MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

ORGANIC CHEMISTRY-II

CO-1: Analyze the principles of Organic chemistry and demonstrate a comprehensive understanding of the Nitrogen containing compounds, Heterocyclic compounds, Alkaloids and Polynuclear Hydrocarbons..

CO-2: Apply the theories and concepts of Organic chemistry to explain the nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects, Relative reactivity of amines, amide, nitro, azo compounds towards nucleophilic substitution reactions, preparation and properties of various organic compounds.

CO-3: Analyze and interpret the various phenomenon of compounds such as hybridization, resonance, hyper conjugation, dipole moment, intermediate formation, bond cleavage and aromatic characteristics to explain the formation and stability of chemical species.

CO-4: Investigate various types of organic reactions, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects, Relative reactivity of amines, amide, nitro, azo compounds towards nucleophilic substitution reactions, preparation and properties of organic compounds.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

INORGANIC MATERIALS OF INDUSTRIAL IMPORTANCE

CO-1: Demonstrate proficiency in utilizing various instrumental methods for Glass, Cement, Ceramics, Fertilizers, Surface coating, catalysis, chemical explosive, Alloys and kind of batteries.

CO-2: Apply theoretical knowledge to analyze and interpret experimental data obtained from instrumental methods to determine the composition, structure, and properties of chemical substances.

CO-3: Develop practical skills in operating and maintaining advanced laboratory instruments used in chemical analysis, ensuring accuracy, precision, and safety.

CO-4: Evaluate and troubleshoot instrumental methods to identify potential sources of error, optimize analytical procedures, and enhance the reliability and sensitivity of chemical measurements.

CO-5: Apply critical thinking and problem-solving skills to design and execute experiments, validate analytical methods, and make informed decisions regarding the selection and application of instrumental techniques in chemical analysis.

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

CO-1: Demonstrate proficiency in utilizing various instrumental methods for chemical analysis, including spectroscopy, chromatography, and electrochemical techniques.

CO-2: Apply theoretical knowledge to analyze and interpret experimental data obtained from instrumental methods to determine the composition, structure, and properties of chemical substances.

CO-3: Develop practical skills in operating and maintaining advanced laboratory instruments used in chemical analysis, ensuring accuracy, precision, and safety.

CO-4: Evaluate and troubleshoot instrumental methods to identify potential sources of error, optimize analytical procedures, and enhance the reliability and sensitivity of chemical measurements.

CO-5: Apply critical thinking and problem-solving skills to design and execute experiments, validate analytical methods, and make informed decisions regarding the selection and application of instrumental techniques in chemical analysis.

CO-5: Apply quality control and assurance principles to ensure the reliability and validity of analytical results obtained through instrumental methods.

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

MATHEMATICS SUBJECTS:

Calculus

CO-1: Apply fundamental concepts of calculus to solve problems in real-life scenarios.

CO-2: Analyze and interpret functions, limits, and continuity using calculus techniques.

CO-3: Demonstrate proficiency in differentiating and integrating various types of functions.

CO-4: Apply calculus principles to solve optimization and related rate problems.

CO-5: Utilize calculus methods to model and solve problems involving growth, decay, and accumulation.

Differential Equations

CO-1: Apply the principles of differential equations to model and analyze real-world phenomena and systems.

CO-2: Solve ordinary and partial differential equations using appropriate methods and techniques, including separation of variables, integrating factors, power series, and Laplace transforms.

CO-3: Analyze and interpret the solutions of differential equations in terms of the underlying physical or mathematical concepts, and draw meaningful conclusions from the results.

CO-4: Employ numerical methods and computational tools to approximate solutions of differential equations when exact solutions are not feasible or readily available.

CO-5: Formulate and solve higher-order linear and nonlinear differential equations, including systems of differential equations, and assess the stability and behavior of their solutions.

Algebra

CO-1: Apply algebraic concepts and techniques to solve mathematical problems in various domains, including linear equations, quadratic equations, polynomial functions, and systems of equations.

CO-2: Analyze and interpret mathematical relationships using algebraic expressions, equations, and inequalities, and utilize them to model and solve real-world problems across different fields of study.

CO-3: Demonstrate proficiency in manipulating algebraic expressions, including simplifying, factoring, expanding, and solving equations involving radicals, logarithms, and exponents.

CO-4: Develop logical and critical thinking skills to solve complex algebraic problems by employing deductive reasoning, mathematical induction, and proof techniques.

CO-5: Apply algebraic concepts to comprehend and interpret graphs, functions, and their transformations, including linear, quadratic, exponential, and logarithmic functions, enabling the analysis of data and patterns in diverse contexts.

Real Analysis

CO-1: Apply fundamental concepts and theorems of real analysis to solve mathematical problems and analyze mathematical structures.

CO-2: Formulate and prove mathematical statements using rigorous logical reasoning and techniques from real analysis.

CO-3: Demonstrate a deep understanding of limits, continuity, and differentiability of real-valued functions and their applications in various mathematical contexts.

CO-4: Analyze and evaluate the convergence and divergence of sequences and series, including power series, and apply relevant convergence tests.

CO-5: Utilize techniques from real analysis to study the properties of functions, including their integrability, uniform convergence, and applications to the calculation of areas and volumes.

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

PHYSICS SUBJECTS:

Mechanics

CO-1: Apply the principles of classical mechanics to analyze and solve problems related to the motion of particles and rigid bodies.

CO-2: Demonstrate proficiency in mathematical techniques and tools, such as calculus and vector algebra, to formulate and solve problems in mechanics.

CO-3: Evaluate and interpret experimental data to validate theoretical concepts and laws in mechanics, and effectively communicate the results through written and oral presentations.

CO-4: Analyze and design mechanical systems by applying the principles of statics and dynamics, including the equilibrium of forces and moments, and the study of motion under various conditions.

CO-5: Demonstrate an understanding of fundamental concepts in mechanics, such as kinematics, dynamics, work-energy theorem, conservation laws, and rotational motion, and their applications in practical engineering problems.

Electricity & Magnetism

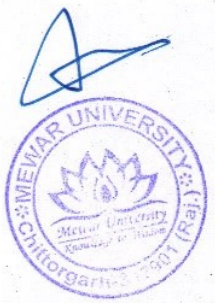
CO-1: Apply the laws of electricity and magnetism to analyze and solve complex electrical and magnetic problems.

CO-2: Demonstrate an understanding of the principles and theories related to electric and magnetic fields, including Gauss's Law, Ampere's Law, and Faraday's Law.

CO-3: Design and analyze circuits involving resistors, capacitors, and inductors, taking into account the behavior of these components in both DC and AC circuits.

CO-4: Explain the phenomenon of electromagnetic induction and its applications in various devices and systems, such as generators and transformers.

CO-5: Evaluate the behavior of electric and magnetic fields in different media and understand the concept of electromagnetic waves, including their generation, propagation, and interaction with matter.



MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

Thermodynamics

CO-1: Apply the laws of thermodynamics to analyze and solve problems related to energy transfer, heat, work, and the behavior of substances.

CO-2: Evaluate and interpret the properties of pure substances and mixtures using thermodynamic principles and equations of state.

CO-3: Analyze and design thermodynamic cycles and processes, such as power cycles, refrigeration cycles, and heat exchangers, for practical applications.

