PAPER –I – GENERAL CHEMISTRY – I (90 Hrs) (I SEMESTER)

UNIT – I (30 Hrs)

1.1 Atomic Structure

Aufbau's principle, Hund's rule and electronic configurations of elements – stability of half filled and completely filled orbital – shapes of s,p,d and f orbitals . S,P,d and f block elements- classification and characteristic properties.

1.2 **Periodicity of Properties**

Definition and periodicity of the following properties –atomic radii, ionic radii, ionization potential, electron affinity and electron negativity (no determination) lanthanide contraction – inert- pair effect and diagonal relationship with examples.

1.3 P**rinciples of Inorganic Analysis**

Principles of acid base equilibria, common ion effect and solubility product and their application in qualitative analysis. Reactions involved in the separation and identification of cations and anions in the analysis- spot test reagents – aluminol, cupferon , DMG,thiourea , magneson, alizarin, and Nesslers reagent Semmicro techniques.

1.4 Types of Solvents

Protic and aprotic solvents, aqueous and non aqueous solvents, liquid ammonia as as solvent .

UNIT – II (30 Hrs)

2.1 Basic concepts of bonding in organic chemistry Hybridisation and geometry of molecules – methane, ethane, ethylene, acetylene, and benzene. Electron displacements effects – Inductive, inductomeric , electrometric, mesomeric, resonance, hyper conjugation and steric effects . Cleavage of bonds- homolytic and heterolytic fission of carbon – carbon bond- reaction intermediates- carbo cations carbo anions and free radicals – their stability.

2.2 Nomenclature of organic compounds.IUPAC recommendations for namic simple aliphatic , alicyclic and aromatic compounds .

2.3 Alkanes – Mechanism of free radical substitution in alkanes .

2.4 Cyclo alkanes- preparation using Wurtz 's reaction Dieckmann's ring closure and reduction of aromatic hydrocarbons. Substitution and ring opening reactions. Baeyers strain theory and theory of strainless rings .

UNIT – II (30 Hrs)

3.1 Quantum Chemistry

Planck's theory – photo electric effect – Compton effect – De. Broglie's relationship heisenberg's uncertainity principle- Schrodinger wave equation (no derivation) – significance of wave functions- probability distribution of electrons – radial probability distribution curves.

3.2 Gaseous State

Gas Laws from the kinetic theory of gases . Transport properties – viscosity – thermal conductivity – diffusion (definitions only)– Maxwell's distribution of molecular velocities(no derivation)-mean – RMS , most probable , velocity equilpartition of energy – virial equation of state – Boyle temperature – coefficient of compressibility and thermal expansion.

3.3 Liquid State

Surface tension – effect of temperature on surface tension – parachor – definition and applications only. Viscosity – effect of temperature , effect of pressure.

3.4 Mesomorphic State

Liquid crystals- classification and molecular arrangements.

Reference Books:

1.Text book of Inorganic Chemistry – P.L.Soni

2.Text book of Inorganic Chemistry – Puri & Sharma.

3.Advanced Inorganic Chemistry – Satya Prakash.

4.Selected topics in Inorganic Chemistry – Malik,Tuli & Madan.

5.Organic Chemistry – Reactions & Reagents – O.P.Agarwal.

6.Text book of Organic Chemistry – P.L.Soni.

7. Text book of Organic Chemistry – B.S.Bhal & Arun Bhal.

8. Physical Chemistry – Puri & Sharma.

PAPER – II- GENERAL CHEMISTRY – II (90 Hrs) (II SEMESTER)

CHEMICAL BONDING

UNIT – I (30 Hrs)

1.1 Ionic Bond

Formation and general properties. Radius ratio rule and its limitations. Hydration energy and lattice energy and their applications . Born –Haber Cycle – Fajan's rules.

1.2 **Covalent Bond**

Valence bond theory . Formation and general properties, orbital overlap. Hybridisation sigma and pi bonds. VSEPR theory and geometries of H_2O, NH_3, CH_4, PCl_5, SF_6, IF_7, BF_3 molecules. Partial ionic character of covalent bond and percentage of ionic character.

1.3 Molecular Orbital Theory

Bonding, anti bonding orbitals and bond order. MO diagrams of H_2,Ne,O_2,O^{2+},$O^{2-}$and CO. Comparison of VB and MO theories. Hydrogen bonding – types, examples and effect on properties .

1.4 **Chemistry of S Block Elements**

Hydrides- Classification and chemistry.

1.5 Alkali Metals

Li,Na,Ka,Rb and Cs occurrence comparative study of elements, oxides , halides, hydroxides and carbonates. Exceptional property of Lithum.

1.6 **Alkaline Earth Metals**

Be,Mg,Ca,Sr and Ba occurrence, and comparative study of the elements oxides,hydroxides,halides,sulphates and carbonates. Exceptional property of Berylium.

UNIT-II(30 Hrs)

2.1 Alkenes – General methods of preparation properties of alkenes – electrophilic and free radical addition – addition reactions with hydrogen , halogens , hydrogen halide(markownikoff's rule) hydrogen bromide(peroxide effect) sulphuric acid, water , hydroboration , ozonolysis, hydroxylation with KmnO4 , alicyclic substitution by NBS.

2.2 Dienes – Stability of dienes, conjugated , isolated and cumulative- stability and chemical reactivity-1,2 and 1,4-additions-Diels-Alder reactions.Synthesis of dienes-1,3 butadiene,isoprene,chloroprene.

2.3 Polymerisation-types of polymerization-free radical cationic and anionic polymerizations including mechanism of preparation of polymers-addition polymers and condensation polymers with examples.

