SEMESTER-I

Inorganic, Organic and Physical chemistry-I (75 Hours)

(15 Hours)

(15 Hours)

UNIT-I (Inorganic Chemistry)

1.1.PERIODIC PROPERTIES: Variation of atomic volume,atomic and ionic Radii, ionization potential,electron affinity and electronegativity along periods and groups-Factors affecting periodic properties.

1.2.SOLUTIONS

Definition of ideal and nonideal solutions-concentration units-molality-molarity-formality-mole fraction-normality-weight percent and volume percent

1.3.BORON FAMILY:

Comparative study of boron family elements. Compounds of boron-diborane structure discussion-borax, boron nitride, boron carbide and borazole.

(15 Hours)

(15 Hours)

UNIT-II (Inorganic Chemistry)

CHEMICAL BONDING

2.1: Lattice energy and Born-Haber Cycle

2.2: Pauling and Mulliken's scales of electronegativity.

2.3: Polarising power and Polarisability-Partial ionic character from electronegativity-Transition from ionic to covalent character and vice-versa-Fajan's rules-concept of hard and soft acids and bases.

2.4: VSEPR Theory: Shapes of simple inorganic molecules($BeCl_2$,BF_3,$SiCl_4$,PCl_5,SF_6,IF_7,H_2O,NH_3,XeF_6) containing lone pair and bond pairs of electrons-Lewis structures.

2.5: Hydrogen bonding-Its nature,types,effect on properties.

2.6: Intermolecular forces-London forces and van der Waals forces.

(15 Hours)

(15 Hours)

UNIT-III (Organic Chemistry)

3.1: Basic concepts in organic chemistry-catenation

3.1.1: Hybridization and geometry of molecules-methane,ethane,ethylene and acetylene(sigma and pi bonds,bond lengths,bond angles,bond energy)

3.1.2: Electron displacement effects Inductive, inductometric, electrometric, mesomeric,resonance (localized and delocalized chemical bond), hyperconjuction and steric effects.

3.1.3: Cleavage of bonds-homolytic and heterolytic fission of carbon-carbon bonds.

3.1.4: Reaction intermediates-free radicals,carbocations and carbanions,carbenes,nitrenes and arynes-their stability.

UNIT-IV (Organic Chemistry) **(15 Hours)**

4. Nomenclature of organic compounds-IUPAC naming of simple and substituted aliphatic, aromatic and alicyclic compounds. Priorities of functional group suffixes in polyfunctional compounds. 1:

4.2: Alkanes

4.2.1: Mechanism of free radical substitution in alkanes.

4.3: Petroleum

4.3.1: Thermal and catalytic process of cracking.

4.3.2: Sythetic petrol-Fischer Tropsch's process and Bergius process, flash point, fire point, smoke point, knocking, octane number and cetane number, antiknocking reagents, power alcohol.

4.4: Alkenes

4.4.1: Properties of alkenes-electrophilic and free radical addition,addition reactions with hydrogen bromide(peroxide effect), sulphuric acid, water, hydroboration, ozonolysis, hydroxylation with $KMnO_4$-allylic substitution by NBS(with mechanisms of all the above reactions)

4.4.2: Problems and conversions.

(15 Hours)

UNIT-V (Physical Chemistry) **(15 Hours)**

5.1: Gaseous state.

5.1.1: The Gas constant "R" in different units-deviation from ideal behaviours-Van der Waal's equation for real gases.

5.1.2: Critical Phenomena-PV isotherms of real gases,critical temperature, continuity of state-relation between critical constants and van der Waal's constants-Determination of critical volume-the law of corresponding states-reduced equation of state.

5.1.3: Molecular velocities-Root mean square, average and most probable velocities(derivation from Maxwell-Boltzmann distribution equation)-Maxwell-Boltzmann distribution of molecular velocities(no derivation)-Collision number and mean free path-Collision diameter.

5.2: Liquid state

Liquid crystals-classification, structure, properties and applications.

Note : * Numerical problems wherever possible (all units)

References:

1.R.D.Madan, J.S.Tiwari and G.L.Mudhara-A text book of First Year B.Sc.Chemistry-S.Chand & Co.

2. G.S.Manku-Theoretical Principles of Inorganic Chemistry Tata McGraw Hill, New Delhi.

3. Paula Yurkanis Bruice-Organic Chemistry, Prentice Hall.

4. J.D.Lee, "Concise Inorganic Chemistry", 5th Edition., Blackwell Science Ltd, Oxford, 2002.

5 B.S.Bahl and arun Bahl, "Advanced Organic Chemistry", S.Chand and Co., New Delhi.

6. B.R.Puri and Sharma, "Principles of Physical Chemistry".

ALLIED CHEMISTRY-I
(FOR MATHS AND PHYSICS)

(FOR THE CANDIDATES ADMITTED FROM THE ACADAMIC YEAR 2007-2008 ONWARDS)

Inorganic, Organic and Physical Chemistry-I (60 HOURS)

(12 HOURS)

(12 HOURS)

UNIT I

1.1 MOLECULAR ORBITAL THEORY

Some important basics concepts of M.O theory-LCAO. Bonding and Anti-bonding Orbitals and bond order. Application of MO theory to Hydrogen, Helium, Nitrogen, Oxygen and Fluorine molecules.

1.2 INDUSTRIAL CHEMISTRY

Fuel gases-Water gas,Producer gas,LPG gas,Gobar gas and Natural gas. Fertilizers-NPK and Mixed fertilizers, micro nutrients and their role in plant life and biofertilizers,Soap and Detergents an elementary idea about preparation and manufacture.Cleaning action of soap and detergents.

UNIT II

2.1 POLAR EFFECTS **(12 HOURS)**

(12 HOURS)

Inductive effect-relative strength of aliphatic mono carboxylic acids and aliphatic amines.Resonance-conditions for resonance,consequences of resonance-re sonance energy.Basic property of Aniline and acidic property of phenol.Hyper conjugation-consequences of hyper conjugation-Heat of hydrogenation,Bond length and Dipole moment.Steric effect-steric accelerated reaction and steric inhibited reaction.

2.2 HALOGEN CONTAINING COMPOUNDS

Important chloro hydrocarbons used as solvents and pesticides(Dichloro methane,Chloroform,Carbon tetra chloride,DDT,BHC) Fluro carbons(Freons)-preparation,properties and uses.

2.3 Types of solvents-Polar,non-polar-dissolving nature.

UNIT III

(12 HOURS)

3.1 AROMATIC COMPOUNDS

Structure,stability,resonance and aromaticity of Benzene.Typical substitution reaction-Nitration,Halogenation,Alkylation.Naphthalene-Isolation,Synthesis,Properties and Structural elucidation and uses.

3.2 ORGANIC REACTIONS

1)Biuret, 2)Decarboxylation, 3)Benzoin, 4)Perkin, 5)Cannizaro, 6)Claisen, 7)Haloform, 8)Carbylamine, 9)Coupling reactions.

3.3 CHEMOTHERAPY

Explanations with two examples each for Analgesics, Antibacterial,Anti-inflammatory,Antipyretic,Antibiotic,Antitubercular,Antiviral,Antitussive,Antiallergic, Atidiabetics,Anti-hypertensive,Antiepileptics,Tranquilizers,Antiseptic and Disinfectant, Antimalarial, Anaesthetics(Local and General).Structures not necessary.

UNIT IV **(12 HOURS)**

4.1 SOLID STATE

Typical crystal lattices-unit cell.Elements of symmetry.Bragg's equation,Weiss indices,Miller indices,simple,body centre and face centred cubes.

4.2 ENERGETICS

Review of first law of thermodynamics-state and path functions-need for the second law-Carnot's cycle and thermodynamics scale of temperature spontaneous and non-spontaneous process-Entropy-Gibb's free energy.Entropy change and Free energy change to decide spontaneity.ΔG in chemical equibilirum.Elementary idea of third law-statement and explanation.

4.3 PHASE RULE

Phase,Component,Degrees of freedom,Phase rule definition.One component-water system.Reduced phase rule-two components-Pb-Ag system.

UNIT V **(12 HOURS)**

5.1 CHEMICAL EQUILIBRIUM

Criteria of homogeneous and heterogeneous equilibria.Decomposition of HI,N_2O_4,$CaCO_3$ and PCl_5

5.2 CHEMICAL KINETICS

Order of reactions-First order reaction,Pseudo unimolecular reaction,Second order reaction,Third order reaction,Zero order reaction.Determination of order of reaction-Experimental method,Graphical method.

5.3 CATALYSIS

Introduction-Types of catalysis,Mechanism of catalysis,Applications of Catalysis

Note : Numerical problems wherever possible (all units)

ALLIED CHEMISTRY-I
(FOR ZOOLOGY)
(FOR THE CANDIDATES ADMITTED FROM THE ACADAMIC YEAR 2007-2008 ONWARDS)
Inorganic,Organic and Physical Chemistry-I (60 HOURS)

UNIT I **(12 HOURS)**

1.1 MOLECULAR ORBITAL THEORY

Some important basics concepts of M.O theory-LCAO.Bonding and antibonding Orbitals and bond order.Application of MO theory to Hydrogen,Helium,Nitrogen,Oxygen and Fluorine molecules.

1.2 INDUSTRIAL CHEMISTRY

Fuel gases-Water gas,Producer gas,LPG gas,Gobar gas and Natural gas.Fertilizers-NPK and Mixed fertilizers,micro nutrients and their role in Plant life and biofertilizers,Soap and Detergents an elementary idea about preparation and manufacture.Cleaning action of soap and detergents.

(12 HOURS)
(12 HOURS)

UNIT II

2.1 VSEPR THEORY

Introduction VSPER theory,Defects of VSPER theory,Shapes of simple Inorganic molecules($BeCl_2$,BF_3,$SiCl_4$,PCl_5,SF_6,IF_7,IF_5,XeF_6)

2.2 VOLUMETRIC ANALYSIS

Basic Principles,Standard solutions-Primary and Secondary standards.Types of titrations-Acid-Base,Redox,Precipitation,Indicators.

(12 HOURS)
(12 HOURS)

UNIT III

3.1 AROMATIC COMPOUNDS

Stucture,stability,resonance and aromaticity of Benzene.Typical substitution reaction-Nitration,Halogenation,Alkylation.Naphthalene-Isolation,Synthesis,Properties and Structural elucidation and uses.

3.2 CHEMOTHERAPY

Explanations with two examples each for Analgesics,Antibacterial,Anti-inflammatory,Antipyretic,Antibiotic,Antitubercular,Antiviral,Antitussive,Antiallergic, Atidiabetics,Anti-hypertensive,Antiepileptics,Tranquilizers,Antiseptic and Disinfectant,Antimalarial,Anaesthetics(Local and General).Structures not necessary.

(12 HOURS)
(12 HOURS)

UNIT IV

4.1 CARBOHYDRATES

Classification-Glucose and Fructose-Preparation and Properties-Elucidation of structure of Glucose-Configuration of Glucose-Fischer and Haworth cyclic structures-Sucrose-manufacture and properties-Starch and Cellulose-Properties and uses.

