

SARDAR PATEL UNIVERSITY
T.Y.B.Sc C-301: ORGANIC CHEMISTRY
(Effective from June, 2008)

Total marks 80: No of questions 06

UNIT: I

SPECTROSCOPY

Determination of structure: Spectroscopic methods. The electromagnetic spectrum.

The infrared (IR) spectrum: Infrared spectra of organic compounds. The nuclear magnetic (^1H NMR) resonance spectrum: Number of signals, positions of signals, chemical shift, peak area and proton counting, splitting of signals. Spin-spin coupling and coupling constant.

^{13}C NMR Spectroscopy:

CMR splitting, chemical shift. CMR spectra of hydrocarbons. Alkyl halides, alcohols and ethers. Spectroscopic analysis of aldehydes, ketones, carboxylic acids, amines and substituted amides, carboxylic acid derivatives.

Problems base on above spectroscopic techniques.

UNIT: II

REACTION MECHANISM AND MOLECULAR REARRANGEMENTS

Carbenes, Birch reduction, Stobbe condensation. Darzens reaction. Arndt-Eistert reaction. Baeyer-Villiger oxidation. Claisen ester condensation. Hofmann-Loeffler reaction. Stevens rearrangement. Favorskii rearrangement. Benzidine rearrangement. Benzilic acid rearrangement. Sommelet rearrangement. Curtius rearrangement. Curtius-Schmidt rearrangement. Pinacol-pinacolone rearrangement. Grovenstein-Zimmerman rearrangement. Wolff rearrangement. Beckmann rearrangement.

UNIT: III

CARBOHYDRATES – I

Introduction of monosaccharides. Definition and classification. (+)-glucose and aldohexose. (-)-Fructose: a 2-ketohexose. Stereoisomers of (+)-glucose. Oxidation: effect of alkali. Osazone formation, epimers, Kiliani-Fischer synthesis. Ruff degradation. Conversion of an aldose into its epimers. The Fischer proof. Configuration of aldose. Optical families D and L.

Tartaric acid, Families of aldose, Absolute configuration, Cyclic structure of D-(+)-glucose, Configuration about C-1. Methylation, Determination of ring size. Conformation.

CARBOHYDRATES – II

Disaccharides and polysaccharides

Disaccharides. (+)- Maltose. (+)-Cellobiose. (+)-Lactose. (+)-Sucrose. Polysaccharides, Structure of amylose. End group analysis. Structure of amylopectin. Cyclodextrine. Structure of cellulose. Reaction of cellulose, Syntheses of ascorbic acid.

UNIT-IV

Orbital Symmetry and Pericyclic reactions

Introduction to pericyclic reaction characteristics of pericyclic reaction. Molecular orbital theory, Wave equation, phase, Molecular orbitals, LCAO method. Bonding and anti-bonding orbitals. Electronics configuration of some molecules. Aromatic character. The Huckel $4n+2$ rule. Orbital symmetry and the chemical reaction. Electrocyclic reactions, Cycloaddition reaction, Sigmatropic reactions. Cope and Claisen rearrangement.

UNIT-V

HETEROCYCLIC COMPOUNDS

Heterocyclic systems. Structure of pyrrole, furan and thiophene. Source of pyrrole, furan and thiophene, Knorr pyrrole syntheses. Pictet-Spengler pyrrole syntheses. Paal-Knorr syntheses. Howland-Hoesch reaction. Vilsmeier-Haack reaction. Feist – Bennert syntheses. Paal syntheses of thiophene. Structure reactivity and orientation effect in pyrrole and thiophene, Electrophilic substitution in pyrrole, furan and thiophene. Saturated five – membered pyrrole ring system.

Pyridine:

Structure, Sources basicity and reactions of pyridine: electrophilic and nucleophilic substitution, reduction of pyridine.

Quinoline and isoquinoline.

The Skraup syntheses of quinoline. The Bischler – Napieralski syntheses of isoquinoline.

Structure and syntheses of Uric acid and purine (Based on Medicus and Fittig formula and proof of Medicus formula based on Behrend and Roosen, Baeyer and Traube's syntheses). Ureides and Turines, Indole and indigo.

UNIT-VI

DYES, PIGMENTS AND DETERGENTS

Introduction. Type of fibers, Dyeing, Fastness properties, bathochromic and hypsochromic effect. Colour and constitution, Relation between colour and constitution: Witt's and modern theories of colour and constitution. Classification of Dyes, Pigments (emulsion composition and dry powder) Fluorescent Brightening agents Non-textile use of Dyestuff with at least one example. Details about food colorants and medicinal Dyes.