2.4 Alkynes-preparation and properties-acidity of alkynes,formation of acetylides,addition of water with $HgSO_4$,catalyst,addition of hydrogen halides and halogens,oxidation,ozonolysis and hydro boration.

UNIT –III(30 Hrs)

Thermodynamics

3.1 Definition and explanation of terms-intensive and extensive properties-types of systems-thermodynamics process-cyclic,reversible,irreversible,isothermal and adiabatic.

3.2 Thermodynamics functions – complete differential zeroth law of thermodynamics-concept of heat and work.

3.3 First law of thermodynamics-Statement and equation Cp,Cv relationship- calculating of W,E and H for the expansion for ideal gases under reversible, isothermal and adiabatic conditions.

3.4 Joule'sLaw-Joule-Thomson effect- inversion temperature and its significance.

3.5 Thermochemistry Bond Energy –Bond dissociation energy - calculation from thermochemical data varition of heat of reaction with temperature Kirchoff's equation.

3.6 Solid State

Elements of symmetry –crystal systems – miller indices- unit cell – space lattice – Bravais lattices.

REFERENCE:

1. Text book of Inorganic Chemistry by P.L.SONI.
2. Text book of Inorganic Chemistry by PURI and SHARMA.
3. Advanced Inorganic Chemistry by SATYA PRAKASH.
4. Selected topics in Inorganic Chemistry by MALIK, TULI and MADAN.

5. Text book of Physical Chemistry by PURI and SHARMA.
6. Advaced Organic Chemistry by Bahl Arun Bhal.
7. Priciples of Reaction Mechanisms in Organic Chemistry by V.S.Parmar & H.M.Chawala.

IICHEMISTRY SYLLABUS -----2004-2005 -

PAPER—III—GENERAL—CHEMISTRY-III(90Hrs) (III-SEMESTER)

UNIT-I (30Hrs)

PRINCIPLES-OF-VOLUMETRIC-ANALYSIS

1.1 Definitions of molality,normality,molarity and mole fraction – definition and examples for primary and secondary standards. Theories of acid-base, red-ox, complexometric, iodometric, and iodimetric titrations. Calculations of equivalent weights, theories of acid-base, red-ox, metal ion and adsorption indicators and choice of indicators.

1.2 'p'block elements-Boron family electron deficiency and electron acceptor behaviour-bonding in borane. Preparation, properties, uses and structure of borazole. $NaBH_4$, boron nitride and $LiAlH_4$.

1.3 Carbon family- Comparison of properties of carbon and silicon valencies, oxides, halides, hydrides and oxyacids classification, preparation, properties and uses of carbides. Classification of silicates, chemistry of silicones.

UNIT-II (30Hrs)

2.1 Aromatic hydrocarbons and aromaticity-resonance in benzene- delocalised cloud in benzene-aromaticity-Huckel's (4n+2) rule and its simple applications. Electrophilic substitution reactions in aromatic compounds. General mechanisms-nitration, halogenation, sulphonation, Friedel-Crafts acylation and alkylation-directive influence – orientation- ortho/para ratio, nuclear and side chain halogenation.

2.2 Polynuclear hydrocarbons-naphthalene,anthracene and phenanthrene-isolation, properties, synthesis and uses.

2.3 Aliphatic Nucleophilic substitutions, mechanism of SN1, SN2 and Sni reactions-effects of structure, substrate, solvent, nucleophile and leaving groups.

UNIT-III (30 Hrs)

3.1 Second law of thermodynamics- need for the II law, statements of the

second law. Spontaneous process, carnot's cycle- efficiency- carnot's theorem(statement only)

3.2 Concept of entropy - definition- entropy of an ideal gas-entropy changes in cyclic,reversible and irreversible processes and physical transformations. Calculation of entropy changes with changes in T, V and P entropy mixing.

3.3 Gibbs free energy – Helmholtz free energy- their variation with temperature, Pressure and volume. Criteria for spontaneity – Gibbs - Helmholtz equations – derivation and applications.

II CHEMISTRY IV - SEMESTER

PAPER-IV GENERAL CHEMISTRY IV (90Hrs)

UNIT-I (30Hrs)

1.1 Nitrogen family (10Hrs)
Comparative study of N, P, As, Sb and Bi - elements, oxides, oxyacids, Halides and anhydrides valency states - preparation, properties, structures and uses of hydrazine, hydroxyl amine and hydrazoic acids, preparation and uses of $NaBiO_3$.

1.2 Oxygen family(6Hrs)
Comparative study of O, S, Se and Te - elements, hydrides, oxides and Oxyacids of sulphur including peroxy acids and thionic acids.

1.3 Halogens(10Hrs)
Comparative study of F, Cl, Br, I and At - elements reactivities, hydracids, oxides and oxyacids, inter halogen compounds, pseudo halogens and positive iodine. Flourides of oxygen . Exceptional properties of Flourine, classification of halides.

1.4 Noble Gases(4Hrs)
Electronic configuration and portion in the periodic table. Applications,

Clatharates and compounds of Xenon, hybridization and geometries of XeF2 , XeF4, XeF6, XeOF4.

UNIT – II (30Hrs)

2.1 Elimination Reactions:
Hoff Mann and Sayetzeff's rules cis and trans eliminations – mechanisms E! and E2 reactions. Eliminations Vs substitution. Re-activities of Methyl, ethyl, propyl, isopropyl, n-butyl, allyl, vinyl and benzyl and intermediate complex mechanism - effect of substituents on reactivity.

2.2 Alcohols and Phenols:
Synthesis by Grignard method and oxy mercuration – chemical reactivity. Polyhydric alcohols – cleavage reactions with periodic acid, lead tetracetate, osmium tetraoxide . Unsaturated alcohols – preparation and reactions of allyl alcohol.

