Shri Govind Guru University, Godhra
B.Sc. Sem-V Chemistry
CHE - 301 Organic Chemistry

UNIT I

(A) Stereo Chemistry [08 Marks]

Optical activity in the absence of chiral carbon (Biphenyls, Allenes and Spirans)

(B) Stereoselectivity and Stereospecificity [06 Marks]

Stereoselective and stereospecific reactions.Mechanism "Addition of halogens to alkenes".Stereochemistry of E_2 reaction (syn and anti elimination).

UNIT II

(A) Inorganic reagents for Organic synthesis [08 Marks]

Use of specific reagents and their synthetic applications with mechanism.

(i) Aluminum Iso propoxide (ii) Lithium Aluminum Hydride (iii) Selenium Dioxide (iv) Osmium Tetroxide (v) Lead Tetra acetate

(B) Molecular rearrangements and Name Reactions [06 Marks]

Rearrangements occurring through Carbocation's, carbenes and nitrenes Principle, Mechanism and Synthetic applications of the reactions:

(i) Wolf rearrangement (ii) Fries migration (iii) Birch Reduction (iv) Oppenauer oxidation reaction

UNIT III

(A) Nucleophilic Substitution at a Saturated Carbon Atom [08 Marks]

Mechanism and scope of reaction-available mechanism, Kinetic Characteristics, Scope of reaction, Stereochemistry of S**N**1 and S**N**2 reactions, Relative reactivity in substitution, Solvent effect, variation at carbon site, Relative leaving group activity, S**N**i (substitution nucleophilic internal) Mechanism and Neighboring group participation. Elimination Reactions, E1, E2 and E1cB mechanism, Orientation E1and E2 reactions, Elimination Vs Substitution.

(B) Organometallic Compounds [06 Marks]

Organomagnesium compounds : The Grignard reagents-formation, structure and chemical reactions.

Organozinc compounds:formation and chemical reactions.

Organolithium compounds:formation and chemical reactions.

UNIT IV

(A) Carbohydrates [06 Marks]

Disaccharides, structure of (+) maltose, (+) cellobiose, (+) lactose and (+) sucrose.

(B)Heterocyclic Compounds [08 Marks]

Introduction to condensed five and six membered heterocycles. Preparation and reactions of Indole, Quinoline and Isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole,quinolone and isoquinoline.

Reference Books :

(1) Organic Chemistry**:** I. L. Finar, Vol-II, 5th Edition, Pearson Education Ltd.

(2) Organic Chemistry**:** Morrison & Boyd, 6th Edition, Prentice Hall of India Pvt. Ltd.

(3) Stereochemistry of carbon compounds**:** E. L. Eliel, Wiley Eastern Ltd.

(4) Stereochemistry and mechanism through solved problems**:** P. S. Kalsi, New Age International.

(5) Stereochemistry of Organic Compounds: Principles and Applications**:** D. Nasipuri; New Academic Science; 4th Revised Edition.

(6) Organic Chemistry**:** Hendrickson, Cram, Hammond, Mc Graw-Hill.

(7) Organic Chemistry**:** 6th Edition, John Mcmurry, Brooks Cole, International Edition.

(8) Organic Chemistry**:** T.W. Graham Solomons and Craig B. Fryhle Wiley, 8th Edition.

(9) Organic Chemistry**:** Francis A. Carey, Mc Graw-Hill, 7th Edition.

(10) Organic Chemistry**:** Leroy G.Wade, Prentice Hall, 6th Edition.

(11) Organic Chemistry**:** Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers. Oxford University Press, USA.

Shri Govind Guru University, Godhra
B.Sc. Sem-V Chemistry
CHE - 302 Inorganic Chemistry

UNIT I

Molecular symmetry **[14 Marks]**

Introduction, symmetry operations and symmetry elements: Cn, σ, Sn, i and E. Point groups for the molecules (excluding S_2**n** and I**h**). Multiplication tables of C_2**v**, C_2**h** and C_3**v** point groups.

UNIT II

(A) Chemical bonding (I) **[07 Marks]**

VB and MO treatment of H_2 and H_2^+, comparison of VB and MO MO treatment of $[V(CN)_6]^{-3}$, $[IrF_6]^{-4}$, $[PtCl_4]^{-2}$ and $[Ni(CN)_4]^{-2}$.

(B) Boron hydrides **[07 Marks]**

Preparation, properties and structure of diborane. Types of bonds found in higher boranes. Structure of B_4H_{10}, B_5H_9, B5H11, and $B_{10}H_{14}$.

UNIT III

(A) Co-ordination chemistry **[07 Marks]**

Reaction, kinetics and mechanism. Trans effect and trans influence, Applications of trans effect in synthesis and analysis. Theories of trans effect: Polarisation theory, π- bonding theory, MO theory. Lability, inertness, stability and instability.

