

M.Sc Chemistry

Programme Outcomes

On successful completion of this Programme, students will have ability to:

PO1. take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3: work and communicate effectively in inter-disciplinary environment, either independently or in a team, and demonstrate leadership qualities. Elicit views of others, mediate disagreements and help reach conclusions in group settings.

PO4. demonstrate empathetic social concern and equity centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. understand the issues of environmental contexts and sustainable development.

PO7. recognize the need to engage in lifelong learning through continuing education and research.

Programme Specific Outcomes

On successful completion of this Programme, students will have ability to:

PSO1 : Do Global level research ,pursue Ph.D programme and targeted approach of

CSIR – NET examination and competitive exams conducted by service commission

PSO2: Attain Enormous job opportunities at all levels of chemical, pharmaceutical, food products and life oriented material industries.

PSO3: get recruitment in R & D and synthetic division of polymer industries & Allied Division.

PSO4: Apply modern methods of analysis to chemical systems in a laboratory setting.

PSO5: Work effectively and safely in a laboratory environment,use technologies/instrumentation to gather and analyze data and work in teams as well as independently.

PSO6:Think critically,develop Scientific temper and analyze various chemical problems.

FACULTY OF SCIENCES

SYLLABUS

of

Master of Science (Chemistry)

(Semester: I)

(Under Continuous Evaluation System)

Session: 2020-21



The Heritage Institution

KANYA MAHA VIDYALAYA

JALANDHAR

(Autonomous)

Master of Science (Chemistry) (Semester-I)

Session 2020-21

COURSE CODE: MCHL-1081

Course Title: Ligand Field Theory (Theory)

Course outcomes:

Students will be able to

CO1:illustrate an understanding of the principles of theories of metal-ligand bond.

CO2:demonstrate an understanding of spectra of coordination compounds.

CO3:analyze the spectra of transition metal ions.

CO4: analyze Tanabe – Sugano and Orgel diagrams.

CO5: interpret the stability of complexes.

CO6:understand the electronic spectra in transition metal complexes.

CO7: learn mathematical rules for the formation of a group and Point groups

CO8:construct the Character table for various point group and to determine the symmetry of hybrid orbitals

Master of Science (Chemistry)
(Semester-I)

Session: 2020-21

COURSE CODE: MCHL-1082

COURSE TITLE: Organic Reaction Mechanism- I (Theory)

Course outcomes:

Students will be able to

CO1:acquire the skills for correct stereochemical assignment and interpretation
in simple organic molecules.

CO2: formulate his/her own reasoned opinions in the mechanistic side of organic
Reactions

CO3: learn the concept of stereochemistry and its importance

CO3: understand the various types of aliphatic and aromatic nucleophilic substitution reaction and their
mechanism

CO4:understand the concept and various types of aromaticity

CO5: know about the stereochemical problems in relation to chemical transformations

CO6:know synthetically the processes relevant organic-chemical reactions and be able
to discuss the mechanism of these reactions

**Master of Science (Chemistry)
(Semester-I)**

Session: 2020-21

COURSE CODE:MCHM-1135

COURSE TITLE: Computer for Chemists

Course outcomes:

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

CO1: write short simple programs in C language and be able to compile and execute them in a host of machines.

CO2: use standard software tools to perform algebraic and numerical calculations often required in elementary physical chemistry in the areas of quantum chemistry, spectroscopy, kinetics and thermodynamics

Master of Science (Chemistry)
(Semester-I)

Session: 2020-21

COURSE CODE:MCHP-1086

COURSE TITLE: INORGANIC CHEMISTRY (PRACTICAL)
(Quantitative Analysis)

Course outcomes:

Students will be able to

CO1:determine the strength of ions by Oxidation reduction titrations

CO2:estimate the amount of ions by precipitation titrations

CO3:estimate the amount of ions by complexometric and gravimetric methods

**Master of Science (Chemistry)
(Semester I)**

Session: 2020-21

COURSE CODE:MCHP-1087

COURSE TITLE: ORGANIC CHEMISTRY (PRACTICAL)

Course outcomes:

The students will be able to

CO1:independently perform two step organic synthesis.