2.3 Phenols:
Acidic charater of phenols – explanation on the basis of resonance stabilization. Ring substitution in phenol – orientation of phenolic group towards electrophiles . Mechanisms of esterification, nitration, sulphonation, halogenation coupling with diazonium salts. Kolbe's reaction , Reimer-Tiemann reactions, Gattermann, Lederer, Manasse and Houben - Hoesh Reactions. Cresols, nitrophenols, aminophenols, di and tri hydric phenols alpha and beta napthols – preparation and properties.

UNIT - III (30Hrs)

3.1 Third law of Thermodynamics:
Nernst heat theorem statement of Third law of thermodynamics. Evaluation and absolute entropy from heat capacity measurements. Exception to Third law.

3.2 Partial Molar Properties:
Chemical potential - Gibbs Duhem equation – effect of temperature and pressure on chemical potential – chemical potential in system of ideal gases – Duhem – Margules equation.

3.3 Thermodynamic

Derivation of the law of chemical equilibrium – reaction isotherm – standard free energy change – standard free energy change and equilibrium constant – variation of equilibrium constant with temperature – Vant Hoff isochore.

3.4 Concept of fugacity and activity – determination of fugacity of gas – activity and activity coefficient.

3.4 Second law of thermodynamics- need for the II law, statements of the second law. Spontaneous process, carnot's cycle- efficiency- carnot's theorem(statement only)

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1.2 Oxygen family(6Hrs)
Comparative study of O, S, Se and Te - elements, hydrides, oxides and Oxyacids of sulphur including peroxy acids and thionic acids.

1.3 Halogens(10Hrs)
Comparative study of F, Cl, Br, I and At - elements reactivities, hydracids, oxides and oxyacids, inter halogen compounds, pseudo halogens and positive iodine. Flourides of oxygen . Exceptional properties of Flourine, classification of halides.

1.4 Noble Gases(4Hrs)

Electronic configuration and portion in the periodic table. Applications, Clatharates and compounds of Xenon, hybridization and geometries of XeF2 , XeF4, XeF6, XeOF4.

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Chemical potential - Gibbs Duhem equation – effect of temperature and pressure on chemical potential – chemical potential in system of ideal gases – Duhem – Margules equation.

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3.4 Concept of fugacity and activity – determination of fugacity of gas – activity and activity coefficient.

THIRD YEAR

CORE - PAPER –IX
INORGANIC CHEMISTRY – I (60Hrs)

NUCLEAR CHEMISTRY (20Hrs)

Unit - I

1.1 Natural radioactivity- radioactive series including neptunium series- group displacement law

1.2 Fundamental particles of the nucleus- nucleon terminology, nuclides, isotopes, isobars, isotones, mirror nuclei. Nuclear radius, nuclear mass and nuclear forces operating between the nucleons. N/P ratio, stability belts.

1.3 Nuclear binding energy. Mass defect, simple calculations involving mass defect and B, E per nucleon, magic numbers- liquid drop model – shell model.

1.4 Artificial radioactivity – Induced radioactivity – uses of radioisotopes.

1.5 Nuclear fission – nuclear energy – nuclear reactors- breeder reactor – nuclear fusion – thermonuclear reactions – energy source of the sun and stars.

Unit - II Chemistry of 'f' Block Elements and Metallurgy (25 hrs)

2.1 Occurrence elements, oxidation states, magnetic properties, colour and spectra of lanthanides.

2.2 Occurrence elements, oxidation states, magnetic properties, colour and spectra of actinides.

2.3 Comparative account of – lanthanides and actinides

2.4 Metallurgy and metallugical processes, zone refining, van Arkel process, electroytic refining extraction, alloys and uses of Ti, Zr, pt, Th and U.

2.5 Steel alloys - heat treatment of steel. Preparation and uses of ammonium molybdate, vanadium pentoxide, uranium hexafluoride.

Unit - III Industrial Chemistry (15 Hrs)

3.1 Fuel gases. Ccalorific value-composition and sources/formation of water gas,semi water gas, carbonated water gas, oil gas, natural gas, LPG and bio gas (manufacture not required)

3.2 Water- cause for hardness of water disadvantages – degree of hardness – removal of hardness using ion-exchange resins and boiling.

3.3 Ccomposition and setting of cement.

3.4 Examples for pigments – constituents of paints and their functions.

3.5 Types of glasses.

CORE PAPER – X
ORGANIC CHEMISTRY – I (60 Hrs)

Unit I (20 Hrs)

1.1 Mechanisms of Aldol, Perkin, knoevengal reactions and benzoin condensation-Claisen, wittig. Cannizaro, Reformatsky reactions.

1.2 Mechanisms of reduction with (sodium boro hydride, LiAIH4, Wolff-kishner and MPV) – mechanisms of haloform reaction and Michael addition.

1.3 Photochemistry of carbonyl compounds – Norrish type I and II reactions

1.4 Acid and its derivatives and acid strengths of substituted benzoic acids.Conversion of acids to their derivatives. Dicarboxylic acids – preparation and properties of oxalic, malonic, succinic, glutaric and adipic acids

1.5 Malonic and acetoacetic esters – characterstic reactions of active methylene group – synthetic uses of malonic ester, acetoacetic ester and cyanoacetic ester.