(B) Kinetics and reaction rates of substitution **[07 Marks]**

Ligand field effect and reaction rates, mechanism of substitution reaction.Nucleophilic substitution reaction (SN_1 and SN_2) in octahedral complexes.

Substitution in octahedral Co (III) complexes.Acid hydrolysis, base hydrolysis.Cis effect.

Electron transfer reaction.Mechanism of redox reaction (inner-sphere and outer-sphere).

UNIT IV

(A) Inorganic polymers **[07 Marks]**

Classification of inorganic polymers.

Polymers containing boron and silicon**:** methods of preparation, physical and chemical properties, structures and their uses.

(B) Mossbauer Spectroscopy **[07 Marks]**

Principle and Instrumentation.Experimental technique Application for iron complexes

Reference Books :

(1) Concise Inorganic Chemistry**:** J.D. Lee; Wiley India, 5th Edition (1996).

(2) 'Shriver and Atkins' Inorganic Chemistry**:** Atkins, Overton, Rourke, Weller, Armstrong; Oxford University Press, 5th Edition (2011).

(3) Advanced Inorganic Chemistry**:**.F.A. Cotton and Wilkinson G.; John Wiley, 5th Edition (1988).

(4) Introductory Quantum Chemistry**:** A.K. Chandra; Tata- McGraw Hill, 4th Edition (1994).

(5) Quantum chemistry**:** R.K. Prasad; New Age International, 4th Edition (2010).

(6) Electron and chemical bonding**:** H. B. Grey, W.A.Benjamin. INC, New York.

(7) Inorganic chemistry**:**. James E. Huheey, 4th Edition,Wesley Publishing Company.

(8) Mechanism of Inorganic reaction**:** Basalo and Pearson, 2nd Edition, Wiley Eastern Pvt Ltd.

(9) Introduction to Advanced Inorganic chemistry, Durrant and Durrant, John Wiley.

(10) Advanced Inorganic chemistry**:** (Vol. 1) Satya Prakash, Tuli, Basu and Madan; S. Chand

(11) Advanced Inorganic chemistry**:** Gurdeep Raj; Goel Publishing House, 23rd Edition (1998).

Shri Govind Guru University, Godhra
B.Sc. Sem-V Chemistry
CHE - 303 Physical Chemistry

UNIT I

Thermodynamics [14 Marks]

Carnot cycle, Spontaneous reaction ,Clausius - Clapeyron equation, Trouton's Rule, Craft's equation, van't Hoff's isotherm and isochore equations.

UNIT II

Electrochemistry [14 Marks]

Electrochemical cell and Electrolytic cell, Reversible and irreversible electrodes and cell, Poggendorff's compensation method and Weston cell, Reference electrodes (i) Saturated Calomel Electrode (ii) Standard Hydrogen Electrode (iii) Quinhydrone Electrode, Nernst's single electrode potential equation, Applications of emf measurements to calculate ΔG, ΔGo, ΔH, ΔS , Keq, Ksp, Kw and Kh.

UNIT III

(A) Chemical Kinetics [07 Marks]

Prediction of reaction rate, activation energy, Third order reaction (a=b=c),Primary and secondary salt effect, Heterogeneous reactions, Retarded reaction.

(B) Polymer Chemistry [07 Marks]

Polymerization and types of Polymerization, Co-polymers, Bio-polymers, Polymer additives, Molecular weight determination of polymers, Number average molecular weight, Weight average molecular weight.

UNIT IV

(A) Nuclear Chemistry [10Marks]

Detection of isotopes, Velocity focusing mass spectrograph, Bainbridge and Neiers mass spectroscopy,Dempster's direction focusing mass spectroscopy, Radio active analysis. Applications of isotopes and trace technique examples

(B) Molecular spectra [04 Marks]

Pure rotational spectra, Equation for frequency of pure rotational spectral line, Vibrational-Rotational spectra, Equation for frequency of vibrational-rotational spectral line, Ortho and pera hydrogen.

Reference Books :

(1) Physical Chemistry**:** G. M. Barrow, 5th Edition, McGraw-Hill education, India.

(2) Advanced Physical Chemistry**:** Gurdeep Raj, 35th Edition (2009), Goel / Krshina Publishing House.

(3) Principles of Physical Chemistry**:** Puri, Sharma and Pathania, 42nd Edition, Vishal Publishing Company.

(4) Polymer Science**:** Gowariker, Viswanathan and Sreedhar, 1st Edition (2012 reprint) New Age International.

(5) Essentials of Nuclear Chemistry**:** Arnikar, 4th Edition (2012 reprint), New Age International.

(6) Physical Chemistry**:** Atkins, 9th Edition. Oxford University Press.

(7) Advanced Physical chemistry**:** Gurtu and Gurtu, 11th Edition ,PragatiPrakashan.

