

A.V.Education Society's
DEGLOOR COLLEGE, DEGLOOR

➤ **Programme Specific Outcomes – (Chemistry)**

• **After completing this specific programme M.Sc. – (Chemistry)**

1. National and Global level opportunities to pursue research and Ph. D. program.
2. Enormous job opportunities at all level of chemical, pharmaceutical, food products, life oriented material industries.
3. Specific placements in R & D and synthetic division of polymer industries as well as in allied division.
4. To impart the chemistry knowledge of national and global standard.
5. Discipline specific competitive examinations conducted by different organization.
6. Improvement in the quality of higher education
7. To acquire skills, training and knowledge to enhance their thinking.
8. Upgrading academic resources and learning environments.
9. Science programme should make students centric, interactive and outcome oriented.
10. To motivate and inspire the students to create deep interest in science.

After completing this specific programme – M.Sc. – (Chemistry)

1. **Disciplinary knowledge and skills** : Good knowledge and understanding major concepts of theoretical principle and experimental findings in Chemistry.
2. **Ability**: Ability to use modern instruments, laboratory techniques and design.
3. **Skilled communicator**: Ability to transmit complex technical information in Chemistry.
4. **Critical thinker**: Ability to employ critical thinking.
5. **Problem solver**: Ability to develop efficient problem solving skill.
6. **Ethical awareness**: Capable of demonstrating ability to think and analyze rationally with modern and scientific look.

➤ Course Outcomes – (Chemistry -)

Under Graduate (Course Outcomes)

M.Sc. First Year

Semester – I (Paper-wise)

1. Name of the Paper – I **Inorganic Chemistry.**

- a. To learn various approaches in analyzing structures of simple molecules.
- b. To understand the proposed pathways for reactions taking place in coordination complexes such as substitution reactions, redox reactions etc. and the various factors affecting to rates of these reactions.
- c. To learn about mechanisms proposed for reactions taking place in coordination complexes, and will be able to understand to explain the product formation based on these mechanisms.
- d. To understand how to construct molecular orbital diagrams for simple molecules as well as coordination complexes.
- e. To draw molecular orbital diagrams for sigma and pi bond formation in coordination complexes and will be able to understand and explain the difference between respective molecular orbital diagrams.

2. Name of the Paper – II **Organic Chemistry:**

- a. To learn and understand rules of logarithm, Rules of drawing graph, Derivatives, Integration , different mathematical concept and SI units, and their use in solving numerical.
- b. To understand surface phenomena of heterogeneous phases.
- c. Student should learn the basic knowledge of gas phase, Kinetic theory of gases, critical phenomenon , liquefaction and molecular velocities.
- d. To understand knowledge of solid phase, crystallography and some crystal structure.
- e. To know General characteristics of s-block elements, oxides, hydroxide, carbonate & its complexes
- f. To Study the oxidation and reduction by different methods.

3. Name of the Paper – III **Physical Chemistry:**

- a. To understand the basic concepts, laws and postulates of quantum mechanics
- b. To understand the concept of wave functions and operators and to solve Schrodinger wave equation for rigid rotor, harmonic oscillator and for hydrogen atom.
- c. To understand the concept of angular momentum and electronic structure of atoms.
- d. To understand laws of thermodynamics, concept of partial molar properties and non-ideal systems
- e. To understand the distribution and thermodynamic probability and to discuss the partition functions and its significance.
- f. To relate entropy production in different system and understand Onsager's relations
- g. To develop skill in problems solving.

4. Name of the Paper – IV **Physical methods in Chemistry:**

- a. To introduce the concepts of symmetry.
- b. Study the concept of group theory for understanding molecular representations.
- c. To provide an introductory treatment of bonding theories, electronic and vibrational spectroscopy.
- d. Students should understand Molecular Symmetry, Symmetry operations and symmetry elements, Plane of symmetry, Proper/Improper Axis of symmetry, Inversion center, Identity element.