Synthesis and applications of following dyes from cheapest raw materials.

Direct yellow – 12, Auramine-O, New magenta, Disperse orange – 13, Disperse blue-1, Mercurchrome. Safranine T, Azo dyes pink FG, Caledone jade green,

tartrazine, procion Brilliant M5B, hansa yellow, Ciba blue 2 B, crystal violet, C.I. disperses blue.

Synthetic detergent

Introduction, comparison of soap and detergents. Principle of cleansing action of detergents. Classification of detergents. detergents builders and additives

Synthesis and applications of following compounds from cheapest raw material.

(I) mitanol C2N (II) Tinopol RBX (III) Igepon-T (IV) Sodium lauryl benzene sulphonate (V) sodium lauryl sulthoonate.

Reference Books:

1. Organic Chemistry by Morrison and Boyd, 4th Ed & 6th Ed
2. Synthetic Organic Chemistry by Gurdeep R Chatwall
3. Hand book of synthetic Dyes and Pigments, Vol. 1st and 2nd by K.M. Shah
4. Heterocyclic Chemistry Vol. II by R.R. Gupta. M. Kumar and V Gupta
5. Text book of Organic Chemistry by Arun Bahal and B.S. Bahal. 16^{ed}.
6. Reaction Mechanism in Organic Chemistry by S.M. Mukherji
7. Organic reaction mechanism by R.K. Bansal, 3rd ED.
8. Organic Chemistry, Volume II by I.L. Finar.
9. Reaction Mechanism in Organic chemistry by S.M. Mukherji. And S.P. Singh.
10. Advance Organic Chemistry by Jerry March, 3rd Ed.
11. Principles of Organic Syntheses by R.O.C. Norman

SARDAR PATEL UNIVERSITY
T.Y.B.Sc C-302: ORGANIC CHEMISTRY
(Effective from June, 2008)

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UNIT: I
TERPENOIDS AND HORMONS
Terpenoids:

General introduction nomenclature. General properties of terpeoids. Isolation of monoterpenoids. Isoprene rule. Classification of terpenoids. General methos for the determination of structure of terpenoids. Introduction, isolation and constitution of Citral, α -terpineol. Geraniol. Nerol. Linalool.

Hormones:

Introduction. Difference between Hormones and Vitamins. Sex hormones. Introduction constitution and Johnson synthesis of Oestrone. Introduction, constitution and synthesis of Testosterone.

UNIT: II
ALKALOIDS:

Introduction. occurrence, function, nomenclature, classification, isolation and properties of alkaloids. General methods employed for determining the structure of alkaloids. Introduction. isolation, physiological action, properties, extraction, constitution and syntheses of Adrenaline, Nicotine, papaverine.

Introduction. Isolation and constitution of Quinine.

UNIT – III
AMINO ACIDS AND PROTEINS

Amino acids: structure, amino acids as dipolar ions. Isoelectric points. Configuration. Preparation and reaction of amino acids.

Peptides: geometry of the peptide linkage, determination of structure of peptide. Terminal residue analysis, partial hydrolysis and syntheses of peptides.

Proteins: Classification, denaturation and structure of proteins. Peptide chain, side chain. Isoelectric point, Electrophoresis, conjugated proteins, prosthetic group. Enzyme (definition), coenzymes. Secondary structure of protein. Mechanism of enzyme action (chymotrypsin). Nucleoproteins and nucleic acids.

UNIT – IV
DRUG

Introduction, classification of drugs.

Introduction and classification of following selected class of drugs including at least one example of each class with their structure and uses.

Hypnotics, sedative and anticonvulsants. Histamine and antihistaminic agents. Hematological agents, Antipyretic and analgesics, mode of action of antipyretics. Anthelmintics. Antimalarial. Antiseptic Sulphanilamides. Mechanism of action of sulpha drugs. Antitubercular and Antimaleprosy drugs.

Synthesis and uses of following drugs:

(i) Nirvanol (ii) Thiobarbitone (iii) Phenobarbitone (iv) Dimethydrinate (v) Chlorcyclizine hydrochloride (vi) novalgin (vii) Phenylbutazone (viii) Hetrazan (ix) Miracil – D (x) Chloroquine (xi) Primaquine (xii) Vioform, (xiii) Sulphamethazine, (xiv) Sulphafurazole (xv) Marfanil (xvi) PAS (xvii) Dapsone (xviii) Acedapsone (xix) Warfarin (xx) Chlorpheniramine Maleate.

