Acharya Nagarjuna University
M.Sc. FINAL YEAR CHEMISTRY (ANALYTICAL CHEMISTRY SPECIALIZATION)
Effective for the students admitted from the year 2010 - 2011
SEMESTER III

Paper – I  PRINCIPLES AND TECHNIQUES IN CLASSICAL ANALYSIS  (C3.1(A)- 10)

UNIT-I
THEORY AND PRINCIPLES OF TITRIMETRIC ANALYSIS:
ACID - BASE TITRATIONS:Titrmetric procedures involved in the neutralisation of acids and bases; Acid base indicators-indicator action-preparation of indicator solutions-mixed and universal indicators,
REDOX TITRATIONS: Theoretical principles - red ox indicators-Indicator action.,
Analytical chemistry of some selected oxidants/reductants, selection of suitable indicators for various oxidant/reductant titration systems.
Oxidants: Mn(III),Mn(VII),Ce(IV),Cr(VI),V(V),Ti(III),Iodimetry and iodometry,
Reductants:Cr(II), V(II), Ti(III),Sn(II),
Use of Karl-Fisher reagent in the estimation of moisturecontent.,

UNIT - II
TITRATION IN NON-AQUEOUS SOLVENTS:Choice of solvents for non-aqueous titrations.End point detection- Applications of non-aqueous titrations using glacial acetic acid as titre.
COMPLEXOMETRIC TITRATIONS: Theoretical principles involved in complexometric titrations - role of indicators, EDTA titrations,Silver cyanide titration, Direct titration, back titration,substitution titration,total hardness of water,floride ion as demasking agent- analysis of nickel alloy.
PRECIPITATION TITRATIONS: Theoretical principles involved in argentometric titrations-use of normal and adsorption indicators -Indicator action.,

UNIT-III
GRAVIMETRIC ANALYSIS :Precipitation methods: Nucleation and crystal growth,completeness of precipitation, effect of excess precipitant,pH,complex formation on completeness of precipitation,purity of the precipitate,precipitation from the homogeneous solutions.
Analytical Applications of organic precipitants in gravimetric analysis- Structural requirements of an organic precipitant- Specificity, selectivity, sensitivity, masking .
Complexing precipitants like DMG, Oxine, Salicylaldoxime, α-Benzoinoxime.
Ion association precipitants:Benzidene,Sodium tetra phenyl boron, arsonium salts.

UNIT-IV
CATALYSED AND INDUCED REACTIONS AND KINETIC METHODS OF ANALYSIS:,
Kinetic aspects of the analytical use of chemical reactions-Kinetics of chemical reactions-Kinetic effects in oxidation reduction reactions
Application of kinetic methods: catalytic reactions-enzyme reactions-uncatalysed reactions- determination of components, determination of the rate with change of concentration, ,
Types of kinetic methods: single point method, Differential method, Integral method,
Rate determination by complex decomposition, by steady state condition,Kinetics of enzyme catalysed reactions-Factor effecting- activators, inhibitors, hydrogen ion concentration, temperature-Principles of the analytical use of enzyme reactins-Determinaion of enzymes.

SUGGESTED BOOKS:,
1.I.M.Kolthoff-Volumetric analysis V.A.Strenger Vols I to III,
2.A.I.Vogel - A text Book of quantitative Inorganic analysis - ELBS,
3.H.P.Walton- Principles and methods of chemical analysis-Prentice Hall,
4.Laitnen-Chemical Analysis,
5.C.W.Wilson and D.W.Wilson-Comprehensive analytical Chemistry,
6.R.A.Day Jr and A.L.Underwood-Quantitative analysis-Prentice Hall,
7.K.B.Yarstimiskii-Kinetic Methods of Analysis,
8.D.A.Skoog,D.M.West and F.J.Holler--Fundamentals of Analytical Chemistry,
UNIT-I
Analysis of Limestone: moisture, loss on ignition, insoluble matter (silica), determination of combined oxides ($R_2O_3$), calcium, magnesium, carbon dioxide.
Analysis of haematite: moisture, volatile matter, silica, iron, oxide iron.
Analysis of pyrolusite: moisture, volatile matter, silica, manganese, combined oxides.
Analysis of clay materials: moisture, volatile matter, silica, $R_2O_3$, $Fe_2O_3$.

UNIT II
Analysis of phosphate rock: moisture, loss on ignition, $SiO_2$, alumina, $Fe_2O_3$, total CaO, magnesium.
Analysis of feldspar: silica, sodium, potassium, sulphate.
Analysis of monazite: oxides of cerium, thorium, calcium, magnesium, iron, aluminium, sulphur, silica.

UNIT III
Analysis of ferrous alloys:
Analysis of Steels: types of steels, digestion methods for different types of steels, determination of contents of carbon, silicon, sulphur, phosphorous, manganese, nickel, magnesium, vanadium, molybdenum, nickel, aluminium, chromium and tungsten in steel samples.
Analysis of non-ferrous alloys:
Brass, bronze and solder: Compositions of different alloys, digestion procedures of alloys, Procedures for the determination of contents like tin, copper, lead, zinc and iron, aluminium, manganese, antimony.

UNIT - IV
Analysis of Complex materials:
Analysis of cement: loss on ignition, insoluble residue, total silica, sesqui oxides, lime, magnesia, ferric oxide, sulphuric anhydride.
Analysis of glasses: Determination of silica, sulphur, barium, arsenic, antimony, total $R_2O_3$, calcium, magnesium, total alkalies, aluminium, chloride, fluoride.
Colouring agents in glass: chromium, cobalt, copper, total iron, manganese, nickel, titanium, lead, barium, sodium, potassium, cerium, zirconium, arsenic.

SUGGESTED BOOKS:
1. F.J. Welcher - Standard methods of analysis,
2. J.M. Kolthoff - Volumetric analysis V.A. Strenger Vols I to III,
3. A.I. Vogel - A text Book of quantitative Inorganic analysis - ELBS,
4. H.P. Walton - Principles and methods of chemical analysis - Prentice Hall,
5. Laitinen & Harris - Chemical Analysis,
6. C.W. Wilson and D.W. Wilson - Comprehensive analytical Chemistry,
7. F.D. Snell & F.M. Biffen - Commercial methods of analysis - D.B. Taraporavala & sons,
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SEMESTER III

PAPER -III ANALYSIS of APPLIED INDUSTRIAL PRODUCTS (C3.3(A)-10)

UNIT-I
Analysis of soaps: moisture and volatile matter, cobined alkali, total fatty matter, free alkali, total fatty acid, sodium silicate and chlorides.
Analysis of paints: Vehicle and pigments, Barium Sulphate, total lead, lead chromate, iron pigments, zinc chromate

UNIT- II
Analysis of oils: saponification value, iodine value, acid value, ester value, bromine value, acetyl value
Analysis of industrial solvents like benzene, acetone, methanol and acetic acid.,
Determination of methoxyl and N-methyl groups.,

