ANDHRA UNIVERSITY
COLLEGE OF ENGINEERING
DEPARTMENT OF ENGINEERING CHEMISTRY
M.Sc Applied Chemistry (Semester system)
(A two year course with four semesters)
I year
I Semester
AC 101 : INORGANIC CHEMISTRY – I

Basic quantum mechanics-Functions and operations postulates of quantum mechanics-Schordinger equation-physical significance of wave function-Radial dependence curves-Radial probability distribution curves and their significance-Angular functions.
Applications of Schordinger's equation to a particle in a one dimensional box. Vectorial model of the atom-Atomic spectra and term symbols (R-S Coupling only). Anomalies in the electronic configuration of elements-Modern periodic table-classification of elements-Slater's rule for calculation of schielding constant and effective nuclear change.
Valance bond theory-Simple interpretation of covalentbond-Heitler London theory-Pauling slater theory-Hybridisation and shapes of simple molecules-dative bonding-resonance-multiple bonding beyond second period elements-VSEPR-theory and its importance-Molecular orbital theory as applied to homonuclear and simple hetero nuclear diatomic molecules (non-mathematical approach only)-

Fajan's rules for prediction of non-polar character.
Ionic bond-common structures-properties of ionic compounds-Ionic radius poulings univalent radii-Radius ratio effects –lattice energy- Born haber cycle-Defect structures –Metallic bond (paulings thoery)-Band theory of solids p-type and n-type semiconductors-super conductivity-superconductivity ceramics.
Radio activity decay and equilibrium-Nuclear reactions-Q alues-cross sections-Types of reactions-chemical effects of nuclear transformations-Fission and fusion-fission products and fission yields-Radio active techniques-Tracer techniques-Activation analysis.

SUGGESTED BOOKS FOR READING

1. Inorganic chemistry, principles of structure and reactivity, 4thEdition by James E. Huheey: Elleu A. keiter: Richard L. Keiter.
2. Advanced inorganic chemistry by F.A.Cotton and G. Wilkinson.
3. Theoretical Inorganic Chemistry by Day and Selbin.
4. Concepts and Models in Inorganic Chemistry by Doughlas Mc Daniel.
5. Introductory Quantum Chemistry by A.K. chandra (Tata McGrawhill)
6. Chemistry of Lnathanides by T. Healler, chapman and Hall.
7. Chemical Applications of Group Theory by B.A. Cotton.
8. Basic concepts of Nuclear Chemistry by R.T. Overmann.
9. Introduction to Nuclear Science by M.N.Sastri, East West Press, Madras.

AC 102 : ORGANIC CHEMISTRY-I

STRUCTURE AND REACTIVITY Properties of organic molecules – concept of Aromaticity – Types – Huckel and Craig's rules – Benzenoid and non benzenoid compounds – annulenes – Hetero annulenes – fullerenes (C 60) – Types of organic reactions – mechanisms – Energy and Kinetic aspects – reactive intermediates – their formation and stability – Aromatic substitution reactions (electrophilic, nucleophilic and through benzynes) - radical substitution of arynes . Nucleophilic substitution at a saturated carbon atom – S_N I, S_N 2 and S_N i reactions. Elimination reactions E1, E2 and E1 c B-Elimination versus substitution.

REAGENTS IN ORGANIC SYNTHESIS $NaBH_4$, LAH , Lithium disopropyl amide (LDA)- dicyclohexyl carbodiimide (DCC), 1,3 –Dithiane (reactivity umpolung), OsO4, SeO_2, Crown ethers Wilkinson's catalyst and 2,3 – dichloro – 5,6 – dicyano – 1,4,- benzo quinone (DDQ).

STEREOCHEMISTRY Conformanational isomerism – cyclohexanes and decalins – optical isomerism – optical activity – molecular asymmetry and dissymmetry. Enantio and diastereo selective synthesis. Chirality – optical isomerism in biphenyls , allenes and spirans – optical isomerism in Nitrogen compounds . Geometrical isomerism – acylic and cyclic compounds.

PERICYCLIC REACTIONS Definition – classification selection rules and stereochemistry of electrocyclic reactions, cycloaddition and sigmatropic shifts , sommelet – Hauser , cope and claisen rearrangements – Diels – Alder reaction.

