

Chemistry Department, University of Luck now, Lucknow
M.Sc.(Chemistry) UNDER CBCS (with effect from 2015 onwards)
Theory and Practical papers in each semester

M.Sc. (Chemistry) Semester-I

Paper	Title of the paper	Hrs	Credit	Int. Ass.	Uni. Exam.	Marks
Paper-I	CH-101: Inorganic Chemistry	52	4	30	70	100
Paper-II	CH-102: Organic Chemistry	52	4	30	70	100
Paper-III	CH-103: Physical Chemistry	52	4	30	70	100
Paper-IV (Elective)	CH-105: Concepts of Chemistry	40	3	30	70	100
Paper-V	Practical (CH-104A+CH-104B+CH-104C)	104	8	-	200 (66+66+68)	200

M.Sc. (Chemistry) Semester-II

Paper	Title of the paper	Hrs	Credit	Int. Ass.	Uni. Exam.	Marks
Paper-I	CH-201: Inorganic Chemistry	52	4	30	70	100
Paper-II	CH-202: Organic Chemistry	52	4	30	70	100
Paper-III	CH-203: Physical Chemistry	52	4	30	70	100
Paper-IV (Elective)	CH-205: Inorganic Chemistry	40	3	30	70	100
Paper-V	Practical (CH-204A+CH-204B+CH- 204C)	104	8	-	200 (66+66+68)	200

M.Sc. (Chemistry) Semester-III

Paper	Title of the paper	Hrs	Credit	Int. Ass.	Uni. Exam.	Marks
Paper-I	CH-301: Inorganic Chemistry	52	4	30	70	100
Paper-II	CH-302: Organic Chemistry	52	4	30	70	100
Paper-III	CH-303: Physical Chemistry	52	4	30	70	100
Paper-IV (Elective)	CH-305: Organic Chemistry	40	3	30	70	100
Paper-V	Practical (CH-304A+CH-304B+CH-304C)	104	8	-	200 (66+66+68)	200

M.Sc. (Chemistry) Semester-IV (One theory paper will be taken from each branch)

Paper	Title of the paper	Hrs	Credit	Int. Ass.	Uni. Exam.	Marks
Paper-I	CH-401: Inorganic Chemistry: Bioinorganic & Supramolecular Chemistry	52	4	30	70	100
Paper-II	CH-402: Inorganic Chemistry: Organotransition metal Chemistry	52	4	30	70	100
Paper-III	CH-403: Organic Chemistry: Organic Synthesis	52	4	30	70	100
Paper-IV	CH-404: Organic Chemistry: Medicinal Chemistry	52	4	30	70	100
Paper-V	CH-405: Physical Chemistry: Polymers	52	4	30	70	100
Paper-VI	CH-406: Physical Chemistry: Electrochemistry	52	4	30	70	100
Paper-VII (Elective)	CH-408: Physical Chemistry	40	3	30	70	100
	Practical (CH-407A+CH-407B+CH-407C):	104	6	-	150 (50+50+50)	150
	CH-407D: Seminar		2	50	-	50

M.Sc. Chemistry
University of Lucknow

Programme Outcome

- PO-1.** Demonstrate, solve and understand the major concepts in all disciplines of Chemistry independently and in group as well as draw logical conclusions through Project and Seminar Presentation.
- PO-2.** Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of Chemistry experiments
- PO-3.** Equip students to face the employment challenges and instil confidence to turn into entrepreneur and also step into research career.
- PO-4.** Generation of new scientific insights or to the innovation of new applications of chemical research
- PO-5.** Present scientific and technical information resulting from laboratory experimentation in both written and oral formats.
- PO-6.** Apply modern methods of analysis to chemical systems in a laboratory setting.
- PO-7.** The students will become well versed in the mechanisms of all types of high level and complicated chemical reactions.
- PO-8.** The students will improve their competencies on par with their counterparts in premier institutions across the nation.