Unit - II (25Hrs)

2.1 Tautomerism – definition – keto-enol tautomerism (identification, acid and bae caralysed inter – conversion mechanism, preparation and characterstics) – amidoimidol and nitro-acinitro tautomerisms. Stereoisomerism – definition – classification into optical and geometric isomerism

2.2 Optical isomerism – optical activity – optical and specific rotations – conditions for optical activity – asymmetric centre – chairality – achiral molecules – meaning of (+) and (-) and D and L notations – Elements of symmetry – Racemisation – methods of racemisation (by substitution and tautomerism) – Resolution – methods of resolution (mechanical, seeding, biochemical and conversion to diastereoisomers) – Asymmetric synthesis (partial and absolute synthesis) –Walden Inversion.

2.3 Projection formulae – Fischer, flying wedge, sawhorse and Newmann projection formuale- notation of optical isomers – Cahn-Ingold-Prelog rules –R – S notations for optical isomers with one and two asymmetric carbon atoms – erythro and threo representations.

2.4 Optical activity in compounds not containing asymmetric carbon atoms – Biphenyls allenes and spiranes.

2.5 Geometrical isomerism- cis-trans, syn-aanti and E-Z notations –geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes – methods of

distinguishing geometrical isomers using melting point, dipole moment, dehydration, cyclisation and heat of hydrogenisation.

Unit - III (15 Hrs)

3.1 Synthesis and reactions of quinoline, isoquinoline and indole with special reference to skraup. Bischleer and Napieralskii and Fisher indole synthesis.
3.2 Nitro compounds and amines – Conversion of nitro benzene to ortho, para and meta dinitrobenzenes, TNT.
3.3 Aromatic nitro compounds reduction in neutral, acidic and alkaline media.
3.4 Diazotisation and its mechanism. Synthetic applications of diazonium salts.
3.5 Comparative study of primary, secondary & tertiary amines.

CORE PAPER – XI
PHYSICAL CHEMISTRY – I (60 Hrs)

Unit - I (30 Hrs)

1.1 Solutions – Solutions of gases in liquids – Henry's law – solution of liquids in liquids. Raoult's law. Binary liquid mixtures- ideal solutions – deviations from ideal behaviour – vapour pressure – composition and vapour pressure – temperature curves – azeotropic distillation,
1.2 Distribution law – Thermodynamics derivation and applications.

1.3 Metalic and electrolytic conductors - specific -, equivalent and molar conductance - measurement of conctance - variation of conductance with dilution for strong and weak electrolytes (qualitative explanation) - Transport number and its determination by Hittorffs and moving boundary method - effect of temperature and concentration - ionic mobility and ionic conductance - Kohlausch's las and its applications - salt hydrolysis and ph of a salt solution, buffer action and explanation.

1.4 Theory of strong electrolytes - Debye - Huckel - Onsager theory - verification of Onsager equation - Wein effect and Debye - Falkenhangen effetc - ionic strngth - activity and activity coefficients of strong electrolytes.

1.5 Applications of conductivity measurements - degree of hydrolysis, solubility product and conductometric titrations

Unit II (10 Hrs)

2.1 Adsorption – physisorption and chemisorption
2.2 Freundlich adsorption isotherm – Langmuir adsorption isotherm. BET equation (no derivation)
2.3 Applications of adsorption.
2.4 Catalysis:- definition – homogeneous catalysis – function of a catalyst in terms of Gibb's free energy of activation.Heterogeneous catalysis.
2.5 Kinetics of unimolecular surface reactions.

Unit - III (20 Hrs)

3.1 Chemical kinetics – definition of order and molecularity – methods to determine the rate of reactions.
3.2 Derivation of rate constants for I, II, III and zero order reactions and examples- derivation for time for half change with examples.
3.3 Methods to determine the order of reactions – effect of temperature on the rate of reactions – Arrehenius equation and concept of energy of activation.
3.4 Collision theory and derivation of rate constant for bimolecular reactions – theory of absolute reactions rates- thermodynamic derivation for the rate constant for a bimolecular reaction from it- Comparison of collision theory and ARRT .
3.5 significance of entropy and free energy of activation- consecutive, parallel and reversible reactions (no derivations, only examples)

CORE PAPER - XII
ANALYTICAL CHEMISTRY –I (60 Hrs)

Unit - I (20Hrs)

1.1 Data analysis – theory of errors – idea of significant figures and its importance with examples – precision – accuracy- methods of expressing accuracy – error analysis- minimising errors methods of expressing prison – average deviation – standard deviation and confidence limit.

1.2 **P**rinciples of gravimetric analysis – characteristics of precipitating agentss- choice of precipitants and conditions of precipitation- specific and conditions of precipitation – specific and selective precipitants –DMG, cupferron, salicylaldehyde , ethylendediamine – use of seuesteering agents .

1.3 Co- precipitation – post precipitation- peptisation – differences – reduction of error – precipitation from homogeneous solutions – calculations in gravimetric methods- use of gravimetric factor.

1.4 Thermal analytical methods- principle involved in thermogravimetric analysis and differential gravimetric analysis – discussion of various components with block diagram – characteristic of TGA.

1.5 DTA – factors affecting TGA and DTA curves – thermometric titrations.

Unit - II (15 Hrs)

2.1 Sepration and purification techniques :- Principles involved in the sepration of precipitates – solvent extraction and electrophoresis.

2.2 Purification of solid organic compounds – extraction – use of immiscible solvents – soxhlet extraction – crystallisation – use of miscible solvents – fractional crystallization – sublimation. Purification of liquids- experimental techniques of distillation – fractional distillation – vaccum distillation – steam distillation – tests for purity.

2.3 Chromatography techniques – principles adsorption thin layer, partition and paper chromatography column chromatography – adsorbents - preparation of column – adsorption – elution, recovery of substance and applications.