(8) Physical chemistry**:** Levine, 6th Edition, McGraw-Hill education, India.

ho and Para hydrogen.

Shri Govind Guru University, Godhra
B.Sc. Sem-V Chemistry
CHE - 304 Analytical Spectroscopy

UNIT I

(A) Ultraviolet Spectroscopy **[08 Marks]**

Origin of UV Spectra, Principle, Electronic transition (σ-σ*, n-σ*, π-π* and n-π*), relative positions of λmax considering conjugative effect, steric effect, solvent effect, red shift (bathochromic shift), blue shift (hypsochromic shift), hyperchromic effect, hypochromic effect (typical examples). Aromatic and Polynuclear aromatic hydrocarbons.

(B) Ultraviolet Spectroscopy (**Problems**) **[06 Marks]**

Problems of Dienes and enones using Woodward-Fieser rules.Problems of aromatic ketones, aldehydes and esters using empirical rules.

UNIT II

(A) Infrared Spectroscopy **[08 Marks]**

Introduction, principle of IR spectroscopy, instrumentation, sampling technique, selection rules, types of bonds, absorption of common functional groups.Factors affecting frequencies, applications. Application of Hooke's law, characteristic stretching frequencies of O-H, N-H, C-H, C-D, C=C, C=N, C=O functions; factors affecting stretching frequencies (H-bonding, mass effect, electronic factors, bond multiplicity, ring size).

(B) Infrared Spectroscopy (Problems) **[06 Marks]**

Structural Problems based on Only IR Spectroscopy.

UNIT III

(A) Nuclear Magnetic Resonance **[08 Marks]**

Principal, Magnetic and non magnetic nuclei, absorption of radio frequency. Equivalent and non equivalent protons, chemical shifts, anisotropic effect, relative strength of signals, spin-spin coupling, long range coupling, coupling constant, Deuterium labelling, applications to simple structural problems.

(B) NMR Spectroscopy (Problems) **[06 Marks]**

Structural problems based on only NMR Spectroscopy.

UNIT IV

Structural problems based on UV , IR , NMR. **[14 Marks]**

Reference Books:

(1) Introduction to Spectroscopy**:** Donald L. Pavia, Gary M. Lampman, George S. Kriz Cengage Learning; 4th Edition.

(2) Spectrometric Identification of Organic Compounds**:** Robert M. Silverstein, Francis X. Webster, David Kiemle Wiley; 7th Edition.

(3) Infrared spectra of Complex molecules**:** J. Bellamy, John Wiley & Sons, Inc., 3rd Edition.

(4) Spectroscopic Method in Organic Chemistry**:** Dudley Williams, Ian Fleming McGraw-Hill Education; 6th Edition.

(5) Applications of spectroscopic techniques in Organic Chemistry**:** P.S. Kalsi, New Age International; 6th Edition.

(6) Elementary Organic Spectroscopy; Principles And Chemical Applications**:** Y. R. Sharma, S. Chand & Co Pvt Ltd.

(7) Fundamentals of Molecular Spectroscopy**:** C. M. Banwell and E. McCash, Tata McGraw Hill, 4th Edition.

(8) Modern Raman Spectroscopy**:** A Practical Approach; Ewen Smith, Geoffrey Dent., Wiley; 1st Edition.

Shri Govind Guru University, Godhra
B.Sc. Sem-V Chemistry
CHE – 305 (Subject Elective)
Soil Composition and Analysis

Unit I

Introduction to Soil Chemistry [14 Marks]

Importance of soil, soil formation, composition of soil, the soil profile, types of soil, micro and macro plant nutrients.

Unit II

Analysis of Primary Nutrients [14 Marks]

Soil fertility and productivity, techniques for the analysis of soil, soil reaction, determination of total nitrogen in soil, determination of phosphorus in soil, determination of potassium in soil by flame photometry.

Unit III

Analysis of Secondary Nutrients [14 Marks]

Determination of total sulphur in soil, determination of calcium in soil determination of magnesium in soil, determination of lime and liming material in soil.Mechanical analysis of soil.

Unit IV

Analysis of Micro Nutrients [14 Marks]

Determination of total manganese in soil, determination of Fe (II) and Fe (III) in soil, determination of silica in soil, determination of soluble salts in soil, determination of sodium in soil by flame photometry.

Reference Books:

(1) Environmental Chemistry**:** H. Kaur, PragatiPrakashan, 2nd Edition.

(2) Soils in our Environment**:** Raymond W. Miller, Duane T. Gardiner, Prentice Hall,8th Edition.

Shri Govind Guru University, Godhra
Syllabus for B. Sc. Chemistry Semester V
CHE - 306
Practical [I] (Inorganic and Physical Practicals

[A] Inorganic Qualitative Analysis:

Inorganic Qualitative Analysis of mixture containing six radicals only.