CO2: identify the synthesized compounds by TLC

CO3:perform analysis of common analgesic drugs by TLC

CO4:extract, identify and characterize the compounds isolated from naturalproducts

FACULTY OF SCIENCES

SYLLABUS

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Master of Science (Chemistry)

(Semester: II)

(Under Continuous Evaluation System)

Session: 2020-21



The Heritage Institution

**KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)**

Master of Science (Chemistry) (Semester-II)

Session: 2020-21

COURSE CODE: MCHL-2081

COURSE TITLE: ORGANOMETALLICS CHEMISTRY (Theory)

Course outcomes:

Students will be able to

- CO1: familiarize with the organometallic reaction mechanisms and its applications
- CO2: learn about the Catalysis, hydrogenation of olefins and Oxo process
- CO2: study the concept of oxidation of olefins and polymerization
- CO3: demonstrate basic principles of organometallic compounds.
- CO4: illustrate stability of organometallic compounds.
- CO5: identify the structure and bonding aspects of simple organometallic compounds
- CO6: apply different electron counting rules to predict the shape/geometry of low and high nuclearity metal carbonyl clusters
- CO7: identify different types of organometallic reactions and apply the above concepts to explain different catalytic reactions
- CO8: familiarize with the reactions with and of coordination ligands
- CO9: understand the role of pi acid ligands

Master of Science (Chemistry) (Semester-II)

Session: 2020-21

COURSE CODE:MCHL-2082

COURSE TITLE: Organic Reaction Mechanism – II (Theory)

Course outcomes:

Students will be able to

CO1:learn about the addition reactions between a hetero atom and double bonded carbon compounds

CO2: obtain an outline about elimination reactions and rules used to study elimination reactions

CO3:learn about some specific examples of elimination reactions

CO4:learn the basic mechanism of oxidation in organic compounds

CO5:acquire knowledge about the reagents which causes oxidation and reduction in various compounds

CO6:learn about the formation of carbon - carbon bonds

Master of Science (Chemistry) (Semester-II)

Session: 2020-21

COURSE CODE: MCHL-2083

COURSE TITLE: Physical Chemistry-Quantum Chemistry (Theory)

Course outcomes:

Students will be able to

CO1: have basic idea about quantum chemistry and the mathematics associated with quantum statistics including certain aspects of linear algebra

CO2: apply this knowledge to atomic and molecular structure

CO3: use mathematical techniques in linear algebra for eigen values and eigen vectors and first and second order differential equations not only in quantum chemistry but in other areas of chemistry

CO4: solve all the model problems in quantum mechanics for which exact analytical methods and solutions are available and will apply them to analyze the basis behind the postulatory method of quantum mechanics and which forms the foundations for advanced study of the subject.

CO5: relate concepts that were originally introduced purely as modern atomic physics to molecular systems through harmonic oscillator, spin and rigid rotator

Master of Science (Chemistry)(Semester-II)

Session: 2020-21

COURSE CODE: MCHL-2084

COURSE TITLE: REACTION MECHANISMS AND METAL CLUSTERS(Theory)

Course outcomes:

Students will be able to

CO1:describe the stability of metal complexes by the use of formation constants

andcalculate thermodynamic parameters from them

CO2:learn the mechanism of substitution reaction and explain the parameters that affects the crystal structure of a compound

CO3:determine binary formation constants by different methods

CO4:understand the chemistry of inorganic rings , chains and metal clusters

Master of Science (Chemistry)(Semester-II)

Session: 2020-21

COURSE CODE: MCHL-2085

COURSE TITLE: SPECTROSCOPY – B: Techniques for Structure Elucidation of Inorganic Compounds (Theory)

Course outcomes:

Students will be able to

CO1: identify symmetry elements and symmetry operations

CO2: determine the rotational spectra of linear molecules

CO3: determine IR and Raman activity of linear molecules

CO4: study selection rules for electronic transitions

CO5: understand the principle and spectra interpretation of photoelectron spectroscopy, electron spin resonance spectroscopy, nuclear quadrupole resonance spectroscopy, Mossbauer spectroscopy

Master of Science (Chemistry)(Semester-II)

Session: 2020-21

COURSE CODE: MCHL-2336

COURSE TITLE: MATHEMATICS FOR CHEMISTS

(For Medical Students)

Course outcomes:

Students will be able to acquire knowledge about

CO1: trigonometry

CO2: determinants and matrices

CO3: integration and differentiation

Master of Science (Chemistry) (Semester-II)
Session: 2020-21
COURSE CODE: MCHL-2057
COURSE TITLE: BIOLOGY FORCHEMISTS
(For Non-Medical Students)

Course outcomes:

Students will be able to understand

CO1: organization of life

CO2: genetics

CO3: diversity of life

Master of Science (Chemistry) (Semester-II)
SESSION: 2020-21
COURSE CODE: MCHP-2088
COURSE TITLE: Physical Chemistry (Practical)

Course outcomes:

The students will be able to

CO1: understand and perform multi step organic synthesis.

