Veer-Narmad South Gujarat University
Second Year B.Sc.
Chemistry
Paper-III [Inorganic Chemistry]
(Effective From July - 2007)

70 Marks (External) **Total = 60 Hrs.**
30 Marks (Internal) **Time : 3 Hrs. (Uni. Exam.)**

UNIT - I

Topic - 1

Chemistry of Elements of first transition series : [8 Hrs.]

Characteristic properties of d-block elements, properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, Coordination number and geometry.

Topic - 2

Electronic Configuration of atom L-S coupling : [2 Hrs.]

Introduction, L-S coupling, J-J coupling (introduction), Term Symbol, Determination of microstate of P^2, P^3 system.

Term Symbol of C, N, O, Ni, Ni^{2+}, Fe, Fe^{2+}, Fe^{3+}, Cr, Cr^{3+} and Co^{2+}, V, V^{+3}, Cl.

UNIT - II

Topic - 1

Theory of Bonding in Metal Complexes : [6 Hrs.]

- Theory of bonding in metal complexes (CFT)
- CFSE and its calculations.
- Factors affecting.
- Application of CFT

(1) Magnetic Properties (2) Spectral Properties

Topic - 2

Paper Chromatography : [6 Hrs.]

- Principle, chromatography
- Classification of chromatography
- Types of paper chromatography, one dimensional, two dimensional and radial paper chromatography, R_f value, Use of paper chromatography in Inorganic analysis (I, IIA, IIIB, IV and halides)

UNIT - III

Topic - 1

Quantum Mechanics : [4 Hrs.]

(A) Derivation of the time independent Schrodinger equation, wave function and probability function, well behaved wave function.

(B) Particle in one - dimensional box and its importance.

(C) Operators (definition and derivation), Linear Operators, Commutator Operators, Vector Operators, Laplacian Operators, Hamiltonian Operators, Hermition Operators.

Derivation of Hamiltonian equation, Hamiltonian Operators for H-atom H_2^+,He_2^+ and Li.

Topic - 2

Electron absorption Spectroscopy [4 Hrs.]

- Principle of electronic spectroscopy (Frank-Condon Principle)
- Instruments and their working of visible spectrometer.
- Selection rule (without deviation)
- Spectra of some complex compounds Ti^{+3}, Cu.

Topic - 3

Ion-exchange chromatography : [4 Hrs.]

- Synthesis and Characterization of ion exchanger, Types of ion-exchange resin.
- Ion exchange equilibria, Technique of ion exchange, Application of ion exchange for Separation.

UNIT - IV

Topic - 1

Chemistry of Lanthanide and Actinide Elements : [7 Hrs.]

- Lanthanide and Actinide Elements, Electronic configuration, Sources.
- Occurrence, Extraction by solvent and ion exchange, Properties (Spectral and Magnetic).
- Lanthanide contraction, Use of Lanthanide compounds.
- Industrial use Uranium and Plutonium, Misch metal.

Topic - 2

Non-aqueous solvents: [5 Hrs.]

Physical properties of solvents, types of solvents and their general characteristics, reaction in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

UNIT - V

Topic - 1

Hydrogen Bonding : [4 Hrs.]

Theory of hydrogen bonding, classification, importance of hydrogen bonding in ice, Effect of hydrogen bonding in various fields.

Topic - 2

Bio-Inorganic : Role of metal complexes in Biological systems :[4 Hrs.]

- Introduction, Role of metal ion in different biological processes, Essential, beneficial and toxic metals, Metallo - Porphyrins, Hemoglobin - as Carrier of O_2 and as Carrier of CO_2.
- Myglobin,Chlorophyll, Vitamin B-12.

Topic - 3

Purification of Water : [4 Hrs.]

- Different methods of purification of water for potable and industrial purposes.
- Soft and hard water.
- Desalination ofsea water by reverse osmosis and electro dialysis.
- Permissible limit for potable and industrial water (WHO, IS).

Reference Books :

(1) Introductory Quantum Chemistry by A. K. Chandra, Tata Mc. Graw Hill Delhi.
(2) Atomic Structure and Chemical Bond by Manos Chandra, Tata Mc. Graw Hill Pub. Co. Ltd.