(Minimum 08 mixtures to be done)

[B] Physical Chemistry (Kinetics, Solubility & Instruments)

(1) Kinetics and solubility:

Investigate the order of reaction in experiments no. 1, 2 and 3 by graphical method.

Exp1: Reaction between KBrO3 and KI (a = b)

Exp 2: Reaction between H2O2 and HI (a ≠ b)

(2) Instruments:

Exp 1: Determine dissociation constant of monobasic acid (CH**3**COOH) using pH meter.

Exp 2: Determine the amount of bases in given mix (NaOH+NH4OH) Conductometrically using standard solution of HCl

Exp3: Determine the amount of ferrous in the given solution of Ferrous Ammonium Sulphate potentiometerically using standard KMnO**4** solution.

Reference Books

(1) Vogel's "Textbook of Quantitative Chemical Analysis"**:** Pearson Education Ltd. 6th Edition, 2008.

(2) Vogel's "Qualitative Inorganic Analysis"**:** Pearson Education Ltd. 7th Edition, 2009.

(3) Gurdeep Raj, "Advanced Practical Inorganic Chemistry"**:** Krishna Prakashan, Meerut, 21st Edition, 2009.

(4) J. B. Yadav, "Advanced Practical Physical Chemistry"**:** Krishna Prakashan, Meerut, 29th Edition, 2010.

(5) P. H. Parsania, "Experiments in Physical Chemistry"**:** Neminath Printers Rajkot 1st Edition 2004.

(6) A. M. James and F. E. Prichard, "Practical Physical Chemistry"**:** Longman Group Limited London 3rd Edition Reprinted 1979.

Practical [II] (Organic and Analytical Practicals)

[A] Organic Preparation:

(i) Nitration of Acetanilide

(ii) Partial Reduction : m-nitro aniline from m-di-nitro benzene to

(iii) Benzilic Acid from Benzil (Green Preparation)

(iv) 1,5-Diphenyl-penta-1,4-diene-3-one from Benzaldehyde and Acetone (Green Preparation)

[B] Analytical:

(B-1) Organic Estimation:

(i) Unknown Acid (e.g., Oxalic, Succinic, Citric, Tartaric, Benzoic, Phthalic and Cinnamic acid)

(ii) Ester

(B-2) Chromatography [TLC]

Analysis of the following drugs by Thin Layer Chromatography.

(i) Aspirin (ii) Paracetamol (iii) Ibuprofen

Reference Books :

(1) A. I. Vogel, "Elementary Practical Organic Chemistry Part-II, Qualitative Organic Analysis"**:** CBS Publishers & Distributers, New Delhi, 2nd Edition, 2004.

(2) A. I. Vogel, "Elementary Practical Organic Chemistry Part III Quantitative Organic Analysis"**:** CBS Publishers & Distributers, New Delhi, 2nd Edition, 2004.

(3) Hand book of Organic qualitative analysis by H. T. Clarke.

(4) Practical Organic Chemistry**:** F. G. Mann and B. C. Saunders. Low – priced Text Book. ELBS, Longman.

(5) V.K. Ahluwalia, SunitaDhingra, "Comprehensive Practical Organic Chemistry –Qualitative Analysis"**:** University Press (India) Private Limited, Hyderabad, 1st Indian Edition, 2010.

(6) "Advanced Practical Organic Chemistry"**:** Stanley Thornes Publishers Ltd., J Leonard, B Lygo, G Procter, 1st Indian Edition, 2004.

(7) "Quantitative Analysis"**:** R. A. Day, A. L. Underwood, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th Edition, 2004.

Shri Govind Guru University, Godhra

Syllabus for B.Sc. Sem-VI

CHE - 307 (Organic Chemistry)

UNIT I

(A) Stereo Chemistry [08 Marks]

Concept of prostereo isomerism and chiral synthesis (Asymmetric Induction), Cram's rule, Prelog's generalization, Prelog's rule and assignment of configuration.

(B) Stereochemistry of compounds other then Carbon [06 Marks]

Stereo chemistry of the compounds containing Nitrogen. Phosphorus and Sulphur

UNIT II

(A) Alkaloids [07 Marks]

Classification, General method of determining structure, analytical and synthetic methods, structure of Coniine, Nicotine, Atropine and Papaverine.

(B) Isoprenoids [07 Marks]

Classification, General method of determining structure, Isoprene rule, Chemistry of Citral, α-Terpineol, Camphor and their synthesis, study of reactions of β-carotene (No Synthesis).

UNIT III

(A) Synthetic Dyes [04 Marks]

Classification of Dyes- Anionic and Cationic dyes, Mordant and Vat dyes, Reactive and Dispersed dyes, Synthesis of Alizarin, Malachite green, Indigo, Congo red, Eosin.