4.2 ORGANIC REACTIONS

1)Biuret, 2)Decarboxylation, 3)Esterification, 4)Libermann, 5)Diazo reaction, 6)Benzoin, 7)Haloform, 8)Resorcinol fusion, 9)Bromination, 10)Ozasone formation.

UNIT V **(12 HOURS)**

5.1 COLLOIDS

Colloids-Emulsions-gels-Preparation,Properties and applications.Importance of pH and Buffer in living system

5.2 CATALYSIS

Introduction-Types of catalysis,Mechanism of catalysis,Applications of Catalysis. Importance of Enzyme in Biological system.

Note : Numerical problems wherever possible (all units)

SEMESTER-II

Inorganic,Organic and Physical chemistry-II (75 Hours)

UNIT-I (Inorganic Chemistry)

Oxidation and reduction reactions-oxidation number concept,balancing redox

1.1. Oxidation and reduction reactions-oxidation number concept,balancing redox equations by oxidation number method and ion-electron method-equivalent weight of oxidizing and reducing agents.

Halogen family-comparative study of halogens and their compounds.

1.2.

1.2.1. Oxides and oxyacids of halogens (structure only)-estimation of available chlorine in bleaching powder.

1.2.2. Interhalogen compounds-preparation,properties and uses.

1.2.3. Pseudohalogens-Preparation,properties and uses of cyanogens and thiocyanogen-comparison with halogens.

UNIT-II (Inorganic Chemistry)

2.1. CARBON FAMILY

2.1.1. Comparative study of carbon family elements and their Compounds (hydrides,halides and oxides).

2.1.2. Chemistry of cyanogens,hydrocyanic acid,cyanic acid, thiocyanic acid, ammonium thiocyanate and carbon disulphide.

2.1.3. Structures of graphite,diamond and fullerene.

2.2. Oxygen family-comparative study of oxygen family elements and their compounds.

2.3. Oxygen fluorides. Ozone-Preparation ,properties, structural elucidation and uses. Green-house effect, ozonehole and protection of ozone layer.

2.4. Hydrogen peroxide-Preparation, properties,estimation,structure and uses.

2.5. Peracids of sulphur-their preparation,properties,uses and structures.

2.6. Thionic acids-their preparation,properties,uses and structures.

2.7. Sodium hyposulphite and sodium thiosulphate-Preparation,properties,uses and structures.

UNIT-III (Organic Chemistry)

Cycloalkanes.

3.1. Cycloalkanes.

3.1.1. Preparation using Wurtz's reaction,Diecknann's ring closure and reductions of aromatic hydrocarbons.

3.1.2. Substitution and ring opening reactions.

3.1.3. Bayer's strain theory and theory of strainless rings.

3.2. Alkynes.

Alkynes.

3.2.1. Acidity of alkynes,formation of acetylides,addition of water with $HgSO_4$ catalyst,addition of hydrogen halides and halogens,oxidation,ozonalysis and hydroboration.(With mechanisms of above reactions).

3.3. Dienes-types of dienes-conjugated,isolated and cumulated.

Dienes-types of dienes-conjugated,isolated and cumulated.

3.3.1. Stability and chemical reactivity-1,2 and 1,4 additions,kinetic and thermodynamic controls of a reaction.Diels-Alder reaction.
3.3.2. Synthesis of dienes-1,3 Butadiene,isoprene and chloroprene.
3.3.3. Problems and conversions involving the reactions of alkynes and dienes.

UNIT-IV (Physical Chemistry)

Solid state.

4.1. Solid state.

4.1.1. Isotropic and anisotropic solids.
4.1.2. Nature of the solid state-seven crystal systems-Bravais lattice,unit cell,law of rational indices(Weiss indices) Miller indices,symmetry elements in crystals (for cubic system only in detail).
4.1.3. X-Ray diffraction by crystals-derivation of Bragg's equation-Bragg method – powder method,crystal structure of NaCl,KCl,ZnS and CsCl-radius ratio and packing in crystals-determination of Avogardro's number.
4.1.4. Vitreous state.

UNIT-V (Physical Chemistry)

Macromolecules.

5.1. Macromolecules.

5.1.1. Number average and weight average,molecular weight of macromolecules-determination of molecular weight by osmometry(number average),ultra centrifuge(weight average),Viscometry and light scattering.

5.2. Colloidal state.

Colloidal state.

5.2.1. Size of colloidal particles-Peptization,stability of colloids,coagulation and protection.Reverse Osmosis and desalination of sea water.Donnan-Membrance equilibrium.Electrophoresis and separation of proteins.
5.2.2. Gels and emulsions.

*** Numerical problems wherever possible (all units)**

References:

1. S.S.Dara-A text book of environmental chemistry and pollution control-S.Chand and Co.
2. D.N.Bajpai-Advanced physical chemistry-S.Chand and Co.
3. Bruce H.Mahan, "University Chemistry", Narosa Publishers, NewDelhi 1989.
4. R.T Morrison and R.N.Boyd, "Organic Chemistry", 6th Edition.

PRACTICALS II
INORGANIC QUALITATIVE ANALYSIS
(At the end of Semester II)

Analysis of a mixture containing two cations and two anions of which one will be an interferring ion.Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.

Cation to be studied :
Lead,Copper,Bismuth,Cadmium,Antimony,Iron,Aluminum,Zinc,Manganese, Cobalt,Nickel,Barium,Calcium,Strontium,Magnesium and Ammonium.

Anion to be studied :
Carbonate,Sulphate,Nitrate,Chloride,Bromide,Fluoride,Borate,Oxalate, phosphate and Chromate.

Note : Practical-External-60 marks+Internal-40 marks (Total 100 marks)

ALLIED PRACTICALS

(At the end of even Semester)

I.VOLUMETRIC ANALYSIS

ACIDIMETRY AND ALKALIMETRY

ACIDIMETRY AND ALKALIMETRY

1.
a. Strong acid Vs Strong base.
b. Weak acid Vs Strong base.
c. Determination of Hardness of water.

2. PERMANGANAMETRY

a. Estimation of Ferrous sulphate.
b. Estimation of Oxalic acid.

3. IODOMETRY (Demonstration only)

II ORGANIC ANALYSIS

A study of the reaction of the following organic compounds.

1. Carbohydrate, 2. Diamide, 3. Aldehyde, 4. Ketone, 5. Acid (mono,di), 6. Amine, 7. Phenol.

The students may be trained to perform the specific reactions like tests for elements(nitrogen only),aliphatic or aromatic,saturated or unsaturated and functional group present and record their observations.

Note: Practical-External-60 marks+Internal-40 marks (Total 100 marks)

ALLIED COURSE III

(FOR MATHS AND PHYSICS)

Inorganic,Organic and Physical Chemistry II (60 HOURS)

UNIT-I **12 hours**

1.1 COORDINATION CHEMISTRY

Nomenclature of mononuclear complexes-Werner,Sidgwick and Pauling's theories.Chelation and its industrial importance to EDTA.Biological role of heamoglobin and Cholorophyll.Application of complexes in qualitative and quantitative analysis.

1.2 METALLIC BOND

Electron gas,Pauling and Band theories.Semiconductors-intrinsic,n-type and p-type.Applications of Semiconductors.

1.3 COMPOUNDS OF SULPHUR

Peracids of sulphur and sodium thiosulphate.

UNIT-II **12 hours**

2.1 CARBOHYDRATES

Classification-Glucose and Fructose-Preparation and Properties-Elucidation of structure of Glucose-Configuration of Glucose-Fischer and Haworth cyclic structures-Sucrose-manufacture and properties-Starch and Cellulose-Properties and uses.

2.2 AMINOACIDS AND PROTEINS

Amino acids-classification based on structure and essential and non-essential.Aminoacids-Preparation and Properties-Peptides-(Elementary treatment)-Proteins-Classification based on physical properties and biological functions.Structures of Proteins-Primary and Secondary (Elementary treatment).

UNIT-III **12 hours**

3.1 SYNTHETIC POLYMERS

Teflon,Alkyld and Epoxy resins,Poly esters-general treatment only.

3.2 HETEROCYCLIC COMPOUNDS

Furan,Thiophen,Pyrrole and Pyridine-Preparation and Properties-basic properties of pyridine and pyrrole-quinoline and Isoquinoloine.

3.3 STEREO ISOMERISM

Optical isomerism-Lactic and Tartaric acid-Racemic mixture and resolution.Geometrical isomerism-Maleic and Fumaric acids.Keto-Enol tautomerism. Meaning of E,Z,R,S,D,L,Meso,(+),(-) and (+-) in stereo chemistry.

UNIT-IV **12 hours**

4.1 SURFACE CHEMISTRY

Emulsions,gels-Preparation,Properties and Applications.Electrophoresis,Chromatography-Column,Paper and Thin layer chromatography.

4.2 PHOTOCHEMISTRY

Laws of Photochemistry and Applications.

UNIT-V **12 hours**

5.1 ELECTROCHEMISTRY

Specific and Equivalent conductivities-their determination-effect of dilution on conductivity.An elementary idea about Ionic theory-Ostwald's dilution law,Kohlrausch law,conductivity measurements,conductometric titrations.

5.2 pH AND BUFFER

Importance of pH and Buffers in living systems-pH determination by Colorimetric and Electrometric methods.

Note: Numerical problems wherever possible (all units)

ALLIED COURSE III
(For Zoology)

Inorganic,Organic and Physical Chemistry II (60 HOURS)

UNIT I **12 hours**

1.1 METALLIC BOND

Electron gas,Pauling and Band theories.Semiconductors-intrinsic,n-type and p-type.Applications of Semiconductors.

1.2 ALLOYS

General methods of Preparation and Properties of Alloys.Role of carbon in Steel and treatment of Steel.Applications of Alloys.

UNIT II **12 hours**

2.1 AMINOACIDS AND PROTEINS

Amino acids-classification based on structure and essential and non-essential.Aminoacids-Preparation and Properties-Peptides-(Elementary treatment)-Proteins-Classification based on physical properties and biological functions.Structures of Proteins-Primary and Secondary(Elementary treatment).

2.2 ENZYMES

Introduction,Classification of enzymes,Nomenclature,Co-factor,Co-enzymes,Mechanism of enzyme reaction,Specificity.

2.3 MILK & MILK PRODUCTS

Constituents of milk-Denaturation-Pasturisation-Dairy products.

UNIT III **12 hours**

3.1 SYNTHETIC DYES AND POLYMERS

Teflon,Alkyl and Epoxy resins,Poly esters,Bakelite,Nylon,Rayon-general treatment only.

Dyes-Introduction,Chromophore,Chromogen,Auxochromes,Classification of dyes on the basis of chemical structure and applications-Preparation of methyl orange,phenolphthalein and Bismark brown-their properties and uses.