UNIT-III
Analysis of fertilizers: urea, NPK fertilizer, super phosphate,
Analysis of DDT, BHC, endrin, endosulfone, malathion, parathion.,
Analysis of starch, sugars, cellulose and paper,

UNIT-IV
Gas analysis: carbon dioxide, carbon monoxide, oxygen, hydrogen, saturated hydro carbon, unsaturated hydrocarbons, nitrogen, octane number, cetane number
Analysis of Fuel gases like: water gas, producer gas, kerosene (oil) gas.
Ultimate analysis: carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur.,

SUGGESTED BOOKS:
1. F.J. Welcher-Standard methods of analysis,
2. A.I. Vogel-A text book of quantitative Inorganic analysis-ELBS,
3. H.H. Willard and H. Deal- Advanced quantitative analysis- Van Nostrand Co,
4. F.D. Snell & F.M. Biffen- Commercial methods of analysis-D.B. Taraporavala & sons,
5. J.J. Elving and I.M. Koltchoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII.,
6. G.Z. Weig - Analytical methods for pesticides, plant growth regulators and food additives - Vols I to VII,
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SEMESTER III

PAPER –IV OPTICAL METHODS OF ANALYSIS AND OTHER TECHNIQUES (C3.4(A)-10)

UNIT – I :

UNIT – II :

UNIT – III :
Inductively Coupled Spectrometer : - Principles – Instrumentation – Advantages over Atomic Absorption Spectroscopy – Applications with specific examples like Chromium, Molybdenum, Zirconium and Aluminium.

UNIT – IV :

Radio Chemical Methods : -Objectives, introduction, principles and theoretical aspects, technique/ method, gas counter, scintillation counter, errors and correction, liquid scintillation counting, sample preparation, applications

SUGGESTED BOOKS:
1.B.K.Sharma -- Instrumental methods of chemical analysis,Goel Publishers,
2.G.Chatwal and S.Anand --Instrumental methods of chemical analysis,,
3.A.I.Vogel -- A text Book of Quantitative Inorganic Analysis-ELBS,
4.H.H.Willard,LL Merrit and JA Dean -- Instrumental Methods of Analysis.,
5.Peace-Instrumental Methods of Analysis,
6.J.W.Robinson- Under graduate Instrumental Analysis,
7.G.W Eving- Instrumental Methods of Chemical Analysis.,
8.D.A.Skoog,D.M.West and F.J.Holler--Fundamentals of Analytical Chemistry ,
9.H.Kaur-- Instrumental methods of chemical analysis,Pragathi Prakasan,
10.D.A.Skoog,F.J.Holler and Nieman-- Instrumental Methods of Analysis.,
UNIT-I
MASS SPECTROMETRY:
Principle-theory-instrumentation-interpretation of spectra of metal compounds-identification of compounds of metal compounds from fragmentation pattern. Quantitative analysis of metal chelates-alkaline earth metal derivatives, metal chelates derived from 8-hydroxyquinoline, Schiff's bases-Salicylaldoxime-nitrogen rule, thermodynamic studies-molecular structure Analytical aspects of the mass spectrometry.

UNIT-II
X-RAY SPECTROSCOPY:
Principles-theory, X-ray diffraction -instrumentation -X-ray fluorescence- applications-identification of substances by the powder diffraction method-applications.,

UNIT-III
ELECTRON PARAMAGNETIC RESONANCE SPECTROSCOPY (EPR):,
Principle-theory-instrumentation -hyperfine interactions-determination of 'g' value-ENDOR and ELDOR applications-study of free radicals-structural determination-reaction velocities and mechanisms-study of inorganic compounds-study of catalysis-determination of oxidation state of metal determination of manganese-determination of vanadium.,

UNIT-IV
NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY (NMR):
Principles-theory-instrumentation-differences between NMR and EPR-chemical shift-spin-spin coupling effect of chemical exchange on spin-spin interactions-spin decoupling-limitations of NMR-cause of chemical shift and shielding-applications-qualitative and quantitative analysis-kinetic studies.,

SUGGESTED BOOKS:,
1. Becky -- Ionization mass spectrometry,
2. Physical methods of Analytical Chemistry Vol I - III,
3. J.Roilly and W.N.Ray -- Physical Chemical Methods,
4. Advances in Analytical Chemistry and Instrumentation. Vol I - IV,
5. T.H.Gouw- Guide to modern methods of instrumental analysis,
6. A.I.Vogel -- A text Book of Quantitative Inorganic Analysis-ELBS,
7. P.Delahay -- New instrumental methods in Analytical Chemistry,
8. H.H.Willard,LL Merrit and JA Dean -- Instrumental Methods of Analysis.,
9. Banwell- Fundamentals of molecular spectroscopy,
10. D.M.Willium and I.Fleming - Spectroscopic methods of Inorganic Chemistry,
11. J.Charalambous - Mass spectrometry of metal compounds,
12. J.W.Robinson- Under graduate Instrumental Analysis,
13. D.A.Skoog,F.J.Holler and Neman-- Instrumental Methods of Analysis.,
UNIT I
Analysis of the following drugs and pharmaceuticals preparations:
(Knowledge of molecular formula, structure and analysis)
Analysis of analgesics and antipyretics like aspirin and paracetamol
Analysis of antimalerials like chloroquine.
Analysis of drugs in the treatment of infections and infestations: Amoxycillin, chloramphenicol, metronidazole, penicillin, tetracycline.
Anti tuberculous drug- isoniazid.

UNIT II
Analysis of the following drugs and pharmaceuticals preparations:
(Knowledge of molecular formula, structure and analysis)
Analysis of antihistamine drugs and sedatives like: allegra, zyrtec(citirizine), alprazolam, trazodone, lorazepem.
Analysis of anti epileptic and anti convulsant drugs like phenobarbital and phenacemide.
Analysis of drugs used in case of cardiovascular drugs: atenolol, norvasc(amlodipine),
Analysis of lipitor(atorvastatin) a drug for the preventin of productin of cholesterol.
Analysis of diuretics like: furosemide (Lasix), triamterene
Analysis of prevacid(lansoprazole) a drug used for the prevention of production of acids in stomach.

UNIT III
Analysis of Milk and milk products:
Acidity, total solids, fat, total nitrogen, proteins, lactose, phosphate activity, casein, chloride
Analysis of food materials- Preservatives: Sodium carbonate, sodium benzoate, sorbic acid
Flavoring agents - Vanilla, diacetyl, isoamyl acetate, limonene, ethylpropionate, allyl hexanoate and
Adulterants in rice and wheat, wheat flour, sago, coconut oil, coffee powder, tea powder, milk.

UNIT IV
Clinical analysis of blood: Composition of blood, clinical analysis, trace elements in the body. Estimation of blood cholesterol, glucose, enzymes, RBC & WBC, Blood gas analyser.