(B) Synthetic Drugs [04 Marks]

General Classification, Chemotherapy, Antipyretics, Analgesics, Hypnotics, Sedatives, Anesthetics, Antimalarial, Antiseptics, Cardiovascular drugs.(Minimum two illustrations of each, only names without structures).Methods of preparation and uses of Antipyrine, Phenacetin, n-Hexyl resorcinol, Benzocaine.

(C) Explosives [03 Marks]

Preparation of RDX, PETN, Nitroglycerine, Tetryl.

(D) Pesticides [03 Marks]

Preparation of Aldrine, Malathion, Parathion, Methoxychlor.

UNIT IV

(A) Synthetic Polymer [08 Marks]

Addition or Chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymerizations.

Condensation or step growth polymerization. Polyester , polyamides, Natural and synthetic rubbers.

(B) Fats, Oil and Detergents [06 Marks]

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils, Saponification value, iodine value, acid value. Soaps, synthetic detergents, alkyl and aryl sulphonates.

Reference Books :

(1) Organic Chemistry**:** I. L. Finar, Vol-II, 5th Edition, Pearson Education Ltd.

(2) Organic Chemistry**:** Morrison & Boyd, 6th Edition, Prentice Hall of India Pvt. Ltd.

(3) Stereochemistry of carbon compounds**:** E. L. Eliel, Wiley Eastern Ltd.

(4) Stereochemistry and mechanism through solved problems**:** P. S. Kalsi, New Age International.

(5) Stereochemistry of Organic Compounds: Principles and Applications**:** D. Nasipuri; New Academic Science; 4th Revised Edition.

(6) Organic Chemistry**:** Hendrickson, Cram, Hammond, Mc Graw-Hill.

(7) Organic Chemistry**:** 6th Edition, John Mcmurry, Brooks Cole, International Edition.

(8) Organic Chemistry**:** T.W. Graham Solomons and Craig B. Fryhle Wiley, 8th Edition.

(9) Organic Chemistry**:** Francis A. Carey, Mc Graw-Hill, 7th Edition.

(10) Organic Chemistry**:** Leroy G.Wade, Prentice Hall, 6th Edition.

(11) Organic Chemistry**:** Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers. Oxford University Press, USA.

Shri Govind Guru University, Godhra

Syllabus for B.Sc. Sem-VI

CHE - 308 (Inorganic Chemistry)

UNIT I

(A) Term symbol [07 Marks]

Russel Saunders coupling and determination of Term symbols of the ground state.Calculation of number of microstates. Pigeon hole diagram of $p^2$and d^2configurations. Hund's rule.Hole formulation.

(B) Electronic spectra of metal complexes [07 Marks]

Electronic spectra of transition metal complexes, Laporte orbital and spin selection rules. Orgel energy level diagram of $d^5$and combined diagrams of d^1- d^9, d^2– d^8, d^3–d^7, d^4–d^6 and their spectra. Jahn Teller distortion.Spectro -chemical series.

UNIT II

Quantum chemistry [14 Marks]

Setting up of operators for different observables, Hermitian operator, important theorems concerning Hermitian operator, Particle in a three dimensional box, The rigid Rotator, The Schrodinger equation in spherical polar coordinates for hydrogen atom, separation of variables, solution of R, Θ and Φ equations.

UNIT III

Chemical bonding (II) [14 Marks]

The Huckel Molecular Orbital (HMO) theory, variation principle, solution of Secular equation, HMO treatment to ethylene molecule, allylic cation, allylic free radical and allylic anion, Hybridization: Hybridization wave functions of sp, sp**2** and sp**3**.

UNIT IV

(A) Metal carbonyls [07 Marks]

Mono and poly-nuclear metal carbonyls: Ni(CO)**4**, Fe(CO)**5**, Cr(CO)**6**, Fe**2**(CO)**9**, Fe**3**(CO)**12**, Co**2**(CO)**8**, Mn**2**(CO)**10**, Ir**4**(CO)**12**, Co**4**(CO)**12**.

Metal nitrosyl and metal carbonyl hydrides. Application of IR spectra in the determination of structure of metal carbonyls.

(B) Organometallic compounds [07 Marks]

Definition, classification, synthesis (general methods), properties, structure and application of organometallic compounds of Mg, Al and Be, Structure of Ferrocene and di-benzene chromium.

Reference Books:

(1) Concise Inorganic Chemistry**:** J.D. Lee; Wiley India, 5th Edition (1996).

(2) 'Shriver and Atkins' Inorganic Chemistry**:** Atkins, Overton, Rourke, Weller, Armstrong; Oxford University Press, 5th Edition (2011).

(3) Advanced Inorganic Chemistry**:**.F.A. Cotton and Wilkinson G.; John Wiley, 5th Edition (1988).

