GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
PROGRAMME	M.Sc.					Branch/Spec.	Chemistry		
SEMESTER	I					Version	2.0.0.1		
Effective From Academic Year	2021-22					Effective for the batch Admitted in	July-2021		
Subject Code	MCHE1IOC		Subject Name			Inorganic Chemistry-I			
Teaching Scheme						Examination Scheme (Marks)			
Per Week	Lecture		Practical		Total		CE	SEE	Total
	L	Tu	P	Tw					
Credit	04	-	0	0	04	Theory	40	60	100
Hours	04	-	0	0	04	Practical	-	-	-
Pre-requisites									
Before studying Inorganic chemistry, all students have basic knowledge of inorganic and organic compounds, molecular structure, Molecular orbital theories and knowledge related to UG level chemistry.									
Learning Outcome									
● Basic knowledge of bonding in the metal complexes. ● Understanding of V. B. and M. O. theories. ● Understanding of quantum mechanics and its importance. ● Knowledge of symmetry, groups, point groups and multiplication table.									

Theory Syllabus

Unit	Content	Hours
01	**Reaction Mechanism of Transition Metal Complex:** Reactivity of metal complexes, ligand replacement reaction: classification of mechanism and energy profile of reaction. Inert and labile complexes, interpretation of liability and inertness of transition metal complexes on the basis of VBT and CFT. Factors affecting the liability of a complex, transition state or activated complex, substrate, attacking reagents electrophilic and nucleophilic, Nature of central atom. Kinetic application of CFT. Kinetics of octahedral substitution, acid hydrolysis, factor affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidence in favor of conjugate mechanism, reaction without metal ligand bond cleavage, and reaction of coordinated ligands. Substitution reactions in square planner complexes the trans effect, mechanism of one electron transfer reaction, outerphere type reaction, cross reactions and Marcus-Hush theory, inner sphere type reactions.	15
02	**Symmetry And Group Theory In Chemistry and Its applications: Representation of groups:** • Preparation of matrices and vectors. • Matrix notations for geometrical transformations. • Orthogonality theorem and its consequences. • Reducible and irreducible representations and their relation. • Preparation of character table for C2v and C3v point groups. **Application of group theory to -** • Transformation properties of atomic crystals. • Hybridization scheme for a and n-bonding.	15

03	**Quantum Chemistry:** Discussion of solutions of Schrodinger equation to some model systems e.g. the one dimensional harmonic oscillator, two particle rigid rotator. Ordinary angular momentum, generalized angular momentum, eigen functions of angular momentum, eigen values of angular momentum, different types of Operators and their uses, addition of angular momentum, spin, antisymmetry & Pauli exclusion principle using Ladder operators. Russel-Saunders terms and coupling scheme, Slater-Condon parameters, term separation energies of the pn and d^n configuration, magnetic effect: spin orbit coupling and Zeeman effect (splitting).	15
04	**Co-ordination Chemistry** Stability of co-ordination compound: Introduction, Thermodynamic stability, Kinetic stability, Instability constant, Stability constant, Factors affecting the stability of complex ions, Methods for determination of stability constant and composition of complex, Stereochemistry of Coordination compounds with special reference to chelating ligands (Optical activity of metal complexes with ch ligands). Metal Clusters. 8 bonds. Transition metal complexes of n acceptor (n- Acid) ligands.	15

Reference Books

1. Mechanism of Inorganic Reactions, F. Basolo and R. G. Persons, Wiley Pub Reaction
2. Mechanism of Coordination Compounds, C. H. Langford and H. B. Gray
3. Inorganic Reaction Mechanisms, M. L. Tobe, Nelson Pub
4. Inorganic Chemistry, K. F. Purcell and J. C. Kotz. Quantum chemistry by R K Prasad
5. Co-ordination chemistry by Gurdeep Chatwal, M S Yadav
6. Chemical application of Gtroup theory by F A Cotton
7. Group theory & its application by P K Bhattacharya
8. Inorganic Chemistry -II, H.C.Khera.

