

MSc Chemistry (Pure)

SEMESTER 1

CH 50 01 01	Organometallics and Nuclear Chemistry	Credits: 4
CO1	Discuss the synthesis, structure and bonding in organometallic compounds	
CO2	Differentiate different types of reactions of organometallic compounds	
CO3	Categorize compounds as isolobal and isoelectronic compounds	
CO4	Classify various bioinorganic compounds	
CO5	Outline techniques and applications of nuclear chemistry	

CH 50 01 02	Structural and Molecular Organic Chemistry	Credits: 4
CO1	outline the basic concepts in organic chemistry	
CO2	describe and analyse the organic reactions by physical methods	
CO3	analyse photochemical reactions	
CO4	Analyse reactions based on stereochemical aspects and applications	
CO5	explain conformational aspects	

CH 50 01 03	Quantum Chemistry and Group Theory	Credits: 4
CO1	Deduce various symmetry elements in molecules and classify them into different point groups	
CO2	Apply the concept of GOT to construct character tables of simple point groups and also to deduce the bonding of simple molecules	
CO3	Demonstrate the fundamental concepts of quantum mechanics	
CO4	Apply the concepts to simple systems	
CO5	Summarize on the concept of quantization of angular momentum	

CH 50 01 04	Thermodynamics, Kinetic Theory and Statistical Thermodynamics	Credits: 3
CO1	outline the basic concepts of classical and statistical thermodynamics	
CO2	analyze the macroscopic properties of matter using classical and statistical thermodynamics	
CO3	assess microscopic and macroscopic properties using classical and statistical thermodynamics	
CO4	measure change in thermodynamic properties and absolute values of thermodynamic quantities and equilibrium constants	
CO5	summarize the fundamental concepts of irreversible thermodynamics	

SEMESTER 2

CH 50 02 01	Coordination Chemistry	Credits: 4
CO1	Classify various coordination compounds and sigma & pi bonding ligands	
CO2	Explain different bonding aspects in coordination compounds	
CO3	Investigate electronic, magnetic and spectral properties of coordination compounds	
CO4	Discuss the kinetics and mechanism of reactions of coordination compounds	
CO5	Compare the properties of coordination compounds of lanthanides and actinides	

CH 50 02 02	Organic Reaction Mechanisms	Credits: 4
CO1	Outline the different organic reaction mechanisms	
CO2	summarize about the reactive intermediates and the rearrangements involved	
CO3	Describe the chemistry of carbonyl compounds	
CO4	Outline the different types of concerted reactions	
CO5	Compare the different pericyclic reactions	

CH 50 0203	Chemical Bonding and Computational Chemistry	Credits: 4
CO1	Relate to the different approximation techniques used in molecular quantum mechanics	
CO2	Explain quantum mechanical principles of molecular orbital theory, Hückel molecular orbital theory, valence bond theory and hybridization	
CO3	Apply the concept of linear combination of atomic orbitals to produce molecular orbitals, Hückel molecular orbitals and hybrid orbitals to understand the molecular structure and geometry.	
CO4	Interpret group theoretical principles of molecular orbital theory, valence bond theory and hybridization	
CO5	Identify and explain the main similarities and differences between computational approaches such as ab initio, semi-empirical, DFT and force field methods.	

CH 50 0204	Molecular Spectroscopy	Credits: 3
CO1	Outline the concepts of spectroscopy	
CO2	Analyze the relationship between rotational, vibrational and electronic spectroscopy	
CO3	Summarize the concepts of NMR, EPR and Mossbauer spectroscopy	
CO4	Explain the principles of the Mossbauer spectroscopy.	
CO5	Interpret the various spectra of molecules	

CH 50 0205	Inorganic Chemistry Practical-1	Credits: 3
CO1	Identify and differentiate between the different rare earth cations by different analytical methods.	
CO2	Develop advanced laboratory skills used in inorganic synthesis including spectroscopic and analytical techniques for identification and characterization of inorganic molecules.	
CO3	Apply safety and chemical hygiene regulations and practices.	

CH 50 0206	Organic Chemistry Practical-1	Credits: 3
CO1	deduce techniques separate the organic components	
CO2	Take part in in the preparation of TLC, column chromatography	
CO3	develop skills in separating techniques	
CO4	illustrate advanced knowledge in chemical drawing	

CH 50 0207	Physical Chemistry Practical-1	Credits: 4
CO1	Analyze the extent of adsorption of liquids by solids.	
CO2	Discuss on the phase equilibria for 2 component and 3 component system	
CO3	Discuss on the effect of concentration on surface tension	
CO4	Compare and apply theoretical approaches such as HF and MP2 calculating various properties of molecules using GAMESS software	