SUGGESTED BOOKS:
1. F.J. Welcher-Standard methods of analysis,
2. A.I. Vogel- A text book of quantitative Inorganic analysis-ELBS,
3. F.D. Snell & F.M. Biffen- Commercial methods of analysis- D.B. Taraparovala & sons,
4. J.J. Elving and I.M. Kolthoff- Chemical analysis - A series of monographs on analytical chemistry and its applications -- Inter Science- Vol I to VII,
6. Quantitative analysis of drugs in pharmaceutical formulations by P.D. Sethi
   CBS Publishers and Distributors, New Delhi
7. G. Ingram- Methods of organic elemental micro analysis- Chapman and Hall,
8. H. Winciam and Bobbles (Henry J)- Instrumental methods of analysis of food additives,
9. H. Edward- The Chemical analysis of foods; practical treatise on the examination of food stuffs and the detection of adulterants,
10. The quantitative analysis of drugs- D.C. Garratt- Chapman & Hall,
12. Comprehensive medicinal chemistry- Ed Corwin Hansch Vol 5, Pergamon Press,
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SEMESTER IV
PAPER-III ENVIRONMENTAL CHEMISTRY AND ANALYSIS (C4.3 (A) –10)

UNIT-I
Significance of basic segments of Environment-Nomenclature in the study of Environmental Chemistry.,
SOIL CHEMISTRY & POLLUTION STUDIES: Principles of weathering-effect of temperature, water, air, plants and animals on weathering., Soil formation/development-factors affecting soil development-physical properties of soil; soil colloids-ion exchange properties., Soil fertility, productivity- Soil nutrients-micro and macro.,

UNIT II
STUDY OF WATER POLLUTION AND MONITORING AND TREATMENT METHODS OF WATER POLLUTANTS:
Hydrosphere-water resources-hydrological cycle-unique properties of water- water quality parameters., Pollution from Domestic water ,industrial,agricultural,solid waste, shipping, radio active waste & thermal pollution , Effect of specific pollutants like mercury, lead, arsenic, selenium, nitrates, oil., Effects of soaps,detergents,pesticides,hydrocarbon with regard to water pollution., Techniques of water treatment-Primary, secondary and tertiary methods-use of coagulants-flash distillation-solar stills, ion exchange reverse osmosis, electro dialysis.,

UNIT III
STUDY OF AIR POLLUTION AND MONITORING AND TREATMENT METHODS IN CASE OF AIR POLLUTION:

UNIT-IV
ENVIRONMENTAL CHEMICAL ANALYSIS:
Analysis of soil: Sampling,determination of moisture,total nitrogen, phosphorus, silicon, lime, humus, nitrogen, alkali salts.,
Analysis of water samples : Dissolved oxygen, Chemical oxygen demand ,Biological oxygen demand,Phosphates,nitrogen compounds.analysis of metallic constituents,
Analysis of Air samples: carbon mono oxide,carbon dioxide,sulphur dioxide,hydrogen sulfide,oxides of nitrogen,ammonia,ozone,hydrocarbons and aromatic hydrocarbons.,

SUGGESTED BOOKS:
1. Environmental Chemistry by A.K.De, Wiley Eastern Limited, New Delhi
2. A Text Book of Environmental Chemistry by O.D.Tyagia and M.Mehra-Anmol Publicaitons,
3. Environmental Pollution Control and Engineering by C.S.Rao , Wiley Eastern Limited,
4. Environmental Chemistry by P.S.Sindhu,-New Age International Publishers
5. A Text Book of Environmental Chemistry and Polution Control by S.S.Dara ,S.Chand & Co
6. Environmental Pollution Analysis by S.M.Khopkar, Wiley Eastern Limited, New Delhi
10. Soil Chemical Analysis by M.L.Isackson,Prentice-Hall India Pvt Ltd, New Delhi
UNIT-I
SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS:
SOLVENT EXTRACTION:
Introduction, principle, techniques, factors affecting solvent extraction, quantitative treatment of solvent extraction equilibria - chelate and ion association systems - synergism,
ION EXCHANGE:
Introduction, action of ion exchange resins, separation of inorganic mixtures, applications,

UNIT - II
CHROMATOGRAPHY:
Introduction - Column, paper chromatography - Thin layer chromatography and HPLC and Gas chromatography:
Introduction, equipment. Gas liquid chromatography. Exclusion chromatography. - Applications

UNIT III
Electrogravimetry:
Theory of electro analysis - Polarisation - Over voltage - Principles involved in electrogravimetric analysis - current - voltage curves - separation of metals by electrolysis - constant current - controlled potential electrolysis.
Coulometry:
Coulometry at controlled potential - separation of Nickel and Cobalt - coulometres - types of coulometric analysis - constant current coulometry of coulometric titrations.

UNIT – IV:
Voltametry, Polarography and Amperometric titrations:
Voltametry - Principle of Polarography - dropping mercury electrode; working; factors effecting the limiting current; residual current, migration current - diffusion current - kinetic current - polarographic maximum - Half wave potential - Organic Polarography, Rapid Scan polarography - cyclic voltametry - qualitative and quantitative polarographic analysis - Amperometric titrations - its advantages and disadvantages - Bi Amperometric titrations - Chrono potentiometry

SUGGESTED BOOKS:
1. B.K. Sharma -- Instrumental methods of chemical analysis, Goel Publishers,
2. G. Chatwal and S. Anand -- Instrumental methods of chemical analysis,,
3. J.J. Lingane - Electroanalytical Chemistry - Inter Science,
4. A. I. Vogel -- A text Book of Quantitative Inorganic Analysis - ELBS,
5. H.H. Willard, LL. Merrit and JA. Dean -- Instrumental Methods of Analysis,,
6. Peace - Instrumental Methods of Analysis,
7. J. W. Robinson - Undergraduate Instrumental Analysis,
8. R. A. Day and A. L. Underwood - Quantitative Analysis,
9. G. W. Eving - Instrumental Methods of Chemical Analysis,,
10. D. A. Skoog, D. M. West and F. J. Holler -- Fundamentals of Analytical Chemistry,
11. H. Kaur -- Instrumental methods of chemical analysis, Pragathi Prakashan,
12. D. A. Skoog, F. J. Holler and Neman -- Instrumental Methods of Analysis,,
13. G. H. Morrison and H. Frieser - Solvent extraction in Analytical Chemistry,
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III & IV SEMESTER
PRACTICALS FOR THE EXAMINATIONS TO BE CONDUCTED AT THE END OF IV SEMESTER