2.4 TLC – choice of adsorbent and solvent – preparation of chromatogram and applications- Rf value. Paper chromatography – solvents used and principles- factors affecting Rf value – sepration of aminoacid mixtures. Radial paper chromatography – Ion exchange chromatography – principle – resins – action of resins – experimental techniques – applications – sepration of Zn-Mg, Co-Ni, Cd-Zn, Chloride- bromide.

2.5 Gas chromatography and high-pressure liquid chromatography – principles – experimental techniques – instrumentation and applications.

Unit - III (25Hrs)

3.1 UV- Visible spectroscopy – Absorbtion laws – calculations involving Beer – Lambert's law .

3.2 Instrumentation – photocolorimeteer and spectrophotometer - block diagrams with description of components – theory – types of elctronic transistions- chromophore and auxochromes – absorbtion bands and intensity – factors governing absorbtion maximum and intensity.

3.3 Infrared spectroscopy – principle – types of stretching and bending vibrations- vibrational frequencies – instrumentation – block diagram – source – monochromator-cell sampling techniques –detector and recorders – identification of organic molecules from characteristic absorption bands.

3.4 Raman spectroscopy – Raleigh and Raman scattering – stoke's and anti stokes lines – instrumentation block diagram.

3.5 Differences between IR and Raman spectroscopy – mutual exclusion principle – applications – structural diagonis.

FIFTH SEMESTER

ALLIED - III - PAPER I (60 Hrs)

APPLIED CHEMISTRY - I
(Common To All)

Preparation, Synthesis and structure determination are not required for the compounds mentions.

Unit – I (20 Hrs)

Pharmaceutical Chemistry I

1. Definition of the following terms – drug, pharmachophore, pharmacology, pharmacopeia. Bacteria, virus and vaccine.
2. Causes, symptoms and drugs for anaemia, jaundice, cholera, malaria and filarial.
3. Indian medicinal plants and uses – tulasi, neem, kixhanelli, mango, sempartuthi, adadodai and thothuvalai.
4. Antibacterials – Sulpha drugs –examples and actions – prontosil, sulphathiazole sulphafurazole – antibiotics – definition and action of pencilin, streptomycin, chloramphenicol, eythromycein- tetracyclines. SAR of chloramphenicol only.
5. Antiseptics and disinfectants – definition and distinction – phenolic compounds, chloro compounds, cationic surfacts.

Unit - II (20 Hrs) Phramaceutical Chemistry II

1. Analgesics - Definition and actions - narcotic and narcotic - morphine and its devatives, pethedine and methodone - disadvantages and uses, Antipyretic analgesics - salicyclic derivatives, paracetamol, ibuprofen
2. Drugs affecting CNS - Definition, distinction and examples and examples for - tranqualisers, sedatives, hypnotics, psychedelicdrugs - LSB, hashish - their effects.
3. Anasthetics - Definition - local and general - volatinitrous oxide, ether, chloroform, cyclo propane - uses and disadvantages - non volatile - intravenous - thiopental sodium,methohexitone, propanidid.
4. Causes, medicines and their mode of action for the treatment of - cancer, antineoplatics - diabets - hypoglycemic agents. AIDS - AZT, DDC.
5. Blood - Grouping composition, Rh factor, blood pressure, hypertention and hypotention.

Unit - III (20Hrs) Biological Chemistry and Dairy Chemistry

1. Elementary treatment of digestioon and absorption of cabohydrates, proteins and fats.

2. Elementary treatment of enzymes, coenzymes, cofactors, prosthetic groups and theory of enzyme action.
3. Psycological functions of adrenaline, thyroxine, oxytocin, insulin and sex hormones.
4. Micronutrients and their biological role in human systems.
5. Bioinorganic chemistry - Biologival aspects of Fe, Zn, and Mg, Role of Na, K, Ca and P.

SIXTH SEMESTER

CORE PAPER XIII

INORGANIC CHEMISTRY II (60 HRS)

Unit - I 'd' Block and Coordination Compounds (30 Hrs)

1.1 Characteristics of 'd' block elements. Comparative study of Ti, V, Cr, Mn and Iron group metals - occurence, oxidation states, magnetic properties, catalytic properties and colour.

1.2 coordination compounds-Nomenclature, Werner's theory, EAN rule, coordination number and geometry.

1.3 Chelation and effect of chelation. Applications of EDTA.

1.4 Ionisation isomerism, hydrate isomerism, Linkage isomerism, ligand isomerism, coordination isomerism, polymerization isomerism. Geometrical and optical isomerism in 4 and 6 coordinated complexes.

1.5 Theory of bonding, valence bond theory - hybridization, geometry and magnetic properties. FAilure of VBT.

Unit - II Crystal Field Theory (20 Hrs)

2.1 Crystal field theory - spectrochemical series - splitting of 'd' orbitals in octahedral, tetrahedral and square planar complexes.

2.2 CFSE calculations in octahedral, tetrahedral and square planar complexes.

2.3 Low spin and high spin complexes - Explanation of magnetic properties, colour and gemetry using CFT.

2.4 Comparison of VBT and CFT. Trans effect and its explanation

2.5 Pi acceptor ligands - Bonding, hybridization and structures of carbonyles of Ni, Cr, Fe, Co. Mn, W and V.

Unit - III
Types of Solvents (10 Hrs)

3.1 Protonic and aprotic solvents.
3.2 Aqueous and non aqueous solvents.
3.3 Liquid ammonia as a solvent.

3.4 **Noble Gases (4 Hrs)**
Electronic configuration and position in the periodic table. Applications, clatharates and compounds of xenon, hybridization and geometries of XeF_2, XeF_4, XeF_6, $XeOF_4$.

3.5 Importance of fertilizes - examples - secondary nutrients - role on the growth and development compositing and manures.