CHEMISTRY OF HETEROCYCLIC COMPOUNDS Synthesis and reactivity of Benzofuran, Benzothiophene , Indole, Pyrimidine, Pyrazine, Oxazole, Quinoline and Isoquinoline.

AC 103 : PHYSICAL CHEMISTRY –I

SOLID STATE CHEMISTRY – I Introduction, classification, laws of crystallography, crystallographic systems, space lattice, types of lattices, Brags Equation, Fourier synthesis, X-ray spectrometer, lane photograph, Rotating crystal mkethod, Powder method, Neutron Diffraction, Heat capacities of solids, Molar heat capacities, application, quantum theories of specific heats (Einstein Equation, Debye equation) Born Hager cycle, cohesive energy Ionic crystal. Properties of solids, Rhedogical plastic flow and elastic its glass transition temperature.

SOLID STATE CHEMISTRY – II Defects in solids-point defects- linear defect-Frenkel & Schotkey defect (Mathematical derivations). Band theory of solids-semiconductors – Extrinsic & Intrinsic non stochiometric, organic semiconductors, p-n junction, rectifiers, transistors, metal purification by zone refining, preparation of single crystals of Si & Ge (Czochralski crystal pulling method) doping, Integrated circuits.

CHEMICAL KINETICS –I Introduction, order, molecular its rate constant specific reaction rate, zeroth order first order second order third order rate equations (with suitable gaseous phase and liquid phase reaction determination of order of reactions (method of integrations, Time to complete definite fraction of the reactions, differential method, isolation method) opposing, reactions Hydrogen-bromine, hydrogen- chlorine reactions, consecutive reactions photolysis of acetaldehyde.

KINETICS – II Theories of reaction rates-(collision and transition state teas). Fast reaction Flow systems Stoppers flow method Effect of substitute Hemet equations Taft equation primary and secondary salt effects, effect of dielectric constant of solvent, ion – ion interaction, catalysis, Acid – base Enzyme catalysis. Oscillating reactions, Autocatalysis, chemical chaos.

SUGGESTED BOOKS:

1. solid stat3e chemistry by Azaroch.
2. Chemical Kinetics- Laidiler.

AC 104 : ANALYTICAL METHODS IN APPLIED CHEMISTRY - I

TREATMENT OF ANALYTICAL DATA Errors in Quantitative Analysis – Standard deviation-Variance – regression analysis- statistical design of experiments and sampling . Quality control- standards of purity .

Basic components of computers – comparison of micro, main frame and super computers. Synopsis of software Packages in Chemistry.

Applications :

1. Standard deviation and variance of universate data.
2. Roots of quadratic – equation and application to hydrogen ion concentration of strong acid .
3. Rate constant of first order reaction or Beer's law by least square method (derivation not needed).

CONVENTIONAL SEPARATION METHODS Precipitation methods- Nucleation and crystal growth- purity of precipitate-coprecipitation post precipitation – homogeneous precipitation (methods) techniques and its advantages. Use of organic reagents as precipitants. Separation by hydroxide and sulphide precipitation.

MODERN SEPRATION METHODS Solvent extraction- general principles – classification of extraction systems and applications to chemical analysis.

Chromatography – adsorption – liquid partition – column – TLC- HPLC-GLC – Basic principles and typical applications to organic and inorganic analysis. Ion-exchange methods. Cation and anion exchangers – ion exchange chromatography – Ion exchange separations – molecular sieves.

Zone Refining technique and applications in the purification of semiconductor materials and preparation of ultrapure compounds.

AC 105 : INORGANIC CHEMISTRY PRACTICAL

1. Preparation of vanadium(V) from ammonium metavanadate and standardisation of vanadium(V) with iron(II)

2. preparation of cerium (IV) sulphate from cerium(IV) oxide and standardization of cerium (IV) sulphate with iron(II)

3. Estimation of iron(III) by photo chemical reduction method.

4. Analysis of iron(III)-iron(II) present in a synthetic mixture (stannous chloride method).

5. Estimation of copper(II) present in a brass sample (iodometric method)

6. Determination of chromium(IV)present in a sample of potassium dichromate.

7. Determination of calcium hardness and magnesium hardness of water sample.

8. Determination of zinc a ferrocyanide.

9. Determination of chloride in a sample of water(silver nitrate method).

AC 106 : PHYSICAL CHEMISTRY PRACTICAL

1. Critical Solution temperature of phenol-water system; effect of Electrolyte.

2. Equilibrium constant of KI +I2-------KI3.

3. Hydrolysis of an ester – A Kinetic study.
4. Dimerisation constant of benzoic acid by the distribution method (Benzene –water system)

