M.Phil. –Chemistry [Semester – II]
Paper-I Research Methodology [50 Marks]

(a) Literature Search and
(b) Instrumentation method based on

1. UV/Visible Spectroscopy, IR spectroscopy, Atomic Absorption spectroscopy, Emission spectroscopy;10 articles on recent advances – Talanta, Analytical Chemistry, Chemical education etc.

2. Mass Spectrometry, Kinetic Methods, Electrochemical industries, Automation in Analytical Chemistry; 10 articles on recent advances - Talanta Analytical Chemistry, Chemical Education, etc.

References:-

Research Papers

1. Atomic absorption in clinical analysis.
   Bio Chemical –vol. :13- PP -1989
2. Laser Excited Raman spectroscopy – Chemical Tech.-1982
3. Raman spectroscopy 20 years later – Chemical Tech. – 1990
4. Raman spectroscopy for Qualitative Multi component system International laboratory – 1984.
5. Cyclo dextrin enhanced luminescence Spectroscopy – International Laboratory – 1984 April
6. New developments in Spectrofluorometry.
   -International laboratory -1984 April.
7. Simultaneous kinetic determination of Cu, Co& Ni by means of -C =N – group Interchange reaction – Talanta- vol. : 32- 1985 -PP -851-858.
8. Simultaneous Kinetic determination of Iron and Chromium at the nanogram level – Analytical Chemistry, Vol. : 56-1417-1422(1984)

9. Determination of metals by second harmonic alternating current voltametry with a semi stationary Ag-electrode, Talanta – vol. :32 – pp 539-543.
10. Catalytic titrations – Analyst, vol. :112,June 1987.
11. Monitoring of microgram / liter concentration of tracmetals in sea water. The choice of methodology for sampling and analysis – Analyst Vol. :112 ,June 1987.
12. Differential pulse polarographic determination of iodide in common salt – Analyst, Vol. :113, July 1987.
13. A contribution to the problem of increasing the sensitivity of anodic stripping vollametry – Talanta –vol 19 pp – 1285-1293
14. Simultaneous determination of SO, NO_2 and NO in air by differential pulse polarography – Talanta – vol :26-PP-1011-1014.
15. Extreme trace analysis of elements in the state of the art today & tomorrow –Analyst –vol:112-April 1987
16. Rancidity and its measurements in edible oils and snack foods – A review –Analyst-vol 113-(Feb)1988
17. Measurements of Na & K in Clinical chemistry, a review – Analyst –vol. -113-(March)1988.
18. Enzymes as analytical reagents, substrate definition with soluble and with immobilized enzyme preparation – Analyst – vol :112 pp 719-727 June 1989

Reference Books:

1. Physical methods in chemistry – By R.S.Drago.,
2. Fundamentals of molecular spectroscopy -By C.N.Banwell [Mc Graw – Hill]
3. Principles of Instrumental analysis-By Skoog and West (1980)
4. Thermal methods of analysi-By W.W.Wendlant Interscience, New York

Paper-II (50 Marks)

(I) Stereo chemistry and confirmation (12 Marks)

1. Optical rotation and rotatory dispersion – Relation between rotation and configuration – Atomic asymmetry conformation asymmetry – optical rotatory Dispersion. The axial haloketone mle-ketal formation – stereo selective synthesis – stereo selective polymerization – Topicity.

References:

1. Organic Chemistry – Vol :2 – I.L.Finar
2. Stereo Chemistry – By R.D.Gunstone

(II) Electro Chemistry – (Industrial) (12 Marks)

1. Metal finishing – electroplating – requirements of electroplating process – The mechanism of the electro deposition of metals – performance of anodes – The plating bath – Component of plating both – Typical electroplating processes – Anodizing - The manufacter of capacitors - Electro polishing –other related

   surface finishing techniques –electro chemical cleaning –electro chemical pickling –phosphating and chromating -electro phoreticpainting principles –anodic versus cathodic electropainting – the technology of electrophoretic painting
2. Batteries and fuel cell – battery characteristics – Battery specifications – Evaluation of battery performance – Battery components – the container – separators – current collectors – Electrolyte – active materials - present battery systems – Lead /Acid Batteries – Car Batteries – Nickel / Cadmium batteries – Pocket plate Batteries – Sintered plate batteries – Batteries under development – sodium / sulphur Zinc/Halogen batteries – phosphoric acid fuel cells – Molten carbonate fuel cells.