(3) Theoretical Inorganic Chemistry by M. C. Day & J. Selbin Affiliated, East West Pub. Pvt. Ltd.
(4) Coordination Compounds (Studies in Modern Chemistry) S. F. A. Kettle, Nelson.
(5) Inorganic Chemistry by (Principles of Structure and Reactivity) James E. Huhely, Harper International (NY).
(6) Inorganic Chemistry by R. B. Heslop and P. L. Robinson Elsevier Pub. Co. NY.
(7) Physical Methods Inorganic Chemistry by R. S. Drago, W.B.S. Saunders Co. London, Reinhold Pub. Co. NY.
(8) Basic Concepts of Analytical Chemistry by S. M. Khopkar, Wiely Estern Ltd. New Delhi.
(9) Quantitative Analysis Day & Underwood Prentice Hall of India, Pvt. Ltd.
(10) Instrumental Method of Analysis B. K. Sharma, Krishna Pub. House, Merrut.
(11) Principles of Inorganic Chemistry (Puri, Sharma, Kalia).
(12) Enviornmental Chemistry, By S. K. Banerji. Pretic Hall India Pvt. Ltd.
(13) Progressive Inorganic Chemistry, Suratkar, Thatte, Pandit, Ideal Book Service, Poona.
(14) Advanced Inorganic Chemistry Vol. I & II by Gurudeep Raj, Goel Pub. House, Merrut.
(15) Quantum Chemistry Ir. N. Levine, Prentice Hall.
(16) Advanced Inorganic Chemistry by Cotton & Wilkinson John Wihn Wiely.
(17) Introduction to Chromatography Theory and Practice by V. K. Srivastava and K. K. Srivastava - S. Chand Pub.
(18) Environmental Chemistry by. A. K. De.
(19) Industrial Chemistry by B. K. Sharma.

Veer-Narmad South Gujarat University

Second Year B.Sc.

Chemistry

Paper - IV (Organic Chemistry)

UNIT - I

Topic - 1

[A] Investigation of Reaction Mechanism : [9 Hrs.]

- Organic reaction mechanism
- Transition state theory
- Kinetics
- Non-kinetics reaction investigation
- Isotopic labelling
- Stereochemical studies

[B] The General nature, Reaction mechanism of applications of following reaction :

(1) Bayer-Villger oxidation
(2) Wolf-Kishner reduction
(3) Wittig reaction
(4) Fridel-Craft reaction
(5) Mannich reaction
(6) Benzoin reaction (condensation)
(7) Reimer-Tiemann reaction
(8) Michael reaction

Topic – 2 [3 Hrs.]

Elimination Reaction :

Beta-elimination, E_2 mechanism, E_1 mechanism stereo chemistry of elimination reactions, elimination Vs substitution. Alpha elimination : Generation of carbenes and ketenes.

UNIT - II

Topic – 1 [4 Hrs.]

Heterocyclic Compound :

Classification and nomenclature.

(a) Benzopyrrole (Indole) : Occurence, synthesis (Fischer Indole synthesis, Madeling synthesis, Reissert synthesis, Electrophilic substitution (nitration, sulfonation, halogenation) reactions. Gattermann reaction Riemer Tiemann reaction, Mannich reaction, synthesis of Indigo.

(b) Benzofuran (Coumarone) : Occurence, synthesis, substitution reactions (nitration, sulfonation, halogenation, acylation) reduction, reactions with ozone and sodium.

(c) Benzothiophene (thionaphthene) occurence, synthesis, substitution reactions (nitration, sulfonation, bromination acylation, chloromethylation), reactions with phenyl lithium, carbon dioxide diazodiacetate, sodium and other sulfur, Raneynickel.

(d) Quinoline : Synthesis (Skraup's synthesis, Frieldander method) reduction and oxidation of Quinoline, electrophilic substitution reactions, nitration sulfonation, halogenation, Friedel Crafft's reaction and nucleophilic substitution reactions.

(e) Isoquinoline : Synthesis (by heating Oxime of cinnamaldehyde with P_2O_5 and Bichler-Naieralsky reaction) electrophilic and nucleophilic reactions, oxidation and reduction reactions of isoquinoline.

