

## SEMESTER III

### MCH – 301 : Application of Spectroscopy

#### (Inorganic Chemistry)

##### Unit – I

###### Vibrational Spectroscopy :

Symmetry and shapes of AB<sub>2</sub>, AB<sub>3</sub>, AB<sub>4</sub>, AB<sub>5</sub>, AB<sub>6</sub> mode of bonding of ambidentate ligands, nitrosyl, ethylenediamine and diketonato complexes, application of resonance, Raman Spectroscopy particularly for the study of active sites of metalloproteins.

##### Unit – II

###### Electron Spin Resonance Spectroscopy :

Hyperline coupling. Spin polarization for atoms and transition metal ions. Spin - orbit coupling and significance of g- tensors, application to transition metal complexes (having one unpaired electron) including biological systems and to inorganic freeradicals.

##### Unit – III

###### Nuclear Magnetic Resonance of Paramagnetic Substances in Solution:

Applications of NMR spectroscopy in co-ordination compounds using examples of metal nuclide <sup>77</sup>Se, <sup>113</sup>Cd, <sup>119</sup>Sn, <sup>125</sup>Te, <sup>195</sup>Pt, <sup>199</sup>Hg, contrast agents, Shift reagent, Some application related to biochemical systems.

##### Unit - IV

###### Mossbauer Spectroscopy :

Basic principles, instrumentation, chemical shift, spectral display  
Application of the technique to studies of (1) bonding and structure of Fe<sup>+2</sup> and Fe<sup>+3</sup> compounds including those of intermediate spin,

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- (2)  $\text{Sn}^{+2}$  and  $\text{Sn}^{+4}$  compounds as nature of M - L bond. Co - ordination number, structure and
- (3) detection of oxidation state and inequivalent MB atoms.

### Unit - V

#### Electronic Spectroscopy :

Electronic Spectral studies for  $d^1 - d^9$  systems in octahedral, tetrahedral and square planar complexes.

#### BOOKS SUGGESTED :

1. Physical Methods for Chemistry. R. S. Drago. Saunders Company.
2. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Craddock, ELBS.
3. Infrared and Raman Spectral Inorganic and Co-ordination compounds K. Nakamoto, Wiley.
4. Progress in Inorganic Chemistry vol. 8, ed. F.A. Cotton. Vol. 15 ed. S. J. Lippard, Wiley.
5. Transition Metal Chemistry ed. R. L. Carlin vol. 3 dekker.
6. Inorganic Electronic Spectroscopy, A.P.B. Lever, Elsevier.
7. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, V. Parish, Ellis Haywood.
8. Practical NMR Spectroscopy, M.L. Martin. J. J. Deepish and G. J. Martin, Heyden.
9. Spectrometric Identification of Organic Compounds, R.M. Silverstein, G. C. Bassler and T. C. Morrill, John Wiley.
10. Introduction to NMR spectroscopy, R. J. Abraham, J. Fisher and P. Loftus, Wiley.
11. Application of Spectroscopy of Organic Compounds, J. R. Dyer Prentice Hall.
12. Spectroscopic Methods in Organic Chemistry D.H. Williams, I. Fleming, Tata Mc Graw - Hill.

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# MCH - 302 : PHOTOCHEMISTRY

## Unit-I

### Photochemical Reactions :

Interaction of electromagnetic radiation with matter, types of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometry.

## Unit - II

### Determination of Reaction Mechanism :

Classification, rate constants and life times of reactive energy state determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Types of photochemical reactions - photo dissociation, gas - phase photolysis.

## Unit - III

### Photochemistry of Alkene :

Intramolecular reactions of olefinic bond-geometrical isomerism, cyclisation reactions, rearrangement of 1, 4 - and 1, 5 -dienes.

### Photochemistry of Aromatic Compounds :

Isomerisation, addition and substitution.

## Unit - IV

### Photochemistry of Carbonyl Compounds :

Intermolecular reactions of Carbonyl Compounds-saturated, cyclic and acyclic,  $\alpha, \beta$ , unsaturated and  $\alpha, \beta$  unsaturated Compounds,

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*Queens University*

cyclohexadienones. Intermolecular cycloaddition reaction-dimerisations and oxetane formation.

## Unit - V

### Miscellaneous Photochemical Reactions :

Photo-Fries reaction of anellid's, Photo-Fries rearrangement. Barton reaction. Singlet molecular Oxygen reaction. Photochemical formation of smog. Photodegradation of polymers. Photochemistry of vision.

### Books Suggested :

1. Fundamentals of photochemistry, K. K. Rothagi - Mukheriji, Wiley - Eastern.
2. Essentials of Molecular Photochemistry, A Gilbert and J. Baggott, Blackwell Scientific Publication.
3. Molecular Photochemistry, N. J. Turro, W. A. Benjamin.
4. Introductory Photochemistry, A. Cox and t. Camp, McGraw Hill
5. Photochemistry, R. P. Kundall and A. Gilbert. Thomson Nelson.
6. Organic Photochemistry, J. Coxon and B. halton, Cambridge University Press.

## MCH - 303 : Analytical Chemistry

### Unit - I

#### Introduction :

Role of analytical chemistry classification of analytical methods classical and instrumental. Types of instrumental analysis Selecting an analytical method Neatness and cleanliness. Laboratory operations and practices. Analytical balance. Techniques of weighing, errors. Volumetric glassware cleaning and Calibration of glassware. Sample preparation dissolution and decompositions. Gravimetric techniques.

