JannayakChrandrashekhar University

Department of Chemistry

Ph. D. Course work Syllabus

PAPER I:Research Methodology

Maximum Marks:100

Written Examination:70

Internal Assessment:30

1. Safety, Hazards and Precautions in Laboratory

   Brief idea about toxicity,explosive nature and illeffects of various chemicals generally used in research and precautions to use them.

2. Purification of chemicals

An idea about LR,GR and AR grade chemicals. A brief knowledge about various techniques such as distillation, fraction distillation,crystallization,chromatography etc.

3. Data analysis-

   Errors in chemical analysis,classification of errors,methods of determination of accuracy,improving accuracy of analysis,significant figures, mean standerdderivation,comperision of result. T-test,F-test and chi-square test,rejection of results,presentation of data.

4. Introduction,definition,theory of sampaling,technique of sampaling,statistical creation of good sampaling and required size,stratifiedsampaling vs randamsampaling. Minimizations of variens of stratified sampaling,transmition and storage of sampal

5. Computer basics and applications-

a) Introduction to basic software

   MS Word

   Power point

   Excel

b) Introduction to Chemistry related software

   Gaussian

   Gaussview

   ChemDraw

c) Introduction to data bases

   SciFinder

   Scopus

Cambridge structural database

BOOKS SUGGESTED

1. Analytical chemistry, G.D. Christian,J.Wiley
2. Fundamentals of analytical chemistry, D.A. Skoog, D.M. Westand F.J. Holler,W.B. Saunders.3.
3. Computers and common sence, R. Hunt and I. Shelley. Prentice Ha

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PAPER II : Advanced Chemistry

Maximum Markes:100

Written Examination:70

Internal assessment:30

[A] Inorganic Chemistry

(i) Symmetry and Group theory-

Symmetry element and symmetry operations with reference to water,ammonia,ethane,benzene etc.

Derivation of matrixes for rotation and inversion operation.

Symmetry point group applied to all type of molecules Chn,Dhn,Chr,Oh.

Group multiplication basis matrix representation, character of representation,character table, reducible and irreducible representation group and subgroup.

(ii)Electronic spectra and magnetic properties of transition metal-

Spectroscopic ground state orgel energy level diagrams for transition metal complexes (d1-d9 state) charge transfer spectra, electronic spectra of octahedral and tetrahedral Cu(II) and Ni (II) complexes and calculation of the ligand field parameters.

(iii)Bioinorganic Chemistry-

Role of metal ions in biological processes, essential and trace metals, DNA polymerization, glucose storage, metal complexes in transmission of energy: chlorophyll, haem protein and oxygen uptake, structure and function of haemoglobin, myoglobin and haemocynin.

(iv)Enviornmental Chemistry-

Composition of atmosphere, vertical temperature, analytical method for measuring BOD, COD, F, oils, metals (As, Cd, Cr, Hg, Pb, Se etc), purification and treatment of water, soil composition, micro and macro nutrients, analytical methods for measuring air pollution, thermal power plants, nuclear power plants, desposal of wastes and their management.

[B] Organic chemistry

1) Applications of spectroscopy in structural identification-

IR Spectroscopy

UV spectroscopy

1H, 13C NMR spectroscopy

Mass spectroscopy

Occurance nomenclature isolation and general methods of structure determination, identification of following

Alkaloid

Terpinoid

Cartenoids

Steroids

Heterocyclic Chemistry

Nomenclature of heterocycles

Aromatic heterocycles

General chemical behaviour of aromatic heterocycle, classification, criteria of aromaticity, heteroaromatic reactivity and tautomerism in aromatic heterocycle, drug design

relationship between chemical structure and biological activity (SAR). Recepter site theory approach to drug design

Disconnection approach-

An introduction to synthons and synthetic equivalents, this connection approach, functional group interconversion, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections reversal of polarity, cyclisation reactions amine synthesis.

[C] Physical Chemistry

Electrochemistry-

Debye Huckle theory of activity coefficient of electrolytic solution, applicability and limitations of Debye Huckle limiting law, ionic strength, over potentials, exchange current density, tafel plot, hydrogen electrode, limiting current residual and charging current, diffusion current, introduction to corrosion, homogenous theory, forms of corrosion, corrosion monitoring and prevention method

Quantum chemistry-

The Schrodinger wave equation, discussion of solutions of the Schrodinger wave equation to some model system viz. particle in a box, hydrogen atom.

Statistical Thermodianamics-

Concept of the Boltsman distribution law, fermi-Dirac and Bose Einstien statistic

Books suggested

1. F. A. Cotton and G. Wilkinson advanced inorganic chemistry, 6thEdn. (199).Symmetry and group theory, Vishal publication
2. Organic Spectroscopy by Y. R. Sharma
3. Bio inorganic, bio organic and supra molecular chemistry by P. S. Kalsi
4. Enviornmental chemistry, S. E. Manahan, Lewis publishers

5. Enviornmental chemistry, Sharma and Kaur, Krishna publishers
6. Designing organic synthesis, S. Warren, Wiley.
7. Advanced organic chemistry, J. March, Wiley
8. Organic synthesis II, L.D.S. Yadav and Jagdamba Singh.
9. Natural Products: Chemistry and biologiclsignificance,Mannm R.S. Davidson, J.B. Hobbs, D.V. Banthrope and I.B. Harbome, Longman, Essex.
10. The chemistry of Heterocycles, T. Eicher and S. Hauptmann,Thiene
11. Physical Chemistry, P. W. Atkins, ELBS
12. Quantum chemistry, Ira N. Levine. Prentice Hall

III: Review of Published Research in the relevant field

Maximum Markes:50

Minimum Passing Markes:25

Credits:3

Each student shall submit three hard bound copies of a review article separately based on published works in one of the following broad field based on at least 50 relevant up-to-date references for evaluation:

1) Inorganic Chemistry
2) Organic Chemistry
3) Physical Chemistry
4) Analytical Chemistry

IV: Comprehensive Viva

Maximum Marks:50

Minimum passing marks:25