CO2: expertise the various techniques of analysis of organic substances

Master of Science (Chemistry)(Semester-II)

Session: 2020-21

COURSE CODE: MCHP-2089

COURSE TITLE: Physical Chemistry(Practical)

Course outcomes:

Students will be able to

CO1: prepare for each experiment by studying lab handouts and links therein

CO2: know about the safety requirements and lab skills required to perform physico-chemical experiments

CO3: design and perform experiments to determine the rate, order, and activation energy of chemical reactions by varying concentrations and/or temperature

CO4: carry out preparation of buffer solutions at a required pH, given a choice of solutions of acid/conjugate base pairs

CO5: know the principle and mechanism of Conductometric titrations and polarimetric experiments

CO6: determine specific and molar refraction using Abbe's refractometer

FACULTY OF SCIENCES

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Master of Science (Chemistry)

(Semester: III)

(Under Continuous Evaluation System)

Session: 2020-21



The Heritage Institution

**KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)**

Master of Science (Chemistry)(Semester-III)

Session: 2020-21

COURSE CODE: MCHL-3081

COURSE TITLE: Inorganic Chemistry-II

(Theory)

Course outcomes:

Students will be able to

CO1: know about the various metal ions present in our body, their function in body and role in medicine

CO2: learn about the different enzymes participating in the chemical reactions inside the body and their functions

CO3: study about the different oxygen carriers present in the body with their structure and stereochemistry

CO4: study in detail about nitrogen fixation reactions and microorganisms involved in nitrogen fixation reactions

**Master of Science (Chemistry)
(Semester-III)**

Session: 2020-21

COURSE CODE: MCHL-3082

**COURSE TITLE:Organic Synthesis
(Theory)**

Course outcomes:

Students will be able to

CO1: understand general mechanistic consideration of organic rearrangements

CO2: understand synthesis and reactions of macrocyclic compounds and fused polynuclear hydrocarbons

CO3: study the synthesis and reactions of three, four, six, seven and large membered Heterocycles

CO4: know about the use of various reagents in organic synthesis and functional group transformations

CO5: understand the basic concepts of supramolecular chemistry

Master of Science (Chemistry)

(Semester-III)

Session: 2020-21

COURSE CODE: MCHL-3083

COURSE TITLE: Surface and Polymer Chemistry

(Theory)

Course outcomes:

Students will be able to

CO1: study concept of adsorption and micelle formation

CO2: learn about the different kinetics and thermodynamics of polymerization

CO3: learn about the type and classification of polymers

CO4: know about the structure, properties and utilization of polymers.

CO5: study in detail about the glass transition temperature

Master of Science (Chemistry)

(Semester-III)

Session: 2020-21

COURSE CODE: MCHL-3084

COURSE TITLE: Electrochemistry and Chemical Dynamics

(Theory)

Course outcomes:

Students will be able to

CO1: Understand the electrochemistry of solutions, method of determination of electrified interfaces, semiconductor electrolyte solution interface

CO2: know theory, monitoring and prevention of corrosion

CO4: understand collision theory of reaction rates, Arrhenius theory and activated complex theory, Lindemann-Hinshelwood theory

CO5: understand various Photochemical reactions, Homogeneous catalysis and kinetics of enzyme reactions, general features and methods of studying fast reactions

CO6: interpret spectra and applications of Voltammetry and Polarography.

Master of Science (Chemistry)

(Semester-III)

Session: 2020-21

COURSE CODE: MCHL-3085

COURSE TITLE: Photochemistry and Pericyclic reactions

(Theory)

Course outcomes:

Students will be able to

CO1: classify the pericyclic reactions and explain them under thermal and photochemical conditions.

CO2: interpret the product of Pericyclic reactions (Cyclo addition, Electrocyclic and sigmatropic Reactions)

CO3: know the basic concepts of photochemical reactions and determine their reaction mechanisms

CO4: apply the knowledge of photochemical reactions of Alkenes, carbonyl compounds, aromatic compounds.

CO5: study named photochemical reactions, photochemistry of smog, polymers and vision

Master of Science (Chemistry)

(Semester-III)

Session: 2020-21

COURSE CODE: MCHP-3086

COURSE TITLE: Inorganic Chemistry Practical (Preparations)

Course outcomes:

Students will be able to

CO1: plan and Conduct experiments for synthesizing, analysing, identifying and characterizing inorganic compounds

CO2: do measurements of magnetic moments of synthesized complexes.

