

Shri Govind Guru University

(Established by Government of Gujarat Vide Gujarat Act no 24/2015)

Towards Smart Quality Education

Faculty of Science

Master of Science

Syllabus for

M.Sc. (CBCS Programme)

Semester - 1 to 4

Effective from June-2019

Website:www.sgggu.ac.in

M. Sc. Semester -I

MSC1C101 Inorganic Chemistry

Unit 1 -Quantum theory and Atomic Structure

Postulates of quantum mechanics, setting up of different observables, eigen value of angular momenta and commutation relations, step-up and step-down operators, angular momenta in many electron atoms.

Schrodinger wave equation and applications : particle on a ring and the simple harmonic oscillator.

H-atom wave functions, solutions of $R_{(r)}$ $\theta_{(\theta)}$ and $\phi_{(\varphi)}$ equations, quantum numbers, angular and radial wave function, shapes of the orbitals, angular momentum of inner quantum number j, physical interpretation of hydrogenic orbitals; space quantization of electronic orbits; electron spin.

Approximation methods : Variation method and application to H atom. Perturbation theory (first order and non-degenerate, application to the Helium atom)

Unit 2- Symmetry and Group Theory

Representation of groups –some properties of matrices & vectors, representation of groups, the Great orthogonality theorem and its consequences, character table, wave functions as basis for irreducible representations, direct product, identifying non-zero matrix elements.

Unit 3- Magnetochemistry

Magnetic susceptibility and basic derivation of diamagnetic susceptibility, pascal constant and its utility, Curie law and Curie-Weiss law, antiferromagnetism and ferromagnetism. Types of antiferromagnetism, antiferromagnetic exchange pathway : Direct –metal- metal interaction and Indirect-atom exchange i.e. super exchange mechanism.

Unit 4- Bio-inorganic Chemistry

Metalloporphyrins (enzymes) definition, hemoglobin and myoglobin, cytochrome, vitamin B₁₂ (cyano cobalamin), zinc metallo enzymes, nitrogen fixation, essential and trace elements in biological system, biochemistry of non metals K, Na pump (action of bath ions), toxic metals and their toxicity.

Co-ordination compounds in medicine

Chelation therapy, gold compounds and rheumatoid arthritis, anticancer drugs –platinum complexes, gold complexes, metallocenes etc, antimicrobial agents, metal complexes as radiodiagnostic agents, magnetic resonance imaging.

Semester I – Theory

MSC1C101 Inorganic Chemistry

References:

1. Introduction to Quantum Chemistry, A. K. Chandra, Tata MacGraw Hill
2. Quantum Chemistry, Ira N. Levine, Prentice Hall
3. Quantum Chemistry by R. K. Prasad, New Age International Publishers (1985)
4. Elementary Quantum Chemistry by D. L. Pilar, Mc Graw Hill Book Co, New York (1968)
5. D. A. McQuarrie Quantum Chemistry, OUP 1983
6. M. W. Hanna, Quantum Mechanics in Chemistry, The Benjamin Pub.
7. Molecular Quantum Mechanics, Third Edition, P. W. Atkins and R.S. Friedman
8. Group theory and symmetry in chemistry, L. H. Hall(McGraw Hill)
9. F. A. Cotton, Chemical Applications of Group theory, Wiley Eastern 2nd Edn.1992
10. V. Ramkrishnan & M. S. Gopinadhan, Group theory in Chemistry Vishal Pub.1996.
11. Inorganic Chemistry, Third Edition, Alan G. Sharpe
12. Theoretical Inorganic Chemistry, M. C. Day, J. Shellin
13. Chemistry, Fifth Edition, John E. McMurry, Robert C. Fay
14. Hermann Dugas, Bioorganic Chemistry, A Chemical Approach to Enzyme Action, Springer International Edition
15. An Introduction to Theoretical Chemistry, Jack Simons, Cambridge
16. Progress in inorganic Chemistry, Vols 18 and 38 ed. J. J. Lippard, Wiley
17. Inorganic Reaction Mechanisms, M. L. Tobe, Nelson Pub
18. Inorganic Chemistry, K. F. Purcell and J. C. Kotz.
19. Principles of Bioinorganic Chemistry, S. J. Lippard and J. M. Bers
20. Bioinorganic Chemistry, I. Bertini, H. B. Gray and S. J. Lippard
21. Principals of Bioorganic Chemistry, S. J. Lippard and J. M. Berg, University Science Books.
22. Bioinorganic Chemistry, I. Bertini, H. B. Gray, S. J. Lippard and J. S. Valentine, University Science Books.
23. Inorganic Biochemistry vols I and II ed. G. L. Eichhorn, Elsevier
24. Introduction to Magnetochemistry, Alan Earnshaw, 1968
25. Elements of Magnetochemistry, Dutta and Syamal, 1993

M. Sc. Semester I- Practicals
MSC1P101 Inorganic Chemistry

1. Semi-microqualitative analysis of 15 mixtures, each having six radicals including less familiar elements (Mo, W, Li, Th, V, Zr, Ce, Be, Ti) and one insoluble compounds.

M. Sc. Semester I- Practicals
MSC1P101 Inorganic Chemistry

References

1. Vogel's Qualitative Inorganic Analysis, Revised by G Svehla, Sixth Edition, Longman, 1987.

M.Sc. SEMESTER - I

MSC1C102 Organic Chemistry

Unit-1

(A) Elimination Reaction

The E₁, E₂, E₁CB mechanism, stereochemistry. Orientation of the double bond *syn* and *anti* eliminations. Reactivity- effects of substrate structures, attacking base, leaving group and medium. Mechanism and orientation in pyrolytic *syn* eliminations- Chugaev, Cope eliminations and Burgess dehydration reaction.

(B) Nucleophilic Substitution Reaction

Mixed S_N1, S_N2 and SET mechanism.

Nucleophilic substitution at (a) Allylic carbon (Allylic rearrangements), (b) Carbonyl (C=O) and Alcohol (c) A Vinyl carbon. Participation of Neighboring groups in Nucleophilic substitution by (a) Carboxylate anion (b) -NH₂ Group (c) Hydroxyl groups (d) Acetoxy group (e) Phenyl group (f) -SH group

Unit-2

(A) Aromaticity

Aromaticity, aromatic character, Frost circle diagram for cyclobutadiene, benzene and others. Resonance and chemical stabilization-aromatic character based on NMR criteria, Huckels rule, energy level of π molecular orbitals, Huckels molecular orbital(HMO) method, MO of simple organic systems such as ethene, allyl and butadiene Aromaticity in benzenoid and non-benzenoid compounds and charged rings, annulenes, fulvenes, azulenes, antiaromaticity and homoaromaticity.