Semester – II

1. Name of the Paper – VI **Inorganic Chemistry.**

- a. To learn basic terms regarding electronic spectra of coordination complexes, interpretation of electronic spectra and various important parameters necessary for it, drawing of Orgel and T-S diagrams used for electronic spectra.
- b. Students should understand magnetic nature of complexes, measurement of magnetic moment in coordination complexes, prediction of magnetic nature of complexes using spin only formula.
- c. Students should learn the terms such as diamagnetic and paramagnetic nature of coordination complexes, difference between them, anomalous magnetic moments, spin cross over etc.
- d. Students should understand the chemistry of carbonyl and nitrosyl molecules, their

application as ligand molecules in complex formation, structure and bonding present in various carbonyl and nitrosyls complexes, applications etc.

- e. Students should learn chemistry of boranes, carboranes and metal clusters, the concept of 3C-2e bond used to explain structural aspects in boranes and carboranes, polyhedral skeletal electron pair theory and its applications in explaining structures of metal clusters

2. Name of the Paper – VII **Organic Chemistry:**

- a. To gain the knowledge of addition reaction between a hetero atom and double bonded carbon compounds.
- b. To learn familiar name Reaction
- c. To obtain an outline about mechanism of Aromatic Substitution reactions
- d. To know synthetically the process relevant Organic –Chemical reactions and be able to discuss the mechanism of these reactions.
- e. To understand the skill of solving problems of pericyclic reactions and to get the clear picture of about pericyclic reactions

3. Name of the Paper – VIII **Physical Chemistry**

- a. Students should understand the basic concepts and properties of surfactants and macromolecules
- b. To learn and apply different laws, principles, theories related to the electrochemistry of the solutions.
- c. To discuss and apply the information about corrosion, its monitoring and presentation.
- d. To distinguish different theories of reaction rates.
- e. To understand the kinetics of complex reactions, catalysis
- f. To perform the calculations and solve the numerical of electrochemistry and chemical kinetics.
- g. To develop skill in problems solving, critical thinking and analytical reasoning.

4. Name of the Paper – IX **Physical methods in Chemistry**

- a. To understand the basic principles of rotational, vibrational, electronic and Raman spectroscopy.
- b. To identify and explain factors that influence the strength and frequency of peaks in the Microwave, IR spectra.
- c. To know the selection rule for rotational, Vibrational and electronic spectroscopy.

- d. To determine the vibrations for a molecule and identify whether they are active in infrared and/or Raman spectroscopy.
- e. To know the difference between Stokes and anti-Stokes lines in a Raman spectrum.
- f. To understand the electronic spectra of atomic and diatomic molecular systems.
- g. To justify the absorption lines in atomic electronic spectra and the broad bands in molecular electronic spectra.
- h. To interpret the molecular electronic spectra and deduce the electronic structure information in ground and excited states of diatomic molecules.
- i. To know the importance of the Nuclear Quadrupole Resonance Spectroscopy in the characterizing organic and inorganic compounds.
- j. To know how the electric fields gradient in molecules influences NQR, and ESR spectra.

5. Name of the Paper – XI Laboratory Course (Inorganic)

- a. To learn the synthesis methods for the preparation of various coordination complexes and will understand the basic principles involved in operational procedures while synthesizing the complexes to a deeper level.
- b. To characterize a synthesized complex using various characterization techniques such as melting point determination, solubility behavior in various solvents, molar conductance, magnetic susceptibility measurements, IR and electronic spectra etc.
- c. Students should be able to understand operation, procedures, care that should be taken while using these techniques and the practical utility of these techniques.
- d. To understand the basic principles lying behind inorganic analysis such as precipitation, solubility product, buffer solution, applications of buffer solution in maintaining pH, common ion effect etc. and this much information will be helpful while analyzing any inorganic compound in future

6. Name of the Paper – XII Laboratory Course (Organic)

- a. To learn the pilot separation of the binary mixture .
- b. To familiarize the systematic procedure of organic mixture analysis
- c. To understand the preparation involving nitration, bromination, Sandmeyer reaction, and Aldol condensation
- d. To learn the test involving identification of special elements
- e. To learn the confirmatory test for various functional groups

- f. To understand the technique involving drying and crystallization by various methods
- g. To understand the various techniques of preparation and analysis of organic substances
- h. To learn the estimation of various organic compounds.
- i. To understand micro scale technique.

