion of three year degree program in Chemistry a Student should be able to:

- CO1: Develop ability of scientific reasoning and analytical problem solving.
- CO2: Gain knowledge of Chemistry through theory and practical.
- CO3: Understand of major concepts in all disciplines of chemistry.
- CO4: Create an awareness of the impact of chemistry on the environment, society, and development
- CO5: Explore the jobs related to chemistry in public and private sectors such as chemists, food inspector, lab technician, etc.
- CO5: Continue higher studies.

1.1. The Outcomes of B. Sc.Ist year (Chemistry)

1.1. 1. The Outcomes of B. Sc.Ist year (Paper I-Physical Chemistry)

After successful completion of course a Student should be able to:

- CO1: Learn mathematical concepts required for understanding physical chemistry.
- CO2: Learn computer, its hardware, software and operating systems.
- CO3: Understand concepts behind solid, liquid and gaseous states of matter.
- CO4: Understand colloids, macromolecules and concepts behind catalysis and its applications.

1.1. 2. The Outcomes of B. Sc.Ist year (Paper II-Inorganic Chemistry)

After successful completion of course a Student should be able to:

- CO1: Understand atomic structure, modern periodic table and periodic properties of elements.
- CO2: Understand the concept of chemical bonding
- CO3: Learn chemistry of s and p block elements and extraction and isolation of Li, Be and F_2
- CO4: Preparation, properties and structures of common compounds such as diborane, borazine, hydrazine, interhalogens and polyhalides and fluorides of xenon.
- CO5: Understand chemistry of oxyacids of B, P and S

1.1. 3. The Outcomes of B. Sc.Ist year (Paper III-Organic Chemistry)

After successful completion of course a Student should be able to:

- CO1: Know structure and bonding of compounds of carbon and factors that control their reactivity such as inductive effect, resonance, hyperconjugation etc.
- CO2: Gain basic knowledge of stereochemistry of organic molecules.
- CO3: Learn chemistry of alkenes, alkynes, alkadienes, cycloalkanes, alkyl halides, Grignard's Reagent, Alcohols, ethers, carbonyl compounds, carboxylic acids and amines.
- CO4: Understand synthesis and application of active methylene compounds.

1.1. 4. The Outcomes of B. Sc.Ist year (Chemistry Practical)

After successful completion of course a Student should be able to:

- CO1: Analyse an inorganic mixture qualitatively for five radicals.
- CO2: Determine molecular weight of sulphur by Rast Method
- CO3: Study Kinetics of precipitation of sulphur from sodium thiosulphate by mineral acid and dissolution of Mg-ribbon in HCl.
- CO4: Determine the percentage composition of a given binary mixture (non-interacting systems) by viscosity and surface tension methods.
- CO5: Prepare organic compounds: Acetanilide, p-bromoacetanilide and picrates and their purification

1.2. The Outcomes of B. Sc.IInd year (Chemistry)

1.2. 1. The Outcomes of B. Sc.IInd year (Paper I-Physical Chemistry)

After successful completion of course a Student should be able to:

- CO1: Understand concepts of thermodynamics (First and second law) and thermochemistry.
- CO2: Understand Chemical and Phase Equilibrium
- CO3: Understand underlying concepts of electrochemistry, electrochemical cells, buffers and corrosion.

1.2. 2. The Outcomes of B. Sc.IInd year (Paper II-Inorganic Chemistry)

After successful completion of course a Student should be able to:

- CO1: Understand concept of electrode potential, EMF diagrams and their utility.
- CO2: Understand chemistry Transition Elements and their Coordination Compounds
- CO3: Study Non-aqueous solvents such as liquid ammonia and liquid sulphur dioxide
- CO4: Study of Lewis and HSAB concepts of acids and bases.