UNIT IV **12 hours**

4.1 VITAMINS

Vitamin A,B complex,C,D,E and K.Classification,Occurance,Deficiency disease and Estimation of vitamins A,B, and C.Biological functions of Vitamin A,B and C.

UNIT V **12 hours**

5.1 BLOOD

Blood-Composition,Serum analysis,Haemoglobin analysis.Functions of Plasma Proteins and Haemoglobin.Maintanance of pH of blood.Estimation of sugar in blood and urine.Estimation of Cholestrol.

Note: Numerical problems wherever possible (all units)

SEMESTER-III

Inorganic,Organic and Physical chemistry-III (75 Hours)

UNIT-I (Inorganic Chemistry) 15 hours

ELECTRONIC STRUCTURE

1.1. Nitrogen family:

Nitrogen family:

1.1.1. Comparative study of nitrogen family elements and their compounds(oxides,halides,hydrides and oxyacids).

1.1.2. Chemistry of hydrazine,hydrazonic acid,hydroxyl amine and sodium bismuthate.

1.2. Zero group elements:

Position in the periodic table-isolation of noble gases from the atmosphere and Uses-Compounds of xenon-XeF_2,XeF_4,XeF_6,XeO_3 and $XeOF_4$-Preparation,properties,structure and uses.

1.2. Alkali and Alkaline Earth Metals:

Alkali and Alkaline Earth Metals:

1.3.1. Comparative study of alkali metal and alkaline earth metal compounds(oxides,halides,hydroxides,carbonates,sulphates).

1.3.2. Diagonal relationship between lithium and magnesium.

1.3.3. Preparation,properties and uses of lithium aluminium hydride and sodium borohydride.

UNIT-II (Organic Chemistry) 15 hours

Conformational analysis.

2.1. Conformational analysis.

2.1.1. Definition strain,dihedral angle,illustrations for each.

2.1.2. Conformational analysis of ethane and n-butane(with energy diagrams).

2.1.3. IUPAC Nomenclature of simple and substituted alicyclic bicyclic compounds.

2.2. Aromatic hydrocarbons and aromaticity.

2.2.1. Structure and stability of benzene ring-resonance in benzene-delocalized pi-election cloud in benzene.

2.2.2. Aromaticity-Huckel's Rule(4n+2) and examples-Cyclopropenylcation-Benezene,Naphthalene,anthracene,furan,pyrrole,thiophene,pyridine and Ferrocene.

UNIT-III (Organic Chemistry) 15 hours

Electrophilic substitution reactions in aromatic compounds.

3.1. Electrophilic substitution reactions in aromatic compounds.

3.1.1. General mechanism of electrophilic substitution reactions-Effect of Substituents - activating and deactivating groups orientation.

3.1.2. Nitration,sulphonation,halogenation,Friedel-Craft's alkylation and acylation reactions-Nuclear and side chain halogenation.
3.2. Polynuclear hydrocarbons:
3.2.1.Naphthalene and Anthracene - Isolation,properties,structure and uses.

UNIT-IV (Physical Chemistry) 15 hours

Quantum theory and atomic spectra.
4.1. Quantum theory and atomic spectra.
4.1.1. Bohr's model of atoms.Bohr's theory of hydrogen atom and spectral lines.Limitations of Bohr model.Sommerfield's extension.
4.1.2. Photoelectric effect and Crompton effect.De Broglie's equation and verification.(Davisson and Germer experiment).
4.1.3. V.B Theory-postulates-application to the formation of simple molecules like hydrogen and helium.Overlap of atomic orbitals and principles of hybridization.
4.1.4. M.O. Theory-bonding,antibonding molecular orbitals-MO diagrams of simple homonuclear diatomic molecules.(H_2,He_2,He^{+2},Li_2,Be_2,B_2,N_2,O_2& F_2) and hetero nuclear diatomic molecules-HF and CO.
4.1.5. Comparison of V.B. and M.O. Theories.
4.1.6. Quantum numbers: Principal,Azimuthal,Magnetic and Spin quantum numbers and their significance-principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion principle,Hund's rule,Aufbau principle,(n+1) rule,stability of half-filled and fully filled orbitals-inert pair effect.

UNIT-V (Physical Chemistry) 15 hours

Electric properties of matter.
5.1. Electric properties of matter.
5.1.1. Electric properties of molecules-polarization,polarizability and diploe moment.Atomic,induced and orientation polarization-Mosotti-Clausius equation-measurement of molar polarization.
5.1.2. Dipole moment-determination by Temperature,Refractivity and Dilute solution methods. Dipole moment of diatomic and polyatomic molecules-Bond moments.

Applications of dipole moment measurements:

1. In determining the percent ionic character of bonds.
2. Shapes of simple inorganic and organic molecules(BCl_3,H_2O,CO_2,NH_3,CCl_4).
3. Dipole moment of substituted benzenes-o,m & p-dichlorobenzene.

5.2. Magnetic properties of matter.
Magnetic properties of matter.
5.2.1. Magnetic flux-magnetic permeability-magnetic susceptibility.Diamagnetism,paramagnetism,ferro and anti-ferro magnetism-Curie temperature.
5.2.2. Determination of magnetic susceptibility-Guoy's method-Number of unpaired electrons-spin only magnetic moment value.
Application to structure of the following compounds
$K_3Fe(CN)_6$,$K_4Fe(CN)_6$,$Ni(CO)_4$.

Note: Numerical problems wherever possible (all units)

References:

1. P.L.Soni & Mohankatyal, Text Book of Inorganic Chemistry 20th revised edition, Sultan Chand 1992.

2. R.B.Puri & L.R.Sharma, “Principles of Inorganic Chemistry”, Sultan Chand 1989.

3. P.L.Soni & H.M.Chawla, “Text book of Organic Chemistry”, Sultan Chand & Sons 1994, Delhi.

4. K.S.Tewari, S.N.Mehrotra and N.K.Vishnoi, “A Text book of Organic Chemistry”.

5. M.K.Jain, “Organic Chemistry”, Shoban Lal Nagin Chand and Co.,

6. B.R.Puri, L.R.Sharma and Madan, S.Pathania, “Principles of Physical Chemistry”, Shoban Lal Nagin Chand and Co., Delhi.

7. Vogel’s “Text Book of quantitative Chemical Analysis” E.L.B.S.

8. R.D.Madan, “Modern Inorganic Chemistry”, 1987, S.Chand and Company (Private) Ltd.,

9. P.L.Soni, “Text Book of Organic Chemistry, Sultan Chand & Co., New Delhi.

10. D.A.Mc quarrie, “Quantum Chemistry”, University Science Books.

ALLIED CHEMISTRY-I

(FOR PHYSICS)

Inorganic,Organic and Physical Chemistry I (60 HOURS)

UNIT I **12 hours**

1.1 MOLECULAR ORBITAL THEORY

Some important basics concepts of M.O theory-LCAO.Bonding and Antibonding Orbitals and bond order.Application of MO theory to Hydrogen,Helium,Nitrogen,Oxygen and Fluorine molecules.

1.2 INDUSTRIAL CHEMISTRY

Fuel gases-Water gas,Producer gas,LPG gas,Gobar gas and Natural gas.Fertilizers-NPK and Mixed Fertilizers,micro nutrients and their role in plant life and biofertilizers,Soap and Detergents an elementary idea about preparation and manufacture.Cleaning action of soap and detergents.

UNIT II **12 hours**

2.1 POLAR EFFECTS

Inductive effect-relative strength of aliphatic mono carboxylic acids and aliphatic amines.Resonance-conditions for resonance,consequences of resonance-resonance energy.Basic property of Aniline and acidic property of Phenol.Hyper conjugation-consequences of hyper conjugation-Heat of hydrogenation,Bond length and Dipole moment.

Steric effect-steric accelerated reaction and steric inhibited reaction.

2.2 HALOGEN CONTAINING COMPOUNDS

Important Chloro hydrocarbons used as solvents and pesticides(Dichloro methane,Chloroform,Carbon tetra chloride,DDT,BHC) Fluro carbons(Freons)-preparation,properties and uses.

2.3 Types of solvents-Polar,non-polar-dissolving nature.

UNIT III **12 hours**

3.1 AROMATIC COMPOUNDS

Structure,stability,resonance and aromaticity of Benzene.Typical substitution reaction-Nitration,Halogenation,Alkylation.Naphthalene-Isolation,Synthesis,Properties and Structural elucidation and uses.

3.2 ORGANIC REACTIONS

1)Biuret, 2)Decarboxylation, 3)Benzoin, 4)Perkin, 5)Cannizaro, 6)Claisen, 7)Haloform, 8)Carbylamine, 9)Coupling reactions.

3.3 CHEMOTHERAPY

Explanations with two examples each for Analgesics,Antibacterial,Anti-inflammatory,Antipyretic,Antibiotic,Antitubercular,Antiviral,Antitussive,Anti allergic,Antidiabetics,Anti-hypertensive,Antiepileptics,Tranquilizers.Atiseptic and Disinfectant,Antimalarial,Anaesthetics(Local and General).Structures not necessary.

UNIT IV

4.1 SOLID STATE

Typical crystal lattices-unit cell.Elements of symmetry.Bragg's equation,Weiss indices,Miller indices,simple,body centre and face centred cubes.

4.2 ENERGETICS

Review of first law of thermodynamics-state and path functions-need for the second law-Carnot's cycle and thermodynamics scale of temperature spontaneous and non-spontaneous process-Entropy-Gibb's free energy.Entropy change and Free energy change to decide spontaneity.ΔG in chemical equibilirum.Elementary idea of third law-statement and explanation.

4.3 PHASE RULE

Phase,Component,Degrees of freedom,Phase rule definition.One component-water system.Reduced phase rule-two components-Pb-Ag system.

UNIT V

5.1 CHEMICAL EQUILIBRIUM

Criteria of homogeneous and heterogeneous equilibria.Decomposition of HI,N_2O_4,$CaCO_3$ and PCl_5.

5.2 CHEMICAL KINETICS

Order of reactions-First order reaction,Pseudo unimolecular reaction,Second order reaction,Third order reaction,Zero order reaction.Determination of order of reaction-Experimental method,Graphical method.

5.3 CATALYSIS

Introduction-Types of catalysis,Mechanism of catalysis,Applications of Catalysis.

Note : Numerical problems wherever possible (all units)

AGRICULTURAL CHEMISTRY

(Non Elective Course-I)

Credit 2
Hours 30

UNIT I **6 hours**

1.1. Soil physical properties-soil separates and particle size distribution-soil texture and structure-bulk density,particle density,pore space,soil air,soil temperature,soil water,soil consistence-significance of physical properties to plant growth.

1.2. Soil chemical properties-soil colloids-inorganic colloids-clay minerals-amorphous-organic colloids-soil organic matter-decomposition-humus formation-significance on soil fertility,soil reaction-biological properties of soil-nutrient availability.