(B) **Acid base** concept, pK_a, Hammett equation, Concept of hindered base, The effect of structure on the strength of acids and bases.

Unit - 3

(A) Reactive intermediates

- (1) Carbocations stability, structure, generation and fate
- (2) Carbanions- stability, structure, generation and fate of carbanions
- (3) Carbenes-stability and structure, the generation and fate of carbenes.
- (4) Free radicals: stability, structure, generation and fate of free radicals, NBS
- (5) Nitrene : stability, structure, generation, reaction

(B) Rearrangements:

General mechanistic considerations, nature of migration, migratory aptitude, and memory effects in respect of following.

(1) Carbon to Carbon migration of R, H and Ar

- (i) Pinacol- Pinacolone rearrangement

- (ii) Favorskii rearrangement
 - (iii) Wagner-Meerwein rearrangement
- (2) Carbon to Nitrogen migrations:**
- (i) Curtius rearrangement
 - (ii) Schmidt rearrangement
 - (iii) Lossen rearrangement

Unit - 4

Stereo Chemistry

Optical and geometrical isomerism, origin of chirality and chiral centre, axis and plane, helicity, Enantiotopic and diastereotopic atoms, groups and faces, prochiral centre, prochiral environments, chiral drugs. Stereo chemistry in additions to alkenes (Syn, Anti, Diels,-alder)

M.Sc. SEMESTER – I

MSC1C102 Organic Chemistry : Theory

References:

- 1) Advanced Organic Chemistry, Reactions Mechanisms and Structure , J. March, 6th Edition, John Wiley.
- 2) Carbenes, nitrenes and arynes, T.L. Gilchrist and C.W. Rees.
- 3) Guidebook to Mechanism in Organic Chemistry by Peter Sykes, 6th Edition, Prentice Hall.
- 4) Advanced Organic Chemistry Part A: Structure and Mechanism and Part B:Reaction and synthesis ,Francis A. Carey, Richard J. Sundberg, 5th Edition, Springer .
- 5) Organic Chemistry, Johnathan Clayden, Nick Greeves, Stuart Warren, 1st Edition, Oxford University Press.
- 6) Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, 3rd Edition, Blackie Academic and Professional.
- 7) Stereo Chemistry , P.S. Kalsi , New Age Publications.
- 8) Reagents in Organic Synthesis- Fieser and Fieser, John Wiley.
- 9) Physical Organic Chemistry by Jack Hynes,(plenum publication)
- 10) Organic Chemistry, T.W. Graham Solomons and Graig B. Frymes, John Wiley and Sons.
- 11) Organic Chemistry, F. A. Carey, McGraw Hill Edition.
- 12) General Organic Chemistry Sachin Kumar Ghose, New Central book agency.
- 13) Organic Chemistry Vol 1-2 I.L.Finar 5th edition,ELBS.

M.Sc. - Semester – I (PRACTICALS)
MSC1P101 Organic Chemistry

One Step Preparation of organic compounds : (Minimum 12)

- i) Nitration
- ii) Bromination
- iii) Acylation
- iv) Reduction
- v) Oxidation
- vi) Condensation reaction
- vii) Diazotization reaction
- viii) Friedl-Craft's reaction
- ix) Cannizzaro reaction
- x) Aldol condensation

M. Sc. - Semester – I (PRACTICALS)
MSC1P101 Organic Chemistry

References:

1. A text book of practical organic chemistry – A. I. Vogel
2. Practical organic Chemistry – Mann and Saunders
3. A handbook of quantitative and qualitative analysis – H. T. Clarke
4. Comprehensive Practical Organic Chemistry : Qualitative Analysis V K Ahluwalia & S. Dhingra.
5. Comprehensive Practical Organic Chemistry : Preparations and Quantitative Analysis V K Ahluwalia & R. Aggarwal Universities Press.
6. An Advance Course in practical Chemistry, A K. Nad, B. Mahapatra and A. Ghoshal.

M.Sc. Semester - I
MSC1C103 Physical Chemistry

Unit I- Chemical thermodynamics:

Nernst heat theorem and its applications to gaseous system, third law of thermodynamics and its applications to evaluate absolute entropies of solids, liquids and gases; partial molar quantities and their determination, Gibbs-Duhem equation, chemical potential, chemical potential of ideal gases and solutions, Raoult's law, real solutions, free energy and solutions, activity and activity coefficients, methods of determination of activity and activity coefficients, fugacity of gases and liquids and methods of its determination.

Unit II- Chemical Kinetics:

Unimolecular reactions, chain reactions and branched chain reactions, explosion limits, chain reaction between hydrogen and bromine, theory of absolute reaction rates, kinetic isotope effect.

Enzyme catalyzed reactions, mechanism, kinetics and some examples.

Unit III- Solid state chemistry:

Bonding in solids and electronic structure in solids, band theory-metals, semiconductors and insulators, defects in crystals, calculation of Schottky and Frenkel defects using statistical method, non stoichiometry, solid electrolytes, diffusion in solids, electrical conductivity in solids, super conductivity.

Unit IV- Surface chemistry:

Physical and chemical adsorption, BET and HJ equations, heat of adsorption, determination of surface area of adsorbents, surface tension, Gibbs's equation, surface active agents, micellisation, critical micellar concentration (cmc), detergency.

M. Sc. Semester I- References: Theory

- (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 – Surdeep Raj
- (5) Advanced physical chemistry – J.N.Gurtu, A.Gurtu
- (6) Thermodynamics for chemists –Glasstone
- (7) Physical chemistry – S. Castellian
- (8) Thermodynamics of non equilibrium processes- Karapitaneh
- (9) Chemical Kinetics- Laidler
- (10) Chemical Kinetics – Frost and Pearson
- (11) Solid state chemistry – H.Keer
- (12) Solid state chemistry- Hannay
- (13) Chemistry of solids – Azaroff
- (14) Surface chemistry – Adamson
- (15) Surface chemistry – Osipov

M.Sc. Semester I -Practicals
MSC1P102 Physical Chemistry

I. Conductometry

1. Titration of mixture of strong acid and weak acid with strong base (HCl + HAC against NaOH)
Titration of mixture of strong acid and weak acid with weak base (HCl + HAC against H_4OH)
2. Solubility product of sparingly soluble salts – PbSO_4 & BaSO_4

II Potentiometry

1. Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH / NH_4OH and find the strength of the acids in mixture.
2. Solubility product of silver halides.