CO-4: Apply thermodynamic principles to analyze the performance and efficiency of various energy conversion systems, including engines, turbines, and power plants.

CO-5: Demonstrate proficiency in utilizing thermodynamic concepts to analyze and design systems for sustainable energy utilization and environmental impact assessment.

Optics

CO-1: Apply the principles of geometrical optics to analyze and predict the behavior of light in various optical systems.

CO-2: Demonstrate an understanding of the wave nature of light and its interactions with different materials and surfaces.

CO-3: Design and perform experiments related to optics, and analyze and interpret the obtained results using appropriate mathematical and statistical methods.

CO-4: Identify and explain the fundamental concepts and phenomena in the field of modern optics, including diffraction, interference, polarization, and optical instruments.

CO-5: Apply the principles of optics to real-world applications, such as optical communication systems, laser technology, and imaging devices, and evaluate their performance and limitations.

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

Course Outcomes (COs) (BOTANY)

Course: Sem I Paper 1 Diversity of Microbes, Algae, Fungi and Archegoniate:

By the end of this course, the students will be able to:

CO-1 Algae can grow quite well in waste water where other organisms would not survive. Phycologists have developed ways to clean up waste water naturally by using algae.

CO-2 As the course include both fundamental and applied aspects of phycology, the students will be benefitted by both and this can direct them towards research in the field of phycology.

CO-3 Microbiology is one of the most vital fields hence studying microbiology will make the students skilful in understanding the basic concept if role of microorganisms in several industries.

CO-4 Bryophytes, Pteridophytes and gymnosperm have immense ecological and evolutionary significance. Understanding that will be instrumental for students to understand how adaptation played an important role in transition to land habit.

CO-5 All the groups have tremendous economic importance as well in form of availability of tannins, resin, gum etc and other economically important products produced by these group of plants. Knowledge about the economic aspect of these groups of plants will be important.

Course: Sem II Paper 1 Plant Taxonomy and Ecology:

By the end of this course, the students will be able to:

CO-1 While studying plant sciences, it is of utmost importance for the students to know how crucial it is to describe different species and how description of each new species is preserved and used for comparison.

CO-2 The course will benefit the students in understanding the rules of nomenclature and also the evolutionary relationship among living organisms.

CO-3 Taxonomy also provides basis for genetic analysis are performed on the basis of systematic. Hence students with a general idea of taxonomy can interconnect other aspects of biology.

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

Course: Sem III Paper 1 Plant Anatomy and Embryology:

By the end of this course, the students will be able to:

CO-1 The anatomy and ecological significance of different types of tissues

CO-2 The taxonomic and evolutionary variation in xylem and phloem components

CO-3 Anatomical adaptation of plants associated with specific habitats.

CO-4 Understanding the process of woody secondary growth in stems

CO-5 The detailed study regarding the scope of anatomy gives a vast overview on wood technology, archaeology, forensics, and palaeontology.

Course: Sem IV Paper 1 Plant Physiology and Metabolism:

By the end of this course, the students will be able to:

CO-1 Study of plant physiology provides the students with the basic idea that we can observe the activities of plants with relation to their external environmental conditions such as heat, drought, cold etc.

CO-2 Physiological studies generate important information useful in field of agronomy, horticulture, genetics and plant breeding.

CO-3 Plant physiology is relevant to number of industries, including food, beverage, pharmaceuticals and textile industries.

CO-4 The students studying plant physiology in depth can get a fair overview of the above-mentioned aspects of it.

MEWAR UNIVERSITY Chittorgarh-312901 (Raj.)

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

Course Outcomes (COs) (ZOOLOGY)

Course: Sem I Paper 1 Animal Diversity & Invertebrates:

By the end of this course, the students will be able to:

CO-1 To understand the Animal diversity around us.

CO-2 To understand the underlying principles of classification of animals.

CO-3 To understand the terminology needed in classification.

CO-4 To understand the differences and similarities in the various aspects of classification.

CO-5 To classify invertebrates and to be able to understand the possible group of the invertebrate observed in nature

Course: Sem II Paper 1 Vertebrates:

By the end of this course, the students will be able to:

CO-1 Understand comparative account of the different vertebrate systems

CO-2 Understand the pattern of vertebrate evolution, organisation and functions of various systems.

CO-3 Learn the comparative account of integument, skeletal components, their functions and modifications in different vertebrates.

CO-4 Understand the evolution of heart, modification in aortic arches, structure of respiratory organs used in aquatic, terrestrial and aerial vertebrates; and digestive system and its anatomical specializations with respect to different diets and feeding habits.

CO-5 Learn the evolution of brain, sense organs and excretory organs to a complex, highly evolved form in mammals;

Course: Sem III Paper 1 Cytology, Genetics and Evolution:

By the end of this course, the students will be able to:

CO-1 Define the basic terms in genetics.

CO-2 Discuss the linkage groups and gene frequency.

CO-3 Explain the concept of mutation.

CO-4 Acquire problem solving and high order analytical skills by attempting numerical problems as well as performing simulation studies of various evolutionary forces in action.

CO-5 Apply knowledge gained, on populations in real time, while studying speciation, behaviour and susceptibility to diseases.

Course: Sem IV Paper 1 Physiology, Biochemistry and Endocrinology:

By the end of this course, the students will be able to:

CO-1 Define the basic terms in physiology.

CO-2 Explain the physiological processes in mammals.

CO-3 Explain the anatomy of various systems.

CO-4 Illustrate the reproductive cycles with hormonal control.

CO-5 Diagrammatically represent the working of kidney.

Mewar university

M.Sc Chemistry

MEWAR UNIVERSITY

PROGRAMME: M.Sc.(Industrial Chemistry)

Program Outcomes (PO):

PO1: Creative Thinking: Students will be able to think creatively to propose novel ideas in explaining facts and figures or providing new solution to the problems in chemistry.

PO2: Interdisciplinary Approach: Students will realize how developments in any science & technology and engineering subject helps in the development of other science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments.

PO3: Personality Development: Students will imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.

PO4 Skills in research and industrial field: Students will build a scientific temper and will be able to learn the necessary skills to succeed in research or industrial field.

PO5 Communication Skills: Students will develop various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.

PO6 Environmental monitoring: Students will be able to understand the environmental issues Global warming, Climate change, Acid rain, Ozone depletion and will create awareness in society.

MEWAR UNIVERSITY

M.SC. Industrial Chemistry

Program Specific Outcomes

PSO-1 Students will be able to explore new areas of research in Organic Chemistry and allied fields of science and technology.

PSO-2 Students will have ability to enter research and teaching as career after completing further higher studies by qualifying examinations conducted for the purpose.

PSO-3 Students will demonstrate proficiency in the use of appropriate library searching and retrieval methods to obtain information about a topic, chemical, chemical technique, or an issue relating to chemistry.

PSO-4 Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

PSO-5 Effectively communicate the techniques and results of laboratory experiments/research through effectively written reports and oral presentations.

MEWAR UNIVERSITY

M.SC. Industrial Chemistry

COs: M.Sc. Industrial Chemistry

Semester-I

Course: Advanced Inorganic Chemistry (CYMS101)

On successful completion of this course, students should be able to:

CO-1. Define different terms pertaining to symmetry in molecules.

CO-2. Predict point symmetry group of molecules based on its symmetry elements.

CO-3. Outline the structure, properties and reactions of transition metal carbonyls and nitrosyl complexes.