Topic - 2

Polycyclic Aromatic Hydrocarbons : [3 Hrs.]

Classification and nomenclature.

(a) linear othofused polycyclic hydrocarbons : Occurence, synthesis of tetracene, pentancene and hexacene.

(b) Nonlinear orthofused polycyclic hydrocarbons Occurrence synthesis of 1, 2 - benzanthrancene, 1, 2, 5, 6- dibenzanthracere, 1, 2- benzphenanthrence.

(c) ortho and perifused polycyclic hydrocarbons Occurrence and synthesis of pyrene, perylene and coronene.

(d) carcinogenic properties of polyclic hydrocarbons.

Topic - 3

Vitamins and Hormones : [3 Hrs.]

Their definitions, classification, analytical and synthetic evidences to prove the structure of Ascorbic acid and Adrenaline.

UNIT - III

Topic - 1

Carbohydrates :

(a) Determination of configuration of D (+) glucose D (–) fructose - method of ascending and descending sugar series.

(b) Objections against open chain structure of D (+) glucose & D (–) fructose-ring structure of them, determination of size of the ring of glucose and fructose.

(c) Method of methylating sugars.

(d) Structure of sucrose.

Topic - 2

Use of Reagents : [4 Hrs.]

(a) Anhydrous aluminium chloride (e) NBS

(b) Grignard reagents (f) Selenium dioxide

(c) Aluminium isoproxide (g) Lithium aluminium hydrode

(d) Diborane

Topic - 3

Compound Containing Reactive Methylene Group : [4 Hrs.]

(a) Malonic ester : preparation and its synthetic applications.

(b) Acetoacetic ester (ethylacetoacetate) preparation and synthetic applications.

(c) Keto-enol tautomerism : factors affecting Keto-enol tautomerism and its mechanism.

UNIT - IV

Topic - 1

Diazonium Salts : [3 Hrs.]

(a) Methanism of dizotisation, reagents for checking completion of diazotisation.

(b) Nomenclature of Diazonium salts.

(c) Reactions of Diazonium salts, replacement reactions in which nitrogen is eliminated, its application in the synthesis of aromatic compounds, reaction in which nitrogen atom are retained.

(d) Laws of coupling, coupling agents, synthesis of diazomino and aminizo compounds.

(e) Benzidine rearrangement.

Topic - 2

Carboxylic acid and its derivatives: [5 Hrs.]

Structure and nomenclature of acid chloride, ester, amides and acid anhydrides; method of formation carboxylic acid derivatives and chemical reactions.

Topic - 3

Organic nitrogen compounds : [4 Hrs.]

(a) Preparation and physical properties and chemical of reactions nitriles, isonitriles, cynates, isocynates, carbonates, semi carbazides and their application in synthetic organic chemistry.

(b) Structure and nomenclature of amines, preparation of alkyl and aryl amines, physical properties and chemical reactions. Gabriel-pthalimide reaction, Hofmann Bromamide reaction.

UNIT - V

Topic - 1

Purines : [2 Hrs.]

(a) Structure of Uric acid and its synthesis by Traube's method.

(b) Synthesis of Purines.

Purnies from Uric acid

Adenine from trobe method

Topic - 2

Organic Sulfur Compound : [4 Hrs.]

(a) Aliphatic sulfur compounds : nomenclature, general methodsof preparation and reaction of mercaptans, thioethers, sulfinic and sulfonic acid, sulfonic acid.

(b) Aromatic sulfonic acid : nomenclature, preparation, reactions and uses of sulfonic acids of benzene, toluene, naphthalene.

Topic - 3

Electromagnetic Spectrum [6 Hrs.]

UV and visible spectroscopy, ultraviolet absorption spectroscopy, absorption laws (Beer-Lambert law) terminology used in UV and visible spectra, molar absorptivity, types of electronic transitions, effect of conjugation, concept of Chromophore and Auxochrome and Hypsochromic shifts UV spectra of conjugated enes and enones, effect of solvent substitution on electronic transition. Problems based on calculation of λ max for conjugated dienes and □-unsaturated carbonyl compounds and substituted Benzene derivatives using relevant rule.