1.2. 3. The Outcomes of B. Sc.IInd year (Paper III-Organic Chemistry)

After successful completion of course a Student should be able to:

- CO1: Study chemistry of carbohydrates with special reference to structure and configuration of glucose and fructose.
- CO2: Understand structure and aromaticity of benzene and mechanism of electrophilic substitution reactions.
- CO3: Study different classes of aromatic compounds such as aromatic halogen, nitro, amino, diazonium salts, aromatic sulphonic acids, phenols, aldehydes and ketones, aromatic acids, polynuclear hydrocarbons, heterocyclic compounds

1.2. 4. The Outcomes of B. Sc.IInd year (Chemistry Practical)

After successful completion of course a Student should be able to:

- CO1: Know calibration of pipettes and burettes, preparation of standard solutions
- CO2: Volumetric analysis,
- CO3: Determine heat of neutralisations, enthalpy of solution, transition temperature.
- CO4: Construct phase diagram of two component system
- CO5: Identify organic compounds

1.3. The Outcomes of B. Sc.IIIrd year (Chemistry)

1.3. 1. The Outcomes of B. Sc.IIIrd year (Paper I-Physical Chemistry)

After successful completion of course a Student should be able to:

- CO1: Understand elementary Quantum Mechanics
- CO2: Understand nuclear forces, radioactivity and its applications
- CO3: Study Statistical/ Molecular Thermodynamics

- CO4: Understand Rotational, Vibrational and Electronic Spectroscopy
- CO5: Understand Photochemistry, Surface Chemistry, chemistry of dilute solutions and colligative properties.

1.3. 2. The Outcomes of B. Sc.IIIrd year (Paper II- Inorganic Chemistry)

After successful completion of course a Student should be able to:

- CO1: Study chemistry of Lanthanides and Actinides
- CO2: Understand crystal field theory for coordination compounds and their electronic spectra
- CO3: Study structure and bonding of Metal Carbonyls Metal Nitrosyls
- CO4: Get knowledge of Environmental Chemistry including environmental pollutants, Green house effect and global warming. Acid rains, Ozone layer

1.3. 3. The Outcomes of B. Sc.IIIrd year (Paper III- Organic Chemistry)

After successful completion of course a Student should be able to:

- CO1: Understand chemistry of different reaction intermediates
- CO2: Understand elimination reactions (E1, E2 and E1CB mechanisms), Selected Molecular rearrangements and important name reactions
- CO3: Study Chemistry of common Polymers and Dyes
- CO4: Study Polynuclear hydrocarbons such as Anthracene and Phenanthrene
- CO5: Study chemistry of quinoline, isoquinoline and indole.
- CO6: Gain knowledge about amino acids, peptides and proteins.

1.3. 4. The Outcomes of B. Sc.IIIrd year (Paper IV- Analytical and Biological Chemistry)

After successful completion of course a Student should be able to:

- CO1: Get knowledge about various topics of analytical chemistry such as Errors and Evaluation of measurements, Volumetric analysis, Gravimetric analysis and Separation techniques
- CO2: Study important topics of biological chemistry such as Biological Membranes, Nucleic acids, Enzymes and Coenzymes and Role of Metals in Biological systems

1.3. 5. The Outcomes of B. Sc.IIIrd year (Chemistry Practical)

After successful completion of course a Student should be able to:

- CO1:Estimate various metals (Ba, Zn, Fe, Ni, Cr, Pb) gravimetrically
- CO2:Study kinetics of reaction between acetone and iodine and the hydrolysis acetates
- CO3:Determine the solubility and solubility products of sparingly soluble compounds
- CO4:Separate binary organic mixture and identification of its components
- CO5:Prepare compounds such as soap, aspirin, benzoic acid, oxalic acid etc
- CO6:Qualitative analysis of food and vegetables

2. Programme Outcomes: M. Sc Chemistry

After successful completion of two year degree program in chemistry a student should be able to:

- PO1: Having a clear perceptive of the subject related concepts and contemporary issues.
- PO2: Demonstrate and apply the fundamental knowledge of the basic principles of Chemistry in various fields.
- PO3: Apply advanced concepts of physical organic, inorganic and analytical chemistry to solve complex problems to improve human life.
- PO4: Design experiments, analyze, synthesize and interpret data to provide solutions to different industrial problems by working in the pure, inter and multi-disciplinary areas of chemical sciences.
- PO5: Carry out independent research / investigation to solve practical problems
- PO6: Create awareness and sense of responsibility towards environment and apply knowledge to solve the issues related to Environmental pollution
- PO7: Apply various aspects of chemistry in natural products isolations, synthesis and chacterisation etc.
- PO8: Design a synthetic route and able to carry out synthesis of important compounds.
- PO9: Develop interdisciplinary approach of the subject.
- PO10: Explore jobs related to teaching and research

2.1. Semester I: Course outcomes

After completion of these courses students should be able to:

2.1.1. Paper-I: Molecular Symmetry and Molecular Vibrations

- CO1: visualize molecule in 3-D, understand the concept of symmetry elements and Symmetry operations and assign point groups to molecules
- CO2: Gain knowledge of matrix representation, character tables, reducible and irreducible representations
- CO3: Correlate application of symmetry to spectroscopy and find IR active modes of vibration.
- CO4: Understand symmetry of orbitals
- CO5: Understand symmetry controlled reactions.