CO-4. Interpret magnetic behavior of transition metal complexes from the electronic structure.

CO-5. Able to define the basics of inorganic chemistry.

Course: Recent Developments in Organic Chemistry-I (CYMS102)

On successful completion of this course, students should be able to:

CO-1. Demonstrate an understanding of the effect of the electronic structuture on chemical bonding and aromaticity.

CO-2. Enumerate thermodynamics and kinetics of chemical reactions.

CO-3. Interpret configuration and conformational analysis of organic compounds.

CO-4. Explain nucleophilic substitution and elimination reactions.

CO-5. Predict the mechanism of addition reaction of unsaturated systems.

Course: Course: Advanced Physical Chemistry- IV (CYMS 103)

On successful completion of this course, students should be able to:

CO-1. Appreciate the basics of thermodynamics.

CO-2. Interpret partial molar properties and its variation with temperatures and pressure.

CO-3. Enumerate the chemical potential of the system.

CO-4. Interpret valence bond and molecular orbital theory for diatomic molecules.

CO-5. Outline Huckel MO treatment for simple and conjugated polyenes.

CO-6. Identify crystal system and different types of crystal defects.

Course: Application of Mathematics and Computers in Chemistry (CYMS104)

On successful completion of this course, students should be able to:

CO-1. Evaluate the significant characteristics of data obtained in experiments.

CO-2. Intererpret data by statistical tools like correlation analysis scatter diagram and leastsquare analysis.

CO-3. Demonstrate understanding of mathematical tools like differentiation, intrgration, matrix, differential equation and logarithm as required for chemists.

CO-4. Recognize the importance computation in chemistry.

CO-5. Construct algorithms and flow charts for relevant problems.

CO-6. Recognize important features of computer high level languages like Fortran and C.

Course: Spectroscopic Techniques-I (CYMS105)

CO-1. List the electronic transitions and vibration frequencies of organic compounds withdifferent functional groups

CO-2. Enumerate the effects of interactions like hydrogen bonding and solvent in theelectronic and IR spectra.

CO-3. Demonstrate an understanding of Raman spectra of diatomic and polyatomiccompounds.

CO-4. Interpret structural features of different compounds from mass spectra and EPR.

CO-5. Analyze NMR spectra of organic compounds from its structures.

CO-6. Interpret spectral data to predict the structure of compounds.

Laboratory Courses (CYMS 105)

Course: Lab (Part-a) Inorganic Chemistry Practical-I

On successful completion of this course, students should be able to:

CO-1. Carry out gravimetric titration to quantitatively determine Silica and volumetrically Fe inan ore.

CO-2. Determine of Cu iodometrically and Fe volumetrically in a given sample of CopperFerrite.

CO-3. Determine capacities of cation and anion exchange resin in terms of milliequivallents/gof dry resin

CO-4. Know how to prepare Copper pyrites and determine percentage yield of Copper Ferrite.

Course: Lab (Part-a) Organic Chemistry Practical-I

On successful completion of this course, students should be able to:

CO-1. Execute separation of compounds and qualitative identification of compounds.

CO-2. Carry out the following synthesis:

a. acetylation of chlorestorol to prepare cholesteryl acetate.

b. Oxidation of adipic acid by chromic acid

c. Use of Grignard reagent to prepare triphenyl methanol from benzoic acid.

d. Aldol condensation to Dibenzal acetone from benzaldihyde

e. Sandmeyer reaction to prepare p-chlorotoluene from p-toluidine

f. Acetoacetic ester condensation to Preparation of ethyl-n-butylacetoacetate

g. Haloform reaction to for preparation of iodoform from acetone

CO-3. Perform preparation of anthranilic acid, floroscine and methyl orange in the laboratory.

Course: Physical Chemistry (Part-C)

CO-1. Operate potentiometer to determine

a. Normality of each acid in a given mixture of strong acid and weak acid.

b. Solubility and solubility products salts of silver like AgCl,AfBr and AgI

CO-2. Carry out conductometric experiments to find out:

a. Normality of strong acid from mixture of strong acid and weak acid

b. Relative strengths of chloroacetic acid and acetic acid.

CO-3. Ability to do colorimetric experiments to verify Beer-Lambert law for copper-ammoniacomplex and determine unknown copper ion concentration

CO-4. Carry out thermometric measurement to determine heat of solution of simple salts like KCl, NaCl, $MgCl_2$ in 1M solution and that of sparingly soluble salt like benzoic acid by solubility measurements.

Semester-II:

Course: Recent Developments in Organic Chemistry II (CYMS 201)

On successful completion of this course, students should be able to:

CO-1. Reproduce the mechanisms of important molecular rearrangement reactions.

CO-2. Be able to explain the important organic reactions with mechanism & their application.

CO-3. Outline synthetic strategy, disconnection & chemo selectivity of the reactions.

CO-4. Appreciate role and mechanism of action of protecting functional groups in

organicchemistry.

CO-5. Able to define the type of reaction.

Course: Bio-organic chemistry (CYMS202)

On successful completion of this course, students should be able to:

CO-1. Appreciate deleterious effects of excess metals like mercury, lead and arsenic in theenvironment.

CO-2. Classify vitamins as water soluble and fat soluble vitamins.

CO-3. Demonstrate an understanding of the structures of vitamins with their mechanism ofaction in human bodies.

CO-4. Interpret the cause of the AIDS disease from genetic changes in human bodies due tothe HIV.

CO-5. Recognize the structure of the anti-AIDS drugs.

CO-6. Discus the structure and properties of amino acids.

Course: Analysis and Separation techniques (CYMS 203)

On successful completion of this course, students should be able to:

CO-1. Determine appropriate chromatographic technique for chemical analysis

CO-2. Comprehend the optimization of chromatographic methods

CO-3. Evaluate the quality of acquired data to predict the compounds

CO-4. Explain the principles electro-migration techniques of the most important liquid and gas chromatography.

CO-5. Evaluate strengths and limitations of the most important chromatographic separation and detection methods in relation to the properties of the sample and of the analysis task.

CO-6. Report chromatographic analyses in a scientifically sound and understandable (intelligible) way.

MEWAR UNIVERSITY

M.SC. Industrial Chemistry

Course: Pericyclic and photochemistry (CYMS 204)

On successful completion of this course, students should be able to:

CO-1. Compare different pericyclic reactions and their mechanism.

CO-2. Outline different physical processes of photochemistry.

CO-3. Enumerate photochemistry of alkenes.

CO-4. Interpret the photochemical reactions of ketones

CO-5. Explain important photochemical reactions undergone by aromatic compound

Course: Polymer Chemistry and organometallic compounds (CYMS 205)

On successful completion of this course, students should be able to:

CO-1. Classify polymers based on its structure.

CO-2. Enumerate different properties of polymers.

CO-3. Identify different important monomers and their manufacturing process.

CO-4. Evaluate the application and the synthesis of polymers.

CO-5. Outline the preparation and properties of transition metal complexes andorganometallic compounds of main group elements.

Course: Laboratory Course-II

On successful completion of this course, students should be able to:

Part-a: Inorganic Chemistry-Practical –II

CO-1. Determine the amounts of Zn and Fe present in a sample of zinc ferrite volumetrically and complexometrically respectively.

CO-2. Determine the influence of surface area and time on the rate of corrosion process.