III pH metry

1. Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH / NH_4OH and find the strength of the acids.
2. Titration of mixture of bases (Na_2CO_3 & NaHCO_3) with standard HCl and find the concentration of bases.

IV Adsorption and kinetics

1. Hydrolysis of esters
2. Reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI. ($a=b$ & $a \neq b$)

V Distribution method

1. Distribution of acetic acid between H_2O and butanol.
2. Distribution of HAC between H_2O and $\text{CHCl}_3 / \text{CCl}_4$.
3. Distribution of I_2 between H_2O and CCl_4 .

M.Sc. Semester - I

MSC1C104 Analytical Chemistry

UNIT-1

Analytical Objectives, Data Handling and Good Laboratory Practice (GLP)

Scope of analytical science and its literature, qualitative and quantitative analysis, Classification of analytical methods, basis of classical and Instrumental method of analysis. GLP- standard operating procedures, quality assurance and quality control.

Non-aqueous titrations: principles, theory, role of solvents and their classification, properties of solvents, Standard titration curves, factors affecting non-aqueous titrations, advantages and limitations.

UNIT-2

Sampling and Calibration Methods

Sampling and sample preparation, general steps in chemical analysis, calibration of glass wares. Finding the best straight line-least square regression, correlation coefficient; Calibration curves, standard addition technique and internal standards. Chemical concentrations.

UNIT-3

Fundamentals of Spectrophotometry

Properties of light, absorption of light, interaction of light with matter and origin of spectra. The spectrophotometer- calibration, sources of light, monochromators and detectors. Beer's law in chemical analysis, photometric accuracy- Ringbom Plot, derivative spectrophotometry, optical rotatory dispersion and circular dichroism.

UNIT-4

Applications of Spectrophotometry

Analysis of mixture-resolved and unresolved spectra, measurement of equilibrium constant: Scatchard Plot; Stoichiometry-method of continuous variation- the Jobs plot. Photometric titrations. Application for quantitative measurement of spectrophotometry.

M.Sc. Semester - I

MSC1C104 Analytical Chemistry- Theory

Reference Books :

1. "Quantitative Chemical Analysis" by Daniel C. Harris, 5th Edition, W.H. Freeman and Company, New York.
2. "Analytical Chemistry" by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.
3. "Principles of Instrumental Analysis" by Douglas A. Skoog, 3rd Edition, Holt-Saunders International Edition.
4. "Instrumental Methods of Chemical Analysis" by Galen W. Ewing, 4th Edition, International Student Edition.

M.Sc. Semester - I Practical

MSC1P102 Analytical Chemistry

1. Calibration of glass wares and balance.
2. Calibration of pH meter, conductometer and potentiometer.
3. Preparation of stock solution and standardization [HCl \longleftrightarrow NaOH \longleftrightarrow KHP]
4. Determination of available chlorine in bleaching powder.
5. Determination of vitamin C in orange juice/amla.
6. Determination of acetic acid in vinegar.
7. Determination of sodium carbonate and sodium bicarbonate in washing soda.
8. Determination of ascorbic acid in vitamin C tablets.
9. Determination of calcium and magnesium in water sample.
10. Determination of total dissolved solids in water samples.
11. Determination of sulphate in water sample.
12. Determination of chloride in water sample.

M.Sc. Semester I

MSC1P102 Analytical Chemistry

References:

1. Analytical Chemistry Practice, John H. Kennedy, Saunders College Publishing, Second Edition 1990.
2. Vogels Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.

M. Sc. Semester - II

MSC1C201 Inorganic Chemistry

Unit I- Chemical Bonding

The method of linear combination

VSEPR, Walsh diagrams(tri-and penta- atomic molecules), $d_{\pi} - p_{\pi}$ bonds, Bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules.

Simple Huckel theory of linear conjugated systems, simple Huckel theory of the cyclic conjugated system and aromaticity, self consistent field method, valence state ionization potentials, Pariser-Parr-Pople approximation.

Band theory of solids, Fermi level, electrical properties, insulators, semiconductors and superconductors (properties).

Unit 2- Application of symmetry

Application of symmetry to hybrid orbital, molecular orbitals, hybridization schemes for σ orbitals, π bonding and molecular orbital for AB_n type of molecules.

Application of symmetry to molecular vibrations, interpretation of IR and Raman spectral data.

Unit 3-Organometallic Compounds

Organometallic compounds of transition elements, stability of metal carbon bond in complexes. Synthesis, uses and structure of organometallic compounds of π bonding organic ligands, 2-electron ligands, olefinic and acetylinic complexes, compound with 3 electron ligand – allylic complexes, compounds. With 4- electron ligands butadiene complexes, n^4 complexes of cyclopentadiene, compounds with 5 electron ligands – cyclopentadienyl, compounds with 6 electron ligands, n^6 complexes of benzene and its derivatives.

Role of organometallic compounds in catalytic reaction.

Unit 4 – Reaction Mechanism

Mechanism of substitution reaction in square planar complexes. Kinetics of substitution reaction of platinum (II) complexes

Effect of leaving group, effect of charge, steric effect, solvent effect, effect of nucleophile, effect of temperature and other effects.

Oxidation-Reduction reaction, electron transfer, tunnelling effect, Marcus –Hush theory, one and two electron transfer inner sphere and outer sphere, effect of ions on rate, electron transfer through extended bridges, unstable oxidation states, hydrated electron.

M. Sc. Semester –II
MSC1C201 (Inorganic Chemistry)- Theory

References

1. Introduction to Quantum Chemistry, A. K. Chandra, Tata MacGraw Hill
2. Quantum Chemistry, Ira N. Levine, Prentice Hall
3. Quantum Chemistry by R. K. Prasad, New Age International Publishers (1985)
4. D. A. McQuarrie Quantum Chemistry, OUP 1983
5. M. W. Hanna, Quantum Mechanics in Chemistry, The Benjamin Pub.
6. Lectures on Chemical Bonding and Quantum Chemistry, S. N. Datta, A Prism Book
7. Group theory and symmetry in chemistry, L. H. Hall(McGraw Hill)
8. Coulson's Valence, R. McWeeny, ELBS
9. F. A. Cotton, Chemical Applications of Group theory, Wiley Eastern 2nd Edn.1992
10. V. Ramkrishnan & M. S. Gopinadhan, Group theory in Chemistry Vishal Pub.1996.
11. Inorganic Chemistry, Third Edition, Alan G. Sharpe
12. Theoretical Inorganic Chemistry, M. C. Day, J. Shellin
13. Chemistry, Fifth Edition, John E. McMurry, Robert C. Fay
14. An Introduction to Theoretical Chemistry, Jack Simons, Cambridge
15. Progress in inorganic Chemistry, Vols 18 and 38 ed. J. J. Lippard, Wiley
16. Mechanism of Inorganic Reactions, F. Basolo and R. G. Persons, Wiley Pub
17. Reaction Mechanism of Coordination Compounds, C. H. Langford and H. B. Gray
18. Inorganic Reaction Mechanisms, M. L. Tobe, Nelson Pub
19. Inorganic Chemistry, K. F. Purcell and J. C. Kotz.
20. Principles of Bioinorganic Chemistry, S. J. Lippard and J. M. Bers
21. Mehrotra R. C. and Singh A. Organo Metallic Chemistry, Willey Eastern Ltd., New Delhi
22. Coates G. E. Green MIH Wade, K and Aylett B. J. Organo Metallic Comounds Chapman and Hall, London