(4) Introductory Quantum Chemistry**:** A.K. Chandra; Tata- McGraw Hill, 4th Edition (1994).

(5) Quantum chemistry**:** R.K. Prasad; New Age International, 4th Edition (2010).

(6) Electron and chemical bonding**:** H. B. Grey, W.A.Benjamin. INC, New York.

(7) Inorganic chemistry**:**. James E. Huheey, 4th Edition,Wesley Publishing Company.

(8) Mechanism of Inorganic reaction**:** Basalo and Pearson, 2nd Edition, Wiley Eastern Pvt Ltd.

(9) Introduction to Advanced Inorganic chemistry, Durrant and Durrant, John Wiley.

(10) Advanced Inorganic chemistry**:** (Vol. 1) Satya Prakash, Tuli, Basu and Madan; S. Chand

(11) Advanced Inorganic chemistry**:** Gurdeep Raj; Goel Publishing House, 23rd Edition (1998).

Shri Govind Guru University, Godhra

Syllabus for B.Sc. Sem-VI

CHE - 309 (Physical Chemistry)

UNIT I

Thermodynamics [14 Marks]

Colligative properties: Boiling point elevation and freezing point depression. Molal elevation constant (Kb) and Molal depression constant (Kf), Calculation of absolute value of entropy using third law of thermodynamics, Law of mass action using chemical potential, Partial molar quantity,Partial molar volume.

UNIT II

Electrochemistry [14 Marks]

Concentration cell: Cell with and without transference, Electrode concentration cell, Gas electrode concentration cell, Activity and activity coefficient determination, Define liquid junction potential and how it can be avoided, Equation for liquid junction potential, Decomposition potential, Overvoltage, Tafel equation

UNIT III

(A) Phase Rule [07 Marks]

Binary system : Zn-Cd and Pb-Ag,Zeotropic and azeotropicmixtures (solid and liquid), Steam distillation, Zone refining.

(B) Osmosis [07 Marks]

Desalination and reverse osmosis, Electrodialysis, Electrochemistry and pollution control, Removal of Cu, Ag and Fe from waste water.

UNIT IV

(A) Photochemistry [07 Marks]

Laws of Photochemistry :Grotthuss-Draper Law, Einstein Law, Quantum yield ,Reasons for high and low quantum yield, Fluorescence and Phosphorescence, Chemiluminescence, Photosensitized reactions.

(B) Metallic Corrosion [07 Marks]

Types of corrosion, Electrochemical series, Corrosion in acidic and neutral medium, Differential aeration principle, Atmospheric corrosion, Prevention of corrosion by various factor.

Reference Books :

(1) Physical Chemistry**:** G. M. Barrow, 5th Edition, McGraw-Hill education, India.

(2) Advanced Physical Chemistry**:** Gurdeep Raj, 35th Edition (2009), Goel / Krshina Publishing House.

(3) Principles of Physical Chemistry**:** Puri, Sharma and Pathania, 42nd Edition, Vishal Publishing Company.

(4) Polymer Science**:** Gowariker, Viswanathan and Sreedhar, 1st Edition (2012 reprint) New Age International.

(5) Essentials of Nuclear Chemistry**:** Arnikar, 4th Edition (2012 reprint), New Age International.

(6) Physical Chemistry**:** Atkins, 9th Edition. Oxford University Press.

(7) Advanced Physical chemistry**:** Gurtu and Gurtu, 11th Edition ,PragatiPrakashan.

(8) Physical chemistry**:** Levine, 6th Edition, McGraw-Hill education, India.

Shri Govind Guru University, Godhra

Syllabus for B.Sc. Sem-VI

CHE - 310 (Analytical Chemistry)

UNIT I

(A) Errors and treatment of Analytical data: [08 Marks]

Significant figures, Accuracy and precision, Types of errors and minimization of errors. Ways of expressing accuracy and precision. Rejection of a result, Test of significance (Q-Test, Student t-Test and F-Test) correlation coefficient.Literature of Analytical Chemistry.

(**B**) **Visible Spectroscopy [06 Marks]**

Introduction, Beer Lambert's law, instrumentation (light source, optical system, wavelength selector, light sensitive device), Accuracy and error of Spectrophotometry

UNIT II

(A) Chromatographic methods: [08 Marks]

General principle, classification of chromatographic separation.Ion exchange chromatography (Ion Exchange equlibria, Types of Ion Exchange capacity, Application of Ion Exchange resins).Gas Chromatography, Instrumentation and evolution of data.High Performance Liquid Chromatography (HPLC) Principle and Instrumentation.

(B) Solvent Extraction Separation: [06 Marks]

Principles of solvent extraction, choice of solvent, distribution coefficient, distribution ratio, percentage (%) extraction.The extraction process, solvent extraction of metals, selective extraction and separation efficiency.