CO-3. Estimate the amount of cadmium and zinc from mixture by anion exchange

chromatic method.

CO-4. Preparation of zinc ferrite and pentathiourea dicuprous nitrate to determine the percentage yield.

CO-5. Estimation of the phosphoric acid in cola drinks by molybdenum blue method.

Part-b: Organic Chemistry Practical-II

CO-1. Perform the following quantitative analysis:

a. determine the percentage and number of hydroxyl groups in organic compound byacetylation method.

b. Estimate amines and phenols using bromated-bromide and acetylation method

CO-2. Determine iodine and saponification value of an oil sample.

CO-3. Perform laboratory experiments to determine dissolved oxygen, COD and BOD of watersamples.

CO-4. Carry out multi-step synthesis by the following reactions:

(a) Cannizzaro reaction using 4-chlorobenzaldehyde as substarte

(b) Benzilic acid rearrangement:benzilic acid from benzaldehyde via benzoin and benzilintermediates respectively.

(c) Hofmann bromamide rearrangement: Anthranilic acid from pthalic anhydride vis pthalimide intermediate.

(d) Beckmann rearrangement: Benzophenone from benzene.

CO-5. Perform phase transfer catalysis using diethyl malonate or ethy acetate and alky halide.

Part-C: Physical Chemistry-II

At the end of the course, students should be able to:

CO-1. Construct phase diagram for three component system containing C_2H_5OH, C_6H_6 and H_2O.

CO-2. Use colorometry method to find out concentration of ammonia in an unknown solution.

CO-3. Perform potentiometry to find out redox potential of Fe^{+3}/Fe^{+2} sysytem and

amount ofhalide in a given mixture of KCl and KBr.

CO-4. Determine the solubility of PbI_2 in presence of different concentrations of KNO3 and KClrespectively.

CO-5. Determine the solubility of sparingly soluble salts like PbSO4, AgIO3 and Ag2CrO4through conductometric experiments.

Semester-III

Semester-III

Course: Introduction To Chemical Engineering -I

At the end of the course, students should be able to:

CO-1. Familiar with the types of important classes of Thermodynamics processes.

CO-2. Student will able to classify material balance and energy balance and explain their uses.

CO-3. Student will able to understand and explain the concept of equipment design and vessels design.

CO-4. Student will able to understand & explain the application part of ceramic coating, chemical addition, and agitation of chemical reactants.

CO-5. Student will able to understand & explain the industrial instrumentation.

Course: Introduction To Chemical Engineering –II

At the end of the course, students should be able to:

CO-1. Familiar with the types of important classes of Evaporators & their techniques.

CO-2. Student will able to understand and explain the concept of different types of distillation processes and explain their uses.

CO-3. Student will able to understand the classification of types of filters and their uses.

CO-4. Student will able to understand & explain the concept of drying.

CO-5. Student will able to understand & explain the crystallization and gas absorption.

Course: Organic Chemical Industries

On successful completion of this course, students should be able to:

CO-1. Outline the classification, nomenclature and brief idea of dyes, pigments and intermediates.

CO-2. Explain the importance role of photosensitive dyes, dyes as food additives, natural dyes.

CO-3. Student will able to understand the classification of types of common food stuffs and their uses.

CO-4. Student will able to understand & explain the concept of food additives and their role.

CO-5. Student will able to understand & explain the chemistry of oils, soaps and detergents.

Course Inorganic Chemical Industries

On successful completion of this course, students should be able to:

CO-1. Student will able to understand & explain the chemistry of Paper and Pulp Industries.

CO-2. Explain the importance role of manufacture of Nitrogen, sulphur and sulphuric acid industries.

CO-3. Have some knowledge of milk and milk products, composition and structure of milk importance.

CO-4. Have some knowledge of Leather Chemistry and manufacture, preparation of hides, cleaning, soaking, limiting and degreasing, finishing Products.

CO-5. Have acquired the skills to understand the Soil Chemistry.

Laboratory Courses

Course: Lab (Part-a): Industrial Chemistry-I

CO-1. Student will able to understand and identify given sample by gravimetrically and volumetrically.

CO-2. Student will able to find out the percentage of available chlorine in the given sample of bleaching Powder.

CO-3. Student will able to Prepare Copper Ferrite ($CuFe_2O_4$) & Find out percentage practical yield of the Copper Ferrite ($CuFe_2O_4$).

CO-4. Student will able to analyze the cement sample for its constituents.

CO-5. Student will able to determine the amount of copper and zinc from given sample of brass alloy.

Course: Lab (Part-b): Industrial Chemistry-II

CO-1. Student will able to understand & explain the preparation and estimation of compounds.

CO-2. Carry-out chromatographic techniques of TLC and column chromatography to separateand identify compounds from mixture from their R_f values.

CO-3. Student will able to prepare p – bromoacetanilide, Benzene azo β – Napthol.

CO-4. Student will able to Estimate Ibuprofen, caffeine in given sample.

CO-5. Student will able to execute separation of compounds and qualitative identification of compounds.

Course: Lab (Part-c): Industrial Chemistry-III

CO-1. Operate potentiometer to determine

a. Normality of each acid in a given mixture of strong acid and weak acid.

b. Solubility and solubility products salts of silver like AgCl,AfBr and AgI

CO-2. Carry out conductometric experiments to find out:

a. Normality of strong acid from mixture of strong acid and weak acid

b. Relative strengths of chloroacetic acid and acetic acid.

CO-3. Ability to do colorimetric experiments to verify Beer-Lambert law for copper-ammoniacomplex and determine unknown copper ion concentration

CO-4. Carry out thermometric measurement to determine heat of solution of simple salts likeKCl, NaCl, $MgCl_2$ in 1M solution and that of sparingly soluble salt like benzoic acid by solubility measurements.

CO-5. Student will able to determine hydrolysis constant of aniline hydrochloride by pH metry

Semeter IV

Course: Major Project

On successful completion of this course, students should be able to:

CO-1. To make links across different areas of knowledge and to generate, develop andevaluate ideas and information so as to apply these skills to the project task.

CO-2. Acquire the skills to communicate effectively and to present ideas clearly and coherentlyto specific audience in both the written and oral forms.

CO-3. Collaborative skills through working in a team to achieve common goals.

CO-4. Attain the skill to learn on their own, reflect on their learning and take appropriateactions to improve it.

CO-5. Develop a relevant and informed opinion, or point of view, that is appropriate for its audience and purpose.

CO-6. Demonstrate effective writing skills and processes by employing the techniques of academic writing, including invention, research, critical analysis and evaluation, and revision.

CO-7. Understand the role that effective presentations have in public/professional contexts and gain experience in formal/ informal presentation.

Mewar university

M.Sc Chemistry

Program Outcomes (PO)

PROGRAMME: M.Sc.(Organics Chemistry)

PO1: **Creative Thinking:** Students will be able to think creatively to propose novel ideas in explaining facts and figures or providing new solution to the problems in chemistry.

PO2: Interdisciplinary Approach: Students will realize how developments in any science & technology and engineering subject helps in the development of other science subjects and vice-versa and how interdisciplinary approach helps in providing better solutions and new ideas for the sustainable developments.

PO3: Personality Development: Students will imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.

PO4 Skills in research and industrial field: Students will build a scientific temper and will be able to learn the necessary skills to succeed in research or industrial field.