References:

1. Modern electroplating – By Lowenheim F.A.
2. Industrial electrochemistry – By Kuhn A.T.
   -- By mantell (C.L.)

(III) Quantum Chemistry [13 marks]

1. Desplacement functions for particle waves – de Broglie concept- Derivation of state particle – The Hamiltonian operator for total energy – some properties of linear operators- Development of time dependent wave functions – Average values for dynamic variables- Lagrange's Equation.
2. Three dimensional boxes and finite barriers- orthogonality of wave functions – Hermitian operators- The assurance of real variables- A single particle in a three dimensional box.- Allowed energy levels in a cubic box- probability densities for a particle in a cubic box- The variation method – the perturbation method – The secular equations – The valence bond theory- Molecular orbital theory- The principle of quantum statistical mechanics.

References:

1. Valency and molecular structure --By E. Cartwell
2. Foundations of Quantum Chemistry --By T.E.Peacok [John Wiley & Sons]
3. Advanced Inorganic Chemistry --By Gurdeep and Harish [Goel Publishing House]

(IV) Polymer Chemistry [13 marks]

1. Polymer chains- chain – configuration of macromolecules – free radical polymeristion kinetics – intiator efficiency, auto accelarated and chain transfer reactions, Polymer degradation- Condensation polymerization and co-polymerisation.
2. Techniques for structural characterization – light microscopy. Scanning electron microscopy / x-ray- diffraction, thermogravimetric analysis, differential thermal analysis, differential scanning colorimetry.

References:

1. Principles of polymer Chemistry-P.J.Flory

2. Principles of Polymer Chemistry- By Revve. A.

PAPER- III- [Elective] ORGANIC CHEMISTRY
[50 marks]

1. Spectroscopy methods [25marks]
2. Ultraviolet and visible spectroscopy- colour and light absorption – Instrumentation and sampling – solvent effects – Application of electronic spectroscopy – conjugated Dienes, trienes and polymers – conjugated polymers and Eneynes – unsaturated carbonyl compounds – Benzene and its substitution derivatives – Heterocyclic systems – stereo chemical factors in electronic spectroscopy – Bi phenyls and binaphthyls - cis and trans isomers – fluorescence and phosphorescence – Absorption spectra of charge transfer complexes - symmetry restrictions on the allowedness of electronic transitions – optical rotatory dispersion and Dichronism – Electron spectroscopy for chemical analysis – Rapid – scan ultra violet – visible spectrometers – problems.
3. Mass spectroscopy – Instrumentation – Isotope abundances – The molecular ion – metastable ion m/z values – fragmentation process – fragmentations associated with functional groups – Alternatives to Electron – impact ionization – Gas Chromatography – Mass spectroscopy (G.C./M.S.) – Isotope substitution in Mass spectroscopy – Mass spectroscopy problems.

References:

1. Physical methods in Chemistry
   - By R.S. Drago.
2. An introduction to spectroscopic methods for the identification of organic compounds –
   - By Scheinmann, Vol. : 1&2

2. Carbohydrates [25 marks]

1. Vitamin C of L (+) – ascorbic acid – Maltose – Cellobiose – Trilsaccharides – Raffinose – Gentianose – Evertrilose – Poly saccharides – Cellulose & starch – Molecular weight determinations – chemical & physical methods – amylase & amylopection – photo synthesis of carbohydrates.
2. Glycosides – synthesis of glycosides – Inositol – Ganglioside – Tndican – Ruberythric acid – Arbution & methyl arbution – salicin.