2.1.2. Paper-II: Physical Chemistry (Quantum Chemistry)

- CO1: Understand the limitation and origin of Quantum Chemistry
- CO2: Understands the basic postulates of quantum chemistry, Schrodinger equation and its solutions for one electron system
- CO3: Significance of wave function, its normalization and various applications in dealing with rigid rotor and harmonic oscillator
- CO4: To solve the Schrodinger equation using various approximation methods like variation method and Perturbation method

2.1.3. Paper-III: Inorganic Chemistry (Main Group Elements)

- CO1: Study Stereochemistry and Bonding in Main Group Compounds
- CO2: Study Walsh diagram, dπ– pπ bonds, Bents rule,

- CO3: Structure and bonding of Borane anions and silicates
- CO4: Preparation, Properties, Structure and Applications of Alkyl and aryls of Lithium, Beryllium, Magnesium, Aluminum, Mercury and Tin.

2.1.4. Paper-IV: Organic Chemistry (Aromaticity and Reaction Mechanism)

- CO1:Understand concept of aromaticity, antiaromaticity, nonaromaticity and homoaromaticity with examples
- CO2:Basic Principles of organic reaction mechanism and its determination
- CO3:Mechanism and stereochemistry of S_N1, S_N2, S_N1' and S_N2' reactions and NGP in substitution reactions
- CO4:Aromatic nucleophillic and electrophilic Substitution reactions with mechanism
- CO5:Mechanism and stereochemistry of Elimination reactions

2.1.5. Chemistry Practical

- CO1:Determine the solubility of benzoic acid in water
- CO2:Determine the distribution coefficient of benzoic acid between benzene and water
- CO3:Determine the distribution coefficient of iodine in different solvents
- CO4:Study order of reaction
- CO5:Qualitative analysis of an inorganic mixture of seven radicals
- CO6:Chromatographic separation of metal ions
- CO7:Analyse of primary binary organic mixture
- CO8:Determine equivalent weight of organic acids

2.2. Semester II: Course outcomes

After completion of these courses students should be able to:

2.2.1. Paper I: Analytical chemistry

- CO1: Study Electroanalytical Techniques like Conductometry, Potentiometry Voltametry and Polarography.
- CO2:Study Thermoanalytical Methods like TGA, DTA and DSC
- CO3: Study Radiochemical methods like Isotope Method, Inverse Isotopic Dilution, and Neutron activation technique.
- CO4:Study Chromatographic Method like GLC, GC and HPLC
- CO5:Understand Spectral Methods like Nephleometry, Turbidimetry, Flame Photometry

2.2.2. Paper II: Physical Chemistry (Thermodynamics and Electrochemistry)

- CO1:Know important concepts of Thermodynamics like Joule Thomson's effect, Gibbs Helmholtz equation, The Clausius Claypeyron equation
- CO2:Study The Maxwell's relation, Thermodynamic equation of state, Chemical potential
- CO3: Study fugacity and activity coefficient and its determination.
- CO4: Study third law of thermodynamics, Nernst heat theorem and residual entropy.
- CO5: Study Electrochemistry involving Wein effect and Debye – Falkenhagen effect,
- CO6: Study effect of ionic strength on the rate of ionic reactions.
- CO7: Understand Electrical double layer, electro kinetic phenomena, Overvoltage, Limiting

2.2.3. Paper III: Inorganic Chemistry (Transition Elements)

- CO1:Understand structures of Coordinate Metal Complexes (CN 2 to 8)
- CO2:Stereoisomerism in six coordinate octahedral complexes

- CO3: Kinetics and mechanism of substitution reactions in octahedral Co (III) and square planar Pt (II) complexes.
- CO4: Electron Transfer Reactions of metal complexes
- CO5: Metal Ligand Equilibria

2.2.4. Paper IV: Organic Chemistry (Natural Products and Organic Photochemistry)

- CO1: Understand different pathways of Biogenesis of Natural Products.
- CO2:Know structure elucidation of Terpenoids (camphor, abietic acid, squalene)
- CO3: Know structure elucidation of Alkaloids (nicotine, Quinine, Morphine and reserpine)
- CO4: Study large ring alicyclic compounds.
- CO5: Study basic concepts of Organic Photochemistry
- CO6: Study Photochemistry of Alkenes involving isomerization, cyclization dimerization and photo-oxidation reactions and rearrangements
- CO7: Photochemistry of Carbonyl Compounds involving reduction, inter and intermolecular addition (Paterno- Buchi), fragmentation (Norrish-1 and Norrish-2), isomerization, Photo-Fries rearrangement.