UNIT III

Electro analytical Techniques:

(A) Polarography: [07 Marks]

Introduction, Principle, electrode, Types of currents, Determination of half wave potential, Ilkovic equation, methods of determining concentration (Standard addition method and Calibration method

(B) Potentiometry: [07 Marks]

The scope of potentiometric titrations, Precipitation and neutralization titrations, Graphical method including Gran's plot for selecting end point, Differential titration, Dead stop titration, Ion selective Electrode, various types of Ion selective Electrodes and use of Calcium ion selective electrode.

UNIT IV

(A) Atomic Spectroscopy [06 Marks]

Introduction, Principle, Flame Emission Spectroscopy (FES) and Atomic adsorption Spectroscopy (AAS), Principal, comparison and applications, Burners (Total consumption burner and Premix burners)

(**B**) **Acid Base Titrations:** **[04 Marks]**

Titration of poplyprotic acid and mixture of acids, titration of salts, Differential Alkali titration.

(**C**) **Redox titration:** **[04 Marks]**

Titration involving Iodine: iodimetry and iodometry, Titration with reducing agents and oxidizing agents, metallic redactors.

Reference Books :

(1) Analytical Chemistry**:** Gary D. Christian, 6th Edition; Wiley & Sons

(2) Fundamentals of Analytical Chemistry**:** D. A. Skoog, D. M. West and F. J. Holler, 9th Edition, Cengage Learning.

(3) Instrumental Methods of analysis**:** (CBS) H.H . Willard, L.L. Mirrit, J.A. Dean

(4) Solvent extraction in Analytical Chemistry**:** G.H. Morrison, F. Frieiser, John Wiley & Sons, NY.

(5) Instrumental Methods of Inorganic Analysis**:** A.I. Vogel, ELBS

(6) Chemical Instrumentation**:** A Systematic approach- H.A. Strobel

(7) The principals of ion-selective electrodes and membrane transport**:** W.E.Morf

(8) Principles of Instrumental Analysis**:** Douglas A. Skoog., F. James Holler, Stanley R. Crouch, Cengage Learning; 6th Edition.

(9) Quantitative Chemical Analysis**:** Daniel C. Harris, W H Freeman, New York.

(10) Ion exchange and solvent extraction of metal compounds**:** Y. Macros, A.S.Kertes, Wiley, Interscience.

Shri Govind Guru University, Godhra
Syllabus for B.Sc. Sem-VI
CHE - 311 (Subject Elective)
Daily Use Industrial Chemistry

UNIT I Chemistry OfCosmetics [14 Marks]

A general study including preparation and uses of the following : Hair dye, hair spray, shampoo, suntan lotion, face powder, lipsticks, talcum powder, nail enamel, cold creams , vanishing creams, shaving creams .Qualitative and quantitative analysis of borates, carbonates, sulphates, phosphate, titanium and zinc oxide. Analysis of face powder, deodorants and antiperspirants.

UNIT I Chemistry Of Perfumes [14 Marks]

A general study and uses of the following :antiperspirants and artificial flavors, Essential oils and their importance in Perfume industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone. Synthesis and application of Musk xylene, Coumarin, Vanilline, Heliotropian, Linalon,Eugenol, Geraniol ,Civetone, Muscone.

UNIT I Ceramic Industries:

(A)Cement [07Marks]

Introduction, Raw materials,Properties of cement,Uses , Types of cement , High alumina cement, Slag cement, Acid resisting cement, White and coloured cement, Portland cement, Types of Portland cement, Corrosion of concrete or cement stone, Gypsum, Plaster of Paris, Lime and its manufacture.

(A)Glass [07Marks]

Introduction, raw material, types of glasses, properties and uses of glasses, composition, method of analysis sampling and sample preparation, composition analysis preliminary testing, decomposition, chemical methods for the individual constituents of Si, B, Pb, Zn, Al, Cl, Ca, Mg, Ti.

UNIT IVFood Analysis [14 Marks]

Introduction, Reasons for analyzing food, Food safety. Adulteration and contamination:definition. Analysis of moisture of vegetable oils, butter and ghee, honey. Analysis of ash content in spices, honey. Analysis of fat in butter.Analysis of protein content in milk, butter.Analysis of reducing.Sugar of honey.Standard content of some food material.

Reference Books :

(1) E. Stoccchi: Industrial chemistry, Vol-I, Ellis Horwood Ltd. UK.

(2) P.C. Jain , M. Jain : Engineering Chemistry, DhanpatRai& Sons, Delhi.

(3) Shrma , B. K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut(1996).

(4)Basic Text & Reference Books :- Industrial Chemistry, (9th Edition), B.K.Sharma.