Programme Specific Outcome

- PSO-1.** Appreciates the importance of various elements present in the periodic table, coordination chemistry and structure of molecules, properties of compounds, structural determination of complexes using theories and instruments.
- PSO-2.** Gathers attention about the physical aspects of atomic structure, dual behaviour, reaction pathways with respect to time, various energy transformations, molecular assembly in nanolevel, significance of electrochemistry, molecular segregation using their symmetry.
- PSO-3.** Learns about the potential uses of analytical, industrial and medicinal chemistry.
- PSO-4.** Understand and apply principles of Organic Chemistry for understanding the scientific phenomenon in Reaction mechanisms, Stereochemistry, Organic Synthesis, complex chemical structures, instrumental method of chemical analysis, molecular rearrangements and separation techniques.
- PSO-5.** Study of organometallic reactions.
- PSO-6.** Study of biological mechanisms using amino acids.
- PSO-7.** Learn the classical status of thermodynamics.
- PSO-8.** Carry out laboratory experiments taught in Core Theory papers and to understand good laboratory practices with safety.
- PSO-9.** Enhance students' ability to develop mathematical models for physical systems.
- PSO-10.** Global level research opportunities to pursue Ph.D. programme targeted approach of CSIR/UGC – NET examination
- PSO-11.** Discipline specific competitive exams conducted by various service commissions

M.Sc. Chemistry Semester I
Paper I-CH-101: Inorganic Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

- CO-1.** Students gain newer insight regarding the symmetry, bonding, electronic and magnetic properties of inorganic compounds and coordination complexes.
- CO-2.** This forms the basis of the development of newer molecule based materials which can offer attractive electronic properties at the molecular level, supermolecular and supramolecular level.
- CO-3.** Also, the content dealing with the magnetic properties may create zeal amongst the students to design and develop new single molecule magnets which now a day are getting attraction as the contrast agents in magnetic resonance imaging (MRI).

M.Sc. Chemistry Semester I
Paper II-CH-102: Organic Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

All our post-graduate students will be able to:

- CO-1.** Learn and understand the concept and definitions of aromaticity of aromaticity, nonaromaticity and antiaromaticity.
- CO-2.** Know what is of aliphatic electrophilic substitution reactions its mechanism and outcome of these reactions.
- CO-3.** Understand properties and reactivity of stereoisomers, recognize stereochemistry, applications of Cahn-Ingold-Prelog system to an organic molecule and apply stereochemical aspects to reaction mechanism.
- CO-4.** Understand the various types of aliphatic nucleophilic substitution reactions and the processes involved.
- CO-5.** Learn the mechanisms for various organic reactions and their applications in understanding the outcome of unknown reactions.
- CO-6.** Learn and understand molecular orbital symmetries and various theories applicable on thermal and photochemical pericyclic reactions and different preicyclic name reactions.

M.Sc. Chemistry Semester I
Paper III-CH-103: Physical Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

Student will acquire the knowledge of:

- CO-1.** The applications of mathematical tools to calculate the thermodynamic and kinetic properties.
- CO-2.** The theories of kinetics and thermodynamics of reaction rates with special reference to kinetic salt effect.
- CO-3.** Basic surface chemistry, macromolecules, micelles, electrochemistry and electro diffraction giving firm foundation in the fundamentals and applications.

M.Sc. Chemistry Semester I
Paper IV- (CH-104A, CH-104B, CH-104C) : Practical

Credits 8

MM 200 (66+66+68)

Course Outcome:

In order to make students understand the theories taught to them in M.Sc. semester I in different branches of chemistry e.g. Inorganic, Organic, Physical, the following practical are introduced. Students will learn:

- CO-1.** Qualitative analysis of inorganic mixtures and insolubles.
- CO-2.** Separation techniques of cations and anions by chromatography.
- CO-3.** Qualitative analysis of three component organic mixture.
- CO-4.** The basic knowledge like preparation of solutions standardization of secondary solution, dilution, calibration and handling of some sophisticated electronic related to the practical syllabus.
- CO-5.** The basic knowledge of conductance, e.m.f, pH, kinetics and partition coefficient.
- CO-6.** To focus their aim for future prospects of Ph.D programme and Pharmaceutical industry.