PO5 Communication Skills: Students will develop various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.

PO6 Environmental monitoring: Students will be able to understand the environmental issues Global warming, Climate change, Acid rain, Ozone depletion and will create awareness in society.

MEWAR UNIVERSITY

M.SC. Organic Chemistry

Program Specific Outcomes

PSO-1 Students will be able to explore new areas of research in Organic Chemistry and allied fields of science and technology.

PSO-2 Students will have ability to enter research and teaching as career after completing further higher studies by qualifying examinations conducted for the purpose.

PSO-3 Students will demonstrate proficiency in the use of appropriate library searching and retrieval methods to obtain information about a topic, chemical, chemical technique, or an issue relating to chemistry.

PSO-4 Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.

PSO-5 Effectively communicate the techniques and results of laboratory experiments/research through effectively written reports and oral presentations.

MEWAR UNIVERSITY

M.SC. Organic Chemistry

COs: M.Sc. Organic Chemistry

Semester-I

Course: Advanced Inorganic Chemistry (CYMS101)

On successful completion of this course, students should be able to:

- CO-1. Define different terms pertaining to symmetry in molecules.
- CO-2. Predict point symmetry group of molecules based on its symmetry elements.
- CO-3. Outline the structure, properties and reactions of transition metal carbonyls and nitrosyl complexes.
- CO-4. Interpret magnetic behavior of transition metal complexes from the electronicstructure.
- CO-5. Able to define the basics of inorganic chemistry.

Course: Recent Developments in Organic Chemistry-I (CYMS102)

On successful completion of this course, students should be able to:

- CO-1. Demonstrate an understanding of the effect of the electronic structuture on chemicalbonding and aromaticity.
- CO-2. Enumerate thermodynamics and kinetics of chemical reactions.
- CO-3. Interpret configuration and conformational analysis of organic compounds.
- CO-4. Explain nucleophilic substitution and elimination reactions.
- CO-5. Predict the mechanism of addition reaction of unsaturated systems.

Course: Course: Advanced Physical Chemistry- IV (CYMS 103)

On successful completion of this course, students should be able to:

- CO-1. Appreciate the basics of thermodynamics.

MEWAR UNIVERSITY Chittorgarh 312901 (Raj.)

CO-2. Interpret partial molar properties and its variation with temperatures and pressure.

CO-3. Enumerate the chemical potential of the system.

CO-4. Interpret valence bond and molecular orbital theory for diatomic molecules.

CO-5. Outline Huckel MO treatment for simple and conjugated polyenes.

CO-6. Identify crystal system and different types of crystal defects.

Course: Application of Mathematics and Computers in Chemistry (CYMS104)

On successful completion of this course, students should be able to:

CO-1. Evaluate the significant characteristics of data obtained in experiments.

CO-2. Intererpret data by statistical tools like correlation analysis scatter diagram and leastsquare analysis.

CO-3. Demonstrate understanding of mathematical tools like differentiation, intrgration, matrix, differential equation and logarithm as required for chemists.

CO-4. Recognize the importance computation in chemistry.

CO-5. Construct algorithms and flow charts for relevant problems.

CO-6. Recognize important features of computer high level languages like Fortran and C.

Course: Spectroscopic Techniques-I (CYMS105)

CO-1. List the electronic transitions and vibration frequencies of organic compounds withdifferent functional groups

CO-2. Enumerate the effects of interactions like hydrogen bonding and solvent in theelectronic and IR spectra.

CO-3. Demonstrate an understanding of Raman spectra of diatomic and polyatomiccompounds.

CO-4. Interpret structural features of different compounds from mass spectra and EPR.

CO-5. Analyze NMR spectra of organic compounds from its structures.

CO-6. Interpret spectral data to predict the structure of compounds.

Laboratory Courses (CYMS 105)

Course: Lab (Part-a) Inorganic Chemistry Practical-I

On successful completion of this course, students should be able to:

CO-1. Carry out gravimetric titration to quantitatively determine Silica and volumetrically Fe inan ore.

CO-2. Determine of Cu iodometrically and Fe volumetrically in a given sample of CopperFerrite.

CO-3. Determine capacities of cation and anion exchange resin in terms of milliequivallents/gof dry resin

CO-4. Know how to prepare Copper pyrites and determine percentage yield of Copper Ferrite.

Course: Lab (Part-a) Organic Chemistry Practical-I

On successful completion of this course, students should be able to:

CO-1. Execute separation of compounds and qualitative identification of compounds.

CO-2. Carry out the following synthesis:

a. acetylation of chlorestorol to prepare cholesteryl acetate.

b. Oxidation of adipic acid by chromic acid

c. Use of Grignard reagent to prepare triphenyl methanol from benzoic acid.

d. Aldol condensation to Dibenzal acetone from benzaldihyde

e. Sandmeyer reaction to prepare p-chlorotoluene from p-toluidine

f. Acetoacetic ester condensation to Preparation of ethyl-n-butylacetoacetate

g. Haloform reaction to for preparation of iodoform from acetone

CO-3. Perform preparation of anthranilic acid, floroscine and methyl orange in the laboratory.

Course: Physical Chemistry (Part-C)

CO-1. Operate potentiometer to determine

a. Normality of each acid in a given mixture of strong acid and weak acid.

b. Solubility and solubility products salts of silver like AgCl,AfBr and AgI

CO-2. Carry out conductometric experiments to find out:

a. Normality of strong acid from mixture of strong acid and weak acid

b. Relative strengths of chloroacetic acid and acetic acid.

CO-3. Ability to do colorimetric experiments to verify Beer-Lambert law for copper-ammoniacomplex and determine unknown copper ion concentration

CO-4. Carry out thermometric measurement to determine heat of solution of simple salts like KCl, NaCl, $MgCl_2$ in 1M solution and that of sparingly soluble salt like benzoic acid by solubility measurements.

Semester-II:

Course: Recent Developments in Organic Chemistry II

On successful completion of this course, students should be able to:

CO-1. Reproduce the mechanisms of important molecular rearrangement reactions.

CO-2. Be able to explain the important organic reactions with mechanism & their application.

CO-3. Outline synthetic strategy, disconnection & chemo selectivity of the reactions.

CO-4. Appreciate role and mechanism of action of protecting functional groups in

organicchemistry.

CO-5. Able to define the type of reaction.

Course: Bio-organic chemistry (CYMS203)

On successful completion of this course, students should be able to:

CO-1. Appreciate deleterious effects of excess metals like mercury, lead and arsenic in theenvironment.

CO-2. Classify vitamins as water soluble and fat soluble vitamins.

CO-3. Demonstrate an understanding of the structures of vitamins with their mechanism ofaction in human bodies.

CO-4. Interpret the cause of the AIDS disease from genetic changes in human bodies due tothe HIV.

CO-5. Recognize the structure of the anti-AIDS drugs.

CO-6. Discus the structure and properties of amino acids.

Course: Analysis and Separation techniques (CYMS204)

On successful completion of this course, students should be able to:

CO-1. Determine appropriate chromatographic technique for chemical analysis

CO-2. Comprehend the optimization of chromatographic methods

CO-3. Evaluate the quality of acquired data to predict the compounds

CO-4. Explain the principles electro-migration techniques of the most important liquid and gas chromatography.