Reference Books :

(1) Organic Chemistry by R. T. Morison and R. N. Boyd, Prentice Hall India.

(2) Organic Chemistry Vol. I & II by I. L. Finar.

(3) Organic Chemistry Vol. I & II by B. K. Sharma & S. K. Sharma Goel Pub. House, Merrut.

(4) Reaction and Reagents In Organic Synthesis by O. P. Agrawal Goel Pub. House, Merrut.

(5) Organic Chemistry by S. H. Pine.

(6) Reaction Mechanism In Organic Chemistry S. M. Mukharji & S. P. Singh.

(7) Organic Chemistry by L. G. Wade Jr. Prentice Hall.

(8) Fundamentals of Organic Chemistry by Solomon, John Wiley.

Veer-Narmad South Gujarat University

Second Year B.Sc.

Chemistry

Paper-V [PHYSICAL CHEMISTRY]

(Effective From July - 2007)

70 Marks (External) **Total = 60 Hrs.**

30 Marks (Internal) **Time : 3 Hrs. (Uni. Exam.)**

UNIT - I **[12 Hours]**

THERMODYNEMICS

1. Free energy or work function [Gibbs free energy (G) and Helmholtz free energy (A)] Depends of free energy on temperature and pressure. Derivation of Gibbs-Helmholtz equation by making use of work function and free energy function. Derivation of $G = G^0 + RT\ ln\ p$. Relation of ΔG and equilibrium constant KP (Vant Hoff isotherm) Derivation of Vant-Hoff isochore and its integration. Partial molal free energy (Chemical Potential). Gibbs-Duhem equation variation of chemical potential with temp. & pressure. Derivation of Clapeyron and Clapeyron - Clausius equation. Application of Clapeyron-Clausius equation in the derivation of Molal elevation constant & Molal depression constant .Numerical Problems

UNIT-II **[12 Hours]**

ELECTROLYTES OR ELECTRO CHEMISTRY

Ions in solutions, formation of ions in solution metallic conductance, Electrolytic conductance, electrolysis electrical units (i.e. Coulomb, Ampere, Ohm, mho, Volt etc.) Faraday's Law of electrolysis, importance of first and second law). Hittorf's rule, Transport number of ions and its determination by Hittorf's method and moving boundary method.

Kohlraush law of ionic conductance. Application of Kohlraush law to

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(a) Determination of degree of dissociation of weak electrolyte.

(b) Determination of equivalent conductivity of weak electrolytes at infinite dilution.

(c) Determination of Solubility and solubility product of sparingly soluble salts.

(d) Determination of ionic product of water.

(e) Determination of ionic mobility, ionic conductance and transport number of ions.

Conductometric titrations : Principle ,Types of conductometric titrations

(a) Strong acid Vs strong base
(b) Strong acid Vs weak base
(c) Weak acid Vs strong base
(d) Weak acid Vs weak base
(e) Mixture of strong acid and weak acid Vs strong base
(f) Precipitation titrations of
(i) $BaCl_2$ □□ K_2CrO_4 (ii) NaCl $AgNO_3$

Advantages of conductometric titrations over indicator method. Numerical Problems

UNIT–III UILIBRIA **[4 Hours]**

Relation between degree of hydrolysis, Hydrolysis constant and pH of solutions of

(a) Salts of weak acid and strong base
(b) Salts of strong acid and weak base
(c) Salts of weak acid and weak base

Theories of acid-base indicators. Ostwald and Quinonoid theories, choice of indicators, Indicator exponent and useful range of pH of an indicator. Numerical Problems

PARTITION CO-EFFICIENT **[4 Hours]**

Explanation of Nernst distribution law and its conditions for the validity.
Complications arising in distribution law :

(a) Association of solute in one of the phases.
(b) Dissociation of solute in one of the phases.
(c) Dissociation of solute in both the phases.

Derivation of distribution law from Kinetic Consideration explanation of solvent extraction process.