Practical I  Classical Methods of Analysis
1. Analysis of iron ore
2. Analysis of pyrolusite
3. Analysis of brass / synthetic mixture copper and nickel
4. Analysis of synthetic mixture of iron and zinc
5. Analysis of solder
6. Analysis of cement
7. Analysis of total hardness in waters
8. Analysis of chloride in water samples
9. Analysis of dissolved oxygen in water samples
10. Analysis of phosphate and nitrate and ammonia in fertilizers
11. Estimation of total iron with different procedures using various reductants
12. Analysis of zinc in zinc containing alloy using EDTA
13. Analysis of nickel by EDTA
14. Estimation of glucose
15. Analysis of oil for the determination of saponification value, acid value and iodine value

Practical II  Instrumental methods of analysis
1. Determination of alkalinity in industrial or environmental samples using pH metric procedures
2. Assay of commercial acids by pH metric titrations using suitable base
3. Conductometric titrations with individual acids and mixtures of acids
4. Potentiometric titration of Fe(II) with Cr(VI)
5. Estimation of mixture of Mn(VII) and V(V) with Fe(II) using potentiometric techniques.
6. Mixture analysis of Ce(IV) and V(V) with Fe(II) by a potentiometric method.
7. Estimation of potassium thiocyanate with silver nitrate by potentiometric method
8. Estimation of chloride and iodide in a mixture by potentiometric method
9. Determination of Fe(III) colorimetrically using potassium thiocyanate
10. Estimation of amount of manganese by colorimetric procedure
11. Estimation of phosphate by using ammonium molybdate and hydrazine sulphate
12. Simultaneous determination of manganese and chromium in mixture
13. Estimation of nitrate from environmental samples
14. Estimation of phosphate in environmental samples
15. Flame photometric estimations of sodium, potassium and lithium
UNIT-I
Molecular orbital theory - experimental evidence for covalence in coordinate bond of metal complexes- sigma and pi bonding orbitals in octahedral complexes - energy level diagrams - Measurement of pi bonding effects - influence of pi overlap on delta - Qualitative treatment of square planar and tetrahedral complexes on M.O. theory - Concept of resonance
Coordination polymers: linear, two-dimensional and three-dimensional polymers, Chelate effects - Macro cyclic complexes of alkali metals, crown ethers and cryptate forming ligands.

UNIT II
INORGANIC REACTION MECHANISMS:
Homogeneous catalytic hydrogenation - metal ion catalysis of organic reactions - hydrolysis, transamination, aldol condensation, decarboxylation, carboxylation - Synthetic oxygen carriers - Reactions of coordinated ligands - Template reactions, photochemistry of complex ions - photo chemical decomposition of Co(III) and Cr(III) complexes - photolysis of metal tri oxalates - photo absorption and isomerisation in complexes - photo oxidation in solution.

ORGANOMETALLIC CHEMISTRY:

UNIT III
NOVEL INORGANIC COMPOUNDS

UNIT-IV
Catalysis by organometallic compounds - oxidative addition, insertion/migration reactions, hydroformylation, olefin isomerisation and polymerisation reaction - catalysis reaction of synthetic gas-synthetic gasoline - Ziegler - Natta catalysis in polymerization - Dinitrogen complexes - Nitrogen fixation.

SUGGESTED BOOKS:
1. J.L. Huheey: Inorganic Chemistry - Principles, structure and reactions - Harper,
UNIT-I

UNIT - II
SOLID STATE CHEMISTRY:
Structure and bonding in metals-V.B. and band theories-interstitial compounds-Hume-Rothery rules-semiconductors-photo and thermal semi conductors; solid-solid reactions. 


UNIT-III

NON-AQUEOUS SOLVENT CHEMISTRY:Classification of solvents-reactions in liquid ammonia-solution of metal in ammonia-reactions of solvated electron-sulphurdioxide and acetic acid as non aqueous solvents-molten solids as non aqueous systems. 

UNIT- IV
INORGANIC POLYMERS, INORGANIC CHAINS-heterocatenation-intercalation chemistry-inorganic rings-borazines-phoshozenes-cyclo and linear phosphazines- homocyclic and heterocyclic inorganic ring systems-cages-boron cage compounds-boranes-and carboranes-metal clusters-binuclear and trinuclear clusters-bonding. 

SUGGESTED TEXT BOOKS:
2. W.E.Addison: Structural Principles of Inorganic Compounds-Longmans, 
3. R.S.Drago : Physical Methods in Inorganic Chemistry-Reinhold, 
5. J.B.Ander and A.J.Sonnessa : Principles of Chemistry-Macmillan, 
6. A.Barnard : Theoretical Basis of Inorganic Chemistry- Tata-McgrawHill., 
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SEMESTER III
PAPER-III INSTRUMENTAL METHODS IN INORGANIC ANALYSIS (C 3.3(In)-10)

UNIT – I
Radio Chemical Methods : - Objectives, introduction, principles and theoretical aspects, technique/method, gas counter, scintillation counter, errors and correction, liquid scintillation counting, sample preparation, applications


UNIT – II


UNIT – III

UNIT – IV

Inductively Coupled Spectrometer : - Principles – Instrumentation – Advantages over Atomic Absorption Spectroscopy – Applications with specific examples like Chromium, Molybdenum, Zirconium and Aluminium.

SUGGESTED BOOKS ;
2. J.W.Robbinson- : Under-graduate Instrumental Analysis,
5. Willard ,Merrit and Dean :Instrumental Methods of Analysis - D.Van Nostrand,
6. J.A.Barnard and R.Chayan : Modern Methods of Chemical Analysis,
8. S.M.Khopkar : Basic Concepts of Analytical Chemistry-,
10. B.K.Sharma -- Instrumental methods of chemical analysis,Goel Publishers,
11. G.Chatwal and S.Anand --Instrumental methods of chemical analysis,,
12. J.J.Lingane- Electroanalytical Chemistry- Inter Science,
13. Peace,Instrumental Methods of Analysis,
15. H.Kaur-- Instrumental methods of chemical analysis,Pragathi Prakasan,
16. D.A.Skoog,F.J.Holler and Nieman-- Instrumental Methods of Analysis.,
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SEMESTER III
PAPER-IV BIO-INORGANIC CHEMISTRY (C3.4(In)-10)

UNIT-I
Introduction, role of essential and non-essential elements in living systems,
Importance of elements with particular reference to: calcium, sodium and potassium,
Metallo-porphyrines-structures & functions of the following: chlorophyll and its activity-role of Mg in photosynthesis;
Haemoglobin: Structure and mechanism of transportation of oxygen-mioglobin
Other biological dioxygen carriers like: Hemerythrin, and hemocyanine

UNIT - II
Enzymes - Importance and introduction : Enzyme related proteins of cobalt(II), copper, molybdenum, Vitamin B_{12} & B_{12} - coenzymes,
Enzymes - Structure and function: red ox reactions-oxidation of ascorbic acid by Cu(II) enzymes-peroxydases and catalases-cytochromes.,

UNIT-III
Reduction of nitrogen by nitrogenase,
Carboxylation and decarboxylation reactions-phosphorylation - exchange of functional groups - blocking of functional groups - transportation and storage of metal ions by complex formation,