UNIT II **6 hours**

2.1 Fertilizer-definition-fertilizer recommendation based on soil testing-fertility index-nitrogenous fertilizers(preparation and structure is not necessary)-effect of nitrogen on plant growth and development.Phosphate fertilizers(preparation and structure is not necessary)-effect of phosphorous on plant growth and development.

2.2 Secondary and micro nutrient fertilizers-complex fertilizers-complex and mixed fertilizers-sources,manufacture,properties and reactions in soils.

UNIT III **6 hours**

3.1 Biofertilizers-nitrogen fixing biofertilizer-rhizobium,azospirillum-phosphate mobilizing biofertilizer-bacteria bacillus,pseudomonas,fungi-aspergillus,pencillium.

3.2 Preparation of slow release fertilizers-compatability of fertilizers-fertilizer blending-preparation of different fertilizer mixtures-fertilizer prescription for different soils and crops.

UNIT IV **6 hours**

4.1 Nutrient potential of different organic manures-agricultural,industrial and urban wastes.

4.2 Green manures-green leaf manure-bulky organic and concentrated organic manures-compost-enriched farm yard manures,composting of coir pith;sugarcane trash,leaf liters and farm wastes-oil cakes,bone meal,fish meal,guano poultry manures-fertilizers use efficiency-integrated nutrition management

UNIT V

5.1 Pest management and control:

Pesticides-characteristics-uses-fate of pesticides in soil and plants-impact of pesticides on environment-safety measures in the analysis and handling of pesticides.

5.2 Insecticides,Fungicides,Herbicides and Acaricides-definition-examples and uses(preparation and structure is not necessary).

References:

1. N.C.Brady. The nature and properties of soils, Eurasia publishing house,(P) Ltd 9th edition 1984.

2. Biswas, T.D. and Mukerherjee S.K. 1987 The text book of soil science.

3. A.J.Daji(1970) A text book of soil science, Asia publishing house, Madras.

4. Donhue, R.L.Miller and Shickluna.J.C, 1987. Soils-An introduction to soils and plant growth, Prentice hall of India(P) Ltd., New Delhi.

5. Colling.G.H 1955, Commercial fertilizers, McGraw Hill publishing Co., Newyork.

6. Tisdale, S.L.Nelson, W.L and Beaton.J.D, 1990, Soil fertility and fertilizers, Macmillan publishing company, Newyork.

7. Hesse.P.R 1971 A text book of soil chemical analysis John Murray, Newyork.

8. JAckon.M.L 1958, Soil chemical analysis, Prentice hall of India(P) Ltd., NewDelhi.

9. Buchel.K.H 1983, Chemistry of pesticides-John Willey & Sons, Newyork.

10. Melnikov.N.N 1971 Chemistry of pesticides vol.36 of residue review-springer verlae, Newyork.

11. Sree Ramula, U.S 1971, Chemistry of insecticides and fungicides-Oxford and IBH publishing Co., NewDelhi.

SEMESTER-IV

INORGANIC,ORGANIC AND PHYSICAL CHEMISTRY-IV

INORGANIC CHEMISTRY **75 hours**

UNIT I **15 hours**

1.1 COINAGE METALS.

COINAGE METALS.

1.1.1. Comparative study of coinage metals and Chemistry of photography.

1.2 ZINC GROUPS METALS.

ZINC GROUPS METALS.

1.2.1. Comparative study of zinc group metals,Galvanisation,Evidences for the existence of mercurous ion as Hg_2^{2+}

1.3 TRANSITION METALS AND THEIR COMPOUNDS .

1.3.1. Group study of titanium,vanadium,chromium,manganese and iron groups.

UNIT II **15 hours**

2.1 INNER TRANSITION ELEMENTS:

INNER TRANSITION ELEMENTS:

2.1.1. Lanthanides-occurrence-general study of lanthanides involving electronic configuration,oxidation states,magnetic properties and complexation behaviour.

2.1.2. Lanthanides-seperation by ion exchange and solvent extraction mehods-lanthanide contraction.

2.1.3. Actinides-Occurrence-electronic configuration,oxidation states,magnetic properties and complexation behaviour.

2.1.4. Comparison of lanthanides and actinides and their position in the periodic table.

ORGANIC CHEMISTRY

UNIT III **15 hours**

3.1 Grignard reagents and their synthetic uses.

3.2 Grignard reagents and their synthetic uses.

Aliphatic nucleophilic substitutions-mechanism of SN1,SN2 and SNi reactions,effect of solvents,leaving groups,nucleophiles and structure of

3.3 substrates.

Elimination reactions-Hofmann and Saytzeff's eliminations-cis trans

3.4 eliminations.Mechanism of E1 and E2 reactions.

Alcohols.

3.4.1. Chemical reactivity-Distinction between primary,secondary and tertiary alcohols.Lucas reagent (mechanism of observations),oxidation,hydrogenation and Victor Mayer's method.Effect of alcohol intake(methanol and ethanol)

3.4.2. Polyhydric alcohols.Ethylene glycol,glycerol:Properties including oxidation using periodic acid and lead tetra acetate.

3.5. Ethers.

3.5.1. Methods of preparation of aliphatic and aromatic ethers-reactions of ethers-1,4-dioxin-Preparation and uses-Epoxides-Preparation and reactions.Acid-base mechanism of cleavage of epoxides.

PHYSICAL CHEMISTRY

UNIT IV **15 hours**

4.1 Chemical kinetics.

4.1.1. Rates of reactions,rate laws,rate constant,order and molecularity of reactions.Rate equationd for zero,first,second and third order reactions.Derivation of rate constants for zero,first and second order reactions,Fractional order reactions.Examples:Half life period,Pseudo first order reactions examples.

4.1.2. Temperature dependence of reaction rates-Arrehenuius parameters and calculations.

4.1.3. Theories of reaction rates-simple collision theory-limitations-steady state approximation-Lindemann's hypothesis of unimolecular reactions-Theory of absolute reaction rates.(elementary treatment only).

UNIT V **15 hours**

5.1. Catalysis and adsorption.

5.1.1. Homogeneous and heterogeneous catalysis-Gibb's adsorption isotherm-statement only-Langmuir adsorption isotherm-statement and application to surface area calculations.Intermediate complex and adsorption theories.Types of catalysis promoters and poisions(Inhibitors).

5.1.2. Enzyme catalysis-mechanism-factors affecting enzyme catalysis Michaclis-Menton equation.

5.2. Photochemistry.

5.2.1. Grothus-Draper Law,Lambert-Beer's Law,Stark-Einstein's Law of photochemical equivalence.Quantum yield-Examples of low and high quantum yield(Decomposition of HI,Formation of HCl and HBr-Actinometry.Comparison of thermal and photochemical reactions of HBr.

Note: Numerical problems wherever possible (all units).

Reference Books:

1. R.Gopalan, P.S.Subramanian, K.Rengarajan-"Elements of Analytical Chemistry" Sultan Chard & Sons.
2. V.S.Parmar & H.M.Chawla-"Principles of reaction mechanisms in Organic Chemistry".
3. P.I.Soni & Mohan Katyal, "Text Book of Inorganic Chemistry".
4. I.L.Finar, "Organic Chemistry, Volume I" E.L.B.S. LONDON.
5. B.R.Puri, L.R.Sharma and Madan, S.Pathma, "Principles of Physical Chemistry".
6. R.D.Madan, "Modern Inorganic Chemistry", 1987, S.Chand and Company (Private Limited), New Delhi.

PRACTICALS II
VOLUMETRIC ANALYSIS

I.ACIDIMETRY AND ALKALIMETRY

II.PERMANGANOMETRY

1.Estimation of Mohr's Salt
2. Estimation of Oxalic Acid
3.Estimation of Calcium

III.DICHROMETRY

4 .Estimation of Ferrous Ion

IV.IODO AND IODIMETRY

5 .Estimation of Copper
6. Estimation of Potassium Dichromate
7. .Estimation of Arsenious oxide

V.ARGENTOMETRY

8 .Estimation of Chloride

VI.COMPLEXOMETRIC TITRATIONS

9 .Estimation of Zn,Mg and Ca ions using EDTA

ALLIED PRACTICALS

(At the end of even Semester)

I.VOLUMETRIC ANALYSIS

1.ACIDIMETRY AND ALKALIMETRY

a.Strong acid Vs strong base
b.Weak acid Vs strong base
c.Determination of Hardness of water.

2.PERMANGANOMETRY

a.Estimation of Ferrous sulphate.
b.Estimation of Oxalic acid.

3.IODOMETRY (Demonstration only)

II.ORGANIC ANALYSIS

A study of the reaction of the following organic compounds.

1.Carbohydrate, 2.Diamide, 3.Aldehyde, 4.Ketone, 5.Acid(mono,di), 6.Amine, 7.Phenol.

The students may be trained to perform the specific reactions like tests for elements(nitrogen only),aliphatic or aromatic,saturated or unsaturated and functional group present and record their observations.

Note: Practical-External-60 marks+Internal-40 marks (Total 100 marks

INDUSTRIAL CHEMISTRY

(Non Elective Course-II)

UNIT I

1.1 Cement: Manufacture-Wet process and dry process,types,Analysis of major constituents,setting of cements,Reinforced concrete.Cement industries in India.

1.2 Glass: Types,composition,manufacture of optical glass,coloured glasses and lead glass.

UNIT II

2.1 Sugar: cane sugar manufacture,recovery of sugar from molasses,sugar estimation,sugar industries in India.

2.2 Paints and Varnishes: Primary Constituents of paints,Dispersion medium(solvent),binder,pigments.

UNIT III

3.1 Chemical explosives: Origin of explosive,preparation and chemistry of TNT,Dynamite,Cordite,Picric acid and gun powder.

3.3 Water industry: Pollution of water by fertilizers,detergents,pesticides and industrial wastes,BOD,COD thermal pollution,water treatment-Ion exchange electrodialysis,reverse osmosis,softening of hard water.

UNIT IV

4.1 Coal: Origin and economic importance of coal,types analysis and composition,coal gasification,coal-tar.

4.2 Petroleum: Origin,refining,cracking,reforming,knocking and octane number.

+*/

UNIT V

5.1 Fuel gas: Large scale production,storage,hazards and uses of coal gas,water gas,producer gas.

5.2 Fertilizers: Fertilizer industries in India,manufacture of ammonia,ammonium salts,urea,super phosphate,triple super phosphate and nitrate salts.

References:

1. B.N.Chakravarty, Industrial Chemistry, Oxford & IBH Publishing Co., NewDelhi, 1981.
2. B.K.Sharma, Industrial Chemistry, Goel Publishing House, Meerut.
3. P.P.Singh, T.M.Joseph, R.G.Dhavale, College Industrial Chemistry, Himalaya Publishing House, Bombay, 4th Edition 1983.

