

Department of Chemistry 2023-24

Programme Outcomes: B. Sc. Chemistry

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

Programme Outcomes

- PO-1. Solve, Discuss and Explain major concepts in all disciplines of chemistry.
- PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion.
- PO-3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of chemical reactions.
- PO-4. Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.
- PO-5. Find out the green route for chemical reaction for sustainable development.
- PO-6. To inculcate the scientific temperament in the students and outside the scientific community.
- PO-7. Use modern techniques, decent equipment and Chemistry software
- PO-8. To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.
- PO-9. Identify chemical formulae and solve numerical problems.
- PO-10. Use modern chemical tools, Models, Chem-draw, Charts and Equipment.

Programme Specific Outcomes

PSO-1. Use the knowledge of Chemistry through theory and practicals.

PSO-2. identify the structure-activity relationship.

PSO-3. Explain good laboratory practices and safety.

PSO-4. Create the research oriented skills.

PSO-5. Use of sophisticated instruments/equipment's.

After completion of these courses students should be able to;

B. Sc. I Semester I (NEP 2020)

DSC-3A- Chemistry paper I (Inorganic Chemistry)

CO-1. Explain the Bohr's theory of hydrogen atom and its limitations, Wave particle duality, Heisenberg uncertainty principle, Quantum numbers and their significance, Shapes of s, p and d atomic orbitals.

CO-2. Describe a) Aufbau's principle b) Hund's rule of maximum multiplicity c) Pauli's exclusion principle.

CO-3. Predict the Periodicity of the p block elements.

CO-4. Relate the Chemical Bonding and Molecular structure.

CO-5. Discuss theories of acids and bases

CO-6. Discuss the Valence bond theory (VBT).

DSC-4A- Chemistry paper II (Organic Chemistry)

CO-7. Describe Curved arrow notations, Cleavage of Bonds: Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyper conjugation effect

CO-8. Explain Reactive Intermediates: Generation, Structure, Stability and Reactions of Carbocation's, Carbanions and carbon free radicals.

CO-9. Predict the Nomenclature of stereoisomers: D and L, erythro and threo, R and S, E and Z.

CO-10. Discuss the Aromaticity concept and predict the Aromatic, Non aromatic, Antiaromatic, Pseudoaromatic compounds.

CO-11. Relate the structure of Heterocyclic compound.

CO-12. Describe the chemical and physical properties of Heterocyclic compound.

B.Sc. I Semester II

DSC-4B-Chemistry Paper IV (Analytical Chemistry)

CO-13. Explain Analytical processes (Qualitative and Quantitative), Methods of analysis (Only classification), Sampling of solids, liquids and gases, Errors, types of errors.

CO-14. Discuss the Basic Principle of Chromatography, Basic terms, Classification of Chromatography.

CO-15. Comparison of paper chromatography and TLC

CO-16. Outline of titrimetric Analysis such as Strong acid-strong base, Strong acid-weak base, Strong base-weak acid, Complexometric titrations.

CO-17. Use and Applications Water Analysis.

CO-18. Explain the Analysis of Fertilizers.

CHEMISTRY-DSC 3B: Chemistry Paper-III (Physical Chemistry)

CO-19. Explain the First law of thermodynamics, Statements of second law of thermodynamics, Carnot's cycle and its efficiency, Statement of Third Law of thermodynamics

CO-20. Discuss the term Adsorption

CO-21. Discuss the Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution.

CO-22. Compare between ΔG and ΔG° , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases.

CO-23. Relate Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Ideal and Non ideal gases.

CO-24. Illustrate Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. Van der Waals equation of state for real gases.

CO-25. Find the Derivation of Zero order reaction, First order reaction, Pseudo-unimolecular reactions, second order reaction.

B.Sc.Part II (CBCS and NEP)

Semester III

Paper No. DSC- C3 - Chemistry paper no. V (Physical Chemistry)

CO-26. Discuss Types of conductors, Conductivity, Equivalent and Molar conductivity and their variation with dilution for weak and strong electrolytes in aqueous solution

CO-27. Illustrate the conductance by using Wheatstone bridge. Kohlrausch law of independent migration of ions and its applications such as Ionic mobility, determination of degree of ionization of weak electrolyte, solubility and solubility products.

CO-28. Describe all Physical Properties of Liquids and Third order reactions, derivation of rate constant.

CO-29. Explain the Adsorption as a surface phenomenon, Definition of adsorption, adsorbent, adsorbate, absorbent. Factors affecting adsorption, Types of adsorption

CO-30. Compare between physical and chemical adsorption, Adsorption isotherms: Freundlich adsorption isotherm, Langmuir adsorption isotherm.

CO-31. Outline of Types of Nuclear radiation, properties of α , β and γ radiations, Detection and measurement of nuclear radiations by Scintillation and Geiger muller counter methods.

Paper No. DSC-C4- Chemistry paper no. VI (Analytical Chemistry)

CO-32.Explain the Basic Concepts in Analytical Chemistry

CO-33.Describe all processes involved in gravimetric analysis.

CO-34.Find the all parameters of water.

CO-35.Describe chromatographic techniques.

CO-36.Discuss the Theory of Corrosion and Electroplating.

CO-37. Explain applications of petroleum products.

B.Sc. Part II (CBCS)

Semester IV

Paper No. DSC-D3- Chemistry paper no. VII (Industrial Chemistry)

CO-38. Describe the concept in Co-ordination chemistry

CO-39. Compare between double salt and complex salt

CO-40. Find the IUPAC nomenclature of coordination compounds

CO-41. Explain the Chelation, classification and its applications.

CO-42. Outline of P- Block elements and its characteristics.