UNIT-IV
Metal ion toxicity- metal ion detoxification-nitrogen fixation in vitro and vivo-bio chemistry of metals-ADP and ATP-Inorganic Chemistry of biological systems- antibiotics and related complexes.,

SUGGESTED BOOKS :
2. D.Banerjea-Fundamental principles of Inorganic Chemistry - S.Chand &,
3. D.Banerjea - Coordination Chemistry - Tata McGraw Hill, New Delhi,
4. Gurudeepraj- Advanced Inorganic Chemistry - Vol 2, Goel Publishing House, Meerut,
5. E.I. Ochiai - Bio-Inorganic Chemistry-An Introduction-Allyn & Bacon, Lonndon,
6. K.Hussain Reddy—Bioinorganic Chemistry—New Age International Publs
7. Bertini, Gray, Lippard & Valentine -- Bioinorganic Chemistry-Viva-Low priced
8. Lippard & Berg—Principles of Bioinorganic Chemistry- Panima Publs Co
Acharya Nagarjuna University

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SEMESTER IV

Paper I – PHOTONORGANIC CHEMISTRY (C4.1(In)-10)

UNIT-I


UNIT II

EXCITED STATES OF METAL COMPLEXES: comparison with organic compounds, electronically excited states of metal complexes, charge-transfer spectra, charge transfer excitations, methods for obtaining charge – transfer spectra.

METAL COMPLEX SENSITIZERS: Metal complex sensitizer, electron relay, metal colloid systems, semiconductor supported metal or oxide systems, water photolysis, nitrogen fixation and carbon dioxide reduction.

UNIT III

LIGAND FIELD PHOTOCHEMISTRY: Photo substitution, photo oxidation and photo reduction, lability and selectivity, zero vibrational levels of ground state and excited state, energy content of excited state, zero – zero spectroscopic energy, development of equations for redox potentials of the excited states – Energy transfer under conditions of weak interaction and strong interaction – exciplex formation, conditions for the excited states to be useful as redox reactants, excited electron transfer, metal complexes as attractive candidates.

UNIT IV

REDOX REACTIONS BY EXCITED METAL COMPLEXES: (2,2’- bipyridine and 1,10- phenanthroline complexes). Illustration of reducing and oxidizing character of Ruthenium$^{2+}$ (bipyridal complex, comparison with Fe(bipy)$_3$, role of spin – orbit coupling – life time of these complexes. Application of redox processes of electronically excited states for catalytic purposes, transformation of low energy reactants into high energy products, chemical energy into light.

SUGGESTED BOOKS:

5. Photo chemistry of coordination compounds, V.Balzari and V.Carassiti, Academic Press,
Acharya Nagarjuna University
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SEMESTER IV
PAPER– II PHYSICAL METHODS IN STRUCTURAL STUDIES  (C4.2(In)-10)
(Basic principles and simple applications )

UNIT-I
ELECTRONIC ABSORPTION SPECTROSCOPY - requirement for transitions-nomenclature and assignment of transitions-intensity of transitions-application to inorganic systems-charge transfer spectra-study of molecular addition compounds by UV visible spectroscopy-composition and structure of inorganic complexes.
IR AND RAMAN SPECTROSCOPY: Theory -difference between IR and Raman spectra-basic instrumentation and general experimental techniques-typical applications in inorganic chemistry for structure elucidation.- group frequencies of organic, inorganic and organometallic systems, factors affecting the group frequencies, study of hydrogen bonding effects, vibrational spectra of ionic, coordination and metal carbonyl compounds.

UNIT-II
NMR SPECTROSCOPY Principle-basic instrumentation-chemical shifts-spin-spin coupling-typical applications in structure determination of inorganic compounds and complexes. spin 1/2 nuclei, \(^1\)H, \(^13\)C, \(^19\)F and \(^31\)P, Zeeman splitting, Boltzmann distribution, effect of magnetic field strength on sensitivity and resolution, \(^2\)H-NMR, chemical shift d, anisotropic effects, chemical and magnetic equivalence, coupling constants J, Karplus relationship of J on dihedral angle, first order splitting patterns and structure correlation, second order effects on the spectrum, AB. AMX, AA'BB' spin systems, simplification of second order spectra, high field NMR, double irradiation, selective decoupling, chemical shift reagents. Significance of coalescence temperature. - Introduction to \(^31\)P and \(^19\)F NMR.
ESR SPECTROSCOPY :Principle-basic instrumentation-presentation of spectra -hyper fine splitting-illustrations for structural and reaction mechanistic studies in inorganic chemistry.,ESR spectra of organic free radicals and ion radicals, transition metal complexes, application of spin traps.

UNIT-III
MASS SPECTROMETRY:,Principle-theory-instrumentation-interpretation of spectra of metal compounds-, ionization methods, isotope abundance, molecular ions, fragmentation processes of organic molecules and deduction of structural information, high resolution MS, introduction to soft ionization techniques and illustrative examples in macromolecular and supra molecular chemistry.
MAGNETIC METHODS:,Paramagnetism-diamagnetism-Gouy's method and Faraday's method of magnetic susceptibility measurements-applications for structural studies of inorganic compounds.,
X-RAY DIFFRACTION METHODS: Crystal structure of simple inorganic compounds.,

UNIT-IV
NEUTRON AND ELECTRON DIFFRACTION STUDIES: An out line of their application ,to the study of crystalline solids. Dipole moments-polarization and dipole moments-determination of dipole moments-structural information from dipole moments.Photo electron spectroscopy(CSCA)-principle-some examples of its application in structural analysis.,
ELECTRONIC SPECTROSCOPY: Electronic levels and types of electronic transitions in organic, inorganic and organometallic systems, solvent effects, effect of extended conjugation, Woodward-Fieser rules for calculation of absorption maximum, stereochemistry and electronic absorption.

SUGGESTED TEXT BOOKS:,
2.W.E.Addison: Structural Principles of Inorganic Compounds-Longmans,
3.R.S.Drago : Physical Methods in Inorganic Chemistry-Reinhold,
5.J.B.Ander and A.J.Sonnessa : Principles of Chemistry-Macmillan,
6.A.Barnard : Theoretical Basis of Inorganic Chemistry- Tata-MegrawHill,
PAPER– III INSTRUMENTAL METHODS IN INORGANIC ANALYSIS AND SEPARATION METHODS (C4.3(In)-10)

UNIT – I:
Coulometry: Coulometric analysis at controlled potential – separation of Nickel and Cobalt – coulometres – types of coulometric analysis – constant current coulometry - coulometric titrations.