UNIT – V

POLYNUCLEAR AROMATIC COMPOUNDS

Fused ring aromatic compounds, Nomenclature of naphthalene derivatives. Structure of naphthalene. Reactions of naphthalene: oxidation, reduction, dehydrogenation of hydroaromatic compounds, nitration and halogenation. Orientation of electrophilic substitution in naphthalene. Friedal- Craft acylation and sulphonation of naphthalene. Naphthols. Orientation of electrophilic substitution in naphthalene derivatives. Syntheses of naphthalene derivatives by ring closure (Howorth synthesis),

Anthracene and Phenanthrene

Nomenclature of anthracene and phenanthrene derivatives. Structure of anthracene and phenanthrene. Reactions of anthracene and phenanthrene. Preparation of anthracene derivatives by ring closure (Anthraquinone), preparation of phenanthrene derivatives by ring closure, Carcinogenic hydrocarbons (Arene oxides).

UNIT :VI

ORGANIC PHOTOCHEMISTRY

Principles of photochemistry. Photochemical energy. Electronic excitation, excited states, modes of dissipation of energy (Jablonski diagram). Energy transfer of photosensitization. Photochemistry of carbonyl compounds. Photo oxidation of reduction. Norrish type-I and –II reactions. Photochemical reactions of cyclic ketones. Paterno-Buchi reaction. Photochemistry of α , β -unsaturated ketones, Photochemistry of olefins, Cis-trans isomerification. Dimerization reactions. Photorearrangement of butadienes and of cyclohexadienones. Photo-Fries rearrangement . Barton reaction. Photochemical aromatic substitution and fragmentation.

Referance Book :

1. Organic Chemistry of natural products by Gurdeep Chatwal, Vol.II.
2. A text book of Organic Chemistry by A. Bahl & B.S. Bahl. 16th Ed.
3. Organic Chemistry of natural products by Gurdeep Chatwal, Vol.I.
4. Organic Chemistry by Morrison and Boyds, 4th Ed & 6th Ed
5. Organic Chemistry, Volume I by I.L.Finar.
6. Synthetic Drugs VIth Ed. By Gurdeep Chatwal
7. Medicinal Chemistry 3rd Ed. Ashutosh Kar.
8. Organic reaction mechanism by S.M.Mukherji.
9. Organic reaction mechanism by R.K.Bansal.
10. Organic Chemistry by R.O.C.Norman.

SARDAR PATEL UNIVERSITY
T.Y.B.Sc C-303: INORGANIC CHEMISTRY

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UNIT I [A] SYMMETRY :

Introduction, various types of symmetry elements, Point groups. Properties of point groups, To determine the point group of a molecule, Representations of groups, the character. Some important theorems concerning the irreducible representations and their characters, Character table for point groups C_{2v} and C_{3v}

[B] INTRODUCTION TO THE TRANSITION ELEMENTS : LIGAND FIELD THEORY:

Introduction, Ligand field theory, the crystal field approach, The molecular orbital approach, Magnetic properties of transition metal complexes, Electronic absorption spectroscopy. Some generalizations concerning ligand field splitting and spectra, Structural and thermodynamic effects of d-orbital splitting

UNIT II ELEMENTARY WAVE MECHANICS :

Wave equation, Interpretation of ψ and Heisenberg's uncertainty principle, Properties of ψ , Operators, Second postulate of quantum mechanics, Setting up to of operators for different observable, Third postulate of quantum mechanics. Fourth postulate of quantum mechanics, one dimensional box, Normalization and orthogonality, Characteristics of the wave functions, Three dimensional box. Electron in a ring, THE HYDROGEN ATOM : Transformation of coordinates, Separation of variables, The ϕ equation, the Θ equation, the radial equation.

UNIT III THERMODYNAMIC AND KINETIC ASPECTS OF METAL COMPLEXES.

[A] STABILITY OF COMPLEXES IN AQUEOUS SOLUTION:

Definition of stability, stepwise formation of complexes, , stepwise information and overall formation constants, kinetic vs. thermodynamic stability, labile and inert octahedral complexes according to CFT, factors affecting on the stability of complexes, experimental determination of stability constant and composition of complex (spectrophotometric method, Job's method of continuous variation, potentiometric Bjerrum method)

[B] LIGAND SUBSTITUTION REACTIONS IN OCTAHEDRAL COMPLEXES :

Transition state or activated complex. Types of substitution reactions, labile and inert complexes, acid hydrolysis reactions, base hydrolysis reactions of six- coordinated (III) ammine complexes, anation reactions, substitution reaction without breaking metal ligand bond.