PAPER XIV
ORGANIC CHEMISTRY - II (60HRS)

Unit - I (15 Hrs)

1.1 Diazomethane and diazoacetic ester - preparation, structure and synthetic uses.

1.2 Preparation and properties of - Phenylene diamenes, sulphanilic acid, sulphanila mide.

1.3 Dyes - Theory of colour and constitution. Classification - according to structure and method of application.

1.4 Preparation and uses of 1) Azo dye-methyl orange and Bismark brown 2) Tripheny mehtane dye Malachite gree. 3) Phthalein dye - phenolphthalein and fluroescein 4) Vat dye - Indigo 5) Anthraquinone dye - alizarine.

1.5 Aminoacids and protiens - Classification of aminoacids. Essential and nonessential amino acids.

Unit - II (25 Hrs)

2.1 Preparation of alpha aminoacids, properties and reaction. Zqitter ions, isoelectric points.Peptide synthesis - structure determination of polypeptides - end group analysis.

2.2 Protiens - Classification based on physical and chemical propeties and on psycological functions. Primary and secondary structure of protiens. Helical and sheet structures (elementary treatment only) Denaturation of protiens.

2.3 Nucleic acids. Types of nucleic aciuds - RNA and DNA, polynucleotide chain components - biological functions.

2.4 Carbohydrates - Classification - Constitution of glucose and frutose. Reaction of glucos and fructose - osazone formation. Mutarotation and its mechanism. Cyclic structure. Pyranose and furannose forms, Determination of ring size. Haworth projection formula, configuration of monosaccharides epimenrisation, chain lengthening and chain shortening of aldoses. Inter conversion of aldoses and ketoses.

2.5 Disaccharides - Reactions and structure of sucrose. Structure and properties of starch and cellulose.

Unit - III (20 Hrs)

3.1 Natural products - Terpenses - isoprene rule. Structural elucidations of - feraniol, menthol and alpha terpineol.

3.2 Alkaloids - General methods of isolation and general methods of structure determination of piperine and nicotine.

3.3 Vitamins - Classification - Structural elucidations of - ascorbic acid.

3.4 Molecular rearrangements - Classification as anionotropic - catinotropic and intra molecular. Pinacol - Pinacolone rearrangement (mechanism, evidence for carbonium ion intermediate formation - migratory attitude) Beckmann, Hoffmann, Curtius, Benzilic acid rearrangements (Mechanisms only).

3.5 Claisen rearrangement (sigmatropic) - Evidence for intermolecular nature and allytlic carbon attachment. - para claisen cope and oxycope rearrangements. Fries rearrangement (two mechanisms).

CORE PAPER – XV

PHYSICAL CHEMISTRY II (60 HRS)

Unit - 1 (10 Hrs)

1.1 Photochemistry laws & derivation

1.2 Flurescence, phosphorescene and Chemiluminescence.

1.3 primary and secondary reactions - kinetics of hydregen - bromine reaction - photosentisation -

1.4 Group theory Symmetry operations - products of symmetry operations - classes and sugroups - group multiplication table.

1.5 Properties of a group - point groups - C_2v, C_3v, C_2h, D_4h, D_6h, D_2h, D_3h, Tdf, Oh (any one example for each)

UNIT - II (25 HRS)

2.1 Phase equilibria – Gibb's phase rule.

2.2 Statement and definition of terms-

2.3 Application to one component systems – water and sulphur – thermal analysis and cooling curves reduced phase rule

2.4 Two component systems – lead –silver system – freezing mixtures – system, Ferric chloride – water system.

2.5 Incongruent melting point Na-K system – CST and effect of impurities on CST

UNIT - III ELECTROCHEMISTRY (25 HRS)

3.1 Galvanic Cells - reversible and irreversible electrodes and cells - standard cell - emf and its measurement - types of electrodes - electrode reactions - electrode potentials - reference electrodes - standard electrode potentials.

3.2 Derivation of Nest equation for electrode potential and cell emf- sign coventions - electrochemical series and its application - formation of cells - electrode and cell reactions - cell emf- chemical cells and concentration cells with and without transference - examples and derivation of examples and derivation of expressions for their emfs - liquid junction potential.

3.3 Applications of emf measurements - calculation of G.H, S and equilibrium constants - determination of pH using quinhydrone and glass electrodes - potentiometric titrations.

3.4 Applications of concentration cells - determination of valency of ions - transport number - equilibrium constant - solubility product - activity coeficcients of electrolytes.

3.5 Polarisation - decomposition potential - overvoltage - storage cells - lead acid battery - mechanism of discharging and recharging - fuel cells.

CORE PAPER XVI

ANALYTICAL CHEMISTRY II (60 HRS)

Unit I (15 Hrs.)

1.1 Polarography - principle - concentration polarization - dropping mercury electrode - advantages and disadvantages - convection, migration and diffusion currents - Ilkovic equation (derivatiion not required) and significance.

1.2 Experimental assembly - electrodes - cappillary solutions - current voltage curve - oxygen wave - influence of temperature and agitation on diffusion layer

1.3 Polarography as an analytical tool in quantitative and qualitative analysis.

1.4 Amperometry - basic principles and uses.

1.5 Polarimetry - principle - instrumentation comparison of strengths of acids - estimation of glucose.

Unit - II (25 Hrs)

2.1 NMR spectroscopy - principle of nuclear magnetic resonance - basic instrumentation - shielding mechanism - chemical shift - number of signals - spin - spin coupling and coupling constants - splitting of signals.

2.2 NMR spectrum of simple organic compounds.

2.3 Mass Spectroscopy - Basic Principles of mass spectrum - molecular peak base peak isotopic peak their uses fragmentation - Nitrogen rule - determination of molecular formulae with examples – instrumentation.