5. Inversion of Surcrose –Akinetic study.

6. Conductometric titration of mixture of weak and strong acid with sodium hydroxide.

7. Determination of solubility product of a sparingly soluble salt by conductometric method.

8. Determination of PpKa value of acetic acid using PH Metric method .

9. Formula of Cuprammonium cation –distrubition method.

10. Heat of Neutralisation .

11. Heat of solution.

12. A study of the adsorption of oxalic acid on charcoal.

13. Study of binary liquid mixture involving azeotrope .

14. Study of a two component system involving eutectic or compound formation .

15. Phase diagram of a three component system (chloroform –acetic acid – water)

TEXT BOOKS

1.Practical Physical Chemistry by Alexander .

I year
II Semester

AC 201 : INORGANIC CHEMISTRY-II

Co-ordination chemistry of metal complexes valence bond theory of complex compounds –Inner and outer orbital complexes-Electroneutrality principle and back bonding –Isomerism in coordination compounds –crystal field theory crystal field stabilization energy- crystal effects in tetrahedral and square planar complexes.

Application of crystal field theory to account for spectral and magnetic properties of complexes and stabilization of an oxidation state of a metal ion in a complex. Octahedral and planar substitution mechanisms in co-ordination compounds-Introduction to Molecular orbital theory of complex compounds –Nephelauxetic effect.

Inorganic reaction mechanisms- concept of hard and soft acids and bases-Mechanism of redox reactions outer sphere mechanisms ,Inner sphere mechanisms-Metal cluster compounds-Sandwich compounds and metal carbonyls.

Chemistry of lanthanides and actinides –Stable oxidation states-Lanthanide and actinide contraction-Absorption spectra of lanthanides and actinides and their magnetic properties-separation of Lanthanides and actinides, uses of lanthanides and their compounds.

Mass bar spectroscopy –principles and chemical applications –counting techniques-G.M.ionization and scintillation counters-statistics-Application of Radio-isotopes-Iodine -131 and cobalt-60 in Radio therapy. P32 in fertilizers-use of r-rays , food preservation,vegetable preservation –leak testing in high vacuum systems.

AC 202 : ORGANIC CHEMISTRY – II

MECHANISMS OF SOME TYPICAL NAME REACTIONS AND PHOTO CHEMISTRY Aldol , Perkin, Benzoin , Cannizaro ,Wittig, Grignard, Reformatsky reactions. Favorskii, Wagner-Meerwein, Hofmann, Schmidt, Lossen, Curtius,Beckmann, Baeyer-Villiger, Fries rearrangements. Hydroboration, Oppenauer Oxidation-Clemmenson, Wolf-Kishner,Meerwein-Pondorf-Verley and Birch reductions-Hofmann-Loffler-Freytag reaction-Michael and Mannich reactions-pinacol-pinacolone rearrangement.Basic concept of free radical formation,their stability and polymerisation.

PHOTOCHEMISTRY Jablonski diagram-cis-trans isomerism, paterno-Buchi reaction, Norrish Type I and II reactions, Barton reaction, di-pimethane rearrangement.

CHEMISTRY OF NATURAL PRODUCTS Classification,isolation, synthesis and structural elucidation of terpenoids, alkaloids and purines.

Terpenoids : Camphor, α-Pinene,Santonin, and α and β-Vetivones.

Alkaloids : Papaverine, Nicotine, Quinine and Atropine.

Purines : Caffeine.

ORGANIC SPECTROSCOPY Basic principles of Absorption spectra –UV – VISIBLE, IR and NMR spectroscopy methods- Mass spectrometry. Determination of structure of simple organic compounds like Ethyl alcohol, 1-pentanol, p-methoxy Benzyl alcohol, P-cresol, phenyl acetic acid, cinnamic acid pinacolone,Acetophenone, cyclopentanone, salicylaldehyde, Benzyl acetate, Benzamide, N,N-Dimethyl aniline, 1,3,5- trimethyl benzene.