Applications of distribution law to -

(i) Washing of precipitates in Gravimetric analysis.
(ii) Desilverisation of lead by Park's process.
(iii)Liquid - Liquid chromatography (Partition chromatography). Numerical Problems

ADSORPTION **[4 Hours]**

Adsorption and Absorption, Head of adsorption, Characteristics of adsorption, Physical adsorption and Chemical adsorption. Distinction between physical adsorption and chemical adsorption. Freundlich's adsorption isotherm, Langmuir's adsorption isotherm. Ion exchange adsorption, Cationic and anionic exchange application of adsorption including ion-exchange adsorption.Catalysis, General features of catalysis. Heterogeneous catalysis, Adsorption theory of catalysis.

UNIT - IV

PHOTOCHEMISTRY **[6 Hours]**

Introductio to photochemistry, Basics of electromagnetic radiations, photons, Thermal and Photochemical reactions. Difference between thermal and photochemical reaction.

Photochemical Laws

(a) Grothus Draper's Law
(b) Lambert Beer's Law
(c) Einstein's Law of photochemical equivalence. Quantum yield or efficiency. Experimental determination of Quantum yields. Reasons of Law and high quantum yield. Primary and secondary photochemical reactions. Factors affecting quantum yield. (i.e. temperature, coave length, light intensity and inert gases).

Isomeric changes, polymerisation, Double decomposition, Dissociation, photosensitisation, photophysical processes [Fluorescence, Phosphorescence] Chemiluminescene. Factors affecting Fluorescence, phosphorescence. Relation between fluorescence intensity and concentration, Relation between phosphoresence intensity and

concentration. Application of Fluorescence and phosphorescence, Laser technique. Numerical Problems

CHEMICAL KINETICS **[6 Hours]**

Kinetics of IInd order reaction (a □ b). Effect of temperature on rate of reaction in detail ,Derivation of Arhenius equation.

Theories of reaction rates

(1) Collision theory
(2) Transition state theory

Energy of activation including determination, effect of catalysis on energy of activation. Numerical Problems

UNIT - V **[12 Hours]**

SPECTROSCOPY

Various type of spectra given by molecular species (brief summary) [i.e. Their region, energy changes occur] : NMR, ESR or EPR, Pure rotational spectra, Vibrational and Vibrational - Rotational spectra, Raman spectra.

Electromagnetic radiation with wavelength and energy. Radio frequency, Microwave, IR, UV/visible, X-ray region.

Rotational spectra, calculation of bond-length. Vibrational rotational spectra, Hook's law, vibrational energy level. Light scattering and Raman spectroscopy with applications. Principle and working of single beam spectrophotometers. Numercial Problems

References :

(1) Physical Chemistry by Gurdeep Raj.
(2) Physical Chemistry by K. L. Kapoor Vol. - I to IV. [Pub. Macmilan]
(3) Advance Physical Chemistry by D. N. Bajpai.
(4) Text Book of Physical Chemistry by S. C. Khetarpal & Yogeshwar Sharma. [Pub. R-Chand]
(5) Physical Chemistry by Puri & Sharma [S. Nagin & Co.]
(6) A Text Book of Physical Chemistry by A. S. Negi & Anand [New Age International]
(7) Physical Chemistry by P. L. Soni & O. P. Dharmraj.
(8) Physical Chemistry by B. K. Sharma.
(9) Essential of Physical Chemistry by Bahl Tuli & Bhal.
(10) Elemental Physical Chemistry by Glasston & Lewis.
(11) Physical Chemistry by K. K. Sharma, L. K. Sharma [Vikas Publition House, New Delhi]

Veer-Narmad South Gujarat University
Second Year B.Sc.
Chemistry Practical
(Effective From July - 2007)

84 Marks (External) **Sub. 56 Marks (external)**
36 Marks (Internal) **24 Marks (Internal)**
Time : 3 Hrs. (Uni. Exam.)

Only Paper V :28 Marks (External)
12 Marks (Internal)
Time : 7 Hrs. (Uni. Exam.)

INORGANIC QUALITATIVE ANALYSIS

LIST OF INORGANIC CHEMICALS USED FOR INORGANIC QUALITATIVE ANALYSIS

CHLORIDES - Bi^{+3}, Cu^{+2},Cd^{+2},Fe^{+3}, Mn^{+2}, Co^{+2}, Ni^{+2}, Ca^{+2}, Ba^{+2}, Sr^{+2}, Na^{+1}, K^{+1}, NH_4^{+1}.