2.4 Mass spectrum of simple organic compounds - identification - alcohols, aldehydes, aromatic hydrocarbons.

2.5 X-ray methods - Bragg's equation - explanation of terms - determination of structure of NaCl.

Unit - III

3.1 Introduction to computers and its application in chemistry.

3.2 Introduction computers - Characteristics of a computer - types of computers - block diagram of a digital computer.

3.3 Introduction to C-Structure of a C Program Key terms - the art of programming.

3.4 General features of a programming language - Algorithm flow chart the character set of C data types - identifiers -reserved words - variables-onstants - key words - escape - sequence type conversion C operation (basic aspects only)

3.5 Application of computer in chemistry - (only selected programs) determination of molarity, normality and molality of solution - calculation of pH.

core paper xvii

PRACTICAL V

ORGANIC ANALYSIS AND PREPARATION

1) Organic Preparations involving

   a) Oxidation (benzaldehyde to benzoic acid)

   b) Hydrolysis (methyl salicylate or ethyl benzoate to the acid)

   c) Nitration (metadinitrobenzeze or picric acid)

   d) Halogenation (parabromoacetanilide from acetanilide)

   e) Dizotisation (methyl orange)

   f) Aclyation (benzoylation of betanaphthol)

   g) Esterification.

2) Organic analysis : Reaction of the following functional groups :

   Aldehyde, detone, carboxylic acid (mono and di), ester, carbohydrate (reducing and non reducing), phenol, aromatic primary amine, amide, nitro compound, diamide and anilide, Analysis of organic compounds containing on functional group and characterization with a derivative.

3) Determination of boiling point and melting point - demonstration experiments.

CORE PAPER XVIII

PRACTICAL VI

GRAVIMETRIC ESTIMATION

1. Estimation of sulphate as barium sulphate.
2. Estimation of barium as barium sulphate.
3. Estimation of barium as barium chromate.
4. Estimation of lead as lead chromate.
5. Estimation of silver as silver chloride.
6. *Estimation of calcium as calcium oxalate monohydrate.
7. *Estimation of nickel as DMG complex
8. Estimation of zinc of magnesium as oxinate

***Need not be given for Examination**

CORE PAPER XIX

PRACTICAL VII

PHYSICAL CHEMISTRY

1. Distribution Law
   a) Determination of partition coefficient of iodine between carbon tetra chloride and water
   b) *Degree of association of benzoic acid between water and benzene.
   c) Equilibrium constant of the reaction $KI + I_2 = KI_3$

2. Kinetics

   Determination of the orders of the following reactions.

   a) Acid catalysed hydrolysis of an ester (methyl or ethyl acetate)
   b) Saponification of an ester (methyl or ethyl acetate)
   c) Iodination of acetone.

3. Molecular weight of a solute - Rast's method using naphthalene, meta dinitrabenzene and diphenyl as solvents.

4. Heterogeneous equilibria :

   a) * Phenol - water system - CST

5. a) Effect of impurity - 2% NaCl or succinoc acid solutions on phenol - determination of the concentration of the concentration of the given solution.

b) Determination of the transition temperature of the give salt hydrate.

$Na_2 S_2O_3 5H_2O$, $CH_3 COONa, 3H_2O$, $SrCl_2, 6H_2O$, $MnCl_2, 4H_2O$

6. Electrochemistry

Conductivity

a) Determination of cell constant and equivalent conductivities of solutions of two different concentrations.

b) Conductometric titration of a strong acid against a strong base.

***Need not be given in examination.**

ALLIED III – PAPER II

(60 Hrs)

APPLIED CHEMISTRY - II

Job/Skill Development

Unit - I (15 Hrs)

1.1 Milk Definition, general composition - physical - chemical changes taking place in milk due to boiling.

1.2 Pasteurization, sterilization and homogenization - explanation

1.3 Components of milk - lipids, proteins, carbohydrates, vitamins, ash and mineral matters - names and functions.

1.4 Definition and compositions of cream, butter, ghee, icecream, stabiliser and emulsifier.

1.5 Milk Powder, definition and need for making - manufacture of whole milk power by spray drying process.

Unit - II

Polymer Chemistry And Leather Chemistry (25 Hrs)

2.1 Classification of polymers - natural and synthetic - rubber, cellulose, starch, wool, silk - synthetic rubber, polygenes, acrylics, polyamides, polyesters, PVC polyurethane - starting materials and uses only.

2.2 Number average molecular weight and weight average molecular weight. Special Properties of polymers.

2.3 Structure and compositions of hides, skins and leather. principles of pretanning Process. Vegetable, mineral and synthetic tanning.

2.4 Chemistry of chrome tanning. Dyeing of leather.

2.5 Tannery effluents - pollution and control

Unit - III Agricultural Chemistry (20 Hrs)

3.1 Soil - Definition, Classification and properties of soil - soil water, soil oil, soil temperature, soil minerals, soil colloids, soil pH, soil acidity, soil alkalinity.

3.2 Soil fertility and its evaluation -buffering of soil and its effect. Soil formation and its reclamation.

3.3 Classification and examples for insecticides, fungicides and herbicides

3.4 Fluorine compounds, boron compounds, arsenic compounds, mercury compounds pyridine compounds

3.5 Ill effects of use of chemical fertilisers and insecticides.

Reference Books :

Inorganic Chemistry :

1. Concise Inorganic Chemistry - J.D. Lee - 3rd, Edition, Von Nostrand
2. Inorganic Chemistry - P.L. Soni-Sutan Chand
3. Inorganic Chemistry - Puri and Sharma Nagain
4. Inorganic Chemistry - Modan S.Chand
5. Advanced Inorganic Chemistry - Cotton and Wilkinson
6. A Textbook of Inorganic Chemistry -S.K.De-New Age
7. Inorganic Chemistry
8. Industrial Chemistry - B.K. Sharma - Goel Publications
9. General and Inorganic Chemistry Part I Sarkar, Books and Allied (P) Ltd.
10. General and Inorganic Chemistry Part II Sarkar, books and Allied (P) Ltd.