M. Sc. Semester II- Practicals

MSC1P201 (Inorganic Chemistry)

1. Preparation and determination of purity of double and complex salts. At least ten preparations should be done.
2. Colourimetric estimation of any five out of Ni, Fe.

M. Sc. Semester II- Practicals

MSC1P201 (Inorganic Chemistry)

References

1. Vogels Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.
2. Advanced Practical Inorganic Chemistry, Gurdeepraj, Goel Publishing House, 2001.
3. An Advanced Course in Practical Chemistry, A.K. Nad, B. Mahapatra, A. Ghosal, New Central Book Agency, 2004

M.Sc. SEMESTER - II
MSC1C202 Organic Chemistry

Unit-1

Spectroscopy

- 1) ¹³C NMR : General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants.
- 2) Mass spectroscopy : Introduction, ion production, EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. High resolution mass spectroscopy.
- 3) Examples of mass spectral fragmentation of organic compounds, NMR, IR, UV with respect to their structure determination.

Unit - 2

(A) Photochemistry:

- (1) Photochemical reactions: Principles of energy transfer, electronic excitation and molecular orbital view of excitation, excited states and fate of excited molecules (modified Jablonski diagram), Photosensitization.
- (2) Photochemistry of carbonyl compounds: Representation of excited states of ketones, photoreduction Norrish type I & II reactions, Reactions of cyclic Ketone, oxetane formation (Paterno-Buchi reaction)
- (3) Di- π methane rearrangement, Dienone photochemistry, cis-trans isomerisation and photochemistry of conjugated olefins.

(B) Chemistry of Heterocycles

- (1) Nomenclature of heterocycles : Replacement and systematic nomenclature (Hantzsch Widman system) for monocyclic, fused and bridged heterocycles. General chemical behavior of aromatic heterocycles.
- (2) Five-membered heterocycles : Oxazole, Isoxazole, Thiazole, Pyrazole, Imidazole, Triazoles, Tetrazole.
- (3) Six membered and benzofused six membered heterocycles : Pyrazine, Pyridazine, Pyrimidine, Cinnoline, Quinazoline, Quinoxaline.

Unit - 3

Name reactions : General nature, method, mechanism and synthetic applications of the following reactions:

- (i) Vilsmeier-Haack reaction
- (ii) Mitsunobu reaction
- (iii) Suzuki reaction
- (iv) Balz-Schiemann reaction
- (v) Sonogashira coupling
- (vi) Stobbe condensation
- (vii) Jones oxidation
- (viii) Swern oxidation reaction

- (ix) Perkin reaction
- (x) Darzen's glycidic ester synthesis
- (xi) Mannich reaction
- (xii) Finkelstein reaction
- (xiii) Ullmann reduction
- (xiv) Witting reaction
- (xv) Knoevanagel reaction

Unit-4

Reagents in organic synthesis : Mechanism selectivity and utility of following reagents:

- (i) Gilman's reagent-Lithium dimethylcuprate
- (ii) Lithium diisopropylamide (LDA)
- (iii) Dicyclohexyl carbodiimide (DCC)
- (iv) 1,3 – Dithiane (Umpolung reagent)
- (v) Dess- Martin periodinane
- (vi) Bakers yeast
- (vii) Azo-bis-isobutyronitrile
- (viii) Oxaziridine
- (ix) Thionyl Chloride
- (x) DDQ
- (xi) Ter-butyl Hydro Peroxide
- (xii) Di-methyl dioxirane
- (xiii) Phase transfer catalysis : Quaternary ammonium and phosphonium salts.

M.Sc. SEMESTER II - Theory

MSC1C202 Organic Chemistry

References :

- 1) Modern Synthetic Reactions, H.O.House, W.A. Benjamin.
- 2) Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, 3rd Edition, Blackie Academic and Professional.
- 3) Spectrometric Identification of Organic Compounds by Robert M. Silverstein, 7th Edition, Wiley.
- 4) Mass Spectrometry – A Textbook Jurgen Gross, 1st Edition, 2002, Springer – Verlag Berlin Heidelberg.
- 5) Introductory Photochemistry, A.Cox and T.Camp, McGraw Hill.
- 6) Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.
- 7) Organic Photochemistry, J. Coxon and B. Halton, 2nd Edition, Cambridge University Press.
- 8) Strategic Applications of Named Reactions in Organic Synthesis, Laszlo Kurti and Barbara Czako, 1st Edition, Academic Press.
- 9) Name Reactions and Reagents in Organic Synthesis, Bradford P. Mundy, Michael G. Ellerd, Frank G. Favalaro, 2nd Edition, Wiley – Interscience.
- 10) Name Reactions. A Collection of Detailed Reaction Mechanisms., Jie Jack Li, 3rd Edition, Springer.
- 11) Heterocyclic Chemistry, volume 1-3, R.R. Gupta, M. Kumar and V. Gupta, Springer-Verlag.
- 12) Heterocyclic Chemistry, J.A. Joule, K.Mills, and G.F. Smith, 3rd Edition, Chapman and Hall.
- 13) Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical.
- 14) Contemporary Heterocyclic Chemistry, G.R. Nikome and W.W. Poudler, Wiley.
- 15) Comprehensive Heterocyclic Chemistry, A.R. Kartizky, and C.W. Rees.
- 16) Encyclopedia of Reagents for Organic Synthesis, Leo A. Paquette, David Crich and Phillip L. Fuchs, John Wiley and Sons Inc.
- 17) Organic Chemistry, T.W. Graham Solomons and Graig B. Frymes, John Wiley and Sons.
- 18) Organic Chemistry, F. A. Carey, McGraw Hill Edition.
- 19) General Organic Chemistry Sachin Kumar Ghose, New Central book agency.
- 20) Guidebook to Mechanism in Organic Chemistry by Peter Sykes, 6th Edition, Prentice Hall.
- 21) Advanced Organic Chemistry Part A: Structure and Mechanism and Part B: Reaction and synthesis, Francis A. Carey, Richard J. Sundberg, 5th Edition, Springer.
- 22) Organic Chemistry Vol 1-2 I.L.Finar 5th edition, ELBS.