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Selecting and handling of reagents. Laboratory notebooks. Safety in the analytical laboratory.

### **Errors and Evaluation :**

Definition of terms in mean and median. Precision - standard deviation, relative standard deviation Accuracy - absolute error, relative error. Types of error in experimental data determinate (systematic), indeterminate (or random) and gross. Sources of error and the effects upon the analytical results. Methods for reporting analytical data. Statistical evaluation of data - indeterminate errors. The uses of statistics.

## **Unit II**

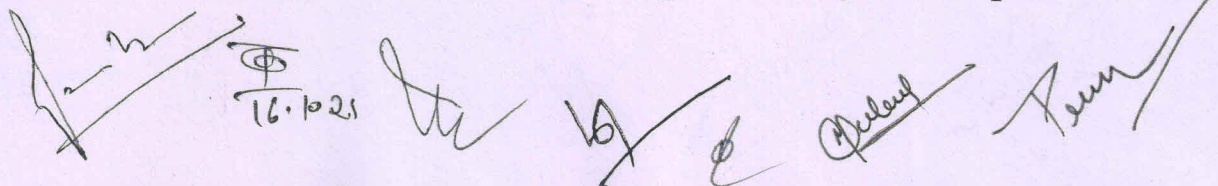
### **Food analysis :**

Moisture, ash, crude protein, fat crude fiber, carbohydrates, calcium, potassium, sodium and phosphate food adulteration common adulterants in food, contamination of food stuffs. Microscopic examination of foods for adulterants. Pesticide analysis in food products. Extraction and purification of sample. HPLC Gas chromatography for organophosphates. Thin - layer chromatography for identification of chlorinated pesticides in food products.

## **Unit-III**

### **Analysis of Water Pollution :**

Origin of Waste water, types, water pollutants and their effects. Sources of water pollution - domestic, industrial, agricultural soil and radioactive wastes as sources of pollution. Objectives of analysis - parameter for analysis - colour, turbidity, total solids, conductivity, acidity, alkalinity, hardness, chloride, sulphate, fluoride, silica, phosphates and different forms of nitrogen, Heavy metal pollution-

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public health significance of cadmium, chromium, copper, lead, zinc, manganese, mercury and arsenic. General survey of instrumental technique for the analysis of heavy metals in aqueous systems. Measurements of DO, BOD, and COD. Pesticides as water pollutants and analysis. Water Pollution laws and standards.

#### Unit - IV

##### Analysis of soil, Fuel, Body Fluids and Drugs :

(a) Analysis of soil, moisture pH total nitrogen, phosphorus, silica, lime, magnesia, manganese, sulphur and alkali salts.

Fuel analysis : liquid and gas. Ultimate and proximate analysis-heating values-grading of coal. Liquid fuels-flash point, aniline point, octane number and carbon residue. Gaseous fuels-produced gas and water gas-carorific value.

#### Unit - V

##### (a) Clinical Chemistry :

Composition of blood-collection and preservation of sampler. Clinical analysis. Serum electrolytes, blood urea nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphates. Immunoassay : principles of radio immunoassay (RIA) and applications. The blood gas analysis trace elements in the body.

##### (b) Drug analysis :

Narcotics and dangerous drug. Classification of drugs.

Screening

by gas thin-layer chromatography and spectrophotometric measurements.

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## Books Suggested :

1. Analysis Chemistry, G.D. Christian, J.Wicy.
2. Fundamentals o Analytical Chemistry, D.A. Skoog, D.M. West and F.J. Hooler, W.B. Sanuders.
3. Analysis Chemistry-Principles. J.H. Kennedy. W.B. Sanuders.

## MCH – 304 : Medicinal Chemistry

### Unit - I

#### Structure and activity :

Relationship between chemical structuare and biological activity (SAR). Receptor Site Theory Approaches to drug design. Introduction to combinatorial synthesis in drug discovery. Factors affecting bioactivity. QSAR-Free- Wilson analysis, Hansen anaiysis, relationship between free - Wilson analysis and Hanson analysis.

### Unit - II

#### Pharmacodynamics :

Introduction, elementary treatment of enzymes stimulation, enzyme inhibition, sulfonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation. significance of drug metabolism in medicinal chemistry.

### Unit - III

#### Antibiotics and antibacterials :

Introduction, Antibiotic  $\beta$  -Lactam type – Penicillins, Cephalosporins, Antitubercucular-Streptomycin, Board spectrum antibiotic – Tetracyclines, Anticancer-Dactinomycin ( Actinomycin D ).

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## Unit - IV

- Antifungal - polyenes, Antibacterial - Ciprofloxacin, Norfloxacin, Antiviral - Acyclovic

Antimalarials : Chemotherapy of malaria. SAR. Chloroquine Chlorquanide and Mefloquine.

## Unit - V

Non - steroidal Anti - inflammatory Drugs : Diclofenac Sodium, Ibuprofen and Netopam

Antihistamic and antiasthmatic agents : Terfenadine, Cinnarizine, Salbutamol and Beclomethasone disone dipropionate.

## M. Sc. III SEMISTER PRACTICAL

( Duration : 6-8 hrs in each branch )

Practical examination shall be conducted separately of each branch

## INORGANIC CHEMISTRY

M.M :60

Quantitative determination of a three component mixture / Chromatographic Separations	42
Record	08
Vivavoice	10

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