7. Name of the Paper - XIII **Laboratory Course (Physical)**

- a. To study the potentiometric, conductometric, pH metric and colorimetric titrations.
- b. To learn separation and estimation of metal ion.
- c. To learn and understand different instrumental techniques.
- d. Knowledge through experiments
- e. Handling of experimental arrangements.

8. Name of the Paper - XIV **Laboratory Course (Analytical)**

- a. To understand basic principles and theory of different instruments
- b. To perform different experiments on conductometer, pH meter, potentiometer, calorimeter, polarimeter, refractometer
- c. To set various experiments based on the different instrumentations
- d. To understand basic principles and theory of measurements of density, viscosity, refractive index, surface tension, adsorption
- e. To perform different qualitative and quantitative analysis.

M.Sc. II Year

Semester – III (Paper-wise)

1. Name of the Paper – XV **Advanced Spectroscopic Methods**

- a. Students should learn the structure determination of organic molecules by spectroscopic methods.
- b. Students should learn the ultra-violet and visible spectroscopy to determine absorption maximum in dienes, enones and aromatic compounds.
- c. Students should understand the applications of IR spectroscopy for functional group determination.
- d. Students should understand the importance and applications of proton magnetic resonance spectroscopy for determination of structure of unknown and known organic

compounds.

- e. Students should learn the CMR to authenticate the position of carbon atom in organic molecules.
- f. To understand the molecular mass of the organic molecule by fragmentation pattern.
- g. To know the complete structure of compounds using UV, IR, PMR, CMR and Mass spectroscopic methods.

2. Name of the Paper – XVI **Natural Products**

- a. To learn the different natural products, and their Nomenclature, occurrence, deficiency syndromes.
- b. To understand the Biogenesis of Natural Products.
- c. Students should learn the Structure elucidation and synthesis of Vitamins, Terpenoids and Steroids.
- d. To learn the physiological effects of prostoglandins, pyretheroids and their applications
- e. Students should learn medicinal application of different natural products

3. Name of the Paper – XVII **Organic Synthesis**

- a. To understand the Dakin reaction, Etard reaction, HVZ reaction, Umpolung synthesis and Stephen reaction .
- b. To know about the Barton reaction, Jones oxidation, Oppenauer oxidation and Michel addition .
- c. To understand the different types of reduction reaction .
- d. To learn about the synthesis and applications of the organic reagents like 9-Borabicyclo(3.3.1)nonane (9-BBN) and n-butyl lithium .
- e. To learn the synthesis and applications of the organic reagents like ceric ammonium nitrate (CAN), DCC, Grignard reagent, LDA, Gilman reagent, NBS and PCC.
- f. To know about the complex metal hydrides, Hilman's reagent, lithium dimethyl cuprate and dicyclohexyl carbodimide, 1,3-dithiane.
- e. To know the detail study of woodward, provost hydroxylation, selenium dioxide, crown ethers and Peterson's synthesis, Wilkinson's catalyst and Baker yeast.

4. Name of the Paper – XVIII **Medicinal Chemistry**

- a. To learn basic principles involved in drug discovery and designing process
- b. To understand the role of medicinal chemist in development of medicinal agents
- c. To learn insight knowledge to analyze and perform SAR and QSAR

- d. To learn how to analyze and perform SAR of Antimicrobial drugs, Antibiotics, Coagulants and Anticoagulants Understand key component of drug discovery process and drug designing
- e. To understand the functional group modification and their utility in SAR and QSAR.
- f. To analyze the recent research articles related with drug design of antimicrobial agents and antibiotics.