2.2.5. Chemistry Practical

Physical Chemistry:

- CO1: Draw the solubility curve for water-acetic acid- chloroform system.
- CO2: Study the adsorption of oxalic acid on charcoal and draw the Freundlich isotherm.
- CO3: Determine the rate constant of the acid-catalyzed hydrolysis of ethyl acetate at laboratory temperature.

- CO4: Determine the rate of constant of the hydrolysis of ethyl acetate by sodium hydroxide at laboratory temperature.
- CO5: Carry out the conductometric titration between the strong acid and strong alkali.
- CO6: Determine the dimerization constant of benzoic acid in benzene medium by partition method.
- CO7: Determine the solubility of salicylic acid in water at different temperatures and calculate the heat of solution.

Inorganic Chemistry

- CO8: Gravimetric and / or volumetric estimation of mixture of metal ions

Organic Chemistry

- CO9: Two step synthesis of organic compounds
- CO10: Purification of organic compounds by distillation under reduced pressure, steam distillation, and fractional crystallization

2.3. Semester III: Course outcomes

After completion of these courses students should be able to:

2.3.1: Paper I: Spectroscopy- 1

- CO1: Study important concepts of UV-Visible Spectroscopy and its role in structure elucidation of organic compounds
- CO2: Study important concepts of Infrared Spectroscopy and its role in structure elucidation of organic compounds
- CO3: Study Raman Spectroscopy
- CO4: Study diffraction methods (X-ray Electron diffraction Neutron diffraction) for structure determination

2.3.2: Paper II-A: Physical Chemistry (Advanced Quantum Mechanics)

- CO1: Importance of Symmetry in Quantum Mechanics
- CO2: Huckel Molecular Orbital Theory and its Applications
- CO3: Semi–Empirical and Ab–Initio SCF Theories such as Hartee-Fock, Self consistent field (SCF) method, Semi–empirical SCF theory (CNDO, INDO & MNDO) etc.
- CO4: Density functional theory (DFT)

2.3.3: Paper II-B: Inorganic Chemistry (Chemical Application of Symmetry and Group Theory)

- CO1: Study Elements of Symmetry and Point Groups
- CO2: Understand multiplication tables, irreducible representations, orhtogonality Theorem.
- CO3: Understand Matrix Representations of symmetry elements, transformation matrices

- CO4: Study Cartesian coordinate and internal coordinate methods of normal mode analysis for different point groups
- CO5: Valence Bond treatment of planar, tetrahedral and square planar hybrid orbitals
- CO6: Derivation of 'd' orbital splitting patterns of central atom

2.3.4: Paper II-C: Organic Chemistry (Stereochemistry)

- CO1: Understand elements of symmetry and chirality.
- CO2: Study Interconversion of Fischer, Newmann and Saw-Horse projections, configurational projections, R/S and E/Z
- CO3: Study stereomerism with axial/ planar chirality and Helicity
- CO4: Understand concept of Asymmetric synthesis
- CO5: Study stereochemistry of N, S and P containing organic compounds
- CO6: Study conformation and stability of mono and disubstituted cyclohexanes

2.3.5: Paper III-A: Physical Chemistry

- CO1: Conductance in non–aqueous media
- CO2: Electro Kinetic Phenomena such as electrophoresis and electroosmosis
- CO3: Corrosion of metals and its mechanism

2.3.6: Paper III-B: Inorganic Chemistry (Coordination Chemistry)

- CO1: Understand Energy levels in an atom
- CO2: Study free ions in tetrahedral, octahedral and square planar crystal fields, Orgel diagrams, Tanabe Sugano diagrams.
- CO3: Interpret Electronic spectra of complexes
- CO4: Understand Magnetic properties of Complexes
- CO5: Know Metal-ligand Bonding, Limitations of CFT, Nephelauxetic series,

- CO6: Draw Molecular orbital energy level diagram of octahedral, tetrahedral and square planner complexes.