CORE COURSE – VII INORGANIC CHEMISTRY –I (90 HOURS)

(18HOURS)

UNIT – I

COORDINATION COMPOUNDS:

1.1 Types of ligands. IUPAC nomenclature

1.2 Types of ligands. IUPAC nomenclature

Theories of coordination compounds – Werner, Sidgwick, Valence bond, Crystal field, molecular orbital and ligand field theories – Theory – Comparison – Merits and demerits (application not required)

UNIT – II

2.1 Isomerism – Stability of complexes – factors affecting the stability of complexes.

2.2 Isomerism – Stability of complexes – factors affecting the stability of complexes.

Unimolecular and bimolecular nucleophilic substitution reactions in octahedral

2.3 and square planar complexes – Trans effect.

Application of coordination compound – Detection of potassium ions, separation of copper and cadmium ions. Estimation of nickel using DMG and aluminium

2.4 using oxine.

Structure of EDTA and its complexes. Complexometric titrations – principles and application.

UNIT – III

3.1 Biologically important coordination compounds – Chlorophyll, haemoglobin,

Biologically important coordination compounds – Chlorophyll, haemoglobin,

3.2 vitamin B-12 - their structure – application (structural elucidation is not required)

Metal carbonyls – Mono and poly nuclear carbonyls of Ni, Fe, Co and Mn –

3.3 synthesis, reactions, structure and uses.

Nitrosyl compounds – classification, preparation, properties and structure of nitrosyl chloride and sodium nitroprusside.

UNIT – IV

4.1 Binary compounds – hydrides, borides, carbides and nitrides – classification,

Binary compounds – hydrides, borides, carbides and nitrides – classification, preparation, properties and uses of compounds hydrides, borides, carbides and

4.2 nitrides.

Organometallic compounds of alkenes and cyclopentadiene – preparation, structure, bonding and uses of olefine and ferrocene only.

UNIT – V

5.1 **GRAVIMETRIC ANALYSIS**:

GRAVIMETRIC ANALYSIS:

Characteristics of precipitating agent – choice of precipitants – specific and selective precipitant. Condition of precipitation. Types of precipitates. Purity of precipitates. Coprecipitation and post precipitation. Precipitation from Coprecipitation and post precipitation.

Precipitation from Precipitation from

homogeneous solution. Digestion and washing of precipitate. Ignition of the precipitate. Use of sequestering agents.

5.2 **GROUP THEORY AND ITS APPLICATIONS TO INORGANIC** **GROUP THEORY AND ITS APPLICATIONS TO INORGANIC** **MOLECULES**.

Symmetry elements – symmetry operations – mathematical group multiplication tables, point groups of simple molecules.

(H_2, HCL, CO_2, H_2O, BF_3 NH_3)

REFERENCES:

1. P.L. Soni,: Tex Book of Inorganic Chemistry, S. Chand & Co., New Delhi (1999)
2. B.R. Poori, & L.R. Sharma: Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co., New Delhi (2000)
3. R.D. Madan, G.D. Tuli and S.M. Malik, Selected Topic in Inorganic Chemistry, S. Chand & Co., New Delhi (1988)
4. J.D. Lee: Concise Inorganic Chemistry, E.L.B.S., IV Edn, m (1991)
5. Jeffery et al : "Vogel Text Book of Inorganic Quantitative Analysis", Longman (1984)
6. R.L. Madhan, Tuli, Malik : "Text Book of Inorganic Chemistry" Volume I & II.
7. Sathiya Prakash: "Text Book of Inorganic Chemistry" Volume I & II.

CORE COURSE – VIII ORGANIC CHEMISTRY –I (90 HOURS)

(18HOURS)

UNIT – I

ACIDS AND ACID DERIVATIVES:

1.1 Ionization of carboxylic acids – Acidity constants – comparison of acid strengths Ionization of carboxylic acids – Acidity constants – comparison of acid strengths of substituted acids – Acid strength of substituted Benzoic acids – Hammett equation. Hell – volhard – Zelinski reaction.

1.2 Dicarboxylic acids – preparation and properties of Oxalic, Malonic, Succinic, Glutaric and Adipic acids, unsaturated acids and hydroxyl Acids.

1.2.1 Malonic and Acetoacetic esters – Characteristics of reactive methylene group – synthetic uses of Malonic and Acetoacetic esters.

1.3 Tautomerism – Definition – Keto Enol Tautomerism (identification, Acid and Tautomerism – Definition – Keto Enol Tautomerism (identification, Acid and base catalysed Interconversion mechanism, Amido – Imido and Nitro Acinitro Tautomerism (Just inter – conversions only)

UNIT – II

REACTIONS OF CARBONYL COMPOUNDS (18 Hrs)

(18 Hrs)

2.1 Carbonyl Polarisation – Reactivity of Carbonyl group – Acidity of alpha Carbonyl Polarisation – Reactivity of Carbonyl group – Acidity of alpha

2.2 hydrogen.

Mechanisms of Aldol, Perkin, Knoevenagal and Benzoin condensation.

2.3 Mechanisms of Claisen, Reformatsky, Wittig and Cannizaro reactions.

Mechanisms of Reduction (sodium borohydride, $LiAlH_4$, Wolff – Kishner and MPV Reductions) – Mechanisms of Haloform reaction and Michael addition and Oppenaeur Oxidition.

(Problems and conversion wherever applicable)

UNIT – III

MOLECULAR REARRANGEMENT (18 Hrs)

(18 Hrs)

3.1 Classification (anionotropic, cationotropic) Intermolecular and intra molecular Classification (anionotropic, cationotropic) Intermolecular and intra molecular

3.2 rearrangement.

Pinacol – pinacolone rearrangement – Mechanism, Evidence for carbonium ion

intermediate formation – Migratory aptitude and applications.

3.3 Beckmann, Benzidine, Hoffmann, Curtius, Benzilicacid, cope and oxycope rearrangements and fries rearrangement (mechanisms only).

UNIT – IV

STEREOISOMERISM – I **(18 Hrs)**

(18 Hrs)

4.1 Stereoisomerism – Definition – Classification – Optical and Geometrical

Stereoisomerism – Definition – Classification – Optical and Geometrical

4.2 isomerisms.

Optical isomerism – Optical activity – Optical and specific rotation – elements of symmetry. Criteria for optical activity. Asymmetric centre Chirality – Achiral molecule – Meaning of D and L forms – Racemization – Methods of Racemization (by substitution and tautomerism) – Resolution – Methods of Resolution (Mechanical separation, seeding, biochemical and conversion to Diastreoisomers) – Asymmetric synthesis partial and Absolute Asymmetric synthesis) – Walden inversion, Vant Hoff rule of superposition – Freudenberg's

4.3 rule of shift.

Notations for optical isomers – relative and absolute configuration – D, L Notations – Cahn – Ingold – Prelog rules.

UNIT – V

STEREOISOMERISM – II **(18 Hrs)**

(18 Hrs)

5.1 R.S. notations of optical isomer with one asymmetric carbon – Erythro and Threo

R.S. notations of optical isomer with one asymmetric carbon – Erythro and Threo

representations. Fischer projection, Sawhorse, Newmann projection Fischer

projection, Sawhorse, Newmann projection Sawhorse, Newmann projection,

projection Newman projection projection
Sawhorse, n Newmann projection

representation of molecules with one and two asymmetric carbon atoms only.

5.2 Optical activity of compounds containing no asymmetric carbons – Biphenyls, Optical activity of compounds containing no asymmetric carbons – Biphenyls, Allenes and Spiranes.

5.3 Geometrical isomerism - cis – trans, Syn – Anti and E – Z Notations – Geometrical isomerism

- cis – trans, Syn – Anti and E – Z Notations – - cis – trans, Syn – Anti and E – Z Notations – Geometrical isomerisms in Maleic and Fumaric acids and in Unsymmetrical aldoximes and ketoximes – Methods of distinguishing geometrical Isomers (Dipole moment, Dehydration, Heat of Hydrogenation, Cyclization, Melting points) – Methods of determining the configuration of Geometrical isomers.

REFERENCES:

1. B.S. Bahl and Arun Bahl, Advanced Organic Chemistry : S. Chand & Co., New Delhi (1988)
2. P.L. Soni and H.M. Chawla: Text Book of Organic Chemistry – 28th Edition (1999) – Sultan Chand , New Delhi
3. Ravi Bhushan: Stereoisomerism of carbon compounds – CBS – Publishers, Delhi – Revised Edn. (1998)
4. P.S. Kalsi: Stereochemistry, conformation and mechanism, Willey Eastern Limited, New Delhi
5. D. Nasipuri, Stereochemistry of Organic Compounds, Wiley Eastern Ltd., New Delhi (1992)
6. I.L. Finar, Organic Chemistry Volume 1, E.L.B.S. London (1998)
7. Seyhan Ege, "Organic Chemistry – Structure and reactivity " – AITBS Publishers.
8. R.K. Bansal, " Organic Reaction Mechanisms, " Tata Mc Graw Hill, 1975.
9. P.S. Kalsi" Organic Reactions and their Mechanism," New Age International Publishers.
10. S.H. Pine, J.B. Hendrickson, D.J. Cram and G.S. Hammond, "Organic Chemistry", Mc Graw Hill fourth Edition 1980.

CORE COURSE – IX PHYSICAL CHEMISTRY –I

(18HOURS)

UNIT – I – SOLUTIONS

1.1 IDEAL BINARY LIQUID MIXTURES : Ideal liquid mixtures – (Benzene and

IDEAL BINARY LIQUID MIXTURES : Ideal liquid mixtures – (Benzene and

Toluene) – Raoult's law and Henry's law – Deviation from Raoult's law and Henry's law. Activity and activity coefficient. Duhem – Margule's equation – its application to fractional distillation of binary miscible liquids – Non ideal systems – Azeotropes – (HCl – water & Ethanol – water systems). Applications of azeotropes in organic chemistry. Applications of azeotropes in organic chemistry.

1.2 Partially miscible liquid pairs – Phenol – water, Triethyl amine – Water and Nicotine – Water systems – Lower and Upper CSTs, Effect of impurities on CST. Immisicible liquids – Principle and applications of steam distillation – Nernst Distribution Law – Derivation and applications.

Partially miscible liquid pairs – Phenol – water, Triethyl amine – Water and

1.3

1.4

DILUTE SOLUTIONS AND COLLIGATIVE PROPERTIES: Determination of molecular weights – Relative lowering of vapour pressure. Laws of Osmosis – Osmotic pressure and its applications. Elevation of boiling point and Depression of Freezing point – Relation between colligative properties and molecular mass. Abnormal molecular mass. Vant Hoff factor, Degree of dissociation and association of solutes. Vant Hoff factor, Degree of dissociation and

UNIT – II PHASE RULE **(18HOURS)**

2.1 Meaning of the terms – Phase – component and Degree of Freedom Derivation of gibb's phase rule. Phase equilibria of one component systems – water, CO_2 and sulphur systems.

Meaning of the terms – Phase – component and Degree of Freedom Derivation of

2.2

Phase equilibria of two component – Solid – Liquid equilibria – Pb – Ag systems – Desilverisation of lead.