[C] LIGAND SUBSTITUTION REACTION IN SQUARE-PLANAR COMPLEXES:

The trans effect , theories of trans effect, mechanism of substitution reactions, factors affecting the rates of substitution reaction in square

planar complexes.

UNIT IV PRINCIPLES OF METALLURGY AND CHEMISTRY OF Fe, Ni, Cu, Pb, Ag and U.

Minerals and ores, General principles of metallurgy, ore dressing or concentration of ore, calcinations and roasting, extraction of free metal.

Refining or purification of metals, furnaces.

METALLURGY OF Fe, Ni, Cu, Pb, Ag and U:

Ni- Ores extraction, crushing and concentration of the ore, production of Ni by Orford's process and Mond's process.

CU- Ores extraction dressing of ore, Roasting treatment of matte for copper by Bessemerisation, refining or purification by electrolytic refining

Fe-occurrence, cast iron, wrought iron, steel- Bessemer process and open-hearth process.

U- occurrence, extraction :: coupellation process, amalgamation process, alkali digestion process. From carnotite ore. properties, compounds of uranium-uranium hexa fluoride- UF_6 .

Ag-occurrence extraction coupellation process, carbon reduction process, purification

Pb: occurrence extraction, properties, uses, alloys and compounds of lead.

UNIT V Organo metallic chemistry

Introduction, general methods of preparation, general properties, organo metallic compounds of alkali metals, organo metallic compounds of beryllium, magnesium, aluminium, metal carbonyl complexes, cyclopentadienyl complexes: metallocenes, some properties of ferrocene, structure and bonding in ferrocene, molecule, ionic cyclopentadienyl compounds

UNIT VI [A] Bio inorganic chemistry

Introduction, the role of model systems, the alkali and alkaline earth metals, metalloporphyrins. iron-sulfur proteins. Hemerythrin, Oxygen supply and transport. The bioinorganic chemistry of cobalt: Vitamin B12, Metalloenzymes, Nitrogen fixation.

[B] Catalysts

Introduction, Description of catalysts, Properties of catalysts, Catalytic steps

Examples, The nature of catalysts, Catalytic steps, Examples.

Reference Books:

Sr. No.	Title of the Book – Edition	Author
01.	Introductory Quantum Chemistry – 4 th	A k Chandra
2.	Basic Inorganic Chemistry – 3 rd	F. Albert Cotton Gloffery Wilkinson Paul L. Gaus
3.	Theoretical Inorganic Chemistry – 2 nd	M.C. Day & J. Selbin
4.	Selected Topics in Inorganic Chemistry – 7 th	Wahid U Malik G.D.Tuli R.D.Madan
5.	Satyaprakash's Modern Inorganic Chemistry	R.D.Madan
6.	Advanced Inorganic Chemistry Volume II -18 th	Satyaprakash G.D.Tuli S.K.Basu R.D.Madan
7.	Basic Inorganic Chemistry -3 rd	F.Albert Cotton Geoffery Wilkinson Paul L. Gaus
8.	Textbook of Inorganic Chemistry	P.L.Soni

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UNIT I NUCLEAR CHEMISTRY AND RADIOCHEMISTRY

Discovery of nucleus, Rutherford model of atom. properties of nucleus. composition of nucleus, atomic mass unit, nuclear stability, belt of stability, important points, meson theory of nuclear forces. decay processes, electron capture, positron emission, alpha decay, beta decay, internal conversion, lighter radioactive nuclides, theories of nuclear composition, proton electron theory, proton neutron theory, meson theory of nuclear forces, neutron proton theory, the antiproton neutron theory, nuclear mass, nuclear charge, nuclear size, nuclear spin and magnetic moment, structure of the nucleus, nuclear models, liquid drop model, shell model and magic numbers, Fermi gas model, nucleon pairing, odd even effect binding forces in nucleus.

UNIT II INDUSTRIAL CHEMISTRY

(A) HEAVY CHEMICALS

Manufacture, properties and uses of H_2SO_4 , HNO_3 , NH_3 , $NaOH$

(B) GLASS & CERAMIC INDUSTRY

GLASS: Introduction, physical properties of glass, chemical properties of glass, characteristics of glass, raw materials, chemical reactions, methods of manufacture, formation of batch material, melting chemical reactions in the furnace, shaping of forming, Forcault process of shaping sheet or window glass, shaping of plate glass, annealing, finishing, classification of glass making furnaces, methods of division of the tank and flame space, devices for recovery of heat and waste gases, electric and flame electric furnaces, flame electric furnaces, auxiliary furnaces, some special glasses.

