

## SEMESTER IV

### MCH-401 : APPLICATION OF SPECTROSCOPY

( Organic Chemistry )

#### Unit – I

##### Ultraviolet and visible spectroscopy:

Various electronic transitions (185 - 800 nm) Beer-Lambert law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl c, unsaturated carbonyl compounds, dienes, Conjugated polymers, Fieser Woodward rules for Conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic compounds. Steric effect in bipheyls.

#### Unit – II

##### Infrared Spectroscopy:

Characteristic vibrational frequencies of alkenes, alkenes, alkenes, aromatic compounds, alcohols, ether's, phenols and amines. Detailed study of carbonyl compounds ( Ketone's, aldehyde's esters, amides, acids, anhydride's, lactones, lactams and Conjugated carbonyl compounds ). Effect of hydrogen bonding and solvent Effect on vibrational frequencies, overtones, combination bands and Fermi resonance.

##### Optical Rotatory Dispersion ( ORD ) and Circular Dichromium ( CD ):

Definition, deduction of absolute configuration, octant rule for ketones.

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### Unit - III

#### Nuclear Magnetic Resonance Spectroscopy:

General introduction and definition, chemical shift, spin - spin interaction, shielding mechanism, mechanism of measurement, chemical shift values and correlation for protons bonded to carbon ( aliphatic, aliphatic, aldehydic and aromatic ) and other nuclei ( alcohols, phenols, enols, carboxylic acids, amines, amides & mercapto ) chemical exchange, effect of deuteration, complex spin - spin interaction between two, three, four and five nuclei ( first order spectra ), Stereochemistry, hindered rotation, Karplus curve variation of coupling constant with disordered angle. Simplification of complex spectra, nuclear magnetic double resonance, NMR shift reagents, solvent effect. Fourier transform technique, nuclear overhauser effect (NOE).

### Unit - IV

#### Carbon - 13 NMR Spectroscopy:

General considerations, chemical shift ( aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon ), coupling constants. Two dimension NMR spectroscopy - COSY, NOESY, DEPT, IONEPT, APT and INADEQUATE techniques.

### Unit - V

#### Mass spectrometry:

Introduction ion production E1, C1, FD, ESI and FAB, factors affecting fragmentation, ion analysis, ion abundance Mass spectral

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fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak. Me Lafferty rearrangement. Nitrogen rule. High resolution mass spectrometry. Example of mass spectral fragmentation of organic compounds with respect to their structure determination.

**Book Suggested:**

13. physical Methods for chemistry, R . S. Drago, Saunders company.

14. structural Methods in Inorganic chemistry, E.A.V. Ebswoth, D.W.H. Rankin and S. Cradock, ELBS.

15. Infrared and Raman spectral : Inorganic and Cordination Compounds K.Nakamoto, Wiley.

16. Progress in Inorganic chemistry vol., 8,ed., F.A. Cotton, vol., 15 ed. S. J. Lippard, Wiley.

17. Transition Metal chemistry ed. R.L. Carlin vol. 3 dekker.

18. Inorganic Electronic Spectroscopy, A.P.B. Lever, Elsevier.

19. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic chemistry, .v. Parish, Ellis Haywood.

20. Practical NMR Spectroscopy, M.L. Martin. J.J. Deepish and G. J. Martin, Heyden.

21. spectrometric Identification of organic compounds, R. M. Silverstein, G. C. Bassler and T. C. Morrill, john Wiley.

22. Introduction to NMR Spectroscopy, R. J. Abraham, J. Fisher and P. Loftus, Wiley.

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# MCH-402: SOLID STATE CHEMISTRY

## Unit – I

### Solid State Reactions:

General principles, experimental procedure, co-precipitation as a precursory to solid state reactions, kinetics of solid state reactions.

## Unit-II

### Crystal Defects and Non- Stoichiometry:

Perfect and imperfect crystals, intrinsic and extrinsic defects-point defects line and plane defects. Vacancies-Schottky defects and Frenkel defects. Thermodynamics of Schottky and Frenkel defects formation, colour centers, non-stoichiometry and defects.