TEXT BOOKS FOR AC: 102 AND : 202

1. A guide book to mechanisms in Organic chemistry by Peter Sykes : ELBS.
2. Organic chemistry, Vol. I (6th Edn.) and Vol. II (5th Edn .) by I.L. Finar, ELBS.
3. Organic chemistry by Mukherjee, Singh and Kapoor, Vols. I.and II, Wiley Eastern
4. Reaction mechanism in Organic chemistry by Mukerjee and Singh, Macmillan India.
5. Organic spectroscopy by William Kemp, ELBS (2nd Edn .)

REFERENCE BOOKS FOR AC 102 AND AC :201

1.Advanced organic chemistry by Jerry March, Wiley Eastern.
2. Chemistry of Natural Products by K.W. Bentley (Editor).
3. Stereochemistry of carbon compounds by E.Eliel, McGraw –Hill.
4.Spectrometric Identification of Organic Compounds by R.M. Silverstein and Francis X. Webster, 6th edition, John Wiley and Sons.

AC 203 : PHYSICAL CHEMISTRY – II

PHOTO CHEMISTRY Consequences of light absorption – quantum yield and its determinations – fluorescence , phosphorescence and sensitized fluorescence – photolysis of aldehydes and ketones photochemical reactions between hydrogen and halogens – photosynthesis – flash photolysis .

ELECTRO CHEMISTRY Interionic attraction theory of Debye and Huclel – Onsagor's modification - determination of activity coefficients from EMF 's of reversible cells – concentration cells with and with out transference, liquid junction potentials – applicability to hydration numbers – determination of thermodynamic data from EMF measurements – primary cells fuel cells – photoelectrochemical cells .

SURFACE CHEMISTRY Adsorption of gages by solids – Langmuir, Freundlich and B-E-T isotherms – applicability to heterogeneous catalysis – determination of surface area of adsorbents – Electrokinetic phenomena – Donnan membrane equilibrium – emulsions .

CATALYSIS Acid – base catalysis , Michaelis – Menten catalysis, chain reactions- consecutive ,parallel reactions involving unimolecular stops only .

MOLECULAR SPECTROSCOPY Electromagnetic radition – rotation and vibration of diatomic molecules- selection rules – rotation of polyatomic molecules – microwave spectroscopy – vibration of polyatomic molecules infrared and Raman spectroscopy .

SUGGESTED READING FOR AC 103 and AC 203

1. Physical chemistry – S. Glasstone (Macmillan)
2. Physical chemistry – W.J. Moore (Orient Longmans)
3. Physical chemistry – G.M. Barrow (Mc Graw – Hill)
4. Physical chemistry - S.A. Maron –Prutton (Collier – Macmillan)
5. Physical chemistry – G.W. Castellan (Addison – Wesley)
6. Thermodynamics – N.V.Rao (Macmillan)
7. Molecular Spectroscopy –C.N. B.anwell (Tata McGraw-Hill)

AC 204 : ANALYTICAL METHODS IN APPLIED CHEMISTRY – II

OPTICAL METHODS OF ANALYSIS:SU.V. , Visible, I.R., N.M.R.,and E.S.R. spectroscopic methods –basic principles, theory, instrumentation and applications. Flame emmision spectroscopic methods –general principles-theory – instrumentation and applications.

MODERN METHODS OF CHEMICAL ANALYSIS Electrogravimetry –principles – theory –instrumentation and applications to chemical analysis.Polarography-Cyclic Voltametry-principles-theory-instrumentation and applications to chemical analysis. TGA- DTA and DSC- principles and applications to chemical analysis .

PRESCRIBED BOOKS FOR AC – 104 AND AC 204

1.Quantitative Inorganic Analysis – A.I. Vogel, ELBS. Ed.
2. Instrumental Methods of Analysis – Willard Meritt, J.A. Dean and Settle (6^{th} Edn.)
3.Instrumental Methods of Analysis – G.W. Ewing, McGraw- Hill Inc, New York.
4.Instrumental Methods of Analysis – B.K. Sharma, Goel Publishing House, Meerut.
5.Chemical separation Methods – J. A. Dean, Van Nostrand Reinhold Company.
6.Basics of computers for chemists – P.C.Jurs.

REFERENCE BOOKS

1. Separation methods in chemical analysis by James M. Moller (Wiely Interscience 1975)
2. Introduction to separation science By Kargar, Synder and Horwath (willy Interscience 1975).