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FACULTY OF SCIENCE									
PROGRAMME	M.Sc.					Branch/Spec.	Chemistry		
SEMESTER	I					Version	2.0.0.1		
Effective From Academic Year	2021-22					Effective for the batch Admitted in	July-2021		
Subject Code	MCHE1ORC		Subject Name			Organic Chemistry-I			
Teaching Scheme						Examination Scheme (Marks)			
Per Week	Lecture		Practical		Total		CE	SEE	Total
	L	Tu	P	Tw					
Credit	04	-	0	0	04	Theory	40	60	100
Hours	04	-	0	0	04	Practical	-	-	-

Pre-requisites

Before studying organic chemistry, all students should have basic knowledge of organic compounds, general organic chemistry, reactive intermediates and reaction mechanisms.

Learning Outcome

After the successful completion of the course, students will be able to understand

- Basic concept of reaction mechanisms and general organic chemistry.
- Knowledge of photochemistry and photon induced reactions.
- Understanding of basic concepts of stereochemistry.
- Understanding of conformation of various acyclic and cyclic organic molecules.
- Understanding of the concept of tautomerism.

Theory Syllabus

Unit	Content	Hours
01	**Nature of bonding in organic molecules** Delocalized chemical bonding- conjugation, cross conjugation, hyper conjugation, resonance. Tautomerism, Aromaticity in benzenoid and non benzenoid compounds, alternate and non alternant hydrocarbonds, Huckel's rule, energy level of π molecular orbitals, annulenes, antiaromaticity, homoaromaticity, PMO approach. Bonds weaker than covalent-addition compounds, crown ether complexes, cryptands and inclusion compounds.	15
02	**Fundamentals of Stereochemistry** Strain due to unavoidable crowding. Elements of symmetry, conformational free energy, chirality, molecules with more than one chiral center, thereo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces. Stereospecific and stereo selective synthesis. Optical activity in the absence of chiral carbon (biphenyls, allenes and spirane) chirality due to helical shape, stereochemistry of the compounds containing nitrogen, sulfur and phosphorous.	15
03	**Reaction mechanism: Structure and reactivity** Types of mechanism, types of reactions, thermodynamic and kinetic requirement, kinetic and thermodynamic control. Hammonds postulates. Curtin-Hammett principle, potential energy diagram, transition states and intermediates, methods of determining mechanism, kinetic isotopes effect. Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes. The Hammett equation and linear free energy relationship; substituents and reaction constants.	15

04	**Photochemistry** Introduction, Basic laws of photochemistry, Types of radiations, Fluorescence, Phosphoresces Quantum yield, Jablonski diagram, Strokes shift, Photo-Fries reactions of anilides. Photo-Fries rearrangement. Barton reaction, Norrish type-I and types-II reactions, oxetane formation reaction of the Carbonyl Compounds, Photochemical formation of smog, Photo degradation of polymers. Photochemical reaction of olefins and cis-trans stilbenes. Types of photochemical reaction – photo-dissociation, gas phase photolysis.	15

Reference Books

1. Organic spectroscopy by William Kemp ELBS
2. Organic spectroscopy by P.S.Kalsi
3. Organic Chemistry: Vol. 2 1L. Finar, ELBS
4. Reaction Mechanism and Problems in Organic Chemistry – P. Chattopadhyay, Asian Book Pvt Ltd, New Delhi (2003).
5. A Text Book of Organic Chemistry – R.K.Bansal, New Age International (P) ltd. 4th edition (2003).
6. Advanced Organic Chemistry, Part B – F. A. Carey & R. J. Sundberg, Plenum Press (2007).
7. Organic Chemistry by G. Marc. Loudon, Oxford University Press (2002).
8. Organic Reaction Mechanism (II edition) – V.K. Ahluwalia, R.K. Parasar.
9. Reaction Mechanism and Reagents in Organic Chemistry – Gurdeep R. Chatwal.
10. Organic Chemistry by Morrission and Boyd, prentice hall of India pvt ltd (6th edition), (2003)
11. Organic Chemistry – I.L.Finar 6th edition (low price), Pearson Education (2003).
12. Advanced Organic Chemistry (IV edition) – Jerry March.
13. Organic Chemistry by T.W. Graham solimn, Craig B. Fryble, low price 8th edition, John Wiley & Sons, inc.
14. Organic Chemistry by V.K.Ahluwalia, MadhuriGoyal, Narosa Publishing House, (2000).
15. Organic Synthesis (2nd edition) by M.B. Smith, Mcgraw-Hill, Inc. (2001).