(5) A Textbook of Engineering Chemistry by M. M. Uppal

(6) Basic Text & Reference Books :- Industrial Chemistry, (9th Edition), B.K.Sharma.

(7) Basic Text & Reference Books:- Analytical Chemistry by Dr. Alka Gupta, Pragati Prakashan.

(8) Instrumental Methods of Chemical Analysis by Chatwal and Anand

(9) Cosmetics by W. D. Poucher (three volumes)

Shri Govind Guru University, Godhra

Syllabus for B.Sc. Sem-VI

CHE - 312 Practical

Practical –(I) Inorganic and Physical Practical

[A] Inorganic Quantitative Analysis:

(I) Gravimetric determination of the radicals:

(After removal of interfering radicals in mixed solution)

(a) $BaCl_2$, $FeCl_3$ and HCl (Determination of Ba as $BaSO_4$)

(b) $CuSO_4$, $FeSO_4(NH_4)_2SO_4$and H_2SO_4(Determination of Fe as Fe_2O_3)

(c) $CuSO_4$, $Al_2(SO_4)_3$ and H_2SO_4(Determination of Al as Al_2O_3)

(II) Analysis of Alloy:

Brass (Cu → Volumetrically, Zn → Gravimetrically)

[B] Physical: (**Kinetics and Instruments**)

(1) Kinetics:

Investigate the order of reaction in the following experiments by graphical method .

Exp1: Reaction between $KBrO_3$ and KI (a≠ b)

Exp 2: Reaction between H_2O_2 and HI (a = b)

(2) Instruments:

Exp 1: Titration of unknown strength of HCl with standard NaOH solution using pH meter.

Exp 2: Titration of unknown strength of HCl with standard NaOH solution using Potentiometer.

Exp 3: Conductometric titration involving precipitation of NaClwith $AgNO_3$.

Exp4 : To determine the concentration of CrO_4^{2-} and Ni^{2+} in solution by colourimetry.

Reference Books

(1) Vogel's "Textbook of Quantitative Chemical Analysis"**:** Pearson Education Ltd. 6th Edition, 2008.

(2) Vogel's "Qualitative Inorganic Analysis"**:** Pearson Education Ltd. 7th Edition, 2009.

(3) Gurdeep Raj, "Advanced Practical Inorganic Chemistry"**:** Krishna Prakashan, Meerut, 21st Edition, 2009.

(4) J. B. Yadav, "Advanced Practical Physical Chemistry"**:** Krishna Prakashan, Meerut, 29th Edition, 2010.

(5) P. H. Parsania, "Experiments in Physical Chemistry"**:** Neminath Printers Rajkot 1st Edition 2004.

(6) A. M. James and F. E. Prichard, "Practical Physical Chemistry"**:** Longman Group Limited London 3rd Edition Reprinted 1979.

CHE - 312 Practical

Practical –(II) Organic and Analytical Practical

[A] Organic:

Organic separation and Identification:

Separation of Binary Mixtures and Identification (Minimum 8 Mixtures)

(i) Solid + Solid (5 Mixtures)

(ii)) Liquid + Liquid (3Mixtures)

One Mixture from each of the following should be given Acid-Base, Acid-Phenol, Acid-Neutral, Phenol-Base, Phenol-Neutral, Base-Neutral, and Neutral-Neutral. Water soluble compounds are included.

Identification of separated organic compound must be done by physical and chemical tests, sodium fusion test, M.P / B.P., derivatives and crystallization.

[B] Analytical:

Volumetric Analysis:

(1) Estimation of $Fe^{3+}$by EDTA (Back Titration)

(2) Estimation of $Bi^{3+}$by EDTA

(3) Estimation of Chloride by silver nitrate (Mohr's Method)

Reference Books

(1) A. I. Vogel, "Elementary Practical Organic Chemistry Part-II, Qualitative Organic Analysis"**:** CBS Publishers & Distributers, New Delhi, 2nd Edition, 2004.

(2) A. I. Vogel, "Elementary Practical Organic Chemistry Part III Quantitative Organic Analysis"**:** CBS Publishers & Distributers, New Delhi, 2nd Edition, 2004.

(3) Hand book of Organic qualitative analysis by H. T. Clarke.

(4) Practical Organic Chemistry**:** F. G. Mann and B. C. Saunders. Low – priced Text Book. ELBS, Longman.

(5) V.K. Ahluwalia, SunitaDhingra, "Comprehensive Practical Organic Chemistry –Qualitative Analysis"**:** University Press (India) Private Limited, Hyderabad, 1st Indian Edition, 2010.

(6) "Advanced Practical Organic Chemistry"**:** Stanley Thornes Publishers Ltd., J Leonard, B Lygo, G Procter, 1st Indian Edition, 2004.

(7) "Quantitative Analysis"**:** R. A. Day, A. L. Underwood, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th Edition, 2004.