AC 205 : ORGANIC CHEMISTRY PRACTICAL

Synthesis and purification of about ten organic compounds involving one or two Stages. Systematic identification of about eight simple organic compounds having One or two functional groups by functional group analysis, chemical reaction and Derivatisation

TEXT BOOKS

1 A text book of practial Organic chemistry by A.I. Vogel, ELBS and Longman group.
2.Practical Organic chemistry by Mann and Saunders, ELBS and Longman group

II Year
III Semester

AC 301 : INDUSTRIES BASED ON ORGANIC RAW METERIALS

CHEMISTRY OF STARCH Structure, Chemical and Physical properties of mono, di, and polysaccharides. Manufacture and uses of unmodified starch: dextrin sugar syrup: Hydrolysis of starch to edible and industrial glucose, applications of starch in textile sizing and in the fermentation industries- Manufacture of Industrial Alcohol-Manufacture of Vitamin C from glucose.

CHEMISTRY OF CELLULOSE Structure,Chemical and Physical properties. General reactions ,major sources and uses of cellulose, Enzymatic and chemical hydrolysis of cellulose- conversion of cellulose to alcohol. Laboratory and commercial scale preparation of chemical cellulose. Cellulose derivatives like cellulose nitrate, cellulose acetate.

Different methods of wood pulping: Manufacture and cases of different qualities of paper products like cardboard, newsprint, writing paper, tissue paper and filter paper.

PERFUMES Theory of olfaction and mechanism, relation between perfumes and phermones, classification of perfumes, chemistry, manufacture and isolation of the following compounds –Citral, Geraniol, Nerol, Linalool, citronellol, hydroxy citronillol cincal, jasmone, civetone and Muskone, acetylcarane ,acetyl Longifolene.

AC 302 : MINERAL BASED INDUSTRIES

Ferrous and non-ferrous industries-quality-control methods-General principles applied in studying an industry-Manufacture of iron ,steel and special steels Metallurgy of gold and silver.

Explosives, classification, characteristics-special explosives- nitrocellulose-T.N.T Picric acid Dynamite-cordite and Gunpowder.

Classification of cement-Manufacture of portland cement-setting and hardening of cement. Chemical constitution of Portland cement and their characteristics – special cements and their uses.

Classification of ceramics –Basic raw metirial- Application of colours to pottery porcelain and china ware- manufacture. Glass-raw materials, Manufacture of special glass-optical , Borosilicate, flint and coloured glasses.

Industrial poisons and their classification solid liquid and gaseous poisons-their identification- physiological activity and control. Solids:Pb, As, Hg, asbestos, textile fibres. Liquids: organic solvents, gases oxides of S, N and H_2S, Cyanides, Aldehydes, Ketones and Hydrocarbons.

REFFERENCE BOOKS

1. Chemical process industries by N.D. Shreeve.
2. applied chemistry for Engineer by Diamont.
3. Industrial poisons and solvents by Jacobs.
4. chemistry of Engineering materials by Jain & Jain.
5. Engineering chemistry by B.K.Sharma.
6. Environmental chemistry by B.K.Sharma.
7. Corrosion, Volume-I, Metal Environment Reactions by L.L.shreir, Newnes Butterworths, London.
8. Corrosion Engineering by Fontana and Greene, McGraw Hill Publication.

AC 303 : PETROCHEMICALS

PETROLEUM PRODUCTS Origin of petroleum – petroleum resources – petroleum composition – Nature of crude oil – Different types of crude oil. General processing of crude oil – Fractionation and stipping . Thermal decomption process – Stabilization and gas recory. Cracking process – thermal and catalytic . Blending of gasoline – knocking – Octane number. Aviation gasoline. Diesel oil – Cetane number Kerosene. LPG – Composition and uses. Synthetic petrol (Fischer – Tropsch method).

PETROCHEMICCALS Origin of petrochemicals – Types of phemicals. Raw materials for aliphatic, aromatic and inorganic petrochemicals. Manufacture – properties and uses of acetone, acetylene, ethylene, propylene, venyl chloride, butanol, ethyl hexanol and isopropanal.