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FACULTY OF SCIENCE									
PROGRAMME	M.Sc.				Branch/Spec.	Chemistry			
SEMESTER	I				Version	2.0.0.1			
Effective From Academic Year	2021-22				Effective for the batch Admitted in	July-2021			
Subject Code	MCHE1PHC		Subject Name		Physical Chemistry-I				
Teaching Scheme					Examination Scheme (Marks)				
Per Week	Lecture		Practical		Total		CE	SEE	Total
	L	Tu	P	Tw					
Credit	04	-	0	0	04	Theory	40	60	100
Hours	04	-	0	0	04	Practical	-	-	-

Pre-requisites

Before learning Physical chemistry, students should be aware about basic principles and theories of physical chemistry, thermodynamics, electrode potential, chemical reactions and other UG level chemistry.

Learning Outcome

- Knowledge of the phenomena of adsorption and related theories.
- Understanding of the theories of thermodynamics.
- Knowledge of activity and fugacity.
- Basic concept of liquid crystals and their classification.
- Knowledge of the concept of chemical kinetics and its theories.
- Understanding of the theories of unimolecular gaseous reactions.

Theory Syllabus

Unit	Content	Hours
01	**Chemical kinetics and reaction dynamics :** Recapitulation- order of reaction, rate law, zero, first, second (a=b, a≠b), third (a=b=c), nth order rate equation, molecularity. Complexities in simple kinetics – Reversible reactions, parallel (side) reactions, consecutive (sequential) reactions, principle of microscopic reversibility, steady state approximation, elucidating mechanism using SSA. Chain reactions, Numericals	15
02	**Quantum Chemistry** **Introduction to exact quantum mechanical results:** The Schrodinger equation and the postulates of Quantum Mechanics, discussion of solutions of the Schrodinger equations to some model systems viz., particle in a box, the harmonic oscillator, the rigid-rotor, the hydrogen atom **Molecular orbital theory:** Huckel theory of conjugated systems, bond-order and charge density calculations, application to ethylene, butadiene, cyclopropyl radical, cyclobutadiene.	15
03	**Theories of Reaction Rates :** Effect of temperature on reaction rates, Arrhenius equation, Activation energy, Kinetic salt effect (primary and secondary), enthalpy, free energy and entropy of activation, correlation of steric factor in collision theory and entropy of activation, Kinetic of thermal H_2+ Br_2 =reactions, Numericals **Liquid Crystals (The mesomorphic state):** Liquid crystals, Vapour pressure-temperature diagrams, Thermography, LCDS and	15

	the seven segment cell, Classification of thermotropic liquid crystals, Smectic liquid crystals, Nematic liquid crystals, Cholesteric liquid crystals, Disc shaped liquid crystals, Polymer liquid crystals, Polymorphism in thermotropic liquid crystals, Pressure-induced mesomorphism, Molecular arrangements in various states of liquid crystals, The glass state.	
04	**Statistical Thermodynamics:** Concept of distribution, thermodynamic probability and most probable distribution, ensemble averaging, postulates of ensemble averaging. Canonical, grand canonical and micro canonical ensembles, corresponding distribution laws (using Langrange's method of undetermined multipliers), partition functions, translational, rotational, vibrational and electronic partition functions, calculation of thermodynamic properties in terms of partition functions, applications of partition functions.	15

Reference Books

1. Textbook of physical chemistry – W.J.Moore
2. Textbook of physical chemistry – Glasstone
3. Textbook of physical chemistry – P.Atkins
4. Advanced physical chemistry – Gurdeep Raj
5. Principles of Physical Chemistry – Puri, Sharma, Pathania
6. Advanced physical chemistry – J.N.Gurtu, A.Gurtu
7. Thermodynamics for chemists –Glasstone
8. Statistical thermodynamics – M.C.Gupta
9. Physical chemistry – S. Castellian
10. Chemical Kinetics- Laidler
11. Chemical Kinetics – Frost and Pearson