2.3

Compound formation with congruent melting points (Mg – Zn) and incongruent melting points (Na-K). NaCl – water. Efflorescence and deliquescence. (definitions only)

UNIT – III CHEMICAL THERMODYNAMICS **(18HOURS)** **(18HOURS)**

3.1

Definition of Thermodynamic terms: Systems and surrounding – isolated, closed and open systems, Homogeneous & Heterogeneous systems, State of the systems, intensive and extensive variables. Thermodynamic process – cyclic processes, reversible and irreversible, isothermal and adiabatic processes – State and Path functions, exact and inexact differentials, concept of heat and work. Work of

expansion at constant pressure and free expansion.

3.2 **LAWS OF THERMODYNAMICS**: The zeroth law and the first law of

LAWS OF THERMODYNAMICS: The zeroth law and the first law of

thermodynamics.

3.2.1 **First law of thermodynamics** – statements, Definition of internal energy (U), enthalpy (H) and Heat capacity. U and H as the thermodynamic properties. Relation between Cp and Cv; calculation of W, Q, dU and dH for expansion of ideal and real gases under isothermal and adiabatic conditions for reversible and irreversible processes.

3.2.2 Joule – Thomson effect, Joule – Thomson experiment. Relationship between $\mu_{J.T.}$ and other thermodynamic quantities. Calculation of $\mu_{J.T.}$ for ideal and real gases. Joule Thomson coefficient and inversion temperature. The Zeroth law of thermodynamic and absolute scale of temperture.

THERMOCHEMISTRY:

3.3 **THERMOCHEMISTRY:**

3.3.1 Internal energy and enthalpy changes in chemical reactions. Relation between ΔE and ΔH. Relation between enthalpy of reaction at constant volume **(Q_v)** and at constant pressure **(Q_P).** Thermochemical equations, Laws of thermochemistry – Hess's law and its applications.

3.3.2 Standard states – Standard enthalpy of formation. Enthalpy of combustion, Enthalpy of Neutralization, integral and differential heats of solution and dilution. Bond dissociation energy its calculation from thermochemical data. Temperature dependence of ΔH Kirchoff's equation.

UNIT – IV SECOND LAW OF THERMODYNAMICS **(18HOURS)**

(18HOURS)

4.1 SECOND LAW OF THERMODYNAMICS: Need for the law. Different

SECOND LAW OF THERMODYNAMICS: Need for the law. Different

statements of the law. Heat engine – Carnot's cycle and its efficiency.

4.2 Refrigeration cycle – Carnot's theorem – Thermodynamic scale of temperature. CONCEPT OF ENTROPY: Entropy as a state function – Entropy as a function of P, V and T. Entropy changes in phase changes. Entropy of mixing – Clausius inequality – entropy as a criterion of spontaneous and equilibrium processes in

4.3 isolated systems.

GIBB'S AND HELMHOLTZ FUNCTIONS: Gibb's function (G) and Helmholtz function (A) as thermodynamic Quantities - ΔA and ΔG as criteria for thermodynamic equilibrium and Spontaneity – their advantage over entropy change. Variations of ΔA and ΔG with P,V and T. Gibb's - Helmholtz equations and their applications Thermodynamic equation of state. Maxwell's relations.

UNIT V

APPLICATIONS OF II LAW OF THERMODYNAMICS AND THIRD LAW

5.1 Equilibrium constants and free energy change. Thermodynamic derivation of Equilibrium constants and free energy change. Thermodynamic derivation of Law of Mass Action. Equilibrium constants in terms of pressure and concentration – NH_3, PCl_5 $CaCO_3$. Thermodynamic interpretation Le Chatelier's

5.2 principle (Concentration, Temperature, Pressure and addition of inert gases). Equilibrium between different phases – system of variable composition partial molar quantities – Chemical potential of component in an ideal mixture – Gibb's

5.3 Duhem equation – variation of chemical potential with T,P and X (mole fraction). Reaction isotherm – Van't Hoff's equation – Van't Hoff's isochore. Clapeyron

5.4 equation and Clausius Clapeyron equation – Applications.

THIRD LAW OF THERMODYNAMICS : Need for the law. Nernst heat theorem. III Law of thermodynamics – statement and concept of residual entropy. Evaluation of absolute Entropy from heat capacity data. Exception to third law. (Ortho & Para Hydrogen, CO, N_2O and Ice)

REFERENCES:

1. "Principles of Physical Chemistry ". B.R. Puri & Sharma.
2. "Text book of Physical Chemistry", P.L. Soni.
3. "Advanced" , Physical Chemistry Gurudeep raj.
4. "Essentials of Physical Chemistry" , B.S. Bahl, G.D. Tuli & Arun Bahl, S. Chand & Co., New Delhi (1999)
5. "Electro Chemistry " Samuel Glasstone.
6. "Simplified course in Physical Chemistry" , R.L. Madan, G.D. Tuli, S. Chand & Co., New Delhi (1999)
7. "Thermodynamics for students of Chemistry" , Rajaram and Kuriacose.
8. P.W. Atkins," Physical Chemistry" elbs, Oxford Univ. Press, 1998.
9. R.A. Albert and R.J. Silbay, "Physical Chemistry" John Wiley and sons. Inc., New York 1995.
10. Gordon. M. Barrow, "Physical Chemistry", Tata Mc Graw Hill, New Delhi.
11. I.N. Lerine, "Physical Chemistry " , Tata Mc Graw Hill, New Delhi 2002.

CORE COURSE – X PRACTICAL

ORGANIC AND GRAVIMETRIC ANALYSIS PRACTICAL

Organic Chemistry practical

1. PREPARATION :

Oxidation – Benzoic acid from benzaldehyde.

Hydrolysis – Salicyclic acid from methyl salicylilate.

Nitration – Nitrobenzene from benzene.

Bromination – 2,4,6,tri bromo aniline from aniline.

Diazotization – Preparation of methyl orange.

2. Qualitative analysis of organic compounds.
3. Determination of melting and boiling point of organic compounds.

GRAVIMETRIC ANALYSIS:

1. Estimation of calcium as calcium oxalate.
2. Estimation of barium as barium sulphate.
3. Estimation of barium as barium chromate.
4. Estimation of lead as lead sulphate.
5. Estimation of lead as lead chromate.
6. Estimation of nickel dimethylglyoxime.

Internal marks : 40 External marks : 60

ELECTIVE COURSE – I ANALYTICAL CHEMISTRY

UNIT I **(15 HOURS)**

(15 HOURS)

1.1 LABORATORY HYGIENE AND SAFETY

LABORATORY HYGIENE AND SAFETY

Storage and handling of corrosive, flammable, explosive, toxic, carcinogenic and

1.2 poisonous chemicals.

SIMPLE FIRST AID PROCEDURE FOR ACCIDENTS

Acid in eye, alkali in eye, acid burns, alkali burns, bromine burns, poison,

1.3 inhalation of gases, cut by glasses and heat burns.

DATA ANALYSIS

Errors in chemical analysis, classification of errors. Determinant errors, instrumental errors, personal errors, constant errors and proportional errors. Precision, accuracy and rejection of data questioned. Significant figures. Mean deviation and standard deviation. Curve fitting. Method of least squares – definitions only.

(15 HOURS)

UNIT II **(15 HOURS)**

2.1 **Separation and Purification Techniques**: General Principle involved in the

Separation and Purification Techniques: General Principle involved in the

2.2 separation of precipitates. Solvent extraction.

Chromotography: Principles Involved in the adsorption, partition and ion exchange, paper, thin layer, column, gas-liquid chromatography.

2.3 Electrophoresis-– Application.

Desiccants, Vaccum drying, Distillation, fractional distillation, steam distillation, azeotropic distillation, crystallization and sublimation – principles and techniques.

(15 HOURS)

UNIT III **(15 HOURS)**

3.1 **THERMOANALYTICAL METHODS**

THERMOANALYTICAL METHODS

Principles involved in thermogravimetric analysis and differential analysis – instrumentation. Characteristic of TGA (CaC_2O_4 H_2O, $CUSO_4$ $5H_2O$) and DTA

3.2 Curves (CaC_2O_4 H_2O). Factors affecting TGA and DTA curves.

3.3 Thermometric titration of HCl V_s NaOH

3.3.1 Analytical Electro Chemistry

3.3.2 Electrolytic separations.

3.3.3 Principles of electro deposition

Electrogravimetry (estimation of copper and silver only)

UNIT IV

4.1 COLORIMETRIC ANALYSIS

Laws of colorimetry – instrumentation. Nessler's, photoelectric colorimetric method –operation and applications. Estimation of Ni, Cu and Fe.

4.2 Basic principles of flame photometry – Atomic absorption – Spectrophotometry –

Basic principles of flame photometry – Atomic absorption – Spectrophotometry –

4.3 Estimation of Na, K and Ca.

Techniques in Kinetics: Principles and techniques used to follow the kinetics of ordinary and elementary treatment of fast – photo chemical reactions.

(15 HOURS)

UNIT V Computer application in chemistry **(15 HOURS)**

5.1 Elementary features of BASIC and C programming

5.2 Structure, data types, variable, constants, keywords, operators, expressions and library functions.

5.3 Examples of simple chemistry programs.

1. Conversion of celcius temperature to Kelvin temperature. Conversion of celcius

Conversion of celcius temperature to Kelvin temperature. Conversion of celcius

to Fahrenheit and viceversa.

2. Application of Beer Lambert law.
3. Application of Beer Lambert law.
4. Molecular weights from atomic weight.
5. Bohr radius.
6. Average, RMS. And most probable velocities of gas molecules.

Rate constant for a first order reaction

REFERENCES:

1. R. Gopalan , P.S. Subramanian and K. Rengarajan, "Elements of Analytical

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1. R. Gopalan , P.S. Subramanian and K. Rengarajan, "Elements of Analytical Chemistry" Sultan Chand & Sons New Delhi 1995

2. K.V. Raman, Computers in Chemistry Tata Mc Graw Hill Co., New Delhi 1993.

3. B.G. Gottrified., Basic Programming Mc Graw Hill International Ltd 1980.

4. R.A. Day and A.L. Underwood., Quantitative Analysis Prentice Hall of India New Delhi 1998.

5. E. Balagurusamy, C Programming Tata Mc Graw Hill Co., New Delhi 1997.

6. Computer Application in Physical Chemistry Bahl and Arun Bahl (Computers in Chemistry K.V. Raman)

3. B.G. Gottrified., Basic Programming Mc Graw Hill International Ltd 1980.
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5. E. Balagurusamy, C Programming Tata Mc Graw Hill Co., New Delhi 1997.
6. Computer Application in Physical Chemistry Bahl and Arun Bahl (Computers in Chemistry K.V. Raman)

CORE COURSE – XI ORGANIC CHEMISTRY –II (90 HOURS)

(18HOURS)

UNIT – I

PHENOLS AND DYES

1.1 Phenols

Phenols

1.1.1 Acidic character of phenols, Explanation on the basis of Resonance stabilization.

1.1.2 Ring substitution in phenols – orientation of phenolic group towards electrophiles. Esterfication, nitration, sulphonation, halogenation, coupling with diazonium salts, Kolbe's reaction, Reimer – Tiemann reactions, Gattermann, Lederer Manasse and Hoesch reactions.