CO-43. Discuss the Characteristics of d-block elements with special reference to i) Electronic structure ii) Oxidation states, stability of oxidation states of Fe with respective to Latimer diagram iii) Magnetic character iv) Colored ions v) Complex formation.

CO-44. Find the Application of complex formation

Paper No. DSC- D4 - Chemistry paper no. VIII (Organic Chemistry)

CO-45. Explain the reaction and methods of Preparation of Carboxylic acids and their derivatives.

CO-46. Describe the Classification, Nomenclature, structure, Methods of preparation and reactions of Amines and Diazonium Salts.

CO-47. Compare the reducing and non-reducing sugars.

CO-48. Discuss the Classification of carbohydrates.

CO-49. Relate the Reactivity of Carbonyl group and categorize its reactions.

CO-50. Outline of Representation of conformations of ethane by using Saw-Horse, Fischer (dotted line wedge) and Newmann's projection formulae and ethane and n-butane by Newmann's Projection formula.

Course Outcomes

B. Sc III Chemistry

Semester-I

After completion of these courses students should be able to;

Paper XI Physical Chemistry

CO 51 - Describe Heisenberg Uncertainty Principle, concept of energy operator, particle in one dimensional box.

Co 52 - Define Quantum theory, explain Schrodinger wave equation, emf

measurement and its application.

CO 53 – Analyze electromagnetic spectrum, Raman Spectra compare and contrast rotational spectra, vibrational spectra, vibrational Raman spectra and rotational Raman spectra of diatomic molecule.

CO 54 – Write Photochemical Law's, reactions and various Photochemical Phenomena.

CO 55– Classify solutions, relation vapour pressure temperature relations.

CO-56.Compare between electrodes and cells.

Paper IX Inorganic Chemistry

CO-57. Find the meaning of various terms involved in Acids and Bases.

CO-58.Describes the shapes of d-orbitals.

CO-59. Discuss the Applications of Semiconductor and Superconductors.

CO-60.Predict the mechanism involved in Organometallic Chemistry.

CO-61.Explain the homogenous catalysis and heterogeneous catalysis.

CO-62.Predict the degeneracy of d-orbitals.

Paper X Organic Chemistry

CO-63. Describe the principle of UV Spectroscopy.

CO-64. Impart the concept of vibrational Transitional region of IR Spectrum.

CO-65. Illustrate the Structure of Unknown Organic compounds.

CO-66. Compare between UV and NMR.

CO-67.Explain the principle of mass spectroscopy.

CO -68.Solve the problem based on UV, NMR and IR.

Paper XII Analytical Chemistry

CO-69. Explain the Precipitation Techniques.

CO-70. Discuss the applications of organic precipitants.

CO-71. Explain the Principle of flame photometry.

CO-72. Design the experimental set up for flame photometry.

CO-73. Describe the theory of Colorimetry and spectrophotometry.

CO-74. Identify the concept of Quality control.

CO-75.Categorised the different functional group based on Chromatography.

B. Sc III Chemistry

Semester-II

Paper XIII Inorganic Chemistry

- CO 75 – Explain SN 1 and SN 2 reactions for inert and labile complexes.
Co 76 – Describe the Thermodynamic and Kinetic aspects of metal complexes.
CO 77 –Discuss the Nuclear reactions and energetic of nuclear reactions.
CO 78 – Use of Thorium, Uranium and Plutonium in atomic energy.
CO 79 – Compare between lanthanide and actinides.
CO80- Predict Biological role of alkali and alkaline earth metal ions with special referenc to Na⁺, K⁺ and Ca²⁺.

Paper No. XIV Organic Chemistry

- CO-81. Use and application Lithium aluminium hydride LiAlH₄, Raney Nickel, Osmium tetroxide, Selenium dioxide (SeO₂), Dicyclohexyl Carbodiimide (DCC), Diazomethane.
CO-82. Explain the Diels -Alder reaction, Meerwein –Pondorff-Verley reduction, Hofmann rearrangement, Wittig reaction, Wagner- Meerwein rearrangement, Baeyer Villiger oxidation.
CO-83. Discuss the Retrosynthesis of different Molecules.
CO-84. Describe Electrophilic addition to >C=C< and –C≡C– bonds.
CO-85. Solve the problem based on addition reaction.
CO-86. In part the concept of Anti-Markovnikoff's addition.
CO-87. Explain Synthesis and uses of ethambutal, phenobarbitone, isoniazide, benzocaine, Chloramphenicol, paludrine.
CO-88. Outline the biogenesis of Alkaloids, Terpenoids.

Chemistry Paper No. XV (Physical Chemistry)

- CO-89. Discuss Gibbs phase rule, Phase diagram, true and metastable equilibria.
- CO-90. Compare one component systems and two component systems.
- CO-91. Describe the concept of Thermodynamics and its applications
- CO-92. Explain the different State of solid, Laws of crystallography, Weiss indices and Miller indices.
- CO-93. Solve the Numerical problems based on Derivation of Bragg's equation.
- CO-94. Predict the Simultaneous reactions such as Opposing reaction, Side reaction, Consecutive reactions, Chain reaction, Explosive reaction.

Paper No. XVI (Industrial Chemistry)

- CO-95. Discuss Manufacture of cane sugar in India: Extraction of juice, Clarification, Concentration, crystallization, centrifugation and other details of industrial process.
- CO-96. Explain the Manufacture of Industrial Heavy Chemicals.
- CO-97. Describe the use, Classification and applications of Synthetic Polymers.
- CO-98. Categorised the different term involved in nanotechnology.
- CO-99. Impart the role of Petroleum industry and eco-friendly fuels.
- CO-100. Identify the concept of Nanotechnology.