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FACULTY OF SCIENCE									
Programme	Master of Science					Branch/Spec.	Chemistry		
Semester	I					Version	2.0.0.1		
Effective From Academic Year			2021-22			Effective for the batch Admitted in			July-2021
Subject code	MCHE1SST		Subject Name			Selected Spectroscopic Techniques-I			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	04	00	00	00	04	Theory	40	60	100
Hours	04	00	00	00	04	Practical	00	00	00

Pre-requisites:

Before learning analytical chemistry, student should aware about basic principles and theories of Analytical chemistry, instrumental methods of analysis and other UG level chemistry.

Learning Outcome:

- Basic knowledge of various spectroscopic techniques and their instrumentation.
- Interpretation of organic/inorganic compounds using spectroscopic techniques.
- Knowledge of atomic and molecular spectroscopy.
- Principle and applications of absorption and emission spectroscopy.

Theory syllabus

Unit	Content	Hrs
1	**UV – Visible spectroscopy:** Types of transitions; Factors affecting spectral characteristics (structural and non-structural); Effect of conjugation; Instrumentation, applications, Calibration of UV Visible Spectrophotometer as per Pharmacopoeia, Absorption of dienes, polyenes, carbonyl compounds and α,β- unsaturated carbonyl compounds and Aromatic compounds. Woodward rule and its application.. **IR Spectroscopy:** Vibration modes and bond stretching, Absorption of common functional groups, electrical and steric effects, effects of Hydrogen bonding, Fingerprint region and interpretation of IR spectra, qualitative interpretation of I.R. spectra, recent advances in I.R. spectroscopy including FTIR, ATR, etc. Numerical based on UV-visible and IR.	15
2	**X-Ray Diffraction:** Diffraction of X-rays by crystals, The Laue equations and Bragg's law, Definitions related to crystal structure, crystallographic direction and crystallographic phases, X-ray diffraction experiments: The powder method and the single crystal method. Reciprocal lattice, Structure factor and its relation to intensity and Electron density. The phase problem. Description of procedure for an X-ray structure analysis, Applications of X-ray diffraction.	15
3	**Nuclear Magnetic Resonance Spectroscopy:** Fundamental principles of NMR (Magnetic properties of nuclei, applied field and precession, absorption and transition frequency), chemical shifts concept, factors affecting chemical shift, isotopic nuclei, reference standards, Proton magnetic spectra, their characteristics, presentation, terms used in describing spectra and their interpretation (signal no., position, intensity), signal multiplicity phenomena in high resolution PMR; Spin spin coupling, application of signal splitting and coupling constant data for interpretation of spectra, decoupling and shift reagent methods. Brief outline of principles of FT-NMR with reference to 13C NMR: Spin-spin and spin lattice relaxation phenomena, free induction decay (FID), nuclear overhauser enhancement; ^{13}C NMR spectra; their presentation, characteristics, interpretation, examples and applications. Brief indication of	15

	application of magnetic resonance spectral data of other nuclei by modern NMR instruments.	
4	**Mass Spectrometry:** Basic principles and brief outline of instrumentation, ionization modes (electron ionization and chemical ionization) types: molecular ions, meta stable ions, fragmentation processes, fragmentation patterns and fragment characteristics in relation to parent structure and functional groups, relative abundances of isotopes and their contribution to characteristic peaks, mass spectrum; its characteristics, presentation and interpretation, GC-MS including recent advances in MS, Fast atom bombardment mass spectroscopy.	15

Reference Books

1. Instrumental Method of Analysis – Willard Dean & Merrit
2. Text Book of Inorganic Chemistry — A.I. Vogel
3. Pharmaceutical Chemistry Vol. I & Vol. II — Becket and Stanlake
4. Introduction to Spectroscopy: Donald L. Pavia, Gary M. Lampman, George S. Kriz
5. Cengage Learning; 4th Edition.
6. Spectroscopic Method in Organic Chemistry: Dudley Williams, Ian Fleming McGraw-Hill Education; 6th Edition.
7. Applications of spectroscopic techniques in Organic Chemistry: P.S. Kalsi, New Age International; 6th Edition.