M.Sc. Chemistry Semester-I (Elective)
Paper V-CH-105 : Concepts of Chemistry

Credits 3

MM = 100 (70+30)

Hours 40

Course Outcome:

After the completion of the course the students will acquire the knowledge of:

- CO-1.** Use of arrow notations in Organic reactions mechanism, different kinds of polymer and their importance, different techniques of polymerization, each quantum number represents and how to obtain quantum numbers for any electron in an atom and determine the number of protons, neutrons, electrons and nuclei in elements and compounds.
- CO-2.** Periodic properties of all the elements, electronegativity and whether a bond is metallic, ionic, covalent or polar covalent.
- CO-3.** Predict atomic structure, chemical bonding or molecular geometry based on accepted models
- CO-4.** Electronic effects operates in covalent bonds, Types of Reactions and different types of Intermediates formed during the reactions
- CO-5.** Appropriate method of solution for a variety of Mathematic problems, basic physical quantities and various gas Laws for observation of behaviour of gas and Kinetic molecular model.

M.Sc. Chemistry Semester II
Paper I - CH 201: Inorganic Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

- CO-1.** In this semester students learn the reaction mechanism and vibrational properties associated with inorganic coordination complexes which now-a-days are gaining importance as
 - Homogenous catalysts
 - Electron transfer agents
 - Sensors to detect ions as well as molecules such as nitroaromatic compounds a noxious compound utilized as an ingredient in explosives
 - Sensitizers in new-generation solar cells
- CO-2.** To asses and describe the bonding properties in the targeted compounds which have been designed for above mentioned applications Fourier-Transform IR Spectroscopy and Raman spectroscopy have to be utilised. So, the student after accomplishing this semester is supposed to become expert in assessing the bonding situations in varied types of compounds.

CO-3. The bond formation is an important phenomenon in chemistry. In this semester students learn about the design of different highly reactive but potent organometallic compounds.

CO-4. This information can be a stepping stone to such students who are willing to excel themselves in industries in particular dealing with pharma sector.

M.Sc. Chemistry Semester II
Paper II - CH 202: Organic Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

All our post-graduate students will be able to:

CO-1. Understand what are aromatic electrophilic and nucleophilic substitutions and free radical reactions and their mechanism with the help of suitable examples.

CO-2. Understand and reproduce accepted mechanisms of addition reactions between carbon- carbon multiple bonds, carbon- hetero atom multiple bonds and mechanism of some specific name reactions.

CO-3. Explain elimination reactions with the help of specific examples.

CO-4. Understand the instrumental techniques, terms used in various spectroscopy and interpretation of spectra and to determine the structure of organic molecules using ¹H NMR, ¹³C NMR, Mass, UV and IR spectroscopic techniques.

M.Sc. Chemistry Semester II
Paper III - CH 203: Physical Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

Course Outcome:

Students will recognize the importance of:

CO-1. The limitation of classical thermodynamics, statistical thermodynamic and non-equilibrium thermodynamics.

CO-2. The difference between the classical and quantum mechanics.

CO-3. The connections between common approximation methods and standard chemical frame works (eg. Born oppenheimer approximation, molecular orbital theory).

M.Sc. Chemistry Semester II
Paper IV - (CH-204A, CH-204B, CH-204C) : Practical

Credits 8

MM 200 (66+66+68)

Course Outcome:

In order to make students understand the theories taught to them in M.Sc. semester(II) in different branches of chemistry e.g. Inorganic, Organic and Physical Chemistry, the following practicals are introduced .Students will learn:

CO-1. Qualitative analysis and determination of two metal ions volumetrically and gravimetrically.

CO-2. The preparation of selected inorganic compounds and their characterization by spectroscopic method.

CO-3. Two steps synthesis involving different name reactions.

CO-4. The basic knowledge like preparation of solution, standardization of secondary solution, dilution, calibration, and handling of some sophisticated electronic related to the practical syllabus.

CO-5. The basic knowledge of conductance measurement, Ostwald dilution law, solubility of sparingly soluble substance, potentiometry, pH- metery, order of reaction, saponification of an ester, phase diagram of three component system, inversion of cane sugar by polarimetry and kinetics using Visible spectrophotometer.

CO-6. To focus their aim for future prospects of Ph.D. programme and Pharmaceutical industry.