11. Chemical Methods for Environmental Analysis Ramesh and Anbu, macmillan.

Organic Chemistry :

1. Textbook of Organic Chemistry - P.L.Soni - Sultan Chand
2. Advanced organic Chemistry - B.S.Bahl - S. Chand
3. Principles of Organic Chemistry - A.K.Bansal - New Age
4. A Textbook of Organic Chemistry - A.K.Bansal - New Age
5. Organic Chemistry - I.L.Finar - Volume I & II - Addision Welsey
6. Organic Chemistry - R.T. Morrison and Boyd - Prentice Hall
7. Stereochemistry of Organic Compounds - D.Nasipuri - New Age
8. Stereochemisty, Conformation and Mechanisms - Kalsi - New Age
9. Organic Chemistry - P.H. Pine - Mcgrew Hill
10. Organic Chemistry - Solomons - John Wiley
11. Chemistry of Natural Products - O.P. Agarwal - Goel Publications.
12. Organic Chemistry - John McMurry Vth Edition - Thompson Asia Pvt. Ltd.
13. Advanced General Organic Chemistry - Sachin K. Ghosh - Books and Allied (P) Ltd.
14. Textbook of Organic Chemistry - P.S. Kalsi - Macmillan
15. Reaction Mechanism Inorganic Chemisty - S.M.Mukhergi and S.P. Singh - Macmillan

Physical Chemistry :

1. Principles of physical chemistry - B.R. Puri and Sharma - Shobanlal Nagin Chand & Co.,
2. Text Book of physical chemistry - P.L. Soni - Sultan Chand.
3. Physical Chemistry - negi and Anand - new age
4. Physical Chemistry - Kundu and jain - S.Chand.
5. Physical Chemistry - K.L. Kapoor - macmillan - 4 volumes.
6. Elements of physical chemistry - gallstone and Lewis - Macmillan.
7. Text book of physical chemistry - S.Glasstion, Mecmillan.
8. Fundamentals of physical chemistry - maron andLandor - Colier - Macmillan.
9. Physical chemistry - G.W. castellan - Narosa Publishing house.
10. Physical chemistry - Walter J. Moore - Orient Longman.
11. Numberical Problems on physical Chemistry Gashal, Books and Allied (P) Ltd.,
12. Universal General Chemistry, C.N.R.Rao, Maclmillan.

Analytical Chemistry:

1. Analytical Chemistry - S.M. Khopkar - new Age International
2. Analytical Chemistry - R.Gopalan - Sultan Chand
3. Fundamentals of analytical Chemistry - A.Skog and M.West

4. Vogel's handbook of quantitative inorganic analysis - Longman
5. Instrumental methods of analysis - Skog
6. Instrumental methods of analysis - Willard et al - CXBS
7. Physical-chemical techniques of analysis-P.B.Janarthanam. Vol-I and II-A-Asian Publishing
8. Instrumental methods of chemical analysis - B.K. Sharma - Goel Publications
9. Analytical Chemistry S. Usherani, Macmillan

Practical Chemistry

1. Vogel's textbook of chemical analysis
2. Practical chemistry -A.O. Thomas-Scientific book center, Cannanore
3. Practical Chemistry - S.Sundaram - 3 Volumes - S.Viswanathan
4. Vogel's textbook of practical organic chemistry - Longman

Allied Subject:
Applied Chemistry

6. A textbook of pharmaceutical chemistry – Jayashree Ghosh-S.Chand
7. Pharmaceutical chemistry – S.Lakshmi Sultan Chand
8. Pharmacology and pharmatherapeutics – R.s. Satoskar – Popular prakashan – Vol. I and II
9. Medicinal chemistry – Asutosh Kar – New Age
10. A textbook of synthetic drugs – O.D. Tyagi – Anmol Publication.
11. Introduction to iological chemistry – J. Awapara Prentice Hall
12. A textbook of biochemistry – Ambika.S.
13. Biochemistry – A.L. Lehinger.
14. Essentials of biological chemistry – James Fanley – East West press
15. Qutline of dairy technology – Sukumar De
16. Principles of daily technology – Robert Jenness
17. Indian dairy products – K.S. Rangappa and K.T. Acharya
18. Polymer chemistry – M.G. Arora – Anmol publications – New Delhi
19. Text-book of polymer science – F.W. Billmeyer – New Age International
20. Polymer chemistry an introduction – M.P. Stevens – Oxford
21. Chemical technology of leather – ISI
22. Fundamentals of leather science – Woodroffe
23. Tanning process – Crthman
24. Publications of CLRI-Chennai
25. Nature and properties of soils – harry, O.Buckman
26. Soil sciences – A. Sankara
27. Applied chemistry for Home Science and Allied Sciences, T.Jacob, Macmillan.
28. Applied chemistry –theory and practice – O.P. Vermani and A.K. Narula

29. Industrial Chemistry – B.K. Sharma

Computer:

30. Computer in Chemistry – K.V. Raman
31. Programming with C – Venugopal and prasad
32. Programming in C (II Edition) E Balguruswamy
33. Programming language C with Practicals – Ananthi Seshasayee – Margam
34. Introduction to computing, Computer laboratory and CAD Dr. Gautam Roy, Books and Allied (P) Ltd.,