BROMIDES - Sr^{+2}, Na^{+1}, K^{+1}, NH_4^{+1}

IODIDE - K^{+1}

NITRITE - N^{+1}, K^{+1}

NITRATE - Pb^{+2}, Bi^{+3}, Co^{+2}, Ni^{+2}, Ba^{+2}, Sr^{+2}, Na^{+1}, K^{+1}, NH_4^{+1}

SULPHITE - Na^{+1}

SULPHIDE - Zn^{+2}, Sb^{+3}

SULPHATE - Cu^{+2}, Cd^{+2}, Al^{+3}, Fe^{+2}, Zn^{+2}, Mn^{+2}, Co^{+2}, Ni^{+2}, Mg^{+2}, Na^{+1}, K^{+1}, NH_4^{+1}

CARBONATE - Pb^{+2}, Bi^{+3}, Cu^{+2}, Ce^{+2}, Zn^{+2}, Mn^{+2}, Co^{+2}, Ni^{+2}, Ca^{+2}, Ba^{+2}, Sr^{+2}, Mg^{+2}, Na^{+1}, K^{+1}, NH_4^{+1}

PHOSPHATE - Cu^{+2}, Al^{+3}, Fe^{+3}, Zn^{+2}, Mn^{+2}, Co^{+2}, Ni^{+2}, Ca^{+2}, Ba^{+2}, Sr^{+2}, Mg^{+2}, Na^{+1}, K^{+1}, NH_4^{+1}

OXIDE - As^{+3}, Sb^{+3}

Inorganic qualitative analysis of mixture containing **four radicals.** The mixture may be soluble in water or dilute hydrochloric acid or concentrated hydrochloric acid excluding Arsenite, Aresnate, Chromate and Borate.

N.B. Candidate should perform the analysis of <u>at least 10</u> mixtures.

The following exercises should not be asked in the university examination :

1. Calibration of Burette 50 ml., Pipette 5 ml.& 25 ml., Measuring Flasks 100 ml. & 250 ml.

VOLUMETRIC EXERCISE

(1) To determine the amount of Nickel by EDTA.
(2) To determine the amount of Copper by EDTA.
(3) To determine the amount of Zinc by EDTA.
(4) To determine the amount of H_2O_2 Iodometrically.
(5) Determination of total hardness of water by EDTA.

GRAVIMETRIC ESTIMATIONS

Gravimetric Estimation of (1) Fe^{+2} as Fe_2O_3
Given Solution Fe- NH_4–SO_4 + Conc. H_2SO_4

(2) Ba^{+2} as $BaSO_4$
$BaCl_2$

(3) Mn^{+2} as $Mn_2P_2O_7$
$MnCl_2$ + Conc. HCl

(4) Ni^{+2} as Ni $(DMG)_2$ $NiCl_2$ +
Conc. HCl

ORGANIC SPOTTING

Organic spotting & preparation of derivative only.

ACID - Salicylic acid, Cinnamic acid, Phenyl acetic acid, Anthranilic acid, Sulphanilic acid, Hippuric acid.

BASE - o-Nitroaniline, m-Nitroaniline, p-Nitroaniline, p-Chloroaniline, Dimethylaniline, Diethylaniline, Diphenylamine, p- toludine.

PHENOL - Alpha napthol, Beta napthol, o-Nitro phenol

NEUTRAL- ALDEHYDE - Glucose, Benzaldehyde
KETONE - Methyl Ethyl ketone, Acetophenone
ESTER - Ethylacetate, Butylacetate
ALCOHOL - Ethanol, Butanol
HYDROCARBON - Anthracene, Panhthalene, Diphenyl
NITRO HYDROCARBON - m-Dinitro benzene, Nitro benzene
HALOGENATED HYDROCARBON - Carbon tetrachloride, Chlorobenzene, Bromobenzene, p- Dichlorobenzene
AMIDE - Benzamide, Thiourea
ANILIDE - Acetanilide
QUINONE - Anthraquinone

N.B. Candidate should perform the analysis of <u>at least 12</u> substances.