CERAMIC: what are ceramics, subdivision of ceramic, general properties of ceramics, permeable and impermeable wares, distinction between permeable and impermeable wares, classification based on reduction in porosity, basic raw materials, other ingredients, manufacturing process, grinding of raw material, mixing or preparation of bodies, body preparation using clay in plastic form, body preparation using dry clay, body preparation using clay slip, filtering, kneding, jollying, slit casting, pressing, extrusion, turning, drying, types of driers, firing, glazing, frits, decoration, application of colors to the pottery, porcelain and china, raw materials, manufacture, earthenware and stone wares, important points.

UNIT III (A) INORGANIC POLYMERS

Introduction, classification of inorganic polymers, general properties of inorganic polymers, polymers containing boron, silicon, phosphorus and sulfur.

(B) INDUSTRIAL GASES

Carbon dioxide, hydrogen, oxygen and nitrogen, rare gases of the atmosphere, helium, acetylene, sulfur dioxide, carbon monoxide, nitrous oxide.

UNIT IV

(A) ALLOY AND INTER-METALLIC COMPOUNDS:

Introduction, Types of alloys, Rules for formation of alloys, Ferrous and non-ferrous alloys.

(B) PASSIVITY & CORROSION

Introduction to passivity, Alternative definition of passivity, Theories of passivity, Is passivity universal phenomenon?, application of passivity, Electrochemical passivity, Mechanical passivity, Introduction to corrosion, Economic aspects of corrosion, Types of corrosion, Corrosion by gaseous environment, Immersed corrosion, Prevention from corrosion.

UNIT V

(A) ISOMERISM AMONG INORGANIC COMPLEXES:

Structure isomerism, stereo or space isomerism, geometrical isomerism in 4 and 6 coordination compounds, To distinguish cis and trans-isomers, Optical or mirror image isomerism, Conditions for a molecule to have optical isomers, Optical isomerism in 4- and 6- coordination compounds, resolution of racemic mixtures.

(B) CHEMISTRY OF METALLIC CARBONYLS AND METALLIC NITROSYLS:

Metallic Carbonyls: General methods of preparation, general properties, structure and nature of M-CO bonding in carbonyls, Effective atomic number (EAN) rule as applied to metallic carbonyls, 18-electron rule as applied to metallic carbonyls, Some carbonyls

Metallic Nitrosyls: some metallic nitrosyls. Effective atomic number (EAN) rule as applied to metallic nitrosyls.

UNIT VI

(A) THE CARBON FAMILY

Group trends, Hydrides, Halides, Zeolites, Oxygen compounds of Germanium, Tin and Lead, Complexes of elements of Carbon family, Halides, oxides and salts.

(B) INTER HALOGEN COMPOUNDS

Inter halogen compounds, Introduction, Preparations, properties, structure and geometry of Inter halogen compounds of type XY, XY₃, XY₅ and XY₇.

Reference Books:

SR No.	TITLE OF THE BOOK-EDITION	AUTHOR
1.	NUCLEAR & RADIATION CHEMISTRY- 6 TH	B.K.SHARMA
2.	TEXTBOOK OF INORGANIC CHEMISTRY – 20 TH	P.L.SONI
3.	INDUSTRIAL CHEMISTRY – 9 TH	B.K.SHARMA
4.	ADVANCED INORGANIC CHEMISTRY VOLUME 1-18 TH	SATYA PRAKASH G.D.TULI S.K.BASU R.D.MADAN
5.	SHREVES'S CHEMICAL PROCESS INDUSTRIES-5 TH	GEORGE T. AUSTIN
6.	ADVANCED INORGANIC CHEMISTRY VOL 1, 23 RD	GURDEEP RAJ
7.	SELECTED TOPICS IN INORGANIC CHEMISTRY – 7 TH	WAHID U. MALIK G.D.TULI R.D.MADAN
8.	ADVANCED INORGANIC CHEMISTRY – 5 TH	F.ALBERT COTTON GEOFERRY WILKINSON

SARDAR PATEL UNIVERSITY

T.Y.B.Sc.