2.3.7: Paper III-C: Organic Chemistry (Organic Reaction Mechanism)

- CO1:Study the mechanism and application of Favorskil, Sommetet-Hauser, Stevens, Baeyer-Villinger, Demjanov, Hoffman, Curtious, Schmidt, Wolf bentenzidine and dinone-phenol rearrangements
- CO2:Study underlying concept of Pericyclic reactions of different types
- CO3:Study Addition Reactions through Carbon-Carbon double bond
- CO4: Understand Mechanism of addition to C=O bonds, Cram's rule, condensation reaction involving enolates e.g., Aldol, Cannizzaro, Stobe and Claisen condensations.

2.3.8: Paper IV-A: Physical Chemistry (Thermodynamics and Intermolecular Forces)

- CO1: Understand intermolecular forces such as Dispersion, dipole, induction and Charge transfer forces. The hydrogen bond
- CO2:Know thermodynamics of Mixtures
- CO3: Study phase equilibria and phase diagrams of eutectic systems, Systems exhibiting complete miscibility in solid and liquid phases, mixtures having a congruent melting point.
- CO4:Understand thermodynamics of Irreversible Processes

2.3.9: Paper IV-B: Inorganic Chemistry (Supramolecular Chemistry)

- CO1: Understand the underlying concepts of Supramolecular Chemistry such as host-guest interactions, molecular recognition host design, templates and self assembly.
- CO2: Study of Crown ethers Cryptands, Spherands, Podants, expanded porphyrins, guanidinium based receptors, solid state clatharates, zeolites

2.3.10: Paper IV-C: Organic Chemistry (Biomolecules)

- CO1: Chemistry and Physiological functions of vitamins (A, D, E, K, B, C etc)
- CO2: Understand structure and function of steroidal hormones (estradiol, progesterone)
- CO3: Understand structure and function of non-steroidal hormones (Theroxine and Andernalin)
- CO4: Study of Chemistry of Steroids (Diel's hydrocarbon, and Cholestrol)
- CO5: Study Chemistry and therapeutic uses of cartistone.

2.3.11: M. Sc. (Final Semester III) Physical chemistry Practical

pH-Metry:

- CO1: Determine strength of strong acid and strong base.
- CO2: Determine strength of weak acid by pH titration with a strong base.
- CO3: Verify Hendersons's equation.

Conductometry

- CO4: Determine equivalent conductance of strong electrolytes at infinite dilution.
- CO5: Study Conductometric trtration of strong acid with strong base
- CO6: Study Conductometric titration of weak acid with strong base
- CO7: Study Titration of mixtures of acids
- CO8: Precipitation titration
- CO9: Verify Ostwald's dilution law
- CO10:Verify Kohlrausch's Law

2.3.12: M. Sc. (Final Semester III) Inorganic chemistry Practical

- CO1: Estimate gravimetrically mixture of three metal ions

- CO2: Estimate calcium and magnesium by EDTA Titration
- CO3:Prepare and Characterize some metal complexes

2.3.13: M. Sc. (Final Semester III) Organic chemistry Practical

- CO1: Multistep synthesis of organic compounds
- CO2: Estimation of sulfur in organic compounds
- CO3: Estimation of glycine

2.4. Semester IV: Course outcomes

After completion of these courses students should be able to:

2.4.1: Paper I: Spectroscopy- 1I

- CO1: Study important concepts of Mass spectrometry and its role in structure elucidation of organic compounds
- CO2: Study important concepts of ^{1}H NMR and ^{13}C NMR spectroscopy and its role in structure elucidation of organic compounds
- CO3: Study Electron Spin Resonance Spectroscopy
- CO4: Study Mossobauer Spectroscopy

2.4.2: Paper II-A: Physical Chemistry (Chemical Kinetics and Reaction Dynamics)

- CO1: Study Kinetics of fast reactions and Oscillatory Chemical Reactions
- CO2: Mechanism of Unimolecular and Biomolecular surface reactions
- CO3: Statistical Treatment of Unimolecular reactions through different theories

2.4.3: Paper II-B: Inorganic Chemistry (Bioinorganic Chemistry)

- CO1: Study Metalloenzymes
- CO2: Understand chemistry of Photosynthesis
- CO3: Understand transport and storage of dioxygen through different carriers
- CO4: Study Electron Transfer in Biology involving metaloproteins and cytochromes
- CO5: Biological nitrogen fixation
- CO6: Role of Metals in Medicine