Analytical Chemistry" by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.

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FACULTY OF SCIENCE									
Programme	Master of Science					Branch/Spec.	Chemistry		
Semester	I					Version	2.0.0.1		
Effective From Academic Year			2021-22			Effective for the batch Admitted in			July-2021
Subject code	MELE1NCH		Subject Name			Nano-Chemistry			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	04	00	00	00	04	Theory	40	60	100
Hours	04	00	00	00	04	Practical	00	00	00

Pre-requisites:

Before learning analytical chemistry, student should aware about basic principles and theories of Nano chemistry, Basic knowledge and understanding of material science and UG level chemistry.

Learning Outcome:

- Understanding of fundamental principles of nanotechnology.
- Knowledge of various nanomaterials.
- History & development of Nano-science and Nano-technology

Theory syllabus

Unit	Content	Hrs
1	**Fundamentals Of Nanotechnology:** Introduction to Nano-science and Nano-technology, Nano-scale material, implications for Physics, Chemistry, Engineering & Biology, and Motivation for Nanotechnology study. Histroy & development of Nano-science and Nano-technology with the emphasis on history of Nano-metals, Chalcogenides & Boron Nitrite and Carbon Nanomaterials.	15
2	**Structures & Classification Of Nanomaterials:** Nano-structures: various types of nano-structures and nano-crystals. Classification of bulk Nano-structured materials, 0D, 1D, 2D structures- Size Effects-Fraction of Surface Atoms-specific Surface Energy anf Surface Stress- Effect on the Lattice Parameter- Photon Density of States Nano-particles, Quantum dots, Nano-wires, Ultra thin films, Multi-layered materials.	15

Reference Books

1. C.Bre' chignac P. Houdy M. Lahmani, Nanomaterials and Nanochemistry, Springer Berlin Heidelberg, Germany (2006).
2. Kenneth J. Klabunde, Nanscale materials in chemistry, Wiley Interscience publications (2001).
3. Hans Lautenshlager, Emulsions, Kosmetik International,(2002).
4. Roque Hidalgo-Alvarez, Structure and Functional properties of Colloids, CRC Press.
5. Richard J. Fann, Chemistry and Technology of Surfactants, Wiley-Blackwell, (2006).

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FACULTY OF SCIENCE

Programme	Master of Science	Branch/Spec.	Chemistry
Semester	I	Version	2.0.0.1
Effective From Academic Year	2021-22	Effective for the batch Admitted in	July-2021
Subject code	MELE1CRG	Subject Name	Chromatography-I

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	00	00	00	02	Theory	40	60	100
Hours	02	00	00	00	02	Practical	00	00	00

Pre-requisites:

Separation techniques are the basis of instrumental analysis widely applied in industry, chemistry, biochemistry, environment science. These techniques are based on principles of chemistry. Therefore, in this module we shall study the principles on which techniques are based and acquire the basic skills necessary to use the techniques

Learning Outcome:

After completion of the course you will

- Understanding the principles of chromatographic techniques, with the emphasis on the application in biochemistry.
- Students are able to design, perform, and interpret chromatographic experiments for biochemical applications.

Theory syllabus

Unit	Content	Hrs
1	**Chromatography-I** Partition Chromatography: Paper chromatography, Thin Layer Chromatography, HPTLC, Column Chromatography, Rf value, chromatogram, single, 2D and 3D chromatography. Ascending and descending chromatography. Applications of partition chromatography.	15
2	**Chromatography-II** **Gas chromatography:** Principle, Theory, Instrument description of equipment and different parts, columns (packed and capillary columns), detector specifications-thermal conductivity detector, flame ionization detector, electron capture detector, Applications **High Performance Liquid Chromatography (HPLC)** – Principle, Theory, Instrumentation, columns and separation modes, Applications with respect to separation of organic compounds, comparison between HPLC and UPLC.	15