(Physical Chemistry)

C-305 (Effective from June, 2008)

Unit: I Spectroscopy

(A) Rotational Spectroscopy

- Diatomic molecules ; Energy levels of a rigid rotor
- Selection rules spectral intensity
- Distribution using population distribution (Maxwell-Boltzmann Distribution)
- Determination of bond length
- Qualitative description of non rigid rotor, isotopic effects

(B) Vibrational Spectroscopy:

- IR Spectrum; energy levels of simple harmonic oscillator model
- Selection rules, pure vibrational spectrum, intensity
- Determination of force constant, P-Q-R bands
- Electronic spectrum – Franck – Condon principle
- Predissociation spectra
- Models of vibration of atoms in polyatomic molecules
- Vibrational coupling application

Unit:II Photochemistry

- Introduction
- Types of chemical reactions
- Difference between dark and photochemical reaction
- Absorption of light
- Laws of photochemistry
- Quantum yield or quantum efficiency
- Deviation in the law of photochemical equivalence
- Reasons of high & low quantum yield
- Factors affecting quantum yield
- Luminescence
- Fluorescence & phosphorescence
- Chemiluminescence's
- Photosensitization

Unit: III X-ray Diffraction

- Crystal shapes and point groups
- Lattice and unit cells
- Miller Indices
- X-ray diffraction
 - Definitions
 - Bragg equation
 - Methods

- X-ray diffraction and unit cells
- Dimensions and the contents of the unit cell
- Ionic radii, covalent radii, van der Waals radii, radius ratio rules
- Lattice energies in ionic crystals
- Neutron diffraction

Unit-IV Colloidal State:

- Type of colloidal system.
- Classification of colloids
- Lyophobic and lyophilic sol
- Size range, preparation and properties of colloidal solution
- Dialysis, electrodialysis
- Ultrafiltration, ultramicroscope
- Electrical properties
- Charge on colloidal solution
- Zeta potential
- Coagulation of colloidal particles
- Flocculation values
- Electrokinetic properties
- Electrophoresis, electroosmosis
- Determination of size and colloidal particles
- Importance and applications of colloids

Unit – V Macromolecules-I

- Introduction
- Classification of polymers
- Nomenclature of polymers
- Isomerism in polymers
- Intermolecular forces in polymers
- Chain growth polymerization – introduction
- Mechanism of free radical, cationic and anionic polymerization
- Kinetics of free radical, cationic and anionic polymerization.
- Mechanism and kinetics polycondensation.

Unit – VI Macromolecules – II

- Polymerization techniques
- Concept of averages-
Number average mol.wt.
Weight average mol.wt.
Viscosity average mol.wt
- Molecular weight and degree of polymerization
- Polydispersity and mol. Wt. distribution
- Methods for determination of molecular weight
- Membrane osmometry
- Vapour phase osmometry.
- Viscometry
- Light scattering
- Numericals

Reference Books:

1. Instrumental methods of chemical analysis by chatwal and anand
2. physical chemistry by B.K.Sharma
3. Advanced Physical Chemistry by Gurdeep Raj
4. Physical Chemistry by G.M.Barrow
5. Solid State Chemistry & its Applications by Anthony R. West
6. Principles of Physical Chemistry by Puri, Sharma, Pathania
7. Principles of Polymer Science by P.Bahadur & N.V.Sastry, IInd edition
8. Polymer Science by V.R.Goswariker, N.V.Vishwanathan & Jaydev Shreedhar

SARDAR PATEL UNIVERSITY

T.Y.B.Sc.

(Physical Chemistry)

C-306 (Effective from June, 2008)

Unit: I Nuclear Chemistry

- Natural Radioactivity & Laws of Radioactive Decay
- Half life, mean life
- General characteristics of radioactive decay
- Decay kinetics
- Types of radioactive decay
- Theory of α -, β -, δ - decay
- Electron capture
- Nuclear reactions
- Bethe's notations
- Types of nuclear reaction
- Transmutations
- Radioactive capture reactions
- Photonuclear reactions
- Thermonuclear reactions

Unit:II Chemical Kinetics and catalysis

- Third order reactions
- Third order in gas and solution
- Complex reactions
- Determination of order of reactions
- Opposing reactions
- Consecutive reactions
- Period of induction
- Free radicals and chain reactions
- Simultaneous side reaction
- The activated complex theory
- Simple collision theory of reaction rates
- Failure of simple collision theory
- Reactions involving ions, primary salt effect
- Criteria of catalysis
- Homogeneous catalysis in gases and liquid phase
- Mechanism of acid base catalysis
- Salt effects, Enzyme catalyzed reactions.
- Mechanisms of enzyme catalyzed reactions

Unit : III Phase Equilibria

- The phase rule
- The phase diagram, the phase rule, theoretical derivation, the sulfur system, the water system
- Distillation of liquid mixtures

- Partially miscible liquid and their distillation
- Completely immiscible liquids
- Steam distillation
- Solid liquid system
- Freezing point and solubility curves , solid phases consisting salt and water
- Continuous series of solid solution