UNIT – II:
Voltametry, Polarography and Amperometric titrations:
Voltametry – Principle of Polarography – dropping mercury electrode; working; factors effecting the limiting current; residual current, migration current – diffusion current – kinetic current – polarographic maximum – Half wave potential – Organic Polarography,
Rapid Scan polarography –cyclic voltametry – qualitative and quantitative polarographic analysis – Amperometric titrations – its advantages and disadvantages – BiAmperometric titrations – Chrono potentiometry

UNIT – III:
SEPARATION METHODS:
SOLVENT EXTRACTION: General considerations-distribution ratio-percent extraction effectiveness of extraction-classification of metal extraction systems-factors which effect chelate formation-process of extraction-quantitative treatment.
TECHNIQUES OF EXTRACTION:
Choice of solvent-batch extraction-continuous extraction-back washing and stripping-treatment of emulsions.
ION EXCHANGE METHODS IN CHEMICAL ANALYSIS: Chemical structure of ion exchange resins, ion-exchange equilibria, selectivity, ion exchange capacity-application of ion-exchangers.

UNIT – IV:
CHROMATOGRAPHIC TECHNIQUES:
(Principles-elementary theory and simple applications)
General introduction- Column chromatography-chromatographic techniques and nomenclature -adsorption chromatography-partition chromatography-paper chromatography-thin layer chromatography-ion exchange chromatography
Gas chromatography-Gas liquid chromatography(GLC)
High Pressure Liquid Chromatography (HPLC)

SUGGESTED BOOKS:
2. J.W.Robbinson: Under-graduate Instrumental Analysis,
3. G.W.Eving : Instrumentation Methods of Chemical Analysis-McGraw-Hill,
4. Willard ,Merrit and Dean :Instrumental Methods of Analysis - D.Van Nostrand,
5. J.A.Barnard and R.Chayan : Modern Methods of Chemical Analysis,
7. B.K.Sharma -- Instrumental methods of chemical analysis,Goel Publishers,
8. G.Chatwal and S.Anand --Instrumental methods of chemical analysis,,
9. J.J.Lingane- Electroanalytical Chemistry- Inter Science,
10. D.A.Skoog,D.M.West and F.J.Holler--Fundamentals of Analytical Chemistry,
UNIT-I
Significance of basic segments of environment-Nomenclature in the study of environmental chemistry.,
Soil chemistry & pollution studies: Principles of weathering-effect of temperature, water, air, plants and animals on weathering., Soil formation/development-factors affecting soil development-physical properties of soil; soil colloids-ion exchange properties., Soil fertility, productivity-Soil micro and macro nutrients.

UNIT-II
AIR POLLUTION:
General classification of atmospheric regions and significance-Chemical reactions taking place in atmosphere-Structure and properties-study of temperature inversion phenomenon.-Depletion of stratospheric ozone and its effect on environment.

UNIT-III
HYDROSPHERE AND WATER POLLUTION ANALYSIS
Hydrosphere-water resources-hydrological cycle-unique properties of water-water quality parameters-domestic water pollution-industrial, agricultural, solid waste, thermal, shipping water pollution and radioactive waste pollution.
Effect of specific pollutants like mercury, lead, arsenic, selenium, nitrates, oil., Effects of soaps, detergents, pesticides, hydrocarbon with regard to water pollution., Determination of D.O., COD, BOD, phosphates, nitrogen compounds.,

UNIT-IV
MONITORING AND TREATMENT METHODS IN CASE OF AIR POLLUTION, WATER POLLUTION & CONTROL:
Continuous monitoring of air pollutants and control-Principles, Monitoring instruments, monitoring of sulphur dioxide, hydrogen sulphide, oxides of nitrogen, oxides of carbon, hydrocarbons, ozone, suspended particulate matter and radioactive substances.,
Techniques of water treatment-Primary, secondary and tertiary methods-use of coagulants-flash distillation-solar stills, ion exchange, reverse osmosis, electroanalysis, electro dialysis.,

SUGGESTED BOOKS:
1. Standard methods of examination of water and waste water.,
3. J.D. Drever-The Geochemistry of Natural Waters-Prentice Hall Inc.
4. N.F. Voznaya-Chemistry of water and microbiology-Mir Publishers.,
5. F.I. Belan-Water Treatment-Mir Publishers,
7. A.K. De-Environmental Chemistry-Wiley Eastern Ltd.,
8. B.K. Sharma-Environmental Chemistry-Pragathi Prakasan,
Practical I  Classical Methods of Analysis
1. Analysis of iron ore
2. Analysis of pyrolusite
3. Analysis of brass / synthetic mixture copper and nickel
4. Analysis of synthetic mixture of iron and zinc
5. Analysis of solder
6. Analysis of cement
7. Analysis of total hardness in waters
8. Analysis of chloride in water samples
9. Analysis of dissolved oxygen in water samples
10. Analysis of phosphate and nitrate and ammonia in fertilizers
11. Estimation of total iron with different procedures using various reductants
12. Analysis of zinc in zinc containing alloy using EDTA
13. Analysis of nickel by EDTA
14. Preparation - I
15. Preparation - II
16. Preparation - III
17. Preparation – IV
18. Preparation - V

Practical II  Instrumental methods of analysis
1. Determination of alkalinity in industrial or environmental samples using pH metric procedures
2. Assay of commercial acids by pH metric titrations using suitable base
3. Conductometric titrations with individual acids and mixtures of acids
4. Potentiometric titration of Fe(II) with Cr(VI)
5. Estimation of mixture of Mn(VII) and V(V) with Fe(II) using potentiometric techniques.
6. Mixture analysis of Ce(IV) and V(V) with Fe(II) by a potentiometric method.
7. Estimation of potassium thiocyanate with silver nitrate by potentiometric method
8. Estimation of chloride and iodide in a mixture by potentiometric method
9. Determination of Fe(III) colorimetrically using potassium thiocyanate
10. Estimation of amount of manganese by colorimetric procedure
11. Estimation of phosphate by using ammonium molybdate and hydrazine sulphate
12. Simultaneous determination of manganese and chromium in mixture
13. Estimation of nitrate from environmental samples
14. Estimation of phosphate in environmental samples
15. Flamephotometric estimations of sodium, potassium and lithium
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SEMESTER III
PAPER – I: ORGANIC SPECTROSCOPY – I. (C3.1(O)-10)

UNIT – I
(a) Ultraviolet spectroscopy: Mechanics of measurement – Energy transitions – Simple chromophores – UV absorption of Alkenes – polyenes unsaturated cyclic systems – Carbonyl compounds
α,β- unsaturated carbonyl systems - Woodward – Fieser rules – aromatic systems – solvent effects – geometrical isomerism – acid and base effects – typical examples – calculation of \( \lambda_{\text{max}} \) values using WF-rules.