Reference Books

1. Separation Methods - M. N. Sastri, 1st ed., Himalaya Publishers, 1991.
2. Principles of Instrumental Analysis – Skoog, Holler, Nieman, 5th ed., Harcourt College Publishers, 1998.29
3. Analytical Chemistry - Gary D.Christian, 6th ed, John Wiley and sons. Inc., New York, sixth edition, 1994.
4. Introduction to analytical Gas Chromatography, Raymond PW Scott,2nd Ed. Marcel Dekker, Inc. New York,1988.
5. Techniques and practice of Chromatography, Raymond PW Scott, Marcel Dekker, Inc. New York,1995.
6. Instrumental Methods of Chemical Analysis by B. K. Sharma
7. Instrumental methods of Analysis by Willard, Merritt, Dean, Settle (CBS).

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FACULTY OF SCIENCE									
Programme	Master of Science					Branch/Spec.	Chemistry		
Semester	I					Version	2.0.0.1		
Effective From Academic Year			2021-22			Effective for the batch Admitted in			July-2021
Subject code	MELE1IDC		Subject Name			Industrial Chemistry-I			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	00	00	00	02	Theory	40	60	100
Hours	02	00	00	00	02	Practical	00	00	00

Pre-requisites:

Before studying Industrial chemistry, all students have basic knowledge of types of reaction, condition, unit operation, unit operation and perfumes.

Learning Outcome:

After completion of the course you will

- Understand the basic concepts of industrial chemistry
- Understand Parameters of Chemical Industry
- Students can understand the process and chemical reaction in industries.
- Understand the reaction mechanism of various name reactions.

Theory syllabus

Unit	Content	Hrs
1	**Chemical Industry:** Introduction, Chemical production, Raw materials and their sources. **a) Parameters of Chemical Industry:** Plant location, Safety, Construction of plant, Management for productivity and creativity, Training for plant procedure and labor, Chemical process technology, Classification of chemical reactions, Batch and continuous operations, Industrial chemical reactions, Conversion, Selectivity and Yield. **b) Unit Operations:** Introduction, Unit operations- Distillation, Crystallization, Filtration, Drying of solids, Extraction, Size reduction (crushers, grinders, and mills), Size separations (mechanical and hydraulic separation), **c) Unit processes:** Introduction, Industrial unit processes- Definition and examples of Alkylation, Amination, Condensation, Cyclisation, Combustion, Cracking and pyrolysis, Hydrogenation and dehydrogenation, Diazotization and coupling, Dehydration, Esterification, Hydrolysis, Halogenation, Isomerization, Ion-exchange, Nitration, Sulphonation, Neutralization, Oxidization, Reduction.	15
2	**Cosmetics Industries:** Introduction, manufacturing process of powder, cream and lotion, lipstick and nail polish, shampoo and hair dyes, tooth paste. **Perfumery Industries:** Compounds used for different perfumes, Essential oils, Preparation of phenyl ethanol, Yara-	15

	Yara, β-ionone, musk ketone, musk ambrette, musk xylene, phenyl acetic acid and its' esters, benzyl acetate, synthetic musk, jasmine.	

Reference Books

1. Chemical Process Industries – Shrieves
2. Chemical Technology – Dryden
3. Chemical Technology – Shah and Pandey
4. Synthetic Dyes – G. R. Chatwal
5. Organic Chemistry Vol. III – S. M. Mukharji, S. P. Singh, R P. Kapoor
6. Paint Technology – Morgan
7. Plants Oils as fuels: Present Science and Future Developments- N. Martini and J. S. Sebeli
8. Biofuels: Air Pollution and Health- K. R. Smith
9. Biofuels and Industrial Products from Jatropha- M. Mittel bach
10. Formulary of Cosmetic Preparations – M. Ash and I. Ash.
11. Formulary of Paints and Other Coatings – M. Ash and I. Ash.
12. Perfumery Technology- B. Billot and F. V. Wells
13. High Energy Materials, Propellants, Explosives and Pyrotechnics- Jai Prakash Agrawal.