M.Sc. Chemistry Semester-II (Elective)
Paper V- CH-205 : Inorganic Chemistry

Credits 3

MM = 100 (70+30)

Hours 40

Course Outcome:

- CO-1. To understand the general characteristics of the s, p, d and f block elements
- CO-2. To study the physical and chemical properties of s, p, d and f block elements
- CO-3. To study the various periodic properties of elements
- CO-4. To explain the formation of different types of compounds and their industrial application
- CO-5. To predict the hybridisation and geometry of simple molecules
- CO-6. To explain the different types of hybridisation, magnetic behaviour and shape of complexes.
- CO-7. To understand the chemistry, analytical and their industrial application of lanthanides and actinides compounds.

M.Sc. Chemistry Semester III
Paper I – CH 301: Inorganic Chemistry

Credits 4

M.M. = 100 (70+30)

Hours 52

Course Outcome:

- CO-1. This semester deals with the some brief glimpses of bioinorganic and detailed investigation of multi-nuclear nuclear magnetic resonance (NMR) for diamagnetic compounds comprising of ^{19}F , ^{31}P , ^{119}Sn , ^{195}Pt and some other nuclei and Electron Spin Resonance (ESR) studies of paramagnetic compounds.
- CO-2. Additionally, students get knowledge about the various pollutants existing in nature and their plausible solutions to cope with.
- CO-3. After completing this semester the students are supposed to have some expertise in dealing with the multinuclear NMR and ESR.
- CO-4. Also, they may get motivated to have inclination towards the bioinorganic chemistry in the next semester.

M.Sc. Chemistry Semester III
Paper II – CH 302: Organic Chemistry

Credits 4

M.M. = 100 (70+30)

Hours 52

Course Outcome:

All our post-graduate students will be able to:

- CO.1- Know about the Nuclear magnetic resonance spectroscopy. Proton chemical shift, spin-spin coupling, coupling constants and applications to organic structures ^{13}C resonance spectroscopy.
- CO-2. Learn the Mass spectrometry and its applications.
- CO-3. Perform characterization of compounds using 1- and 2-dimensional NMR techniques (^1H and ^{13}C), mass spectrometry, infrared and UV spectroscopic techniques for organic structure elucidation of organic molecules.
- CO-4. Learn and understand the basics of photochemical reactions of alkenes, carbonyl and aromatic compounds.
- CO-5. Understand the fundamental properties and reactivity of biologically important carbohydrates molecules.
- CO-6. Understand the mechanism of action of enzymes, enzyme catalysed reactions, enzyme models and applications of enzymes.

M.Sc. Chemistry Semester III
Paper III – CH 303: Physical Chemistry

Credits 4

M.M. = 100 (70+30)

Hours 52

Course Outcome:

Student will gain knowledge of:

- CO-1.** Basic theories and kinetics of solid state reactions.
- CO-2.** Perfect and imperfect crystals and their defects. They will also gain the knowledge of electronic properties and band theory.
- CO-3.** The quantum theory of paramagnetic hysteresis.
- CO-4.** The electrical conducting solids and new superconductors.
- CO-5.** How to determine reaction mechanism and what is the gas phase photolysis.
- CO-6.** The experimental techniques and photochemical processes.
- CO-7.** The biopolymers, their interaction, their thermodynamics and their molecular weight determination.
- CO-8.** The bioenergetics and statistical mechanism in biopolymers.
- CO-9.** The structure and function of cell membrane, transports of ions and application of diffraction methods.

M.Sc. Chemistry Semester III
Paper IV- (CH-304A, CH-304B, CH-304C) : Practical

Credits 8

MM = 200 (66+66+68)

Course Outcome:

In order to make students understand the theories taught to them in M.Sc. semester (III) in different branches of chemistry e.g. Inorganic, Organic and Physical, the following practicals are introduced. Students will learn:

- CO-1.** Gravimetric estimation of complex mixture involving two or three constituents and analysis of alloys and minerals.
- CO-2.** Volumetric estimations and various titrations
- CO-3.** Qualitative analysis, acetylation method, saponification value and extraction of organic compounds.
- CO-4.** The basic knowledge like preparation of solution, standardization of secondary solution, dilution, calibration, and handling of some sophisticated electronic related to the practical syllabus.
- CO-5.** Freundlich Absorption Isotherm, enthalpy, molecular weight determinations by elevation in boiling point method, depression in freezing point method and viscosity method, surface tension, molecular energy and Parachor of given liquid.
- CO-6.** To focus their aim for future prospects of Ph.D. programme and pharmaceutical industry.