M.Sc Semester – II (PRACTICALS)

MSC1P201 Organic Chemistry

Mixture analysis: ternary mixture to be given. (S+S+S)or (L+L+L). Type determination.

Separation by physical and chemical methods. (both permitted in case of liquids)

M.Sc Semester – II (PRACTICALS)

MSC1P201 Organic Chemistry

References:

1. A text book of practical organic chemistry – A. I. Vogel
2. Practical organic Chemistry – Mann and Saunders
3. A handbook of quantitative and qualitative analysis – H. T. Clarke
4. Comprehensive Practical Organic Chemistry : Qualitative Analysis V K Ahluwalia & S. Dhingra.
5. Comprehensive Practical Organic Chemistry : Preparations and Quantitative Analysis V K Ahluwalia & R. Aggarwal Universities Press.
6. An Advance Course in practical Chemistry, A K. Nad, B. Mahapatra and A. Ghoshal.

M.Sc. Semester II
MSC1C203 Physical Chemistry

Unit I : Statistical thermodynamics:

Concepts of distribution of molecules, thermodynamic probability, permutations and combinations, Boltzmann's most probable distribution, partition function-translational, vibrational, rotational, electronic nuclear partition functions.

Unit II : Nuclear chemistry:

Nuclear properties-nuclear radius, coulombic and nuclear potential radius, nuclear spin and angular momentum, magnetic moment, nuclear binding energy, nuclear models-shell model, liquid drop model, Fermi gas model, collective model, radioactive decay, nuclear reactions, evaporation, spallation, fragmentation, fission and fusion reactions, accelerators, reaction cross section, use of radioisotopes as tracers.

Unit III: Polymer chemistry:

Kinetics and mechanism of polymer processes, criteria of polymer solubility, thermodynamics of polymer solutions, polymer characterization, molecular weight of polymer (number average and weight average) , methods of molecular weight determination, properties of polymers and applications.

Unit IV : Electrochemistry:

Sign convention-American, European and IUPAC; Determination of dissociation constant of monobasic acids by conductometry, determination of dissociation constants of monobasic and polybasic acids by potentiometry.

The rate of charge transfer, polarization and overvoltage, basic principle of polarography, origin of different types of current; equation of polarographic wave, Ilkovic equation.

M. Sc. Semester II- References: Theory

- (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 – Surdeep Raj
- (5) Advanced physical chemistry – J.N.Gurtu, A.Gurtu
- (6) Thermodynamics for chemists –Glasstone
- (7) Physical chemistry – S. Castellian
- (8) Thermodynamics of non equilibrium processes- Karapitaneh
- (9) Chemical Kinetics- Laidler
- (10) Chemical Kinetics – Frost and Pearson
- (11) Solid state chemistry – H.Keer
- (12) Solid state chemistry- Hannay
- (13) Chemistry of solids – Azaroff
- (14) Surface chemistry – Adamson
- (15) Surface chemistry – Osipov

M.Sc. Semester - II Practicals
MSC1P202 Physical Chemistry

I. Conductometry

1. Test of validity of Ostwald's dilution law and determination of dissociation constant of weak electrolyte like CH_3COOH & ClCH_2COOH
2. Verification of Debye-Huckel-Onsager's equation in case of strong electrolytes like HCl , NaCl .

II. Potentiometry

1. Titration of dibasic acid like malonic, oxalic, succinic acid with NaOH and find the dissociation constant of acid.
2. Precipitation titration \rightarrow Titration of halides with AgNO_3 . ($\text{KCl} \rightarrow \text{AgNO}_3$ $\text{KCl} + \text{KI} \rightarrow \text{AgNO}_3$)
3. Redox titration Ferrous ammonium sulfate $-\text{KMnO}_4$, $\text{K}_2\text{Cr}_2\text{O}_7$.

III. pH metry

1. Determination of dissociation constant of weak acid like acetic and monochloroacetic acid

IV. Adsorption and kinetics

1. Adsorption of acetic acid on activated charcoal
2. Determination of order of reaction and energy of activation between $\text{K}_2\text{S}_2\text{O}_8$ and KI .

V. Distribution method

1. Determination of the formula of the complex formed between cupric ion and ammonia by distribution method.

M.Sc. Semester II- Practicals
MSC1P202 Physical Chemistry

References:

1. Practical physical chemistry $-\text{J.B.Yadav}$
2. Practicals in physical chemistry $-\text{P.S.Sindhu}$
3. Experimental physical chemistry $-\text{R.C.Das, B.Behera}$
4. Experiments in physical chemistry- $\text{P.H.Parsania, F. Karia}$

M.Sc. Semester - II

MSC1C204 Analytical Chemistry

UNIT-1

Sample Preparation Techniques

Liquid-liquid extraction/solvent extraction-partition coefficient, distribution ratio and percent extraction. Solvent extraction of metal ions-ion association complexes and metal chelates, multiple batch extraction, Craig's counter-current distribution. Accelerated and Microwave assisted extraction, protein precipitation and solid phase extraction (SPE). Hibride SPE and solid phase micro extraction (SPME)

UNIT-2

Chromatographic Methods

Principles of chromatography, classification of chromatographic techniques based on mechanism of retention, configuration, mobile and stationary phase. Efficiency of separation- plate theory (theoretical plate concept) and rate theory (Van Deemter equation). Principles and applications of Paper chromatography, thin layer chromatography, HPTLC and Ion exchange chromatography. Counter-current chromatography for isolation of natural products.

UNIT-3

pH metry and Conductometry

pH measurement with glass electrode, working of glass electrode, mechanism of pH measurement, calibration of glass electrode, errors in pH measurement. Electrical conductance in solutions of electrolytes, measurement of conductance, conductometric titrations- acid-base, precipitation and complex formation titrations.

UNIT-4

Potentiometry and Ion-selective electrodes

Electrochemical cell, cell potentials, sign convention for electrode potentials, types of reference and indicator electrodes-metallic indicator and membrane indicator electrodes. Classification of membrane electrodes-ion-selective and molecular-selective electrodes. Principle, properties and design of ion-selective electrodes. Crystalline and non-crystalline membrane electrodes. Gas-sensing probes and enzyme substrate electrodes. Applications of potentiometric titrations.