References :

1. Carbohydrate Chemistry – By Davidson.
2. Carbohydrate Vol.: -5 Dyke (SF)

Paper III – [Elective] INORGANIC CHEMISTRY {50 MARKS}

1. Co- ordination Chemistry { 25 marks }
2. Chemistry of Lanthanides and actinides – sperations. Spectral and magnetic properties – Use of lanthanide compounds as shift reagents – organo metallic chemistry – organometallic reagents in organic synthesis and in homogeneous catalytic reaction (hydrogenation, hydroformylation, isomerisation and polymerisation) p-acidmetal complexes – activation of small molecules by co-ordinations.

References:

1. Introduction to Ligand field theory
-By Carl. J. Ballhalusen
2. Co-ordination compounds
-By S.F.A.Kettle
3. Modern Co-ordination Chemistry
-By F. Lewils and R.G.Wilkins

2. Group Theory {25 marks}

1. Hybrid orbitals and molecular orbitals for AB_n – Type molecules – Transformation properties of atomic orbitals – Hybridization scheme for 6 orbitals – Hybridization schemes for 'pi' bonding – Molecular orbitals theory for AB_n – Type molecules – relationship of the molecular orbital and the hybridization treatments – molecular orbitals of metal sandwhitch compounds.
2. Molecular vibrations – The symmetry of Normal vibrations – Determining the symmetry types of the normal modes – Contribution of particular internal co-ordinates to Normal modes – calculation of force constants – selection rules for fundamental vibrational transitions .

References:

1. Group theory in chemistry
-By V.Ramakrishnan & M.S.Gopinathan
2. Physical methods in Inorganic chemistry
-By R.S.Gargo
3. Symmetry in Chemistry
-By Jaffe & orelaan

PAPER III – [Elective] PHYSICAL CHEMISTRY [50 MARKS]

Corrosion [25 marks]

1. Electro chemical and thermodynamic approaches to corrosion – Pourbaix potential – Pourbaix diagrams – Energy transfer coefficients and equilibrium potentials – corrosion potential and corrosion current – Electrochemistry of localized corrosion – Modern metallic and non metallic materials for construction – Electrochemical and Radio chemical methods of studing corrosion – corrosion inhibitors.

References :

1. Corrosion and corrosion control -By Herbert H. Uhlig.

2. Electrochemistry {25 marks }

1. The activity of strong electrolytes – Fugacity – The activity of ions – activity coefficient – Theories of strong electrolytes – milner's Theory – Debey and Huckel's theory – The difficiation of polybasic acids – The avidity of acids and bases.
2. The electrode potential – Bulk structure of metals – The surface of metals – the surface of liquid polar phases – metal – metal contact – Electrons in liquid polar phases – measurement of potentials – potentials of zero charge and the nature of the medium – charge and potential distribution at interfaces – potential distribution in the Double layer – simultaneous charge and potential measurements – The electrokinetic potential.

References:

1. Text Book of electrochemistry
-- By G.Kortum and J.O'M.Bockris.
2. An introduction to Electrochemistry
-- By Samuel Glasstone

Paper : III [Elective] ANALYTICAL CHEMISTRY
[50 MARKS]

Articles on recent advances – Talanta – analytical chemistry, chemical education etc.:

1. Determination of trace metals in water using x-ray fluorescence spectrometry – Talanta – Vol.: 19 PP 1363-1375
2. Application of reverse pulse polarography to the determination of substances which form film electrochemically on the mercury electrode – Talanta – Vol. : 20 PP 433-451
3. Application of indirect methods in analysis by AAS –Talanta – Vol.: 20 - PP -433-451
4. Use of NMR for qualitative analysis of pharmaceuticals – Talanta – Vol. : 32 –PP -1069-1071
5. Determination of pencillins by desulphrization with lead and EDTA titration – Talanta – Vol.: 26 –PP – 921-931
6. Proton – activation technique for the determination of antimony – Talanta Vol. : 26 PP 741-745
7. Pepticide residue analysis – Talanta – Vol. : 20 PP 1261-1286
8. Determination of five components in a pharmaceutical formulation using near infrared reflectance spectrophotometry – Analyst – December 1987 – Vol.: 112

[Elective] : Paper – III
[50 marks]

Recent Advancements

1. Nano chemistry
2. Photochemistry
3. Bio inorganic chemistry