SEMESTER 3

CH 50 03 01	Structural Inorganic Chemistry	Credits: 4
CO1	Summarize the knowledge in the advanced areas of solid state chemistry such as structure, reactions and phase transition in solids.	
CO2	Relate the electrical, magnetic and optical properties of inorganic compound to its structures.	
CO3	Analyze the synthesis, structure and bonding demonstrated by inorganic chains, rings, cage and cluster compounds.	
CO4	Recall different types of organometallic polymers	
CO5	Identify different synthesis methods for various solids	

CH 50 03 02	Organic Syntheses	Credits: 4
CO1	Explain metal and nonmetal based oxidation of alcohols and alkenes.	
CO2	Explain catalytic hydrogenation and metal based reductions.	
CO3	Illustrate Brook rearrangement, Tebbe olefination and various name reactions viz. Nef reaction, Kulinkovich reaction, Ritter reaction, Sakurai reaction, Tishchenko reaction.	
CO4	Decide the protecting agents for various functional groups and to discuss peptide synthesis and SPPS	
CO5	Design the synthesis pathway of target molecules by retrosynthetic analysis.	

CH 01 03 03	Chemical Kinetics, Surface Chemistry and Crystallography	Credits: 4
CO1	Interpret the fundamental concept of the kinetics of a reaction and its mechanism from various theories	
CO2	Explain the effect of catalyst and its mechanism on the kinetics of a chemical reaction	
CO3	Define the fundamental concept of surface reactions and various characterization methods	
CO4	Explain the structure and stability of colloids	
CO5	Explain the concept of crystals and methods of characterizing crystal structure	

CH 50 03 04	Spectroscopic Methods in Chemistry	Credits: 3
CO1	Summarize the basic principles of uv-visible, chiroptical, vibrational, 1-D and 2-D NMR and Mass spectroscopy for the structure identification of organic compounds	
CO2	Analyze and interpret uv-visible, chiroptical, vibrational, 1-D and 2-D NMR and Mass spectral data of organic compounds	
CO3	Evaluate various structural possibilities of organic compounds by analysis of uv-visible, chiroptical, vibrational, 1-D and 2-D NMR and Mass spectral data.	
CO4	Deduce the most logical structure of organic compounds by interpretation	

	of uv-visible, chiroptical, vibrational, 1-D and 2-D NMR and Mass spectral data.
CO5	Identify the structure of organic compounds by analysis and interpretation of uv-visible, chiroptical, vibrational, 1-D and 2-D NMR and Mass spectral data.

SEMESTER 4

CH 80 04 01	Advanced Inorganic Chemistry	Credits: 5
CO1	Apply group theory to solve the problems in chemistry.	
CO2	Apply the knowledge of spectroscopy and photochemistry to solve the various problems in chemistry.	
CO3	Explain the scientific revolutions of nanotechnology and to familiarize the classification of nanostructures and to know the applications of nanoparticles in technologically imperative fields.	
CO4	Explain the chemistry of materials and metal organic frame works.	
CO5	Discuss the chemistry of supramolecules.	

CH 80 04 02	Advanced Organic Chemistry	Credits: 5
CO1	Discuss on supramolecules and their applications	
CO2	Develop green alternatives and stereoselective transformations	
CO3	Explain the basic concepts of nano chemistry and the role of polymers	
CO4	Analyse the chemistry of natural products and medicines	
CO5	Outline the methodology of research	

CH 80 04 03	Advanced Physical Chemistry	Credits: 5
CO1	Discuss on photochemistry of molecules and processes involved	
CO2	Describe and analyse the distribution of velocities of various gas molecules and factors affecting them	
CO3	Solve problems on electrochemical cell parameters, electrochemical active surface area, current and over potential under given condition	
CO4	Relate the theories of instrumental methods available in analytical chemistry	
CO5	Explain the advanced techniques in voltammetry, polarography and coulometry	

CH 01 0405	Inorganic Chemistry Practical-2	Credits: 3
CO1	Show the various methods used to estimate binary mixtures.	
CO2	Develop laboratory skills in analyzing samples of different alloys like Brass, Bronze, Coin alloy etc and find its composition.	
CO3	Identify different minerals and estimate the percentage of the parent element present in it by suitable analytical methods.	

CH 01 0406	Organic Chemistry Practical-2	Credits: 3
CO1	Apply the organic synthetic strategies in multi-step synthesis	
CO2	Develop atom economy methodology to synthesize organic compounds	
CO3	Analyze various unknown spectrums	
CO4	Determine environmental friendly methods to synthesize organic compounds	

CH 01 0407	Physical Chemistry Practical-2	Credits: 4
CO1	Evaluate the rate constant of first and second order reactions	
CO2	Interpret the concentrations and molar refractions using refractive index measurements	
CO3	Prove Kendall's equation by viscosity measurements	
CO4	Prove Onsager equation by conductivity measurements	
CO5	Deduce the concentration of acid, mixture of acids, and mixture of halides by potentiometric measurements.	