POLYMERS – I Basic concepts Namenclature- Degree of polymerization – polymerisition process – Classification of polymerization reactions – Difference between thermoplastics and thermosets. Types of polymerization – Addition and step growth. Copolymerisation- Block copolymerisation – Graft copolymerisation. Stereo isomers – isotactic, atactic and syndyotactic polymers. Mechanism of polymerization – free radical and ionic. Heterogeneous polymerization – Zeigler-Natta catalysis. Compounding of plastics – Fabrication techniques of plastic.

AC 304 : DRUGS AND DYES

DRUGS – I Introduction - classification – chemotherapeutic agents – pharmacodynamic agents – Definition of the terms commonly used in the chemistry of drugs – Definitions of the terms commonly used in the chemistry of drugs (pharmacy, pharmacology, pharmacodynamics, pharmacopore, pharmacodynamic agents Metabolites and Antimetabolites, Therapeutic Index)- Structure & Physiological activity relationship, Assay of drugs (chemical assay).

ANTIBIOTICS Chemical structures , methods of production and medical uses of pencillin, streptomycin, chloramphenicol, Tetracyclines.

STRUCTURES AND SYNTHESIS OF THE FOLLOWING TYPES OF DRUGS (Non – structural Streatment only):

SULPHONAMIDES Sulphanilamide, sulphapyridine, sulphathiazole (cibazole), sulphadiazine, sulphamerazine, sulphaguanidine, sulphisoxazole, sulphapyrazine, Marfanil (sulphamylon). Mechanism of action of sulpha drugs.

ANTIPROTOZOAL AGENTS Diodoquine Carbarsone

ANTISEPTICS Chloramine- T (chlorozone), Thymol, Dichloramine- T , Iodoform, Dettol, Mandelic acid , Urotropine.

DRUGS – II

STRUCTURE AND SYNTHESIS OF THE FOLLOWING TYPES OF DRUGS (Non – structural treatment only)

ANTILEPROTIC DRUGS Dapsone (DDS), Acedapsone (DADDS)Chaulmoogra and Hydrocarpus oil .

ANTI CANCER AGENTS Alkylating agents.

MUSTARDS Melphalan, chlorambucil, Amethopterin.

ANAESTHETICS Benzocaine, pentothal sodium

SEDATIVES , HYPNOTICS and ANTICONVULSANTS (anti epileptics) Bromural, Barbiturates (veronal), phenobarbitone, Hydental.

TRANQUILISERS Chloropromazine, Diazepam, Hydroxyzine (atarax), pipradol (meratran).

CARDIOVASCULAR DRUGS Amyl nitrate, Methyldopa.

DIURETICS Furosemide (Lasix) clopamide.
ANTI PYRETICS & ANALGESICS Melubrin, Novalgin, Phenacetin, Paracetamol, Salicin, Salol, Helicin.

ANTI MALARIALS Chloroquine, Parmaquine, camaquine, Paludrine.

ANTI COAGULANTS Heparin, Warfarin, Dicoumarol, Phenindione

DRUGS USEDD IN DIABETES Tolbutamide.

DYES
Introduction – Dye intermediates - Unit processes in the preparation of dye intermediates – Structural features of a dye (Chromophores and Auxochromes) – Bathochromic and Hypsochromic effects – Diazotization and coupling – colour and chemical constitution (Witt's theory, Armstrong theory &Modern theory) .

Classification of dyes

STRUCTURES AND SYNTHESIS OF THE FOLLOWING TYPES OF DYES
(Non – structural treatment only):

NITRO DYES Picric acid ,Napthol Yellow S.

NITROSODYES Fast green O, Naphthol green Y.

AZODYES Methyl orange ,Methyl Red, Bismark Brown, Congo Red

PHTHALEINS Phenolphthalein .

XANTHENES Fluorescein .

RHODAMINES Rhodamines B.

HETEROCYCLICDYES Indophenol blue, Phenylene blue . .

THIAZINE DYES Methylene blue .

CYANINE DYES Quinoline blue .

ANTHRAQUINONE DYES Alizarin .

INDIGOIDS Indigo (Indigotin)

THIOINDIGOS Thio indigo.

PHTHALOCYANINES Copper phthalocyanine.

AC 305 : QUANTITATIVE ANALYSIS PRACTICAL

POTENTIOMETRY

1. Estimation of Iron (II) with chromium (VI) .
2. Estimation of Iron (II) with cerium (IV) .
3. Estimation Vanadium (V) with Iron (II) .