UNIT – II

UNIT – III
(a) NMR spectroscopy: Magnetic properties of Nuclei theory of Nuclear resonance Fourier transformation and its importance in NMR spectrometry. The chemical shift its importance and measurement calculation of chemical shift integration and J values from the spectral data problems related to calculation of chemical shift integration and J values Factors effecting chemical shift such as electro negativity and anisotropy – Shielding and deshielding mechanisms in acetylene carbonyl and Benzene anisotropy – spin-spin Interactions related to first order and higher order spectra – AB – A2 – AB2. ABX – ABC – AMX interactions – temperature dependence spectra – double irradiation and its importance in the interpretation of Proton Spectra – Hydrogen bonding – Geometrical and optical isomerism interpretation of NMR spectrum of a given compound leading to identification –typical examples of PMR spectroscopy.

UNIT-IV
(a) Problems involving individual spectral methods – UV, IR and PMR
(b) Problems involving combined any two of UV, IR and PMR
(c) Problems involving all the three of UV, IR and PMR.

TEXT BOOKS:
1. Spectrometric identification of organic compounds by R.N. Silverstein & G.C. Bassier (John Willey)
2. Spectroscopic methods in Organic Chemistry by Williams and Fleming (Mcgraw Hill)
UNIT-I:
i) Methods for determining Reaction mechanisms by kinetic and non-kinetic studies.
Kinetics of reaction, Energy profile diagram, Intermediate versus transition state, Reaction rate and rate limiting step. Identification of products, testing possible intermediates, trapping of intermediates, Cross over experiments, Isotopic labeling.

ii) Free radicals and their reactions

UNIT-II: Oxidations
Introduction: Different Oxidative processes.
Hydrocarbon: alkenes, aromatic rings saturated C-H groups (activated and unactivated), Alcohols, diols, aldehydes, Ketones, Carboxylic acids, Amines, hydrazines, sulphides. Oxidations with ruthenium tetroxide iodobenzene diacetate and TI(III) nitrate, Lead tetra acetate, SeO₂, MnO₂, Ag₂CO₃, oppenauer oxidation, peracids. Oxidation of C=C perhydroxylation using KMnO₄, OsO₄, peracids.

UNIT –III: Reductions
Reduction by hydride transfer reagents Aluminium alkoxide, LiAlH4, NaBH4, Diisobutyl aluminium hydrides – Sodium cyanide borohydride, trialkyl borohydrides – Reduction with diimide.

UNIT-IV: Nanochemistry

SUGGESTED BOOKS:
2. Advances in Organic Reaction mechanism and structure J. March (McGrew Hill)
3. Aguide Book to Mechanism in Organic Chemistry” by P.Sykes
4. Synthetic approaches in organic chemistry by R.K.Bansal(Narosa Publications)
5. Some modern methods of synthesis by Carruthers ( Cambridge).
6. G.A.Ozin, A.C. Arsenault Nanochemistry, RSC.
7. Diwan, Bharadwaj, Nanocomposites, Pentagon.
UNIT-I
Alkaloids:
(2) Cinchona alkaloids: Cinchonine, quinine, stereochemistry of cinchonine and quinine.

UNIT-II
ISOQUINOLINE & MORPHINE GROUP ALKALOIDS:
(1) Ipecac alkaloids: Emetine, Stereochemistry of emetine.
(3) Biogenesis of alkaloids.

UNIT-III
(1) Indole alkaloids: Reserpine, strychnine, brucine, physostigmine, lysergic acid, isolysergic acid, ergotamine and Ibogamine.
(2) Structure, stereochemistry, synthesis and biosynthesis of Ephedrine, Conine and nicotine.

UNIT-IV
Phenothiazines:
(1) Classification, general methods of synthesis of phenothiazines – pharmacological properties of phenothiazines.
(2) Dimethylamine series: Promazine and promethazine.
(3) Piperazine series: Prochlorperazine and trifluoperazine.
(4) Piperidine series: Thioriazine and mesoridiane.

TEXT BOOKS:
1. Alkaloids by K.W. Bentley Vols I & II.

Books for further Study:
1. Chemistry and physiology of alkaloids by Manske Vol. I & II, VII.
2. Medicinal Chemistry by A. Burger.
3. Isoquinoline Alkaloids by M. Shamma.
UNIT-I
Terpenoids: Classification, sources, isolation, synthesis and stereochemistry with special reference to zingiberene, santoin, eudesmol, abietic acid. Biosynthesis of terpenoids
Flavonoids: Classification, sources, isolation, chemistry and synthesis with special reference to quercetin and kampferol

UNIT-II
Steroid Hormones: Chemistry & synthesis of equilenin, oestrone, progesterone, androsterone, testosterone, cortisolone.
Non steroid hormones: Chemistry & synthesis of thyroxin, epinephrine and oxytocin

UNIT-III
Fat Soluble Vitamins: Chemistry, Synthesis & biosynthesis of vitamin A, vitamin E (α, β, γ, δ-tocopherols) and vitamin K
Water soluble Vitamins: Chemistry, Synthesis and biosynthesis of B1 and C
Chemistry of biomolecules
a) Enzymes: classification, kinetics and mechanism of enzyme action
b) Coenzymes and cofactors: NAD, FAD, folic acid, citric acid cycle.
c) Prostaglandins with special reference to PGE and PGF

UNIT-IV
Naturally occuring insecticides: Introduction, general properties, sources, isolation, synthesis and stereochemistry of Pyrethrin I and II; Jasminol I & II; Jasmonine and Cinerelone.
Structure-activity relationship (SAR) studies and bio synthesis of pyrethrins
Rotenoids – Chemistry and synthesis of rotenone
Isobutylamines: Chemistry and synthesis anacyclin, spilanthol
Minor insecticides of plant origin: pachyrrhizin and custard-apple.

TEXT BOOKS:
1. The Chemistry of Natural Products Vol.II Mono and Sesqui-Terpenes" by P. De Mayo (John Wiley Inc)
2. The Higher Terpenoids Vol.III by P. De Mayo,
3. Steroids by Fieser and Fieser;,
4. The Vitamins by S.F. Dykes;,
5. The Natural Pigments by K.W. Bentley;
6. Biological Chemistry by Holm,,
7. Organic Chemistry Vol.II by I.L. Finar,
9. General Organic and Biochemistry by F.A. Bettelheim and Jerry March, Saunders College, Publishing
Further Study:
1. The terpenoids by Simonsen;
2. The steroids by Shoppee,
3. Chemistry of Carbon compounds by Rodd.
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SEMESTER IV  
PAPER – I: ORGANIC SPECTROSCOPY –II  ( C4.1(O)-10)  

UNIT-I  
(a) CMR spectroscopy – noise decoupled and offresonance spectra of simple Compounds –  
  typical examples: of CMR spectroscopy – simple problems  

UNIT-II  
(a) Mass spectrometry: Introduction – determination of Molecular weight and formulae –  
  Behavior of organic compounds in Mass spectrometer – fragmentation of typical organic  
  compounds – stability of fragments – rearrangements – metastable peaks – Mass spectra of  
  representative compounds and related problems.  