M.Sc. Chemistry Semester-III (Elective)
Paper V- CH-305 : Organic Chemistry

Credits 3

MM = 100 (70+30)

Hours 40

Course Outcome:

All our post-graduate students will be able to:

- CO-1.** Gain the knowledge of different terms used in stereochemistry and types of isomerism.
- CO-2.** learn about structure of amino acids, peptides and proteins.
- CO-3.** Learn classification, types and structure of polymers.
- CO-4.** Learn about role of lipids.
- CO-5.** Know about structure of carbohydrates and many natural products used as drugs.
- CO-6.** To understand about nucleic acids, vitamins and common drugs used in medicinal chemistry.

M.Sc. Chemistry Semester IV
Paper I - CH 401: Bioinorganic and Supramolecular Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

- CO-1.** To recognize the importance of inorganic molecules in supporting organic biological systems.
- CO-2.** To learn about how metal ions function as catalytic and structural centers in biological systems.
- CO-3.** To learn about the metal ion transport and storage within cells and how any malfunction can result in various diseases.
- CO-4.** To gain insight into cutting edge developments that utilizes metal ions for medical purposes.
- CO-5.** To learn methods, including spectroscopy techniques, used to study metal ions in biological systems.
- CO-6.** To develop an appreciation for the structure and function of metal ions in the biological systems and how chemists aim to mimic them.
- CO-7.** A central theme of this course is to recognize the metal used for diagnosis and chemotherapy.
- CO-7.** In the supramolecular chemistry the students gain expertise in developing varied type of sensors and photochemical molecular devices. Additionally, they get the basic knowledge of the biological phenomenon and hence they become able to design and develop the metal based drugs which is now-a-days gaining immense attention.

M.Sc. Chemistry Semester IV
Paper II – CH 402: Organotransition Metal Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

- CO-1.** To know and understand the different properties and structures for organometallic compounds from different parts of the periodic table and their trends.
- CO-2.** To know principal synthetic routes to various classes of organometallic compounds.
- CO-3.** Know and understand the reactivity of organometallic compounds including their application in synthesis.
- CO-4.** To know methods and examples for the study of organometallic compounds in the gas phase, solution phase and solid state.
- CO-5.** To know common ligand classes in organometallic chemistry, their effects on organometallic compounds, and influence on reactivity and catalysis.
- CO-6.** To know and understand key mechanistic steps in reactions involving organometallic compounds.
- CO-7.** Students will learn about synthetically useful transformations including oxidations, reductions, enolate reactions, pericyclic reactions, organometallic reactions, and reactions of electron deficient species. The emphasis will be on developing a mechanistic understanding of selectivity and synthetic strategy.

M.Sc. Chemistry Semester IV
Paper III – CH 403: Organic Synthesis

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

All our post-graduate students will be able to:

- CO-1.** Learn the basic mechanism and reagents used in oxidation of organic compounds.
- CO-2.** Learn the detail study of woodward, provost hydroxylation, selenium dioxide, Jones oxidation and Oppenauer oxidation.
- CO-3.** Gain the knowledge about different reducing agents and the reduction reactions like complete reduction and selective reduction.
- CO-4.** Learn and understand the reagents that causes selective and complete reduction.

CO-5. Learn about the different rearrangement reactions e.g. Pinacol-pinacolone, Wagner-Meerwein, Demjanov, Benzil-Benzilic acid, Favorskii, Arndt-Eistert synthesis, Neber, Beckmann, Hofman, Curtius, Schimdt, Baeyer-Villigr and Shapiro reaction.

M.Sc. Chemistry Semester IV
Paper IV – CH 404: Medicinal Chemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

All our post-graduate students will be able to:

CO-1. Familiarize the basic classification of drugs

CO-2. Learn and know about the structure and synthesis of various drugs e.g. Antineoplastic Agents, Cardiovascular, Local Antiinfectives, Psychoactive drugs and antibiotics.