CO3: estimate metal content in the synthesized complex

Master of Science (Chemistry)

(Semester-III)

Session: 2020-21

COURSE CODE: MCHP-3087

COURSE TITLE: Physical Chemistry Practical

Course outcomes

Students will be able to

CO1: apply the principle and mechanism of Conductometric and potentiometric titrations

CO2: determine the partial molar volume of compounds using Dilatometer

CO3: determine specific and molar refractivity using Abbes refractometer

CO4: study complex formation and the kinetics of hydrolysis Spectrophotometrically

CO5: determine the molecular weight of polymers by viscometry

FACULTY OF SCIENCES

SYLLABUS

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Master of Science (Chemistry)

(Semester: IV)

(Under Continuous Evaluation System)

Session: 2020-21



The Heritage Institution

**KANYA MAHA VIDYALAYA
JALANDHAR
(Autonomous)**

Master of Science (Chemistry)(Semester-IV)
Session: 2020-21
COURSE CODE: MCHL-4081
COURSE TITLE: Advanced Inorganic Chemistry(Theory)

Course outcome:

Students will be able to

CO1: understand Franck-Condon principle

CO2: understand Photo substitution reactions, photoredox reactions, photolysis of water

CO3: oxidative addition and reductive elimination, migration (Insertion) reaction and cyclometallation reactions,

CO4: characterise the compound by synthetic methods and know the chemical behaviour and synthetic applications of hydride compounds

CO4: understand hydroformylation, Carbonylation Reaction, decarbonylation reactions, hydrocyanation Polymerization, Oligomerisation and metathesis reactions and Oxidation reaction

Master of Science (Chemistry)(Semester-IV)
Session: 2020-21
COURSE CODE: MCHL-4082
COURSE TITLE: Chemistry of Natural Products (Theory)

Course outcome:

Students will be able to

CO1: study the biosynthetic pathways of natural products

CO2: Understand the isoprene rule and its role in terpenoids

CO3: Classify and understand the synthesis and structure of steroids and alkaloids

CO4: understand the chemistry of Haemin, chlorophyll, prostaglandins and antibiotics

CO5: classify and elucidate the structure of carbohydrates like starch and cellulose

CO6: determine the structure conformation and properties of proteins

CO7: determine the structure of nucleic acids DNA and RNA

Master of Science (Chemistry)(Semester-IV)

Session: 2020-21

COURSE CODE: MCHL-4083

COURSE TITLE: Chemistry of Materials

Course outcome:

Students will be able to

CO1: understand types of solids, point defects, electrical properties and conduction in metals

CO2: understand reactions in organic solids, photochemical reactions and decomposition and dehydration reactions.

CO3: explain the properties and applications of different types of polymers.

CO4: define the factors affecting glass formation, types, properties and applications of different types of glasses

CO5: learn glass ceramic compositions, properties and applications

CO6: predict the methods of preparation of smart materials, types of superconductors and their applications

Master of Science (Chemistry)(Semester-IV)
Session: 2020-21
COURSE CODE: MCHP-4084
COURSE TITLE: Advanced Practical- Organic Synthesis

Course outcome:

Students will be able to

CO1: plan and implement advance organic synthesis and reactions

CO2: characterize organic molecules by physical and spectroscopic means, including M.P, B.P, and IR

CO3: predict the outcome and mechanism of some simple organic reactions, using a basic understanding of the relative reactivity of functional groups

Master of Science (Chemistry (Semester-IV)

Session: 2020-21

COURSE CODE: MCHP-4085

COURSE TITLE: Advanced Practical- Inorganic Synthesis

Course outcome:

Students will be able to

CO1: apply key concepts of inorganic chemistry and coordination compounds including those related to synthesis, reaction chemistry, and structure and bonding

CO2: design the basic and advanced laboratory procedures used in inorganic synthesis including spectroscopic and analytical techniques for identification and characterization of small molecules

CO3: learn separation of metal cations by chromatographic techniques

Master of Science (Chemistry)(Semester-IV)
Session: 2020-21
COURSE CODE: MCHP-4086
COURSE TITLE: Advanced Practical- Physical Chemistry

Course outcome:

Students will be able to

CO1:experience the scientific methods employed in basic and applied physical chemistry

CO2: design and perform experiments to determine the rate, order, and activation energy of chemical reactions by varying concentrations and/or temperature

CO3: measure equilibrium concentrations and equilibrium constants for acid-base, solubility, and complexation reactions given initial concentrations of reactant

CO4: develop skills in procedures and instrumental methods like polarography, turbidimetry and spectrophotometry,