

MIRZA GHALIB COLLEGE, GAYA

(NAAC ACCREDITED GRADE-'B')

DEPARTMENT OF CHEMISTRY

Programme Name : B.Sc. (Hons) Chemistry

Programme Objectives (POs)

B.Sc. (Hons) Chemistry Programme provides a strong base for students in fundamental knowledge of Chemistry through the core course namely the States, Equilibrium, changes, foundations, Atomic structures, Systematic chemistry of the elements, Detailed study of different classes of compound, Application technique, Reactions and mechanism, Analytical and applied Organic Chemistry. The course is designed by Magadha University which help the students to have a good understanding of the subjects and help them in competing in the various exams.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

This undergraduate programme in Chemistry includes theories, experiment and concepts of Chemistry based subjects. After completing B.Sc in Chemistry various opportunities are available for the candidates.

PSO1: The students will be able to demonstrate both an understanding and the practical application of ethical standards as well as scientific temperaments in public and private life.

PSO2: Either, they can opt for higher education, i.e. M.Sc. or they can go for a job in the relevant field.

PSO3: There are number of job opportunities available for a B.Sc. Chemistry graduate such as Professor, Lab Assistant, Research and Development Manager, Safety Health and Environment specialist, Product officer, Production Chemist, Analytical Chemist.

PSO4: After completion of B.Sc. degree course, students can appear in national entrance tests likes: IIT JAM, JEST, JNU EE, NEST, TIFR-GS, BINC, INAT, GATE in India.

B.Sc. (Hons) Part -I

Paper-1.

Unit A – Physical Chemistry

Unit B- Inorganic Chemistry

Unit C- Organic Chemistry

Courses outcomes:

At the end of the course, students will be able to:-

SECTION A : Physical Chemistry:

CO 1: Define the terms involved in chapters Chemical Kinetics, Chemical equilibrium, Ionic equilibrium and state the laws used in thermodynamics.

CO 2 : Describe Buffer solutions, factors affecting ionization.

CO3 : Interpret the phase diagram, Electrochemical series, Nernst equation.

Section- B (Inorganic chemistry)

CO 1 : Define the terms involved in Atomic structure, chemical bonding and molecular structure.

CO 2: State the laws, principles, hypothesis of Bohr's theory, quantum numbers, Wave mechanical model of an atoms, Fajan's Rule, Vander Waal's forces.

CO 3 : Interpret the size and shape of orbitals based on Radial and angular part of wave function.

SECTION C: Organic Chemistry

CO 1: To discuss the methods of Preparation of benzene, alkyl and aryl halides alcohol, ethers, phenols and carbonyl compound.

CO 2 : To discuss the Nucleophilic Substitution (SN, SN2, and SNi) reactions of alkyl halides.

B.Sc. (Hons) Part -II

Paper-III.

Unit A – Physical Chemistry

Unit B- Inorganic Chemistry

Unit C- Organic Chemistry

Courses outcomes:

At the end of the course, students will be able to: -

SECTION A : PHYSICAL CHEMISTRY:

- CO 1:** Understand the relation between critical constant and Vander waal constants. Law of corresponding states.
- CO 2:** Physical properties of liquids: Viscosity, Refractive index, idea of liquid crystals.
- CO 3:** Understand the concept of Tyndall effect, Brownian movement, Electrophoresis, Second law of thermodynamics, Carnot theorem, Carnot Cycle.
- CO 4:** Define the terms Ostwald's dilution law, Phase rule, Nernst distribution law, factors affecting partition coefficient, thermodynamic derivation, limitations.
- CO 5:** Understanding the concept of Second order reaction, Half life period, Definition and classification of catalyst.

SECTION - B (INORGANIC CHEMISTRY)

- CO 1:** Define dual nature of electrons particles or waves, Uncertainty principle.
- CO 2:** Understand the concept of valence Bond Theory, Double salts and coordination compounds, EAN rule, Shapes of d-orbitals, valence bond method of explaining structures of coordination compounds.
- CO 3:** IUPAC nomenclature of coordination compounds, Noble gas compounds, Pseudo halogens and polyhalides.

CO 4: Understand the concept of general Chemistry of the following elements with special reference to periodic position, oxidation states, reactivity, oxides, halides, complexes, organometallic chemistry and uses. (a) Sc, Y, La (b) Ti, Zr, Hf (c) V, Nb, Ta (d) Fe, Co, Ni.

CO 5: Define i.r. spectroscopy, UV vis spectroscopy, Redox half reactions, kinetic factors, redox stability in water, oxidation by atmospheric oxygen.

SECTION C : (ORGANIC CHEMISTRY)

CO 1: Define Stereoisomerism, projection formulae elements of symmetry, geometrical and optical isomerism, Tautomerism, keto and enol tautomerism estimation and enolic content.

