

North Maharashtra University, Jalgaon

SYLLABUS

T. Y. B. Sc

Subject- Chemistry

(Semester 40-10 Pattern)



With Effect From- June 2014

Prepared By

**Chairman, Members of Board of Studies
And Experienced Teachers in Chemistry,
North Maharashtra University, Jalgaon.**

North Maharashtra University, Jalgaon.

Class:- T.Y.B.Sc. (Semester Pattern) (wef. June 2014)

Faculty meeting chaired by Hon. Dean of Science faculty was held on 04th April 2014, the revised syllabus for T.Y.B.Sc. (Chemistry) is accepted and finalized as per guidelines of Academic Council and with reference to the U.G.C. model curriculum. The nomenclature accepted is as follows.

CH-YSC [Y for year, S for semester and C for course number].

The course structure and title of the courses for T.Y.B.Sc. (Chemistry) are as given below:

Course Title	Semester-V	Periods	Marks	
			Internal	External
CH -351	Physical Chemistry	60	10	40
CH -352	Inorganic Chemistry	60	10	40
CH -353	Organic Chemistry	60	10	40
CH- 354	Analytical Chemistry	60	10	40
CH-355	Industrial Chemistry	60	10	40
CH -356(A) OR	Bio Chemistry	60	10	40
CH -356(B)	Environment Chemistry	60	10	40
	Semester- VI			
CH -361	Physical Chemistry	60	10	40
CH -362	Inorganic Chemistry	60	10	40
CH -363	Organic Chemistry	60	10	40
CH -364	Analytical Chemistry	60	10	40
CH -365	Industrial Chemistry	60	10	40
CH -366(C) OR	Polymer Chemistry	60	10	40
CH -366(D)	Chemistry in Every Day Life	60	10	40
	Annual			
CH-307	Physical Chemistry Practical	120	20	80
CH-308	Inorganic Chemistry Practical	120	20	80
CH-309	Organic Chemistry Practical	120	20	80

Note:-

1. Each period is of 50 minutes duration.
2. Each course is having weightage of four periods per week.
3. Each practical course is having weightage of four periods per week.
4. Examination of practical course shall be held at the end of the academic year.
5. A industrial study tour is compulsory for the T.Y.B.Sc. students. The students should submit their tour reports at the time of practical examination.

Chairman B.O.S.

Dean Sci. Faculty

NOTE:

1. There are in all Six theory courses for each semester and Three annual practical courses.
2. Each theory paper carry 50 Marks out of which 10 Marks are allotted for internal assessment. As per the directions given by University, at the end of each semester internal examination will be conducted for 10 marks and University Examination will be conducted for 40 Marks.
3. The practical examination for courses CH-307, CH-308,CH-309 will be conducted at the end of Semester -VI . Each practical course will carry 100 Marks out of which 20 Marks will be allotted for internal assessment and University Examination will be conducted for 80 Marks.
4. The students has a right to chose any one of the optional paper for Vth semester either CH-356(A) OR CH-356(B) Similarly The students has a right to chose any one of the optional paper for VI th semester either CH-366(C) OR CH-366(D)
5. A student is expected to submit a journal certified by the Head of the Department /Head of the Institution.
6. A student will not be permitted to appear at the practical examination unless he / she produce a certified journal. If the journal is lost ,the student should produce a certificate from Head of the department / Head of the Institution stating that he /she has satisfactorily completed the practical work.
7. Industrial tour is compulsory for all the students. The tour report will be evaluated in Organic Chemistry practical CH-309.

Rules for personal safety in Chemistry Laboratory:

- 1) For eye protection, safety goggles must be worn in the laboratory at all times. If the student wears contact lenses, full protection goggles, which provide total seal around eyes, must be worn. All students are expected to wear safety goggles.
- 2) A long sleeved, knee length laboratory coat/ apron is recommended. Long pants and closed toed shoes must be worn for individual safety. Loose clothing, open style shoes and sandals are prohibited. Long hair must be tied up. Each student will have to get his / her own necessary protection items.
- 3) Prior to the practical examination, the teacher-in-charge will check all protective equipment to ensure that they are in order.
- 4) Pipetting by mouth should be avoided. Use of pro-pipette bulbs is recommended.
- 5) All laboratories should be equipped with safety chart, adequate first aid requirements and fire extinguishers.

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sem. -V

Course No:- CH-351

Subject: Physical Chemistry.

Chapter-1:-Photochemistry

(L-14)(M-10)

Introduction, Difference between photochemical and thermo chemical reactions, Laws of Photochemistry, Grotthus-Drapper Law, Einstein's Law of Photochemical equivalence, Quantum yield, Causes for high and low quantum yield, primary and secondary process, Consequence of light absorption by atoms and molecules, Jablonski diagram, Fluorescence, phosphorescence, Quenching of fluorescence.

Experimental Study of Photochemical reactions, Photochemical gas reactions, Photolysis of ammonia, Combination of H_2 and Br_2 , H_2 and Cl_2 reaction, Photosensitized gas reaction, Chemiluminescence, related numericals.

Ref.1:-Page Nos.:- 775-781,784-790,796-797.

Ref.2:-Page Nos.:-1043-1055.

Ref.3:-Page No.:- 1112-1126,1131-1134

Chapter-2:-Chemical kinetics

(L-18)(M-12)

Introduction, Rate laws, Measurement of reaction rate, Order and molecularity, Distinction between order and Molecularity, First order reaction, Derivation of integrated rate law for first order reaction, characteristics and example Thermal decomposition of azo-isopropane,

Second order reaction, Derivation of integrated rate law for Second Order reaction with equal and unequal initial concentration. Characteristics of Second order reaction, example of second order reaction, Decomposition of acetaldehyde.