Unit : IV Surface , Phenomenon and Adsorption

- Sorption
- Adsorption of gases
- Influence of temperature and pressure
- Nature of adsorbent and adsorbed gas
- Unimolecular layers
- Langmuir adsorption isotherm
- Types of adsorption
- Van der waals adsorption
- Chemisorption
- Persorption
- Adsorption at surfaces of solution
- Formation of unimolecular surface films of spreading oils(unimolecular insoluble film)
- Adsorption by solids from solution

Unit : V Polarography

- Current – voltage relationship
- Interpretation of polarographic waves
- Equation for the polarographic waves
- Half waves potential
- Reversible waves & irreversible waves
- Explanation of polarographic waves
- The charging or residual current
- The migration current
- The diffusion current
- The kinetic and catalytic current
- Departure from diffusion & limited currents
- The dropping mercury electrode
- Advantages & limitation of DME
- Removal of oxygen
- Applications of polarographic analysis
- Advantage of polarography
- Quantitative analysis
- Numericals

Unit : VI Solvent extraction methods and amperometric titrations

(A) Solvent Extraction methods in analysis

- The distribution law
- Thermodynamic derivation
- Application
- Process of extraction
- Factors affecting extraction
- Techniques for solvent extraction
- Quantitative treatment of solvent extraction equilibria
- Classification of solvent extraction system
- Types of extraction system
- Advantages of solvent extraction system
- Application of liquid extraction
- Solvent extraction method in metallurgy
- Solid liquid extraction

SARDAR PATEL UNIVERSITY

T.Y.B.Sc.

Chemistry Practical Course(Physical Chemistry)
C-307 (one Practical of 3 hours from each group)

Group :A

40 marks

1. chemical kinetics of a reaction between $K_2S_2O_8$ and KI in an aqueous system
2. the study of decomposition rate of hydrogen peroxide in presence of catalyst and catalyst with promoter
3. the study of rate of reaction between hydrogen peroxide and KI in an aqueous media.
4. to determine the rate constant for the reaction between $KBrO_3$ and KI in an aqueous media.
5. the distribution coefficient of benzoic acid distributed between water and kerosene.
6. to study the adsorption of acid on activated charcoal
7. to determine molecular weight of polymer by using ubbelhold viscometer

Group: B

(A) Applications of pH metry

1. to determine molarity of strong/weak acid by titrating against 0.1 M NaOH solution
2. the dissociation constant of a weak monobasic acids like HAC , formic acid , benzoic acid by titrating against 0.1 M NaOH
3. to determine molarity of each acid present in a mixture of strong acid and weak acid
4. to measure the pH values of atleast two buffer solution and to determine their respective buffer capacities

(B) Applications of Potentiometry

5. to determine molarity of strong/weak acid
6. the dissociation constant of a weak monobasic acids like HAC, formic acid , benzoic acid & titrating against 0.1 M NaOH
7. to determine molarity of each acid present in a mixture of strong and weak acid
8. to determine concentration of silver nitrate solution by titrating against 0.1 M NaCl/KCl solution
9. to determine solubility and solubility product of sparingly soluble salt AgCl
10. application of conductometry
11. to determine cell constant of a given conductivity cell and solubility and solubility product of sparingly soluble salt ($CaSO_4$, $PbSO_4$)
12. to determine molarity of strong / weak acid by titrating against 0.1 M NaOH solution
13. to determine molarity of strong each acids presents in a mixture of strong acid and weak acid
14. to determine concentration of silver nitrate solution by titrating against 0.1 M NaCl/KCL solution
15. Application of refractometry
16. to determine the molar and specific refraction of pure liquids through the measurement of refractive index

17. to determine the composition of a binary liquid mixture by refractometry
18. Application of Colorimetry:
19. to determine the concentration of KMnO_4 / $\text{K}_2\text{Cr}_2\text{O}_7$ by colorimetry

Viva Voce
marks

05

1. Experimental Physical chemistry by R.C. Das & B Behera.
2. Advanced Practical Physical chemistry by J.B. YAdav.

(b). Amperometric Titrations:

- Amperometric Titrations
- Titration with two indicator electrodes
- Instrumentation
- Indicator and reference electrode
- Titration procedure
- Advantages and disadvantages of amperometric titration
- Applications

Reference Books:

1. Essential of nuclear Chemistry by H.J. Arnikar
2. Introduction to nuclear science by M.N. Sastri
3. Instrumentation methods of chemical analysis by Chatwal & Anand
4. Text book of physical chemistry by Samuel glass tone, IInd edition
5. Text book of physical chemistry by Samuel glass tone & D. Lewis
6. Instrumentation methods of chemical analysis by B.K. Sharma
7. Vogel's text book of Quantitative chemical analysis

Additional books for C-305 & C-306

1. Fundamentals of molecular spectroscopy, 4th edition by Banwell, Colin N and MC Cash
2. Basic concept of analytical chemistry by S.M. Khopkar
3. Physical chemistry through problems by S.K. Dogra & S. Dogra

SARDAR PATEL UNIVERSITY

T.Y.B.Sc.