UNIT-III  
(a) 2D NMR spectroscopy – Definitions and importance of COSY  DEPT  HOMCOR  HETCOR  
  INADEQUATE  INDORE  NEPT  NOESY  HOM2DJ  HET2DJ  DQFCOSY – COSY of  
  menthol DEPT of ethanol – study of simple organic compounds.  

UNIT-IV  
(a) Spectral characters and Structural elucidation of the following natural and synthetic  
  compounds involving all the spectral data  
  1) 4',8-disubsituted Flavone  2) 4,4'-disubsituted chalcone  3) apigenin  4)Kaempferol  5)lawsone  
  6) nicotine  7) Di-subsituted phenanthrene  8) Di-substituted nalphthalene  9) camphor  10) Zingiberene  
  11) Equilenine  12) Progesterone  

TEXT BOOKS:  
1. Spectrometric identification of organic compounds by R.N.Silverstein & G.C.Bassier (John Willey)  
3. Organic photochemistry by R.O.Kan (McGraw Hill)  
UNIT-I: Formation of C-C single & double bonds and Diels–Aider & related reactions
Formation of C-C single bonds – enamines and related reactions – Formation of C-C double bonds – witting reaction of Phosphorus ylides – stereoselective synthesis of tri and tetra substituted alkenes.
Diels–Aider and related reactions – diene-dienophile, intra molecular Diels –Alder reactions, Stereochemistry and mechanism Retro Diels – Alder reaction –1,3-dipolar reactions.

UNIT-II: Synthetic applications of organoboranes and Organic synthesis by Disconnection approach.
Synthetic applications of organoboranes – protonolysis, oxidation, carbonylation Reaction of alkenylborane – enantioselective synthesis of secondary alcohols from alkenes – organolithium compounds.
An introduction of synthons and synthetic equivalents, disconnection approach, functional group interconversions. One group, two group disconnections in simple molecules. Alcohols, Olefins, aryl ketones, α,β-Unsaturated compounds – 1,3 dicarboxyl compounds.

UNIT-III: Green Chemistry and Photochemistry

UNIT-IV: Pericyclic reactions
Pericyclic reactions: Definition, classification, MO theory, Electronic configuration in ground and first excited states of aliphatic conjugated polyene system(upto 4 double bonds).
Cycloaddition Reactions: FMO and correlation diagram methods-(2+2) and (4+2) cycloaddition reactions, stereochemistry. Woodward Hoffman rules.

SUGGESTED BOOKS:
1. Some Modern methods of synthesis By Caruthers (Cambridge)
2. Organic synthesis by Robert & Ireland (Printce Hall of India)
3. Designing Organic Synthesis B staunt Warron, John Wiley & Sons
4. “Pericyclic reactions a mechanistic study” S.M.Mukheji
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SEMESTER IV
PAPER – III: ANITIBIOTICS AND DRUGS     (C4.3(O)-10)

UNIT-I

Antibiotics:
(I) Cell wall biosynthesis, inhibitors, β-lactam rings, antibiotics inhibiting protein synthesis, synthesis of penicillin-G, penicillin-V, ampicillin, amoxicillin, chloramphenicol and cephalosporin
(II) Streptomycin, tetracyclins, terramycin, aureomycin, gramidin.

UNIT-II

Drugs and Medicinal chemistry:
(II) Drugs: Structure synthesis & Activity of the following:
   Anticancer Agents: Taxol, Vinblastine, Vincristine, Campothecin

UNIT-III

Chemotherapy of Brain: Introduction – neurotransmitters
CNS stimulants: Strychnine (CNS activity only) Picrotoxin nikethemide caffeine Nicotine CNS depressants
General anesthetics, mode of action of Sedatives & Hypnotics.

UNIT-IV

(III) Sulpha drugs: Sulphanilamide – Dihydrocurpurine – Prontosil
(IV) Antiseptics: Diphenyl – Chlorophene-2,4,4-trichloro-2’-hydroxydiphenyl ether – aminocerine hydrochloride.
(V) Antifungal agents: 1,8 dihyrosxyanthranol – griseofulvin.

TEXT BOOKS:
1. Introduction to Medicinal Chemistry – Wiley VCH
3. An introduction to drug design by SS Pandeya
5. The Organic Chemistry of drug design and drug action by RB Silverman, Academic press
PAPER- IV: TECHNIQUES FOR MODERN INDUSTRIAL APPLICATIONS. (C4.4(O)-10)

UNIT-I : Classical Methods of purification
1. **Recrystallization**: Basic principles, choice of solvent, seeding, filtration and centrifugation and drying. Industrial applications. Concepts of fractional crystallization.
2. **Distillation**: Basic principles. Distillation types- continuous distillation, batch distillation, fractional distillation, vacuum distillation and steam distillation. Industrial applications.
3. **Solvent extraction**: Basic principles. Different types of extraction. Selection of solvents. Avoiding emulsion formation. Basic concepts on Soxhlet extraction. Industrial applications.

UNIT-II : Adsorption and Partition Chromatography
1. **Introduction to chromatography**: Different types of Chromatography. Adsorption chromatography- adsorbents, solvents, solutes, apparatus. Column Chromatography-stationary phase, Mobile phase, packing of column, advantages and disadvantages.

UNIT-III: Gas Chromatography and High Performance Liquid Chromatography
**Gas chromatography**: Basic Principles. Different types of GC techniques. Selection of columns and carrier gases. Instrumentation, detectors; RT values. Applications in the separation, identification and quantitative analysis of organic compounds.

UNIT-IV : Ion Exchange Chromatography and Electrophoresis

SUGGESTED BOOKS:
III & IV SEMESTERS

PRACTICALS FOR THE EXAMINATIONS TO BE CONDUCTED AT THE END OF IV SEMESTER

PRACTICAL-I

1. Synthesis and purification of Organic Compounds involving two or more stages.  
   (The student must be given training in at least six syntheses/preparations)

For University Practical Examination: Duration: 6 hours  Marks 80

TEXT BOOKS:
1. Practical Organic Chemistry A.I.Vogel (Longmans)
3. A Manual of Practical Organic Chemistry Day Sitaramam & Govindachari
5. Practical Organic Chemistry H.T.Openshaw

PRACTICAL – II

Note: Both mixture analysis and other determinations are compulsory for University examinations

Part 1. Two component mixture analysis
   (The student must be given training in at least six mixtures with different functional groups)

and

Part 2. The following determinations/analysis/methods:

i) Determination of functional groups: NO₂, OMe, OCOCH₃, CO, N and un-saturation semi-micro scale; Carbohydrates: Glucose, Sucrose,
ii) Analysis of Fats and Oils: Saponification and Iodine number
iii) Physical methods chromatography (Column, paper and TLC)
iv) Spectral methods: U.V. and I.R.

For University Practical Examination: Duration: 6 hours Marks 80

Note: University examinations will be conducted one from above two parts