M.Sc. Semester - II

MSC1C204 Analytical Chemistry-Theory

Reference Books:

- 1 “Quantitative Chemical Analysis” by Daniel C. Harris, 5th Edition, W.H. Freeman and Company, New York.
- 2 “Analytical Chemistry” by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.
- 3 “Principles of Instrumental Analysis” by Douglas A. Skoog, 3rd Edition, Holt- Saunders International Editions.

M.Sc. Semester - II Practicals

MSC1P202 Analytical Chemistry

1. Determination of saponification value of oil.
2. Determination of iodine value of oil.
3. Determination of acid value of oil.
4. Determination of dissolved oxygen.
5. Determination of chemical oxygen demand.
6. Determination of iron in iron tablets.
7. Simultaneous estimation of chromium (III) and iron (III) by EDTA titration.
8. Simultaneous estimation of calcium (II) and zinc (II) by EDTA titration.
9. Simultaneous estimation of lead (II) and magnesium (II) by EDTA titration.
10. Determination of Ca in Ginger Sample.

M.Sc. Semester II- Practicals

MSC1P202Analytical Chemistry

References:

1. Analytical Chemistry Practice, John H. Kennedy, Saunders College Publishing, Second Edition 1990.
2. Vogels Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.

SEMESTER -3 (OrganicChemistry)

MSC1C301

Natural Products and Biomolecules

Unit I : Natural pigment

Natural colouring matter, general classification, method of synthesis, biosynthesis studies of anthocyanins (cyanine) flavones (chrysoin) and flavanol (Quercetin)
Porphyrin-structure, isomer, spectral properties and synthesis, General and structure determination of Hemoglobin (Haemin) &chlorophyll .

Unit II : Alkaloids and vitamins

Alkaloids: General biogenetic studies of alkaloids, chemistry of quinine, emetine, strychnine and colchicine

Vitamins : Introduction, synthesis and biochemical function of vitamin B₁(Thiamine), Vitamin D₂
Vitamin C, Biotin and Pantothenic acid .

Unit III: Steroids and hormones

General biosynthesis studies of steroids, structure of cholesterol and ergosterol, stegmasterol (no synthesis), chemistry of bile acids.

Chemistry of androgens, testosterone, estrogens, estrone, estradiol, progesterone their synthesis and biochemical role.

Unit IV: Terpenoids and carotenoids

Classification, nomenclature, general methods of structure determination, chemistry and synthesis of abietic acid, carvone, cadinene, Farnesol and Zingiberine. Biosynthetic studies on tri-terpenoids and tetra-terpenoids.

Reference books:

1. *Organic chemistry vol I & II (sixth edition) I.L.Finar*
2. *Chemistry of vitamins-S.F.Dyke*
3. *Chemistry of natural products by Bantely, Vol1-10*
4. *L.J.Wade Jr. Organic chemistry, Prentice Hall, England cliffs, 1987*
5. *Chemistry of Natural products vol I & II by O.P.Agrawal*

SEMESTER -3 (OrganicChemistry)

MSC1C302

Medicinal Chemistry

General classification, structural variations, synthesis and medicinal uses of the following classes of drugs. In addition to the above structure Activity Relationships and Mode of Action should be discussed in classes wherever it is mentioned.

Unit I : Antibiotics

Antibiotics that interfere with the biosynthesis of bacterial cell wall.

- A. The β -lactam antibiotics : Penicillin and cephalosporin
- B. Non lactam antibiotics (only name and structures)

C. Bacitracin, vancomycin and cycloserine (only name and structures)

Antibiotics that interfere with the protein biosynthesis in microorganisms : non lactum antibiotics, tetracycline, chloroamphenicol

Structure active relationship (SAR) among penicillins and tetracycline.

Non classifiable antibiotics (only structure and therapeutic uses) Synthesis of penicillin V, ampicillin, cephalosporin and chloroamphenicol.

Unit II : Psychoactive drugs

CNS depressant:

- A. General and local anesthetics
- B. Sedative and hypnotics

Antipsychotic drugs

- A. Antidepressant
- B. Neuroleptics

Synthesis of the following

Thiopental, phenobarbital, Temazepam, Triazolam, alprazolam, glutethimide, nikethamide, chlorprocaine, lidocaine and prilocaine, Ibuprofen, meclizine sodium, novalgin, pethidine

Unit III: Antimalarial and Antituberculosis drugs

Antimalarials: Modern chemotherapy of malaria, 4-amino and 8-amino quinolins, 9-amino acridine. Synthesis of quinacrine, chloroquine, primaquine and daraprim. Mode of action of antimalarial agents. SAR of antimalarial agents

Anti tuberculosis: Synthesis of only the following drugs:

Isoniazid (INH), pyrazinamide, Ethambutol, DDS (Dapsone)

Unit IV : Cardiovascular, diuretics and hypoglycemic agents

Synthesis of amyl nitrate, diltiazem, propranolol, methyl dopa, tolezamide, carbutamide, glibenclamide, marceline, chlorothiazide, furosemide and ethacrynic acid

Reference books:

1. *Burger's medicinal chemistry and drug design (5/e) 1997, vol 1 to 5 edited by Manfred E. Woltt (John Wiley and Sons, New York)*
2. *Principles of medicinal chemistry by William A. Foye (ed), Lea and Febiger (Philadelphia)*
3. *Principles of medicinal chemistry vol I & II (5/e) F.S. Kadam, K.R. Mahadik, K.G. Bohra (Nirali publication)*
4. *Medicinal chemistry by Ashutoshkar*
5. *The organic chemistry of drug synthesis vol I, II and III (1980) ed by D. Lednicer and L.A. Mitscher (John Wiley and Sons, New York)*
6. *Wilson and Gisvold text book of organic medicinal and pharmaceutical chemistry (5/e, 1982) by Robert Doerge (J.B. Lippincott Company, Philadelphia/ Toppan Co. Ltd, Tokyo)*
7. *Topics in medicinal chemistry vol I & II by Rabinowitz Myerson (Interscience 1968)*
8. *The pharmaceutical basis of therapeutics by Geoman and Gilman (McMillan Co.)*

SEMESTER -3 (Organic Chemistry)

MSC1C303

Organic Spectroscopy

Unit I: UV & IR

UV: Electronic transitions, chromophores, auxochromes, bathochromic and hypsochromic shifts, solvent effects, Woodward-Fieser rules for dienes, enones and aromatic compounds applications, geometric isomers of U.V., instrumentation & diagram.