1.1.3 Cresols, Nitro and Aminophenols, Di and Trihydric phenols. Alpha and Beta napthols preparation and properties.

1.2 Dyes

Dyes

1.2.1 Theroy of colour and constitution.

1.2.2 Classification – according to structure and application

i. Azodyes – methyl orange and Bismark brown.

ii. Azodyes – methyl orange and Bismark brown.

iii. Triphenyl methane dyes – Malachite green.

iv. Phthalein dyes – Phenolphthalein and fluoroscein.

v. Vat dye – Indigo

Anthraquinone dye – Alizarin.

UNIT – II **(18 Hours)**

NITROCOMPOUNDS, AMINES, AMINOACIDS AND PROTEINS

2.1 Nitrocompounds and amines.

Nitrocompounds and amines.

2.1.1 Conversion of nitrobenzene to ortho, para and meta dinitrobenzenes.TNT – Aromatic Nitro compounds – Reduction in Neutral, acidic and alkaline media.

2.1.2 Relative basic characters of Aliphatic and Aromatic amines.

2.1.3 Ring Substitution in aromatic amines. Diazotisation and its mechanism synthetic applications of diazonium salts.

2.1.4 Diazomethane and diazoacetic ester – preparation, structure and their synthetic uses.

2.1.5 Phenylene diamines.

2.1.6 Sulphanilic acid, sulphanilamide, saccharin, chloramines T.

2.1.7 Diamide – preparation, properties and uses of urea and thiourea.

2.2 Amino acids and proteins.

2.2.1 Classification of aminoacids. Essentials and non-essential amino acids.

2.2.2 Preparation of L –amino acids. Properties and reactions. Zwitter ions, Isoelectric points, peptide synthesis. Structure determination of polypeptides. End group analysis.

2.2.3 Protein – Classification based on physical and chemical properties based on Physiological functions. Primary and Secondary structures of proteins. Helical and sheet structures (elementary treatment only) Denaturation of proteins.

2.2.4 Nucleic acids: Structures of nucleobases – adenine, guanine, thymine, uracil and cytosine, nucleosides, nucleotides, polynucleotides, types of nucleic acids – DNA and RNA – biological functions.

UNIT – III **(18 Hours)**

CARBOHYDRATES

3.1 Classification, constitution of glucose and fructose, Reactions of glucose and Classification, constitution of glucose and fructose, Reactions of glucose and fructose, osazone formation, Mutarotation, and its mechanism, cyclic structure, pyranose and furanose forms. Determination of ring size, formula, configuration of Monosaccharides. Epimerisation, chain lengthening, and chain shortening of aldoses.

Inter conversion of aldoses and ketoses – Haworth, Fisher and chair conformation of glucose.

3.2 Disaccharides – reactions structure and uses of maltose and sucrose. Starch and Disaccharides – reactions structure and uses of maltose and sucrose. Starch and cellulose – preparation, properties and uses.

UNIT – IV **(18 Hours)**
(18 Hours)

HETERROCYCLIC COMPOUNDS

4.1 Aromatic characteristic of heterocyclic compounds.

4.2 Aromatic characteristic of heterocyclic compounds.

4.3 Preparation, Properties and uses of Furan, Pyrrole, Thiophene.

Synthesis and reactions of Pyridine and Piperidine – Comparative basis characters of pyrrole, pyridine and piperidine with amines.

4.4

Synthesis and reactions of Quinoline, Isoquinoline and Indole with special reference to Skraup, Bischler Napieralski and Fischer Indole synthesis. Structural elucidation of pyridine, Quinoline and iso quinoline.

UNIT – V **(18 Hours)**

NATURAL PRODUCTS

5.1 Terpenes, Geraniol. Nerol, Menthol and Alpha – Terpineol.

5.2 Terpenes, Geraniol. Nerol, Menthol and Alpha – Terpineol.

Alkaloids – General methods of isolation and general methods of structure

5.3 determination Conine, Piperine and Nicotine.

Vitamins – Thiamine, Riboflavin, Pyridoxine and ascorbicacid occurrence and biological importance. Structural elucidations of pyridoxine and ascorbic acid.

REFERENCES:

1. P.L. Soni and H.M. Chawla, "Text Book of Organic Chemistry " , 27th edn., Sultan Chand 1997.
2. V.S. Parmar and H.M. Chawla, "Principles of reaction mechanism in Organic Chemistry", 2nd Edn., Sultan Chand 1978.
3. Subash Chandra Rastogi, Satish Kumar Agarwal, Ashok Kumar Sharma, "Chemistry of Natural Products" Vol. I & Vol. II, Edition 1974-75. Jai Prakash Nath & Co., Leading Educational publishers.
4. Ernest L Eliel "Stereochemistry of carbon compounds", 19th Reprint 1995 Tata Mc Graw Hill publishing company ltd.,
5. M.K. Jain "Organic Chemistry" 12th Edn., Shoban Lal Nagin Chand and Co.,

CORE COURSE – XII PHYSICAL CHEMISTRY –II (90 Hours)

UNIT – I **(18HOURS)**

ELECTRICAL CONDUCTANCE

1.1 Electrical transport and Ohm's law, conduction in metals and in electrolyte

Electrical transport and Ohm's law, conduction in metals and in electrolyte

solutions. Specific conductance and equivalent conductance, measurement of equivalent conductance using Kohlrausch's bridege Variation of equivalent conductance with concentration. Variation of equivalent

1.2 Migration of ions – Kohlrausch's law and its application. Arehenius theory of

Migration of ions – Kohlrausch's law and its application. Arehenius theory of

electrolytic dissociation and its limitations. Weak and strong electrolytic

Weak and strong electrolytic

according to Arrehenius theory. Ostwald's dilution law, its uses and limitations. The elementary treatment of the Debye – Huckel Onsager equation for strong electrolytes. Evidence for ionic atmosphere. The conductance at high fields (Wien effect) and high frequencies (Debye – Falkenhagen effect). Transport number and Kirchoff's rule – determination by Kirchoff's method and moving boundary method.

1.3 Application of conductance measurements. Determination of a strong electrolyte

Application of conductance measurements. Determination of a strong electrolyte

and acids. Determination of Ka of acids. Determination of solubility product of a sparingly soluble salt. Common ion effect. Conductometric titrations.

UNIT – II **(18HOURS)**

ACIDS AND BASES

2.1 2.2Modern theories of acids and bases – Bronsted – Lowry concept and Lewis

2.2Modern theories of acids and bases – Bronsted – Lowry concept and Lewis

concept, factors that influence the strength of acids and bases. Definition of pH and pKa – Henderson – Hasseslbauch equations.Determination of pH by colorimetric method.

HYDROLYSIS OF SALTS: Neutralisation, hydrolysis, constant, relations between Kh, Ka, Kw and Kb. Degree of hydrolysis. pH of Hydrolysed salt

pH

of Hydrolysed salt of Hydrolysed salt

solutions. Calculation of hydrogen ion concentration – salts of strong and weak acids with weak bases.

UNIT – II (18HOURS)

EQUILIBRIA IN ELECTRO CHEMICAL CELLS

3.1 Electrolytic and galvanic cells. Reversible and irreversible cells. Conventional representation of Electrochemical cells. Electromotive force of a cell and Electromotive force of a cell and measurements. Computation of cell e.m.f calculation of thermodynamic Computation of cell e.m.f calculation of thermodynamic quantities of cell reactions. **(G,H,S and K).** Applications of Gibbs Helmholtz equation, concentration and E.M.F.

3.2 Types of reversible electrodes – Gas/ metal ion, metal/ metal ion, metal/ insoluble Types of reversible electrodes – Gas/ metal ion, metal/ metal ion, metal/ insoluble salt / anion and Redox electrodes. Electrode reactions. Nernst equation – Electrode reactions.

Nernst equation –

Nernst equation –

derivation of cell E.M.F and single electrode potentials. Standard hydrogen

Standard hydrogen

electrode – reference electrodes – standard electrodes potentials. Electro

chemical series and its significance. Electro

3.3 Concentration cell with and without transport. Liquid junction potential.

Concentration cell with and without transport.

Liquid junction potential. Liquid junction potential.

Application of concentration cells – Valency of ions, solubility product and activity co-efficient, potentiometric titrations. Determination of pH using

Determination of

pH using usin
pH g
usin
g

hydrogen, quinhydrogen and glass electrodes. Determination of Pka of acids by potentiometric methods.

3.4 Corrosion – general theory – Electrochemical theory – prevention of corrosion.

Corrosion – general theory – Electrochemical theory – prevention of corrosion.

UNIT – IV **(18HOURS)**

(18HOURS)

MOLECULAR SPECTROSCOPY

4.1 Definition of spectrum. Electromagnetic radiation, interaction of electromagnetic

Definition of spectrum. Electromagnetic radiation, interaction of electromagnetic

radiation molecules and quantization of different forms of energies in molecules.

4.2 (Translational, rotation, vibrational and electronic).

Microwave spectroscopy – condition – molecular rotation – theory of microwave spectroscopy – selection rule.

4.3 Infra red spectroscopy – condition – molecular vibration – modes of vibration of linear and non – linear molecules, modes of vibration of diatomic, triatomic linear (CO_2) and non – linear triatomic (H_2O) molecules – stretching and bending vibration – selection rules, expression for vibrational frequency (derivation not needed).

4.4 Raman spectroscopy – condition – Rayleigh and Raman scattering – stokes and antistokes lines – Difference between Raman and IR. Spectroscopy – Rotational

Raman Spectra of non – centro symmetric molecule (HCl only), Application to covalent compounds. Mutual exclusion principle.

4.5 UV – visible spectroscopy – condition – theory of electronic spectroscopy – types UV – visible spectroscopy – condition – theory of electronic spectroscopy – types of electronic transitions – Frank – condon principle – predissociation.

UNIT – V **(18HOURS)**
(18HOURS)

5.1 NMR spectroscopy – magnetic and non-magnetic nuclei – condition principle of nuclear magnetic resonance – ring current effect – shielding – chemical shift – number of signals – spin – spin. Coupling – coupling constant (J) – splitting of signals compounds. NMR spectrum of ethylalcohol.