Semester – IV (Paper-wise)

1. Name of the Paper – XX **Advanced Heterocyclic Chemistry**

- a. To learn the fundamental theoretical understanding of heterocyclic chemistry, including alternative general methods for ring synthesis and application of such methods for the preparation of specific groups of heterocyclic systems.
- b. Student should get familiar with particular properties and reactions for the most important heterocycles as well as different systems of nomenclature
- c. Students should learn the most important heterocyclic systems, such as pyridines, quinolines, isoquinolines, pyrroles, furanes, thiophenes, indoles, pyrimidines, purines, imidazoles, aziridines and oxiranes. For each group, ring synthesis, chemical properties and characteristic reactions will be discussed.

2. Name of the Paper – XXI **Advanced Organic Chemistry**

- a. To study the applications and Mechanism of Enzymes
- b. To study the supramolecular chemistry with mechanism
- c. Students should learn Free radical reaction
- d. To study Asymmetric synthesis
- e. Students should learn the basic Principles of Green Chemistry
- f. Students should understand the applications and uses of Green catalysts and Reagents.
- g. To know the use of Ionic Liquids and PTC in Green Synthesis

3. Name of the Paper – XXII **Organic synthesis: Retro synthetic Approach**

- a. To learn the information of disconnection of functional group in organic transformations.
- b. To study the protection and deprotection group approach.
- c. To learn the C-C bond disconnections in various organic molecules.
- d. To know the ring synthesis for cyclic molecules.

- e. To develop synthetic routes based on retrosynthetic analysis for molecules
- f. To learn the subject specific knowledge as well as relevant understanding of the retrosynthesis

4. Name of the Paper – XXIII **Medicinal Chemistry**

- a. To learn the basic principles involved in Anti-cancer and Anti-AIDS agents, Hypoglycemic agents, Cardiac drugs, antiviral antimalarials.
- b. To know the role of medicinal chemist in development of medicinal agents for analgesic agents, Anti-inflammatory drugs, Anaesthetics, depressants, Anticonvulsant agents, Drug acting on Gastrointestinal tract infections
- c. To learn how to analyze and perform SAR of Anti-cancer Agents, Hypoglycemic agents, Cardiac drugs, Antimalarials, Analgesic and Anti-inflammatory drugs, Anaesthetics, Psychoactive Drugs
- d. To learn how to file the patents

5. Name of the Paper – Laboratory Course XXV **Mixture Analysis**

- a. To study the qualitative analysis of ternary mixture in organic chemistry.
- b. To understand the analysis of organic compounds by spectral techniques
- c. To learn basics practical knowledge of qualitative analysis.
- d. To become skilled at organic compounds determination.

6. Name of the Paper – Laboratory Course XXVI **Synthesis of Organic Molecules**

- a. To learn the multistage synthesis of organic molecules.
- b. To become skilled for the synthesis of drug molecules in the laboratory.
- c. To gain the practical knowledge of organic synthesis by microwave irradiations
- d. To learn basics practical knowledge of multistage synthesis of organic molecules.
- e. To learn fundamentals of organic synthesis in drug discovery.
- f. To learn about the one-pot organic synthesis by microwave techniques.

7. Name of the Paper – Laboratory Course XXVII **Physico-Organic Estimations**

- a. To understand the estimation of different organic molecules in day to day's life chemistry.
- b. To gain the practical knowledge to estimate the drug molecules by instrumentation

methods

- c. To learn about the Isolation of natural products.

8. Name of the Paper – Laboratory Course XXVIII Project

- a. To know about the Literature Survey,
- b. Students should learn the Studies of Reactions, Synthesis, Mechanism, Isolation of Natural Products, Standardization of Reaction Conditions, New Synthetic Methods

Head of the Department

Principal