Organic Chemistry (Practical)

C-308 (Effective from June, 2008)

Total 80 marks

1. Separation and identification of 3 component organic mixture : [40]
(benzoic acid, salicylic acid, cinnamic acid, phthalic acid, o-, p- & m-nitrobenzoic acid,
o-, p- & m-chlorobenzoic acid, α naphthol, β naphthol, p-cresol, o-, p- & m-
nitroaniline, p-bromoaniline, N,N-dimethylaniline, p-dichlorobenzene,
naphthalene, anthracene, benzamide, acetanilide, m-dinitrobenzene, acetamide,
MEK, xylene, bromobenzene, benzene, ethyl acetate, methyl acetate, acetone,
aniline, methyl alcohol, ethyl alcohol, benzaldehyde, toluene, chloroform, carbon
tetrachloride, chlorobenzene)

2. Preparations:

[10]

- A. Preparations of idoform from acetone
- B. Preparations of p-nitroniline from acetanilide
- C. Preparations of p-bromoaniline from acetanilide
- D. Preparations of 2,4,6 – tribromoaniline from aniline
- E. Preparations of mythyl orange
- F. Preparations of mordent yellow
- G. Preparations of lake red
- H. Preparations of benzoic acid from benzaldehyde
- I. Preparations of acetanilide from acetophenone
- J. Preparations of m-nitro aniline from m-dinirobenzene
- K. Preparations of o- & p- nitro phenols & separation by steam distillation

3. Estimation

[25]

- A. Estimation of –CooH group
- B. Estimation of aspirin
- C Estimation of amine
- D Estimation of amide
- E Estimation of ketone
- F To determine amount of acetic acid & ethyl acetate
- G To determine the amount of unsaturation.

4. Steam distillation:

[5]

Naphthalene from its suspension in water

5. Viva Voce

[5]

Reference Books:

- 1. A text book of comprehensive practical organic chemistry : preparation and quantitative analysis by V.K.Ahluwalia and Renu aggarwal.
- 2. Vogel's text book of qualitative organic analysis.

SARDAR PATEL UNIVERSITY

T.Y.B.Sc.

Inorganic Chemistry (Practical)

C-309 (Effective from June, 2008)

Total 80 marks

1. SEMIMICRO INORGANIC QUALITATIVE ANALYSIS

(Three positive and three negative radicals)

[30 Marks]

2. GRAVIMETRIC ANALYSIS

[25 Marks]

- 1. Al as Al_2O_3
- 2. Fe as Fe_2O_3
- 3. Ba as $BaSO_4$
- 4. Ni as $Ni(DMG)_2$
- 5. Cr as Cr_2O_3

3. VOLUMETRIC ANALYSIS

[20 Marks]

- 1. Bi^{+3} by EDTA Method
- 2. Pb^{+2} by EDTA Method
- 3. Chloride by Mohr's Method
- 4. Cd and Zn by EDTA Method
- 5. Ca^{+2} by milk
- 6. Ca^{+2} from lime stone

4. ALLOY ANALYSIS
 1. Brass
 2. Bronze
5. SYNTHESIS AND ANALYSIS
 1. tetramminecupricsulphate
 2. cis and trans – bisoxalatodiaquochromate (III)
6. COLORIMETRY
 1. Job's method
 2. Mole ratio method
7. SOLVENT EXTRACTION
Separation and estimation of Mg(II) and Fe(II)
8. ION EXCHANGE METHOD
Separation and estimation of Mg(II) and Zn(II)

VIVA VOCE

[05

Marks]

NB: Electronic Balance should be provided for weighing along with the chemical balance.

Reference Books:

Sr. No.	Title of the Book – Edition	Author
1	VOGEL'S TESTBOOK OF QUANTITATIVE CHEMICAL ANALYSIS 5 TH	G.H.JEFFERY, J. BASSET, J.MENDHAM, R.C.DENNEY
2	VOGEL'S TESTBOOK OF QUALITATIVE INORGANIC ANALYSIS	G.SVEHLA
3	PRACTICAL CHEMISTRY	O.P.PANDEY, D.N.BAJPAI AND S. GIRI
4	AN ADVANCED COURSE IN PRACTICAL CHEMISTRY	GHOSHAL MAHAPATRA, NAD