PH METRY

4. Titration of a strong acid against a strong base.
5. Titration of a weak acid against a strong base .
6. Titration of a mixture of weak acid and a strong acid against a strong base.

CONDUCTOMETRY

7. Titration of a weak acid against a strong base.
8. Determination of percentage purity of $AgNo_3$ Solution using KCL .

COLOURIMETRY

9. Estimation of Manganse .
10. Estimation of Fe (II) .

VOLUMETRIC ANALYSIS

11. Estimation of ZnSo4 with EDRA .
12. Estimation of Calcium and Magnesium present in a mixture with EDTA.
13. Estimation of Fe (II) and Fe (III) present in a synthetic mixture .
14. Determination of copper present in a coin or a brass sample.
15. Analysis of Iron ore.
16. Estimation of Manganese in pyrolucite.
17. Determination of D.O. present in a water sample.

Text Books

1. A text book of Practical Inorganic Chemistry by AI Vogel, ELBS
2. Laboratory manual of Engineering Chemistry by Dr Sudha rani

II Year
V Semester

AC 401 : OILS, FATS, WAXES, & PROTECTIVE COATINGS

OILS , FATS & WAXES Classification of oils , Vegetable, animal and mineral oils – Manufacture of Vegetable oils, Chemical properties and uses – Animal fats and oils, processing, hydrogenation of oils- preparation , properties and uses of waxes.

SOAPS Manufacture, raw material , typical soaps, Glycerin recovery from soap manufacture.

DETERGENTS Raw materials – Classification of surfactants- Biodegradability of Detergents.

SURFACE PROTECTIVE COATINGS Paints – Drying oils , Pigments , Pigment extenders - Water paints – Special paints – Varnishes , Lacquers and Enamels.

TEXT AND REFERENCE BOOKS FOR AC 301 AND AC 401

1. Organic Chemistry Vol.2 IL Finar 5th Edn. Longmans 1975
2. Cellulose as chemical and energy resource CH Wilke, Willey-Inter science, 1975
3. Dryden's outlines of Chemical Technlolgy 2nd Edn., edited and revised by M.Gopala Rao, Marshel sitting – East West Press, 1973.
4. Chemical Process Industries 3 Edn., R Norries Shreve, Mc Graw Hill, 1967.
5. Chemistry of Engg Materials by CV Agarwal.
6. Applied Chemsitry for Engineer's by Diamont
7. Industrial Chemistry by BK Sharma, Goel Publishing house Meerut.
8. Synthetic Organic Chemistry by OP Agarwal, Goel Publishing house Meerut.

AC 402 : CORROSION AND POLLUTION MANAGEMENT

Basic concepts of corrosion- Dry or chemical corrosion and mechanism pilling Bedworth rule. Wet or Electrochemical corrosion –Mechanism of wet or electrochemical corrosion various types of wet or corrosion-Factors influencing corrosion-some important corrosion control methods –cathodic protection - Anodic inhibitors - Thermodynamics and kinetics of corrosion reactions.

Protective coatings Metallic coatings Golvanising and tinning Metal cladding Electro plating –Metallised coatings chemical conversion or inorganic coatings- phosphate, chromate, chemical oxide or anodized coatings.

Drinking water or Municipal water treatment purification for domestic use- Break point chlorination - Desaltination of brackish water : Electro dialysis- Reverse osmosis- chemical analysis of water (chlorine, acidity, alkalinity, hardness, D.O only)

Water and soil pollution, water quality standards (India, W.H.O etc) for drinking water- standards for industrial effluents. Industrial pollutants solids, liquids and goses and their limitations.

Sources of air pollution extent of air pollution in rural and urban areas pollution form Metallurgical, Fertilizer and petrochemical industries, sources of soil pollution types of soil pollution and prevention.

AC 403 : POLYMERS

POLYMERS-II Polymer degradation – Types of degradation – thermal, mechanical, ultrasonic waves, photo-degradation, oxidative degradation (rubber and phenol-fermaldehyde)and hydrolytic degradation.

Kinetics of polymer reaction – addition – Free-radical , cationic and Anionic polymerization. Condensation polymerization – acid catalysed condensation reactions.