CO 2: Explain Electrophilic substitution in benzene nucleus, mechanism of nucleophilic substitution at saturated carbon, Name Reactions.

CO3: Aromaticity and Huckel's rule, Preparation and properties of benzene, toluene, benzene sulfonic acid, nitrobenzene.

CO4: Brief introduction of TLC, paper and gas chromatography.

Paper-IV: CHEMISTRY PRACTICAL.

Courses outcomes:

At the end of the course, students will be able to: -

- CO 1:** Determination of Molecular weight of volatile liquids by Duma's method.
- CO2:** Determination of Molecular weight of volatile liquids by Victor Meyer method.
- CO 3:** Determination of co-efficient of viscosity of liquid using Ostwald viscometer.
- CO 4:** Gravimetric Analysis: Estimations of Ag^+ , Ba^{+2} , Cu^{+2} , Cl^-

B.Sc. (Hons) Part -III

PAPER- V: PHYSICAL CHEMISTRY

PAPER VI: INORGANIC CHEMISTRY

PAPER VII: ORGANIC CHEMISTRY

PAPER VIII: CHEMISTRY PRACTICAL

COURSE OUTCOMES: -

After the completion of courses, students will be able to: -

PAPER- V: PHYSICAL CHEMISTRY

CO 1: Define Collision number, collision frequency, collision diameter and mean free path of molecules of a gas.

CO 2: Understand the concept of Crystal forces, Radius ratio rule and coordination number of ions.

CO 3: Basic principles of different types of absorption idea or IR, UV-vis spectroscopy. Lambert-Beer Law, Stark Einstein Law of photochemical equivalence.

CO 4: Derivation of law of mass action, Von't Hoff reaction, Maxwell thermodynamics relation.

CO 5: de. Broglie equation. Schrodinger equation and its application to H-atom (only interpretation of solution and no solving).

CO 6: Kinetics of third order reactions, half life period and its unit, E.M.F. of concentration cells with and without transference.

PAPER- VI: INORGANIC CHEMISTRY

CO 1: Idea of de Broglie waves. Schrodinger equation and its derivation. Radial and angular wave functions.

CO 2: Molecular orbital theory, Rules of LCAO bonding, antibonding and non-bonding orbital, simple MO diagrams of homonuclear diatomic molecules, calculation of bond order.

- CO 3:** Factors affecting radii of ions, radius of polyatomic ions, C F T, C F S E calculations, effects of C F splitting, chelates, Features of $4n$, $4n+2$, $4n+3$ and $4n+1$ radioactive series.
- CO 4:** Understanding the concept of Electronic configuration and periodic position of lanthanides and actinides, lanthanide contraction and consequences, magnetic properties of lanthanides.
- CO 5:** Role of metals in biological systems: Na, K, Mg, Ca, Fe and Co.
- CO 6:** Principle and applications of Raman spectroscopy, Mossbauer's spectroscopy.

PAPER VII: ORGANIC CHEMISTRY

- CO 1:** General principles of Hyperconjugation, mesomeric effect, hydrogen bond. Carbocation, carbanion carbenes, Nitrene and benzyne.
- CO 2:** Nucleophilic substitution at saturated and unsaturated carbon. Electrophilic and nucleophilic substitution in benzene nucleus.
- CO 3:** Name reactions and rearrangements involving simple aliphatic and aromatic compounds. Naphthalene, anthracene and Phenanthrene.
- CO 4:** **Define** Heterocyclic Compounds, Furan, thiophene, Pyrrole, pyridine, quinoline and isoquinoline.
- CO 5:** Understand drugs like Sulfa drugs, antimalarial, antibiotics, analgesics, pyrogenic sedatives, antiseptics.

Paper-VIII: CHEMISTRY PRACTICAL.

Courses outcomes:

At the end of the course, students will be able to: -

- CO 1:** Qualitative inorganic analysis of mixture containing six radicals e.g. Basic radicals: Ag^+ , Hg^{+2} , Pb^{+2} , Cd^{+2} , Cu^{+2} , Sn^{+4} , Al^{+3} , Cr^{+3} , Ni^{+2} , Co^{+3} , Mg^{+2} , Ba^{+2} .
- Acid radicals: CO_3^{-2} , SO_4^{-2} , SO_3^{-2} , NO_2^- .
- Halides. Oxalate, Acetate, Borate, Phosphate.

CO 2: Preparation of organic compounds: -

- a) Acetylation of salicylic acid, aniline and p-toluidine.
- b) Benzoylation : Preparation of benzanilide and benzoyl derivative of p- toluidine.
- c) Esterification: Preparation of ethyl benzoate.