CO-5. Evaluate strengths and limitations of the most important chromatographic separation and detection methods in relation to the properties of the sample and of the analysis task.

CO-6. Report chromatographic analyses in a scientifically sound and understandable (intelligible) way.

MEWAR UNIVERSITY

M.SC. Organic Chemistry

Course: Pericyclic and photochemistry (CYMS204)

On successful completion of this course, students should be able to:

CO-1. Compare different pericyclic reactions and their mechanism.

CO-2. Outline different physical processes of photochemistry.

CO-3. Enumerate photochemistry of alkenes.

CO-4. Interpret the photochemical reactions of ketones

CO-5. Explain important photochemical reactions undergone by aromatic compound

Course: Polymer Chemistry and organometallic compounds (CYMS 303)

On successful completion of this course, students should be able to:

CO-1. Classify polymers based on its structure.

CO-2. Enumerate different properties of polymers.

CO-3. Identify different important monomers and their manufacturing process.

CO-4. Evaluate the application and the synthesis of polymers.

CO-5. Outline the preparation and properties of transition metal complexes andorganometallic compounds of main group elements.

Course: Laboratory Course-II

On successful completion of this course, students should be able to:

Part-a: Inorganic Chemistry-Practical –II

CO-1. Determine the amounts of Zn and Fe present in a sample of zinc ferrite volumetrically and complexometrically respectively.

CO-2. Determine the influence of surface area and time on the rate of corrosion process.

CO-3. Estimate the amount of cadmium and zinc from mixture by anion exchange

chromatic method.

CO-4. Preparation of zinc ferrite and pentathiourea dicuprous nitrate to determine the percentage yield.

CO-5. Estimation of the phosphoric acid in cola drinks by molybdenum blue method.

Part-b: Organic Chemistry Practical-II

CO-1. Perform the following quantitative analysis:

a. determine the percentage and number of hydroxyl groups in organic compound byacetylation method.

b. Estimate amines and phenols using bromated-bromide and acetylation method

CO-2. Determine iodine and saponification value of an oil sample.

CO-3. Perform laboratory experiments to determine dissolved oxygen, COD and BOD of watersamples.

CO-4. Carry out multi-step synthesis by the following reactions:

(a) Cannizzaro reaction using 4-chlorobenzaldehyde as substarte

(b) Benzilic acid rearrangement:benzilic acid from benzaldehyde via benzoin and benzilintermediates respectively.

(c) Hofmann bromamide rearrangement: Anthranilic acid from pthalic anhydride vis pthalimide intermediate.

(d) Beckmann rearrangement: Benzophenone from benzene.

CO-5. Perform phase transfer catalysis using diethyl malonate or ethy acetate and alky halide.

Part-C: Physical Chemistry-II

At the end of the course, students should be able to:

CO-1. Construct phase diagram for three component system containing C_2H_5OH, C_6H_6 and H_2O.

CO-2. Use colorometry method to find out concentration of ammonia in an unknown solution.

CO-3. Perform potentiometry to find out redox potential of Fe^{+3}/Fe^{+2} sysytem and

amount ofhalide in a given mixture of KCl and KBr.

CO-4. Determine the solubility of PbI_2 in presence of different concentrations of KNO3 and KClrespectively.

CO-5. Determine the solubility of sparingly soluble salts like PbSO4, AgIO3 and Ag2CrO4through conductometric experiments.

Semester-III

Course: Heterocyclic chemistry

At the end of the course, students should be able to:

CO-1. Familiar with the structures of important classes of heterocyclic aromatic organiccompounds.

CO-2. Classify simple heterocyclic aromatic compounds as electron deficient or electron richand explain their reactivity based on these properties.

CO-3. Know how selected organometallic reactions can be applied in heterocyclic chemistry.

CO-4. Explain on a mechanistic level, reactions and synthesis of important electron deficient nitrogen containing heterocycles; pyridines, diazines and their benzo-condenced analogs.

CO-5. Explain on a mechanistic level,the reactions and synthesis of important electron rich heterocycles like furans, pyrroles and thiophenes and 1,3-azoles, and benzo-condensed analogs.

Course: Recent Developments in Organic Chemistry-III

CO-1. Appreciate what is phase transfer catalysis and its types and mechanism of action

CO-2. Outline the methods of preparation of PTCs like macrocyclic ether,quartenery salts,tetrahexyl ammonium bromide,hexa decyl tributylphosphonium bromide and their applications in organic synthesis.

CO-3. Explain microwave spectroscopy for diatomic molecules considering it as rigid rotor.

CO-4. Calculate bond-length and bond –energy from rotational spectra of diatomic molecules.

CO-5. Outlines the principle of working of microwave spectrophotometer.

CO-6. Know the types of sonochemical reactions and their synthetic applications and polymersupported reagents.

CO-7. Appreciate different aspects of research methodology for carrying out research systematically.

Course: Recent Developments in Organic Chemistry IV

On successful completion of this course, students should be able to:

CO-1. Outline the classification, nomenclature and brief idea of drugs.

CO-2. Elucidate structure of drug receptors & mechanism of drug action.

CO-3. Explain the importance role of supramolecular chemistry in organic chemistry, chemical biology, materials science and nanotechnology.

CO-4. Enumerate non-covalent interactions, molecular recognition and self-assembly.

CO-5. Describe important applications of supramolecular chemistry particularly in dynamic combinatorial chemistry, materials chemistry (e.g. soft materials), biological systems and the construction of nanoscale entities.

CO-6. Classify nanoparticles based on their structures.

CO-7. Outline the applications of nano-particles in sensors, catalysis, cells and drug delivery.

Course: Natural Products

On successful completion of this course, students should be able to:

CO-1. Identify and characterize various classes of natural products by their structures.

CO-2. Appreciate the biogenesis of many natural products of importance.

CO-3. Have some knowledge of some of the plants around them and their pharmaceutical importance.

CO-4. Have some knowledge of bacteria, fungi and other life forms from which useful pharmaceuticals are derived.

CO-5. Have acquired the skills to understand the isolation and purification of simple products that are derived from plants and some animals.

CO-6. Students will become familiar with various types of natural products produced by plants, microorganisms, and from marine sources together with applications in medicinal chemistry.

Laboratory Courses

Course: Lab (Part-a): Organic preparation and separation of organic compounds

CO-1. Separate and identify organic compound from a mixture through systematic study.

CO-2. Carry out recrystallisation of compounds; find out melting point and naming ofcompound referring to literature.

CO-3. Prepare an organic compound through a single step reaction or multi-step reactionsthrough intermediate.

CO-4. Have acquired the skills to understand the isolation and purification of simple products that are derived from plants and some animals.

CO-5. Students will become familiar with various types of natural products produced by plants, microorganisms, and from marine sources together with applications in medicinal chemistry.

MEWAR UNIVERSITY Chittorgarh-312901 (Raj.)

Course: Lab (Part-b): Spectroscopic Identification and chromatographic separation of organiccompounds

CO-1. Interpret data of UV, IR ,^{1}H NMR,^{13}C NMR and Mass spectra to identify organiccompounds.

CO-2. Carry-out chromatographic techniques of TLC and column chromatography to separateand identify compounds from mixture from their R_f values.

Course: Lab (Part-c):Biological Activity Lab

CO-1. Run and operate microbiology lab equipments like microscope, incubators andshakers.

CO-2. Carry-out electrophoresis experiments.