ORGANIC ESTIMATIONS

To determine the amount of Acetamide in the given solution - NaOH
To determine the amount of Glucose in the given solution by hypoiodite
To determine the amount of Aniline in the given solution - bromination
To determine the amount of Phenol in the given solution bromination

PHYSICAL PRACTICALS [Any three from the following experiments. 1 to 5]

1. Adsorption : To study the adsorption of given organic acid (acetic acid/oxalic acid) on animal charcoal.

2. Partition Coefficient : To determine the molecular condition of Benzoic acid in its solution in Kerosene/Benzene by the method of partition coefficient.

3. Viscosity : To determine the viscosity of the given liquids and the % of unknown mixture 'C'.

4. Surface Tension : Determine the parachor of $–CH_2$ group of Liquid : [Benzene, Toluene, Xylene]

5. Heat of Solution : To determine the Heat of solution of organic acid (benzoic acid, phthalic acid) by finding the solubility of the acid at two different temp.

6. Conductometric Titration [Any Two]:

(I) To determine the normality of the given HCl solution by the coductometric titration with the given 0·25 N NaOH solution.

(ii) To determine the normality of the given mixture (HCl + HAc) solution by the conductometric titration with the given 0·25 NaOH solution.

(iii) Solubility product : To determine the solubility of $PbSO_4$/MgC_2O_4/SrC_2O_4 conductometrically.

7. pH metry : [Any One]

(I) To determine the normality of weak acid pH metrically using strong base.

(ii) To determine the normality of given acid in (HAc + HCl) pH metrically using strong base.

8. Any Two From the following :

Chemical Kinetics - Ester hydrolysis : To study the monomolecular reaction in the hydrolysis of methyl acetate in N/2 HCl at different initial concentrations.

9. Relative Strength

To determine the relative strength of H_2SO_4 and HCl acids.

10. Relative Strength

To investigate the reaction in saponification of Ethyl acetate by NaOH.

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Industrial Chemicals

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UNIT - I

(A) Synthetic fibres with flowsheet diagram :

(1) Coprolactam, Nylon-6 (3) DMT Ethylene Glycol, Terylene

(2) HMDA, Adipic acid, Nylon-66 (4) Tetrafluoroethylene, Teflon

(B) Synthetic Rubber with flowsheet diagram :

(1) Butadiene, Styrene, Buna-S (3) Chloroprene Neoprene

(2) Acrylonitrille, Buna-N (4) Isoprene, Polyisoprene

(C)Plastics and Resins with flowsheet diagram :

(1) Ureaformaldehyde resin, Bakelite (3) Vinyl alcohol, Polyvinyl alcohol

(2) Vinyl Chloride, pvc (4) Melamine and Melamine resins

(D) Snthetic drugs with flowsheet diagram :

(1) Novacaine (2) Noavlgin (3) Paludrine (4) Paracetamol (5) Sulphathizaole

UNIT - II

(A) Insecticides : [3 Hrs.]

(1) D.D.T. (2) B.H.C. (3) 2,4,D (4) 2,4,5-T (5) Aldrin (6) Malathion (7) MCPA

(B) Detergents : [1 Hrs.]

(1) Propyleneteramer (2) ABS (3) LAS

(C) Explisive :

(1) RDX (2) Nitrocellulose (3) Glyceryl trinitrate

(D) Synthetic Perfumes : [2 Hrs.]

(1) Coumarin (2) Vanillin (3) Muskxylene (4) Muskketone

(E) Phenol : [3 Hrs.]

(1) Rashig process (2) Cumene process (3) Dow-Toluene air oxidation process

(F) Acetylene :

(1) Wulff Process (2) Sachsse Process

UNIT - III

(A) Inorganic Chemicals : [2 Hrs.]

(1) Red Phosphorus (2) Sodium hexa metaphosphare (3) PCl_5 (4) Phosphoric acid

(B) Lime, Cement and Refracories

© Glass

(D) Nonferrous Alloys :

Monel Metal, Duralumin, Wood Metal, Babit Metal, Phsohorus Bronze.

Reference Books :

(1) Riegel's Hand Book of Industrial Chemistry 9th Edition by James A. Kents (BS Publishers, New Delhi)

(2) Unit Process In Organic Synthesis R. H. Groggins.