IR: Vibrational transitions, important group frequencies, factors affecting I.R. group frequency, applications of I.R. instrumentation & diagram. H-bonding & IR spectra.

Unit II : NMR

Elementary ideas of NMR integration, sample preparation (solid & liquid) chemical shifts, factors affecting, chemical shifts, coupling (first order, analysis) instrumentation, diagram and principles and instrumentation, FT, chemical shifts, spin-spin coupling different spin systems, mechanism of spin

coupling. E.g. AB, ABX, factors affecting vicinal and geminal couplings, rate processes, long range couplings, spin decoupling, deuterium labeling, double resonance, shift reagents, solvent shifts, nuclear overhauser effect. 2D NMR (COSY and HETCOR) applications. Coupling constant J.

Unit III: C¹³ NMR and Mass spectrometry

C¹³ NMR: elementary ideas, instrumental problems, Maclearty rearrangement, difference between NMR & PMR, chemical shift features of hydrocarbons, effect of substituent on chemical shifts olefinic, acetylenic, aromatic and carbonyl carbons, effects of coupling Mass spectrometry: theory, instrumentation, modes of ionization, types of detectors, modes of fragmentation. Different types of ions, molecular ions, isotopic peaks, factors controlling fragmentation, hyphenated mass spectroscopy techniques.

Unit IV:

Structural elucidation of drug molecules based on joint application of UV, IR, PMR, CMR and mass spectroscopy.

Reference books:

1. *Spectroscopic methods in organic chemistry*, D.H. Williams and Tanfleming
2. *Spectrometric identification of organic compounds*, T.C. Morrill, R.M. Silverstein and G. Bassler, 6th edition, John Wiley and sons
3. *Introduction to spectroscopy*, D.L. Pavia, G.M. Lampman and G.S. Kriz, 3rd edn, Harcourt college publishers.
4. *Organic spectroscopy* by W. Kemp
5. *Organic spectroscopy* by P.S. Kalsi

SEMESTER -3 (Organic Chemistry)

MSC1C304

Industrial Chemistry

Unit I : Basic principles

Basic chemical data, batch versus continuous operation, design, flow charts, chemical process selection, safety, hazardous, fire toxic materials, research and development patents, good manufacturing practice and laboratory practice.

Unit II: Unit processes in organic chemistry

- (1) Nitration: Nitrating agents. Mechanism of aromatic nitration. Industrial chemicals derived from Benzene, Naphthalene, Anthracene using Nitration.
- (2) Sulphonation : Sulphonating agents. Mechanism of aromatic Sulphonation. Industrial chemicals derived from Benzene, Naphthalene, Anthracene using Sulphonation.,
- (3) Halogenation: Halogenating agents. Industrial important halogenated compounds derived by various routes.
- (4) Amination: Aminating agents, Amination by reduction, Amination by Ammonolysis. Industrial chemicals derived from Benzene using Amination

Unit III

Green chemistry -12 principles of green chemistry

- Green solvents-aqueous phase reactions Wurtz reaction, Wittig-Horner reaction, Michael reaction
- Solid phase reactions: halogenation, aldol condensation, Grignard reaction.
- Ionic liquid as green solvent- hydrogenation, Diels-Alder reaction, O-alkylation and N-alkylation
- Green catalysts of green reagents (introduction)

Unit IV

Manufacture and uses of

-Argeochemicals (insecticides, fungicides, plant nutrients and plant hormones, Weedicides, pesticides)

-Unitoperations

Referencebooks:

1. *Unit processes in organic synthesis by P.H. Groggins*
2. *Industrial Chemical process by R.N. Shreve*
3. *Riegelshandbook of industrial chemistry ed by James and Kent*
4. *Dryden's outlines of chemical Technology M. Gopal Rao*

SEMESTER -3

Organic Chemistry - Practicals MSC1P301& MSC1P302

Preparation of industrially important compounds by following name reactions (mechanism, purification and characterization of the synthesized compounds)

1. Sandmeyer reaction
2. Pechmann reaction
3. Skraup synthesis
4. Riemeier-Tiemann reaction
5. Kolbe-smith reaction
6. Claisen-smith synthesis
7. Hoffman reaction
8. Diels-alder reaction
9. Green –

bromination Estimation

1. Drug assay (estimation of sulphadiazine)
2. Non-aqueous titration
3. Nitrite value
4. Drug dissolution

Reference books:

1. *Quantitative analysis by Arthur I. Vogel*
2. *Quantitative analysis by V.K. Ahluwalia*
3. *Quantitative analysis by Mann and Sanders*

SEMESTER -4 (Organic Chemistry)

MSC1C401

Advanced Organic Chemistry

Unit I : Pericyclic reactions

Introduction, classification of pericyclic reactions, stereochemistry, molecular orbital symmetry, frontier orbitals of ethylene, 1,3-butadiene, 1,3,5-hexatriene and allyl system, F.M.O. and PMO approach to cycloaddition and electrocyclic reactions: Generalisation of Woodward-Hoffmann rule, sigmatropic rearrangement-suprafacial and antarafacial shifts of H. Stereoselectivity in sigmatropic rearrangement, enantioselectivity in pericyclic reactions.

Unit II : Conformational analysis

Confirmation at cyclic systems: Confirmation of cyclohexane, mono and disubstituted cyclohexane, five and six membered heterocycles, stereoelectronic effects, fused bicyclic system, decalin, 2-decalol perhydroanthracene, perhydrophenanthrene, bridged systems-conformation of sugars, steric strains due to unavoidable crowding, stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

Unit III : Oxidation

Introduction, Oxidation with Cr(VI), Mn(VII), Mn(IV), OsO₄, Periodic acid. different oxidation processes, Peroxy acid. hydrocarbons-alkenes, aromatic rings, saturated C-H group (activated and un-activated), alcohols, diols, aldehydes, ketones, amines, hydrazine and sulphides.

Unit IV: Reduction

Introduction, different reductive processes, hydrocarbons-alkanes, alkenes, alkynes and aromatic rings Carbonyl compounds- aldehydes & ketones (LiAlH₄, NaBH₄ only for aldehyde and ketone) acids and their derivatives, epoxides, nitro, nitroso, azo and oxime groups, Shapiro reduction Preparation and properties and application of Pd and Ti compounds as organometallic agents

Reference books

1. *Advance organic chemistry by Jerry March*
2. *Advance organic chemistry by Carey and Sundberg,*
3. *Advance organic chemistry by Francis A. Carey*

SEMESTER -4 (Organic Chemistry)

MSC1C402

Advanced Organic Synthesis

Unit I : Protection of groups

Principle of Protection of alcohols, Carbonyl, Carboxylic acid and amino groups, with different reagents and their de-protection, Synthetic equivalent groups and examples on transformations, synthetic analysis and planning, control of stereochemistry.