Analysis and testing of polymers – weight average nad number average molecular weights of polymers ratio of M_w and M_n. Determination of molecular weight of polymers by Cryoscopy – Light scattering – X-ray scattering – Viscosity – Ultra centrifuge and gel permeation chromatographic methods.

RUBBERS, ELESTOMERS AND ADHESIVES Origion and chemical nature of natural rubber – D irect processing of lLatex – Compounding of rubber – Fabrication of rubber – Vulcanization of rubber. Elastomers – Manufacture, properties and uses of Butadiene, Isoprene and chloroprene. Natural and synthetic adhesives - Classification animal glue. Protein and starch adhesives – Resin adhesives. Difference between plastics, elastomers and adhesives.

RECOMMENDED BOOKS FOR AC – 303 & AC – 403.

1. Petroleum products Hand Book, Virgil.B Guthhrie, Editor, 1st ed Mc Graw Hill book company Inc 1960
2. chemicals from petroleum , A. L. Waddns and J. Murray, ELBS Edn. 1970
3. Textbook of polymer science P. W. Billmeyer, John Wiley, 1962
4. Introduction to polymer chemistry, Raymond B, Seymour.
5. polymer science, V.R. Gowariker et al ., New A ge I ntl (P)Ltd, New Delhi.
6. organic chemistry of synthetic High Polymers, Robert W. Lenz, Interscience Publishers.
7. chemical process Industries 5th Ed , George T. Austin, Mc Graw- Hill company Inc 1984.
8. Industrial chemistry by B k sherma 5th Ed 1993.

AC 404 : FINE CHEMICALS

FOODS AND FOOD ADDITIVES: Carbohydrates, proteins, water and mineral substances, Vitamins .
Flavour compounds : Menthol ,pipertone, Vanillin, Eugenol, monosodium flutamate and carvone.
FLAVOURS: The difference between perfumes and flavours, classification of flavour compounds , chemistry of species and oleoresins, pepper, ginger, aniseed, cuminseed, Coriander, Cellery and cardamon, Chemistry of some major flavours like Coffee , Tea , Cocoa, Onion. Assessment of flavours and blending of flavours .
SWEETENING AGENTS Saccharine , Sodium Cyclamate.

CHEMISTRY OF AGROCHEMICALS :
INSECTICIDES : DDT, BHC,Aldrin, Endosulfon, Malathion, Parathion.
HERBICIDES : 2,4-dichloro phenoxy acetic acid, dalapon, paraquat, Banalin Butacarb .
FUNGICIDES : Boardeaux mixture, Copper oxychloride, Zineb,, Benomyl (Benlate).
RODENTICIDES: Warfarin, Sodium monofluoroacetate, Zinc phosphide.
PLANT-GROWTH MODIFIERS:Growth Regulators,Second-Growth Inhibitors andDefoliants,Yield Stimulators

RECOMMENDED TEXT BOOKS : FOR AC 304 AND AC 404

1. Medicinal Chemistry, A. Burger,3rd Edn ., Wiley, 1970.
2. Chemistry of pesticides, N.M. Melnikov, Residue Reviews, Vol.36, Springer Verlag, New York , 1971.
3. Future for insecticides , R.C. Netealr, J.J.Mckalvery, Jr. John Wiley &Sons, New York, 1976.
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AC 405 : APPLIED CHEMISTRY PRACTICAL

1. Determination of saponification value of an Oil.
2. Determination of Iodine value of an Oil.
3. Determination of Acid value of an Oil.
4. Estimation of Glucose.
5. Determination of Glucose in Jaggery and Honey.
6. Determination of Molecular Weight of a Polymer.
7. Analysis of Drug.
8. Analysis of Fertilizer.
9. Analysis of Pesticide.
10 .Preparation of Soap.
11.Preparation of cold Cream.
12.Preparation of Shampoo.
13.Preparation of Phenol- Formaldehyde Resin.
14.Preparation of Copper pigment .
15.Preparation of Paracetamol.
16.Preparation of Fluorescein dye.
17.Isolation of Caffeine
18.Isolatiopn of Lycopene

Text Books

1. A Text book of practical organic chemistry, A.I. Vogel, ELBS.
2. Laboratory Manual of Organic Chemistry by Raj K Bansal

And

AC 406 : VIVA- VOCE & RECORDS

AC 407 : PROJECT WORK