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FACULTY OF SCIENCE

Programme	Master of Science	Branch/Spec.	Chemistry
Semester	I	Version	2.0.0.1
Effective From Academic Year	2021-22	Effective for the batch Admitted in	July-2021
Subject code	MCHE1PRA	Subject Name	Practical Module-I

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	00	00	06	00	06	Theory	00	00	00
Hours	00	00	12	00	12	Practical	00	200	200

Pre-requisites:

Before performing these practicals, students have basic knowledge of laboratory chemicals, inorganic & organic compounds and their properties, theories related to chemical kinetics, conductometry, organic estimations, apparatus and instruments which are used in performing chemistry practical's.

Learning Outcome:

Understanding of synthetic inorganic chemistry.

- Characterization of synthesized inorganic complexes and Qualitative analysis of inorganic ions.
- Knowledge of basic techniques like crystallization, distillation etc.
- Understanding of synthetic organic chemistry and Practical knowledge of conductometer.
- Practical knowledge and application of theories

Theory syllabus

Unit	Content	Hrs
1	**Inorganic Chemistry** **(A)Qualitative Analysis.** (A mixture containing total 6 radicals and one rare element) (Minimum 10) (a) Less common metal ions – TI, Mo, W, Ti, Zr, Th, V, U (Three metal ions in cationic and three anionic form) (b) Insoluble – oxides, sulphates and halides **(B) Volumetric and Gravimetric Analysis** Separation and determination of two metal ions Cu-Ni, Ni-Zn, Cu-Fe etc. involving volumetric and gravimetric methods. (Minimum 3)	60
2	**Organic Chemistry** **(A) Preparation of organic compounds : (ALL)** i) Nitration ii) Bromination iii) Acylation iv) Reduction v) Oxidation vi) Condensation reaction vii) Diazotization reaction viii) Friedel-Craft's reaction ix) Cannizzaro reaction x) Aldol condensation **(B) Quantitative Estimations (Any Two)** a. Estimation of ester b. Estimation of alcohol/phenol	60

	c. Estimation of glycine d. Estimation of amide	
	Physical Chemistry **(A)Determine the effect on rate constant of hydrolysis of an ester/ionic reactions** 1. Change of concentration of catalyst (HCl) 2. Change of concentration of reactant (Ester) 3. Change of temperature 4. Effect of ionic strength 5. Reaction in micellar media **(B) Chemical Kinetics** 1. To study the reaction between H_2O_2 and HI at two different temperature and calculate the temperature coefficient and the energy of activation. 2. To study the rate constant of the reaction between $K_2S_2O_8$ and KI and study the influence of ionic strength on the rate constant. **(C) Conductometric Analysis** 1. Determine the amount of HCl and CH_3COOH in given solution by conductometric titration against 0.1N NaOH 2. Determine the degree of dissociation and dissociation constant in water for the acetic acid conductometrically 3. Determine the amount of HCl and CH_3COOH in given solution by pHmetric titration against 0.1N NaOH **(D) Potentiometry** 1. Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH / NH_4OH and find the strength of the acids in the mixture. 2. Determination of Solubility product of silver halides.	60

Reference Books

1. A text book of practical organic chemistry – A. I. VogelVogel's Qualitative Inorganic Analysis, Revised by G Svehla, Sixth Edition, Longman, 1987
2. Advanced Practical Inorganic Chemistry, Gurdeepraj, Goel Publishing House, 2001
3. Practical organic Chemistry – Mann and Saunders
4. A handbook of quantitative and qualitative analysis – H. T. Clarke
5. Comprehensive Practical Organic Chemistry: Qualitative Analysis V K Ahluwalia & S. Dhingra.
6. Comprehensive Practical Organic Chemistry: Preparations and Quantitative Analysis V K Ahluwalia & R. Aggarwal Universities Press.
7. An Advance Course in practical Chemistry, A K. Nad, B. Mahapatra and A. Ghoshal.
8. Practical physical chemistry –J.B.Yadav
9. Practical in physical chemistry – P.S.Sindhu
10. Experimental physical chemistry – R.C.Das, B.Behera
11. Experiments in physical chemistry- P.H.Parsania, F. Karia