5.2 ESR spectroscopy – condition – theory of ESR spectra – Hyperfine splitting – ESR spectra of simple radicals (CH_3 CD_3, naphthalene)

5.3 Mass spectroscopy – Basic principles of mass spectroscopy, molecular ion peak, base peak, Isotopic peak and metastable peak – nitrogen rule and ring rule. Mass spectrum of simple organic compounds (Acetaldehyde, Ethyl Mass spectrum of simple organic compounds (Acetaldehyde, Ethyl alcohol)

REFERENCES:

1. B.R. Puri and L.R. Sharma “Principles of Physical Chemistry”.
2. R.P. Varma and Pradeep, “Physical Chemistry”.
3. C.N. Banwel” Fundamental molecular Spectroscopy”, Tata Mc Graw Hill publications , New Delhi 11th reprint 1991.
4. William Kemp “ Organic Spectroscopy”, ELBS, Second Edn., 1987.
5. Dr. S. Jain and S.P. Jankar, Physical Chemistry, Principles and Problems, Tata Mc Graw Hill, New Delhi 1990.
6. B.K. Sen, “Quantum Chemistry , Spectroscopy”,
7. K.V. Raman “Spectroscopy and Mathematics of Quantum Chemistry” in Print.
8. R. Chang, “Basic Principles of Spectroscopy”,
9. Dyer “ Organic Application of Spectroscopy”.
10. Y.R. Sharma “ Elementary Organic Spectroscopy”, Principles and Applications. S. Chand New Delhi 1992.
11. G.M. Barrow, “Introduction to Molecular Spectroscopy”, Mc Graw Hill, New Yark 1964.

CORE COURSE – XIII PRACTICAL - PHYSICAL CHEMISTRY –II
EXPERIMENTS

1. Kinetics:

Acid catalysed hydrolysis of an ester (methyl acetate or ethyl acetate).

2. Molecular Weight :

Rast's method : Napthalene, m-dinitribenzene and diphenyl as solvents.

3. Heterogeneous Equilibrium :

a. Critical solution temperature of phenol water system – effect of impurity on CST (2% NaCl or 2% Succinic Acid solutions)

b. Simple eutectic system: Napthalene – Biphenyl, Napthalene – Diphenyl Amine.

c. Determination of transition temperature : Sodium Acetate, Water Sodium Thio Sulphate $5H_20$ $SrCl_2$. $6H_20$ and $MnCl_2$. $4H_2O$.

4. Distribution Law:

a. Partition coefficient of iodine between carbon tetra chloride and water.

5. Electro Chemistry :

a. Conductivity: 1. Cell Constant

2. Equivalent Conductivity

3. Conductometric titrations.

b. Potentiometry: Potentiometric Titrations.

Internal Marks: 40 Mark **External Marks : 60 Marks**

MAJOR BASED ELECTIVE – INORGANIC CHEMISTRY (90 HOURS)

UNIT – I **(18HOURS)**

NUCLEAR CHEMISTRY: **(18HOURS)**

1.1 Introduction –composition of nucleus and nuclear forces.

1.2 Nuclear stability – n/p ratio, mass defect, binding energy, packing fraction and magic numbers, shell and liquid drop models.

1.3 Isotopes – detection and separation. Isotopic constitution of elements and whole number rule. Derivation of atomic weights from whole numbers. Isobars and Isomers.

UNIT – II (18HOURS)

RADIO ACTIVITY AND NUCLEAR TRANSFORMATION

2.1 Radio Activity – Discovery, detection and measurements (Wilson cloud
Radio Activity – Discovery, detection and measurements (Wilson cloud
Chamber). Radio activity emissions. Disintegration theory – modes of decay – Group displacement law – Rate of disintegration – Half life and average life –

2.2 radio activity series.

Nuclear transformation – use of projectiles – nuclear reactions – fission and fussion. Nuclear reactors. Applications of radio isotopes – Carbon dating – Radio

2.3 active waste disposal.

Radiolysis of water and hydrated electron.

(18HOURS)
(18HOURS)

UNIT – III

METALLIC STATE

3.1 Packing of atoms in metal (BCP, CCP (FCC), HCP).

3.2 Packing of atoms in metal (BCP, CCP (FCC), HCP).

3.3 Theories of metallic bonding – electron gas, pauling and band theories.
Structure of alloys – Substitutional and interstitial solid solutions – Hume Rothery ratio –Crystal defects.

3.4 Semi conductors – Extrinsic and Intrinsic – n-type and p – type – composition,
Semi conductors – Extrinsic and Intrinsic – n-type and p – type – composition,
structure and uses in electronic industry.

(18HOURS)
UNIT – IV **(18HOURS)**

SOME SPECIAL CLASSES COMPOUNDS

4.1 Clathrates – examples and structures. Interstitial compounds and non-

Clathrates – examples and structures. Interstitial compounds and non-

stoichiometric compounds.

4.2

4.3 Silicones – composition, raw materials, manufacture, structure,properties and uses.

4.4. Metal alkyls co-ordination polymers and phosphonitrilic polymers. (2+2 examples for each)

Silicates – Classification into discrete anions one, two and three dimensional structures with typical examples composition, properties and uses of Beryl, Asbestos, Talc, Mica, Zeolites and Ultramarines.

UNIT – V (18HOURS)

5.1 Fossil fuels – varities of coal and petroleum – petroleum refineries in India.

5.2 Fossil fuels – varities of coal and petroleum – petroleum refineries in India.

Gases fuels – natural, gobar, coal, water, semiwater and producer gases, liquefied

5.3 petroleum gases (LPG)

Fertilizers – Manufacture of N, P, K and Mixed fertilizers. Micro nutrients and

5.4 their role in plant life.

5.5 Safety matches fire works and explosives, paints and varnishes.

Effluents and their treatment (Dye, Cement, Tannery, Distillery units)

REFERENCES:

1. P.L. Soni,: Text Book of Inorganic Chemistry , S. Chand & Co., New Delhi (1999)
2. B.R. Poori,& L.R. Sharma: Principles of Inorganic Chemistry, Shoban Lal, Nagin Chand & Co., New Delhi (2000)
3. R.D. Madan, G.D. Tuli and S.M. Malik, Selected topic in Inorganic Chemistry.
4. Esmarch S. Gilreath, "Fundamental concepts of Inorganic Chemistry", International Students edn., Mc graw – Hill Kogakusha Ltd., 1958.
5. Gurdeep Chatwal and M.S. Yadu, "Co-ordination Chemistry", First Edn., Himalaya Publishing House, 1992.
6. Cotton and Wilkinson, "Advanced Inorganic Chemistry", 5th Edn.,
7. S. Glasstone, "Sources book on Atomic Energy" , 3rd Edn., Affiliated East West Press, 1967.
8. B.R. Chakravarthy " Industrial Chemistry".

ELECTIVE COURSE – III PHARMACEUTICAL CHEMISTRY

UNIT – I **(15HOURS)**

1.1 Introduction : Important terminologies used and their meaning – anti metabolities,

Introduction : Important terminologies used and their meaning – anti metabolities,

1.2 virus, bacteria, Mutation and Hemotherapy

An elementary treatment of the mechanism of action of drugs and metabolism or

1.3 biotransformation of drugs.

1.4 Absorption of Drugs: routes of administration.

Causes of some common diseases and their prevention and treatment by drugs Malaria, Filariasis, diphtheria, Whooping cough, influence of measles, mumps, common cold, tuberculosis, Cholera, typhoid, dysentery, Jaundice, epilepsy and

1.5 leprosy.

Minerals biological role of salts of Na, K and Ca, trace elements, Cu, Zn and I – deficiency and sources.

UNIT – II **(18HOURS)**

2.1 Antibiotics : Definition – structure , properties, SAR and therapeutic uses chloramphenical, penicillin, streptomycin and erthyromycin, Semi synthetic production of penicillin – assay of chloramphenicol and penicillin.

2.2 Sulphonamides: Mechanism of action of sulpha drugs – preparation and uses of Sulphanilamide, Sulphadiazine, Sulphapyridine and prontosil.

2.3 Anti – cancer and anti neoplastic drugs: tumer types – causes of cancer – spread of cancer – treatement – structure and uses of anti –neoplastic drugs – Chloramphenical, methotrexate and vinca alkaloids.

2.4 Hypoglycemic drugs: Diabetes – types – control of diabetes – hypo glycemic drugs – insulin and sulphonyl urea.

2.5 Epilepsy: Types – Structure, uses and adverse effects of drugs – phenobarbitone, hydantoin and diazepam.

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3.1 **UNIT – III** **(15 HOURS)**

Analgesics, antipyretics, and anti – inflammatory agents; Analgesics – definition – morphine and its analgesic action SAR – preparation, structure and uses of pethidine and methadone – aspirin – methyl salicylate, paracetamol, phenacetin,

3.2

Antiseptics and disinfectants: Definition – Standardization of disinfectants, uses of phenols, Chlorinated phenols, Halogen compounds, Dyes – Organic mercurials – nitromersol, Thiomersol – formaldehyde nitrofurasone – Cationic surface active

3.3 agent – De qualinum chloride. Distinction between antiseptics and disinfectants.

Anaesthetics: Definition – classification – preparation, structure and uses of volatile anaesthetics – nitrous oxide, ethers, cyclopropane, chloroform, halothane, ethyl chloride – storage, advantages and disadvantages – intravenous anaesthetics – preparation, and Local anaesthetics: requisities – structure and uses of cocaine, benzocaine and procaine.

UNIT – IV

(18HOURS)

4.1 Indian medicinal plants - medicinal values of Adadodai, Tulsi, Sembarithi,

Indian medicinal plants - medicinal values of Adadodai, Tulsi, Sembarithi,

Sindal, Neem, Tuduvalai, Kizhanelli, Arugampillu, Vasalakkirai, Pulikkirai,

4.2 Pasalakkirai and Spinach.

Alkaloids: Sources, isolation and purification, colour reactions and detection –

4.3 quinoline and morpine – sources, extraction, structure uses and SAR.

Anti – psychotic drugs – chloromarine and anxiety drugs – Iprazolam, diazepumatenolol – psychedelic drugs – LSD, hashish – structure therapeutic uses

4.4 and adverse effects.

Organic pharmaceutical aids – role as preservatives, antioxidants colouring, flavouring, sweetening and emulsifying agents – ointment bases.

UNIT – V **(18HOURS)**

5.1 **Blood:** Composition – compatability of blood groups – Rh factor – physiological

Blood: Composition – compatability of blood groups – Rh factor – physiological

function ofplasma protein – role of blood as oxygen carrier **-** blood pressure – hyper tension

hypotension, coagulation – mechanism – role of vitamin K. Anaemia – causesand control – siron containing drugs, vitamin B_{12}.

5.2 AIDS: sources of infection – HIV virus – General symptoms – prevention and

AIDS: sources of infection – HIV virus – General symptoms – prevention and

treatment

5.3 Important inorganic compounds of A1, P, As and Hg – their therapeutic uses.

5.4 Important inorganic compounds of A1, P, As and Hg – their therapeutic uses.

Organic diagonostic agents: Bariumsulphate, Iodine, Sulphomorphthalein, Sodium, Mannitoland Evan's blue.

REFERENCES:

1. Pharmacology and pharmacotherapeutics, Vol I & II, R.s. Satosker and S.D. Bhandarkar,
   Popular Prakashan, Bombay 1980.
2. Pharmaceutical Chemistry S. Lakshmi, Sultan Chand & Co., New Delhi.
3. A Text book of pharmaceutical chemistry, Jayashree Ghosh S. Chand & Co., New Delhi.