Unit II : Disconnection approach

An introduction to synthesis, and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis one group C-X and two group C-X disconnections, chemo-selectivity, reversal and polarity.

Unit III : One group C-C disconnections

Alcohols and carbonyl compounds, region-selectivity, alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis.

Unit IV: Ring synthesis

Synthesis of Saturated heterocycles, synthesis of 3, 4, 5, and 6-membered rings, aromatic heterocycles in organic synthesis. Synthesis of alkanes and cycloalkanes from thiophene, Synthesis of alkenes and cyclo alkenes from pyridines.

Reference books

1. *Organic synthesis : the disconnection approach by stuart Warren (wiley studentedition)*
2. *Organic chemistry- clayden, greeves, warren and wothers, (oxfordpress)*

SEMESTER -4 (Organic Chemistry)

MSC1C403

Bio organic Chemistry

Unit I : Water and vitamins

Water –interaction among biomolecules in aqueous systems, buffering against pH changes, in biological systems, participation of water in biological reactions.

Vitamins-classification, introduction, chemistry, absorption transport, mobilization and biochemical functions of Vitamins A, D, E, K, C, B, B2, B6, H and folic acid

Unit II : Proteins and enzymes

Proteins: properties and conventions of common amino acids, stereoisomerism in α -amino acid, peptides: formation, compositions and sizes of protein separation, purification and characterization, sequencing of peptides, sanger's method, edman degradation, outline of other methods, protein sequences and evolution. Oxygen binding proteins, haemoglobin and myoglobin in oxygen transport and storage.

Enzymes: classification, nomenclature and extraction factors affecting catalytic activity and specificity in action, regulation of enzyme activity, enzyme inhibition, illustrative enzymatic reactions using chymotrypsin, hexokinase, enolase and lysozyme

Unit III: Carbohydrates and nucleic acid

Carbohydrates: classification and stereochemistry, biologically important hexose derivatives, nomenclature of disaccharides, structure and role of some homo and hetero polysaccharides, glucoconjugates : proteoglycans, glycoproteins and glycolipids

Nucleic acid: compounds of nucleic acids, nomenclature of nucleotides, nucleosides, structure of DNA and structure of RNA

Unit IV: Lipids

Nomenclature, structure and physical properties of some naturally occurring fatty acids, triacylglycerol and waxes as sources of stored energy, insulation of water repellants, types of

membrane lipids, introduction to glycerophospho lipids, galactolipids, sphingo lipids, phospholipids and sterols, bile acids.

Reference books:

1. *Principles of biochemistry* – Donald J.Voet, Judith G.Voet, Charlotte W. Pratt (John Wiley and Sons)
2. *Lehninger principles of biochemistry*- David L.Nelson and Michael M.Wax (Palgrave Macmillan / W.H. Freeman Company New York)
3. *Biochemistry* – U.Satyanarayana Baro and Allied P.Ltd., Kolkata

SEMESTER -4 (Organic Chemistry)

MSC1C405

Selected topics in Medicinal Chemistry

Unit I : Drug design:

Introduction, naming of organic medicinal compounds, literature of medicinal chemistry, development of new drugs, procedure followed in drug design, concept of lead compound and lead modification, pro drugs, soft drugs, phase I, II and III clinical trials, structure activity relationship, theories of drug activity : occupational theory, rate theory, induced fit theory, quantitative structure activity relationship, history and development of QSAR. Concept of drug receptors, elementary treatment of drug receptor interactions, physico chemical parameters lipophilicity, partition coefficient, electronic ionization constant, concept of 3-DQSAR.

Unit II : Pharmacokinetic and pharmacodynamics

Pharmacokinetics : introduction to drug absorption, distribution, metabolism, elimination. important pharmacokinetic parameters in defining drug deposition and in therapeutics, uses of pharmaceuticals in drug development process

Pharmacodynamics: Introduction, elementary treatment of enzyme stimulation, enzyme inhibition, drug metabolism, biotransformation, significance of drug metabolism in medicinal chemistry.

Unit III :

Dosage forms, Quality control and application of computers in chemistry

Dosage forms, types of dosages, different routes of administration, quality control of drugs pharmacopias, modern methods of pharmaceutical analysis.

Computer in chemistry

Use of computer in chemistry and industry Important websites for data search chemistry Information about online journals for chemistry

Unit IV:Medicine

Overview, Medicinal use of nanomaterials-Drug delivery

Protein and peptide delivery –cancer, surgery, visualization, nanoparticle targeting

Medical application of molecular nanotechnology-nanorobots, cell repair machines, nanonephrology.

References Books:

1. *Burger's Medicinal Chemistry and Drug Discovery (5/e), 1997, Vol. 1, 2, 3, 4,5, Edited by ManFred E. Wolff (John Wiley & Sons, inc., NewYork).*
2. *Wilson and Gisvold's Text-book of Organic Medicinal and Pharmaceutical Chemistry (5/e, 1982) by Robert F. Doerge (J. B. Lippincott Company, Philadelphia/Toppan Co. Ltd.,Tokyo).*
3. *Principles of Medicinal Chemistry, Vol. I & II (5/e), by S. S. Kadam, K. R. Mahadik, K. G. Bothra (NiraliPrakashan).*
4. *QSAR: quantitative structure-activity relationships in drug design by Jean-Luc Fauchère. ISBN:084515141X, 9780845151419*
5. *QSAR : Hansch analysis and related approaches By HugoKubinyi*

SEMESTER -4 (Organic Chemistry)

MSC1P401 :Organic Preparation & Estimation:

Preparation

1. Cinnamic acid from Benzaldehyde
2. BenzophenoneOxome from Benzophenone
3. Antraquinone from Anthracene
4. 4-phenyl-6-methyl-5-carbethoxy-2-pyrimidone from Urea,Bezaldehyde,EAA
5. 2-phenyl-iodole from Acetophenone and Phenylhydrazine.
6. 2-methylberuimidazole from o-phenylenediamine n
7. 1,1-bis-2-naphthol from 2- Naphthol

Estimation :

1. Estimation of Glycine (Amino acids)
2. Estimation of Aspirine. '
3. Estimation of Isoniazid. (INH)
4. Estimation of Ibuprofen.

MSC1P402 :Industrial Training