CO-3. Prepare culture media, slides and staining of slides

CO-4. Ability to sample and quantify microorganism in air, soil and water.

Semeter IV

Course: Major Project

On successful completion of this course, students should be able to:

CO-1. To make links across different areas of knowledge and to generate, develop andevaluate ideas and information so as to apply these skills to the project task.

CO-2. Acquire the skills to communicate effectively and to present ideas clearly and coherentlyto specific audience in both the written and oral forms.

CO-3. Collaborative skills through working in a team to achieve common goals.

CO-4. Attain the skill to learn on their own, reflect on their learning and take appropriateactions to improve it.

CO-5. Develop a relevant and informed opinion, or point of view, that is appropriate for its audience and purpose.

CO-6. Demonstrate effective writing skills and processes by employing the techniques of academic writing, including invention, research, critical analysis and evaluation, and revision.

CO-7. Understand the role that effective presentations have in public/professional contexts and gain experience in formal/ informal presentation.

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

Program Outcomes

At the end of the program, the student will be able to:

PO	Outcome
PO-1	**Disciplinary knowledge:** The basic objective of this program to impart knowledge of Chemistry more effectively.
PO-2	**Designing Solutions:** To develop skill in practical work, experiments and laboratory materials and equipment's along with the collection and interpretation of scientific data to contribute to Chemistry.
PO-3	**Modern tool usage:** The students will be able to learn necessary computational skill, use of technology and use of ICT required for an effective learning experience
PO-4	**Employability:** The program makes the students ready to take up jobs in various sectors such as research labs, chemical industry, testing laboratories, software company, banks, governments organizations, etc.
PO-5	**Lifelong Learning :** The students will be eligible to appear for the examinations for their jobs in government organizations
PO-6	**Communication Skill:** Communicate effectively on scientific activities by participating in Chemistry related activities, writing effective reports and making effective presentations.
PO-7	**Research Skills**: The program leads the students to the advanced studies i.e. M. Sc and then do some research in multi and inter-disciplinary science for the welfare of the society.
PO-8	**Lifelong Learning:** Graduates will recognize the importance of continuous learning and professional development, staying up-to-date with current trends and advancements in the sciences throughout their careers.

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

Program Specific Outcomes (PSOs):

After completing B.Sc. the student should have:

PSO1: Students should be able to do better and more effective communication of Chemistry, Mathematics, Physics, Botany and Zoology.

PSO2: Students should be able to illustrate mathematical ideas from basic theorems and axioms.

PSO3: Students should be able to apply Chemistry/Mathematics/Physics/Botany/Zoology to solve and analyze theoretical problems.

PSO4: Students should be able to identify applications of Chemistry/Mathematics/Physics/Botany/Zoology in other disciplines in the real world, leading to the enhancement of career prospects in a relevant field and research.

PSO5: Acquire ability to face competitive exams for higher study in a chosen subject and procedural knowledge required for professional engagement in research, industry, teaching or other service.

PSO6: Understand good laboratory practices and safety and develop research oriented skills

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

COURSE OUTCOMES:

CHEMISTRY SUBJECTS:

ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS

CO-1: Demonstrate a comprehensive understanding of the fundamental principles and theories of atomic structure, bonding, and general organic chemistry.

CO-2: Apply the knowledge of atomic structure and bonding to predict the properties and reactivity of elements, compounds, and molecules.

CO-3: Analyze and interpret the various types of chemical bonding, including covalent, ionic, and metallic bonding, to explain the formation and stability of chemical species.

CO-4: Describe the nomenclature, classification, and reactions of aliphatic hydrocarbons, including alkanes, alkenes, and alkynes, and predict their physical and chemical properties based on their structures.

CO-5: Apply the principles of aliphatic hydrocarbons and their reactions to solve problems related to organic synthesis, functional group transformations, and structure-activity relationships.

CHEMICAL ENERGETICS, EQUILIBRIA & FUNCTIONAL ORGANIC CHEMISTRY

CO-1: Analyze the principles and concepts of chemical energetics and equilibria in order to explain the thermodynamics and kinetics of chemical reactions.

CO-2: Apply the laws of thermodynamics and equilibrium concepts to solve numerical problems related to chemical reactions, including the calculation of enthalpy, entropy, and free energy changes.

CO-3: Evaluate the factors that influence chemical equilibria, such as temperature, pressure, concentration, and catalysts, and predict the direction of reactions based on Le Chatelier's principle.

CO-4: Demonstrate an understanding of functional organic chemistry by identifying and classifying different functional groups, as well as explaining their chemical reactivity and significance in organic compounds.

CO-5: Apply the principles of functional group transformations, reaction mechanisms, and organic synthesis to design and propose synthetic routes for the preparation of specific organic compounds.

SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY & FUNCTIONAL GROUP ORGANIC CHEMISTRY-II

CO-1: Analyze and apply the principles of solutions and phase equilibrium in chemical systems.

CO-2: Evaluate the conductance of electrolytes and its correlation to the concentration and temperature, applying the relevant theories and concepts.

CO-3: Examine the principles of electrochemistry and its applications in various chemical processes, including batteries, corrosion, and electroplating.

CO-4: Apply the knowledge of functional groups in organic chemistry to identify, classify, and predict the reactivity and properties of organic compounds.

CO-5: Formulate and solve problems related to the interplay between solution properties, phase equilibrium, conductance, electrochemistry, and functional group organic chemistry, demonstrating critical thinking and problem-solving skills.

INORGANIC CHEMISTRY-I

CO-1: Analyze the principles of Inorganic chemistry and demonstrate a comprehensive understanding of the structure, bonding, and properties of transition metal complexes.

CO-2: Apply the theories and concepts of Inorganic chemistry to predict the geometries, electronic configurations, and magnetic properties of compounds.

CO-3: Analyze and interpret the various types of chemical bonding, including covalent, ionic, and metallic bonding, to explain the formation and stability of chemical species.

CO-4: Investigate the physical properties of states of matter, including solids, liquids, and gases, and explain their behavior based on the underlying principles of intermolecular forces and molecular interactions.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

MEWAR UNIVERSITY

B.SC. (H) CHEMISTRY

POLYMER CHEMISTRY

CO-1: Demonstrate the fundamental principles of polymer chemistry and comprehensive understanding of the key concepts and theories related to polymers, such as polymerization mechanisms and polymer structure.

CO-2: Analyze the synthesis methods for different types of polymers and discuss various polymerization techniques, including addition and condensation polymerizations, and their applications.

CO-3: Evaluate polymer structure influences physical and chemical properties, including mechanical, thermal, and electrical properties.

CO-4: Examine polymer processing and manufacturing techniques and explain the methods used to process and manufacture polymers into various products, such as extrusion, injection molding, and casting.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

TRANSITION METAL & COORDINATION CHEMISTRY, STATES OF MATTER & CHEMICAL KINETICS

CO-1: Analyze the principles of coordination chemistry and demonstrate a comprehensive understanding of the structure, bonding, and properties of transition metal complexes.

CO-2: Apply the theories and concepts of coordination chemistry to predict the geometries, electronic configurations, and magnetic properties of transition metal complexes.

CO-3: Evaluate the role of ligands in coordination chemistry and their effects on the reactivity, stability, and color of transition metal complexes.