2.4.4: Paper II-C: Organic Chemistry (Organic Synthesis)

- CO1: Understand chemistry of Protection and Deprotection of groups
- CO2: Study selective name reactions and their application in organic synthesis

- CO3: Study oxidising agents in organic synthesis
- CO4: Understand Mechanism and stereochemistry of reduction with some specific reagents
- CO5: Study concept of Retrosynthesis in designing synthetic routes for different classes of organic compounds

2.4.5: Paper III-A: Physical Chemistry (Statistical Mechanics)

- CO1: Study basics of Classical Statistical Mechanics
- CO2: Understand Boltzmann distribution law, Fermi – Dirac statistics, Bose – Einstein Statistics
- CO3: Study partition function, relation of the partition function to the thermodynamic function and Determination of Partition functions

2.4.6: Paper III-B: Inorganic Chemistry (Organotransition Metal Chemistry)

- CO1: Understand alkyls and aryls of transition Metals
- CO2: Study compounds of Transition Metal with Carbenes and Carbynes.
- CO3: Study Transition Metal π Complexes
- CO4: Understand Catalysis involving organometallic compounds
- CO5: Study Fluxional organometallic Compounds

2.4.7: Paper III-C: Organic Chemistry (Select Topics in Organic Chemistry)

- CO1:Study hetercycles of different ring size and heteroatoms
- CO2:Study synthetic application of selected readents in organic synthesis
- CO3:Study general structure of RNA and DNA
- CO4: Understand Structure, function and configuration of disaccharides and polysaccharides

2.4.8: Paper IV-C Polymer Chemistry (Elective Paper)

- CO1: Understand chemistry of macromolecules and polymerisation reactions
- CO2:Know different types of molecular weights of polymers
- CO3: Study degradation and processing of polymers
- CO4:Study rheology of polymers

2.4.9: Paper IV-E: Drugs and Agrochemicals (Elective Paper)

- CO1: Study concepts behind drug design
- CO2: Study Quantitative structure activity relationship (QSAR)
- CO3: Study synthesis and action of some antibiotics
- CO4: Study of different class of synthetic drugs
- CO5: Study of insecticides, pesticides and herbicides

2.4.10: M. Sc. (Final Semester IV) Physical chemistry Practical

Chemical Kinetics:

- CO1: Determine rate constant of acid Hydrolysis of ester
- CO2: Determine relative strength of strong acids by studying the kinetics of hydrolysis of ester
- CO3: Study Kinetics of reactions between Potassium Persulphate and Potassium iodide.
- CO4: Study Kinetics of iodination of acetone

Optical Methods:

- CO5: Study Colorimetry : Verification of Lambert’s Beer Law
- CO6: Study Spectroscopic methods of analysis: UV-Visible, IR

  Computational Experiments:

- CO7: Study Geometry optimization and energy calculation
- **Project work**

2.4.12: M. Sc. (Final Semester III) Inorganic chemistry Practical

Potentiometry:

- CO1: Acid-Base, Redox Titrations.
- CO2: Determine stability constants of suitable complex systems.

Conductometry

- CO3: Acid-Base and precipitation Titrations
- CO4: Colorimetry and Spectrophotometry:
- CO5: Estimate metals in solution (V, Cr, Mo, Fe and Ni)

Flame Photometry:

- CO6: Estimate sodium and potassium in admixture.
- CO7: Estimate magnesium and calcium in tap water.
- CO8: Estimate calcium in calcium salt solution.
- **Project Work**

2.4.13: M. Sc. (Final Semester III) Organic chemistry Practical

- CO1: Analysis of ternary organic mixture
- CO2:Estimate glucose
- CO3: Project work

3. Programme Outcomes: Ph.D Chemistry

After successful completion of Ph. D degree program in chemistry a student should be able to:

- PO1: Gain key knowledge of chemistry in specific field and explore laboratory resources
- PO2: Design and carry out scientific experiments as well as accurately record and analyze the results of such experiments
- PO3: Get skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- PO4: Communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.
- PO5: Explore new areas of research in both chemistry and allied fields of science and technology
- PO6: Explore and apply the central role of chemistry in our society and its issues including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
- PO7: Function as a member of an interdisciplinary problem solving team.
- PO8: Explore jobs related to teaching and research