## Unit-III

### Electronic properties and Band Theory:

Metal insulators and semiconductors, electronic structure of solids band theory band structure of Metals, insulators and semiconductors, Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junctions, super conductors. Optical properties-Application of optical electron microscopy. Magnetic Properties-classification of materials : Effect of temperature calculation of Magnetic moment, mechanism of ferro and anti ferromagnetic ordering super exchange.

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# MCH- 403 : NATURAL PRODUCTS

## UNIT-I

### Terpenoids and Carotenoids

Calcifications , nomenclature , occurrence , isolation, general methods of structure determination , isoprene rule. Structure determination , stereochemistry, biosynthesis and synthesis of the following representative molecules: Citral ,Geraniol  $\alpha$ -Terpeneol , Menthol , Farnesol , Zingiberence , Santonin , Phytol , Abietic Acid And B-Carotene

## UNIT-II

Definition , nomenclature and physiological action , occurrence , isolation , general methods of structure elucidation , degradation , classification based on nitrogen heterocyclic ring , role of alkaloids in plants . Structure , stereochemistry , synthesis and biosynthesis of the following :Ephedrine , (+) – Coniine , Nicotine , Atropine , Quinine and Morphine.



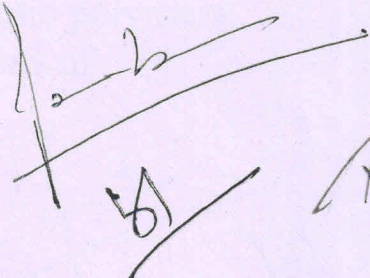
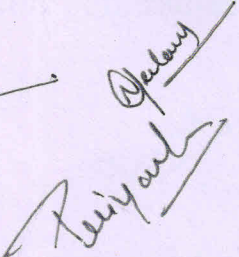
## UNIT-III

### Steroids

Occurrence , nomenclature , basic skeleton , Diel's hydrocarbon and stereochemistry , Isolation , Structure determination and synthesis of Cholesterol , Bile acids , Androsterone , Testosterone , Estrone , Progesterone , Aldosterone , Biosynthesis of Steroids

## UNIT -IV

### Plant Pigments

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## MCH-404 :POLYMER

### Unit – I

#### Basics:

Importance of polymers. Basic concepts : Monomers, repeat units, degree of polymerization Linear, branched and network polymers. Classification of polymers. Polymerization : condensation, addition/radical chain-ionic and co-ordination and copolymerization. Polymerization conditions and polymer reactions. Polymerization in homogeneous and heterogeneous systems.

### Unit – II

#### Polymer Characterization:

Polydispersion-average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersityan molecular weight distribution. The practical significancs of molecular weight. End-group, Viscosity, light scattering, osmotic and ultracentrifugation methods.

### Unit – III

#### Analysis and testing of Polymers:

Chemical analysis of polymers, spectroscopic meathods, X-ray diffraction study. Microscopy . Tharmal analysis and physical testing-tensile strength. Fatigue, impact. Tear resistance, Hardness and abrasion resistance.

### Unit – IV

#### Inorganic Polymers

A general survey and scope of polymers special characteristics, classification, homo and hetero atomic polymers. Structure, Properties and Applications of

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- a. Polymers based on boron-boranes and carboranes.
- b. Polymers based on Silicon, silicone's polymetalloxanes and polymetallosiloxanes, silazanes.

### Unit – V

#### Structure, Properties and Applications of

- a. Polymers based on Phosphorous-Phosphazenes, Polyphosphates.
- b. Polymers based on Sulphure-Tetrasulphur tetranitride and related compounds.
- c. Co-ordination and metal chelate Polymers.

#### Books Suggested

1. Inorganic Chemistry, J.E. Huheey, Harper Row.
2. Developments in Inorganic polymers Chemistry, M.F. Lappert and G.J. Leigh.
3. Inorganic polymers – N.H. Ray.
4. Inorganic polymers, Graham and Stone.
5. Inorganic Rings and Cages : D.A. Armitage.
6. Textbook of Plymers Science, F.W. Billmeyer Jr. Wiley.
7. Contemporary Polymer Chemistry, H.R. Al cock and F.W. Lambe, Prentice Hall.

### M.Sc. IV SEMISTER PRACTICAL

( Duration : 6-8 hrs in each branch )

Practical examination shall be conducted Separately for each branch.

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