Rayat Shikshan Sanstha's

Dr.Patangrao Kadam Mahavidyalaya Ramanandnagar (Burli)

Department of Chemistry 2024-25

Programme Outcomes: B. Sc. Chemistry

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

Programme Outcomes

PO-1. Solve, Discuss and Explain major concepts in alldisciplines 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 sustainabledevelopment.

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/equipments.

After completion of these courses students should be able to;

B. Sc. I Semester I (NEP 2020)

ICH-101- Chemistry paper I (Inorganic Chemistry)

CO-1. Explian 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
CO-3 b) Hunds rule of maximum multiplicity c) Pauli's exclusion principle.
CO-4. Predict the Periodicity of the p block elements.
CO-5. Relate the Chemical Bonding and Molecular structure.
CO-6. Discuss theories of acids and bases

OCH-102- Chemistry paper II (Organic Chemistry)

CO-7.Desribe Curved arrow notations, Cleavage of Bonds: Homolysis and Heterolysis. Organic molecular species: Nucleophiles and electrophiles. Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyperconjugation effect
CO-8. Explain Reactive Intermediates: Generation, Structure, Stability and Reactions of Carbocations, 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

ACH- 202- Chemistry Paper IV (Analytical Chemistry)

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

CO- 14. Distinguish between classical and industrial chemistry. Learning and Understanding basic concepts and concentration terms c. Knowledge of IPR

CO-15. Discuss the Basic Principle of Chromatography, Basic terms, Classification of Chromatography. 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.

PCH-201-Chemistry Paper-III (Physical Chemistry)

CO-19. Discuss the concept Logarithm, Graphs – Quadrants Drawing of Linear Graphs, Slopes. Deviation and Integration.

CO-20 .Explain the First law of thermodynamics, Statements of second law of thermodynamics, Carnot's cycle and its efficiency, Spontaneous process and Non Spontaneous.

CO-21. Find the Derivation of Zero order reaction, First order reaction, Pseudo-unimolecular reactions, second order reaction.

CO-22. Principle of construction working and Abbe's refractmeter. Discuss hydrogen bonding, London force, dipole-dipole interaction.

CO-23. Explain the surface tension, Viscosity, Refractive index.

CO-24. Learning and coherent understanding of basic concepts in electrochemistry, conductors and conductivity cells,

CO-25. Measurement of conductance with suitable examples and numerical problems.

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. Kolharausch 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.Discribe 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.Expalin 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 AnalyticalChemistry

CO-69. Explain the Precipitation Techniques.
CO-70. Discuss the applictions 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 theary of Colorimery and spectrophotometry.
CO-74. Identify the concept of Quality control.
CO-75.Categarised the different functional group based on Chromatograohy.

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 Ca^{2+}.

Paper No. XIV Organic Chemistry

CO-81. Use and application Lithium aluminium hydride $LiAlH_4$, Raney Nickel,Osmium tetraoxide,Selenium dioxide (SeO_2),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.Inpart 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. Categarised 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.