CO-4: Investigate the physical properties of states of matter, including solids, liquids, and gases, and explain their behavior based on the underlying principles of intermolecular forces and molecular interactions.

CO-5: Examine chemical kinetics and reaction rates, and utilize mathematical models to analyze and predict the factors affecting the rate of chemical reactions, including temperature, concentration, and catalysts.

PHYSICAL CHEMISTRY-I

CO-1: Analyze the principles of Physical chemistry and demonstrate a comprehensive understanding of the solid state, liquid state and gaseous state..

CO-2: Apply the theories and concepts of Physical chemistry to explain the laws, phenomenon's, thermodynamics and mechanics of compounds.

CO-3: Analyze and interpret the various types of laws, phenomenon's, thermodynamics and mechanics to explain the formation and stability of chemical species.

CO-4: Investigate the physical properties of states of matter, including solids, liquids, and gases, and explain their behavior based on the underlying principles of intermolecular forces and molecular interactions.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

GREEN CHEMISTRY

CO-1: Analyze the principles of Green chemistry and demonstrate a comprehensive understanding of the Green Synthesis, Green Routes and Processes.

CO-2: Apply the theories and concepts of Green chemistry to explain the combinatorial green chemistry, ultrasonic chemistry and microwave chemistry of compounds.

CO-3: Analyze and interpret the various types of green routes of synthesis, interconversions and solventless reactions to explain the formation and stability of compounds.

CO-4: Investigate the design and use chemicals and materials that are less toxic to humans and the environment. This leads to safer products for consumers and workers who handle these substances.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

ORGANIC CHEMISTRY-I

CO-1: Analyze the principles of Organic chemistry and demonstrate a comprehensive understanding of the nomenclature, hybridization, shapes, Stereochemistry, reactivity and stability of organic compounds..

CO-2: Apply the theories and concepts of Organic chemistry to explain the classification, structure, effects, reactions, bonding, configurational and conformational analysis of organic compounds.

CO-3: Analyze and interpret the various phenomenon of compounds such as hybridization, resonance, hyper conjugation, dipole moment, intermediate formation, bond cleavage, projection formulas, isomers and aromatic characteristics to explain the formation and stability of chemical species.

CO-4: Investigate various phenomenon of compounds such as hybridization, resonance, hyper conjugation, dipole moment, intermediate formation, bond cleavage, projection formulas, isomers and aromatic characteristics to explain the formation and stability of chemical species.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

PHYSICAL CHEMISTRY-II

CO-1: Analyze the principles of Physical chemistry and demonstrate a comprehensive understanding of the Thermodynamics, Thermochemistry, Chemical Equilibrium and solutions.

CO-2: Apply the theories and concepts of Physical chemistry to explain the laws of thermodynamics, state functions, Gibbs energy, Rault's law, Hemry's Law and colligative properties of compounds.

CO-3: Analyze and interpret the various types of laws, phenomenon's, thermodynamics and solutions colligative properties to explain the formation and stability of chemical species.

CO-4: Investigate the laws of thermodynamics, state functions, Gibbs energy, Rault's law, Hemry's Law and colligative properties of compounds

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

INORGANIC CHEMISTRY-II

CO-1: Analyze the principles of Inorganic chemistry and demonstrate a comprehensive understanding of the metallurgy, acid and bases, periodic properties, Noble gases and inorganic polymers.

CO-2: Apply the theories and concepts of Inorganic chemistry to occurrence of metals, standard electrode potential, HSAB Principles, Hydride transfer, VSEPR theory and synthesis, structure, applications of Inorganic polymers.

CO-3: Analyze and interpret the occurrence of metals, standard electrode potential, HSAB Principles, Hydride transfer, VSEPR theory and synthesis, structure, applications of Inorganic polymers, to explain the formation and stability of chemical species.

CO-4: Investigate the metallurgy, acid and bases, periodic properties, Noble gases and inorganic polymers.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

ORGANIC CHEMISTRY-II

CO-1: Analyze the principles of Organic chemistry and demonstrate a comprehensive understanding of the alkyl and aryl halides, alcohol, phenol, ether, epoxide, aldehyde, ketone, carboxylic acid and its derivatives.

CO-2: Apply the theories and concepts of Organic chemistry to explain the nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects, Relative

reactivity of alkyl, allyl/benzyl,vinyl and aryl halides towards nucleophilic substitution reactions, preparation and properties of organic compounds.

CO-3: Analyze and interpret the various phenomenon of compounds such as hybridization, resonance, hyper conjugation, dipole moment, intermediate formation, bond cleavage, projection formulas, isomers and aromatic characteristics to explain the formation and stability of chemical species.

CO-4: Investigate various types of organic reactions, nucleophilic substitution reactions – SN1, SN2 and SNi mechanisms with stereochemical aspects, Relative reactivity of alkyl, allyl/benzyl,vinyl and aryl halides towards nucleophilic substitution reactions, preparation and properties of organic compounds.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

ANALYTICAL METHODS IN CHEMISTRY

CO-1: Apply mathematical and statistical methods to analyze chemical data and draw meaningful conclusions.

CO-2: Demonstrate proficiency in using various analytical techniques and instruments for qualitative and quantitative chemical analysis.

CO-3: Design and execute experiments to determine the composition and properties of chemical substances using appropriate analytical methods.

CO-4: Evaluate and interpret experimental data using statistical tools and present the results effectively in written and graphical formats.

CO-5: Apply critical thinking and problem-solving skills to troubleshoot analytical challenges and propose appropriate solutions in the field of chemistry.

PHYSICAL CHEMISTRY-III

CO-1: Analyze the principles of Physical chemistry and demonstrate a comprehensive understanding of the Phase Equilibrium, Chemical Kinetics, Catalysis and Surface Chemistry.

CO-2: Apply the theories and concepts of Physical chemistry to explain the degrees of freedom, Gibbs Phase Rule, Clausius-Clapeyron equation, Phase diagrams, Gibbs-Duhem-Margules equation, Nernst distribution law, Order and molecularity of a reaction, Collision theory, acid-base catalysis, Michaelis-Menten mechanism, Physical adsorption, chemisorption, adsorption isotherms and mechanisms of catalyzed reactions at solid Surfaces.

CO-3: Analyze and interpret the various types of degrees of freedom, Gibbs Phase Rule, Clausius-Clapeyron equation, Phase diagrams, , Nernst distribution law, Order and molecularity of a reaction, Collision theory, acid-base catalysis, , Physical adsorption, chemisorption, and mechanisms of catalyzed reactions at solid Surfaces.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.

INORGANIC CHEMISTRY-II

CO-1: Analyze the principles of Inorganic chemistry and demonstrate a comprehensive understanding of the coordination chemistry, transition elements, Lanthanoids and Actinoids.

CO-2: Apply the theories and concepts of Inorganic chemistry to explain coordination chemistry, transition elements, Lanthanoids, Actinoids and Bioorganic Chemistry.

CO-3: Analyze and interpret the coordination chemistry, transition elements, Lanthanoids, Actinoids and Bioorganic Chemistry to explain the formation and stability of chemical species.

CO-4: Investigate the metallurgy, acid and bases, periodic properties, Noble gases and inorganic polymers.

CO-5: Communicate scientific findings and observations effectively through well-organized laboratory reports, including concise summaries, detailed procedures, accurate calculations, and insightful discussions, following the standard format and scientific writing conventions.