CO-3. Understand drug designing and development, their SAR and QSAR.

CO-4. Understand mode of action of different drugs.

CO-5. Learn and know about the role of drugs to inhibit the particular enzymes and treatment of disease.

CO-6. Understand and apply knowledge about recent developments in medicinal chemistry.

M.Sc. Chemistry Semester IV

Paper V – CH 405: Polymer

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

Student will learn to:

CO-1. Define related concepts of polymers.

CO-2. Summarize historical evolution of the polymers.

CO-3. Recognize monomers and polymers.

CO-4. Evaluate structure of polymers.

CO-5. Recognize bonds between polymer chain.

CO-6. Debate thermal character and affecting factors of thermal behavior.

CO-7. Use determining method of molecular weight.

CO-8. Categorize polymer.

CO-9. Explain production processes.

M.Sc. Chemistry Semester IV

Paper VI – CH 406: Electrochemistry

Credits 4

MM = 100 (70+30)

Hours 52

Course Outcome:

Student will gain better understanding of theoretical and quantitative treatment of:

CO-1. Electrokinetic phenomenon, electro-osmosis, streaming potential and sedimentation potential.

CO-2. The chemical basis of biological phenomenon, cellular structure and donnan membrane equilibrium.

CO-3. The concept of physics and physical chemistry for the study of biological system, e.g. core conductor model, limiting current in semiconductors etc.

CO-4. Theories and importance of over voltage and different types of polarography e.g. A.C. and square waves, pulse.

CO-5. General principles of semi conductivity, semiconductors, conducting polymers and fullerene-doped conductors.

CO-6. Brief idea of electrochemistry of molten electrolytes and non aqueous solvents.

CO-7. Brief idea of fuels cells and its importance, also mention difference between the batteries.

M.Sc. Chemistry Semester IV
Paper VII - (CH-407A, CH-407B, CH-407C): Practical

Credits 6

MM 150 (50+50+50)

Course Outcome:

In order to make students understand the theories taught to them in M.Sc. semester(IV) in different branches of chemistry e.g. Inorganic, Organic and Physical, the following practicals are introduced. Students will learn:

- CO-1.** Inorganic preparations in aqueous and organic medium.
- CO-2.** Colorimetric and spectrophotometric analysis.
- CO-3.** Three steps synthesis and identification of organic compound by their spectral data
- CO-4.** The basic knowledge like preparation of solution, standardization of secondary solution, dilution, calibration and handling of some sophisticated electronic related to the practical syllabus.
- CO-5.** The basic knowledge of kinetics by conductance method, pH determination pK value determination, spectrophotometer experiment, Cryoscopy method and Refractometry.
- CO-6.** To focus their aim for future prospects of Ph.D. programme and Pharmaceutical Industries.

M.Sc. Chemistry Semester IV
CH-407D SEMINAR

Credits 2

MM 50

Course Outcome:

- CO-1.** Students will be able to plan and strategize a scientific problem, and implement it within a reasonable time frame.
- CO-2.** It is expected that after completing this project dissertation, students will learn to work independently and how to keep accurate/readable record of assigned project.
- CO-3.** In addition, students will be able to know the library search and handle the data in a meaningful way.
- CO-4.** Subsequently, the students should be able to critically examine research articles, and improve their scientific writing/communication skills and power point presentation.

M.Sc. Chemistry Semester-IV (Elective)
Paper VIII- CH-408 : Physical Chemistry

Credits 3

MM = 100 (70+30)

Hours 40

Course Outcome:

Students will recognize the importance of :

- CO-1.** The limitation of classical thermodynamics.
- CO-2.** The basic theory of Quantum Mechanics and spectroscopy.
- CO-3.** Give a brief account of solution, dilution solutions and electrical conductance of electrolytic solutions and its measurements.
- CO-4.** Elementary quantum mechanics and basics of spectroscopy.
- CO-5.** The aspect of electrochemistry with the help of thermodynamics and Redox potentials. The reaction rates are studied to obtain a brief picture of what molecules do to each other during the Course of reaction.
- CO-6.** To understand how enzyme Catalysis increase reaction rates without altering the chemical equilibrium.