Third order reaction, Derivation of integrated rate law for with equal initial concentration, characteristics of third order reaction, examples of third order reaction,

Pseudo molecular reaction, Hydrolysis of Methyl acetate, Inversion of cane sugar, Methods to determine order of reaction using Integrated rate equation method, Graphical method, Half life method, Differential method.

Effect of temperature on reaction rate, Arrhenius equation, related numerical.

Ref.-1:-Page Nos.-548-565,571-574.

Ref.-2:-Page Nos.-731-755.

Chapter-3:-Electrochemical Cell.

(L-16)(M-11)

Introduction, Classification of electrochemical cell, Liquid junction potential, Chemical cell with and without transference, concentration cell, electrode concentration cell without transference, electrolyte concentration cell with transference, electrolyte concentration cell with and without transference Determination of junction potential of concentration cell with transference. Reversible with cation and reversible with anion.

Application of emf measurement, Determination of solubility product, Determination, pH of using hydrogen electrode, quinhydrone electrode and glass electrode, potentiometric titrations, Related numerical.

Ref.-1:-Page Nos. 497-519

Chapter-4:-Solid State:

(L-12)(M-07)

Introduction, Unit Cell, Weiss and Miller indices, Inter planar distance in cubic crystals, Properties of crystal, anisotropic, isotropic, etch figure, polymorphism, X rays, Use of X-ray in determination of crystal structure, Bragg's Equation, Bragg's of X ray spectrometer, Powder method of crystal

analysis, x-ray analysis of NaCl, Position of Na⁺ and Cl⁻ ions in lattice, Calculation of inter-planer distance (d) and wavelength (λ) of X rays, Number of molecules in unit cell, Determination of Avogadro's number, related numerical.

Semiconductors, Solar cells, Liquid Crystals, and applications of liquid crystal.

Ref 1:-Page Nos.:-70-73, 76-87.

Ref.2:-Page Nos.:-450-451, 471-473.

Reference Books:-

1. Fundamental of Physical Chemistry - Moron and Prutton 4th edition, Oxford and IBH Publishing Co. Pvt. Ltd.
2. Essential of Physical Chemistry –Arun Bahl, B.S.Bahl, G.D. Tuli, S. Chand Publication, revised edition-2009.
3. Principles of Physical chemistry- Puri, Sharma and Pathaniy-46thEddⁿ.
4. Electrochemistry - C.H.Hanman, John Wiley (1998)
5. An introduction to Electrochemistry - Samuel Glasstone, Affiliated to East-west press.
6. Solid State Chemistry- D.K Chkaravarty, New Age International Ltd. Publisher, New Delhi.
7. Principle of solid state -H.V.Keer (1993),New Age International(P) Ltd., New Delhi.
8. A Basic course in Crystallography - J.A.K.Tareen and R.N.Kutty, University press-2001.

Subject: Physical Chemistry**Chapter-1:-Investigation of Molecular Structure.****(L-13)(M-10)**

Introduction, Molar refraction, Dipole Moment, induced dipole moment, Electrical polarization of molecules. Orientation of dipole in an electric field, Debye equation. Method of determination of dipole moment, vapour-temperature method, Dilute solution method, molecular structure and dipole moment.

Molecular Spectroscopy – Introduction, Electromagnetic radiation, types of spectra, Rotational, Vibration and Electronic energy levels; Region of Spectra, Fluctuation in dipole moment due to rotational, Vibration and electronic excitation. Rotational Spectra of a rigid diatomic molecule, non rigid diatomic molecule-Moment of inertia, Energy Levels, Selection Rules, Nature of Spectrum, Determination of Bond Length, Isotopic Substitution, effect on rotational Spectra. Mathematical interpretation of rotational spectra in terms of bond length, reduced mass and moment of inertia of HCl and CO molecule and related numerical.

Ref.-1:-Page Nos.:-691-697**Ref.-5.:-Page Nos.:-5-9,34-41.****Chapter-2:- Radioactivity****(L-20) (M-12)**

Introduction, Radioactive elements, types of radioactive decay, decay schemes , General characteristic of radioactive decay, Decay kinetics-Decay constant, half life period ,mean life, Units of radioactivity, α decay-The range and ionizing power of α decay, The α particle energy spectrum, Geiger-Nuttals law, β decay-Types of β decay. Detection and measurement of nuclear radiation, G. M. Counter. Related numericals.

Application of radioactivity – Radiochemical principle of tracer technique; application of tracer technique – Chemical investigation reaction mechanism- esterification, hydrolysis, oxidation, structure determination - PCl_5 molecules, Thiosulphate ion, Physico chemical research - Determination of solubility of sparingly soluble substance, Surface area of powder precipitate
Agricultural application – Optimum use of Fertilizer, genetic engineering of crop improvement, Control of Predatory insects.

Medical applications- Thyroditis, Bone fracture Healing, Brain tumor location, Defects in Blood Circulation.

Ref.-6:-Page Nos. 122-125,140-141, 148-150, 299-305,407-410

Chapter-3:- Chemical Thermodynamics

(L-17) (M-10)

Introduction, Second law of Thermodynamics, Entropy, Entropy changes in isolated system, Entropy changes for systems only, Entropy changes in ideal gases and physical transformation, Entropy changes in chemical reactions, Third law of thermodynamics , Evaluation of absolute entropy, Related numericals.

Ref.-1:-Page Nos.:- 162-170,174-175, 176-177, 179-184.

Chapter-4:-Surface Phenomenon and Catalysis

(L-10)(M-08)

Introduction, Adsorption, adsorption of gases by solids, types of adsorption isotherm, Freundlich and Langmuir's, Langmuir's adsorption equation, adsorption of solutes by solids, application of adsorption ,catalysis of gaseous reaction by solid surfaces, One reactant slightly adsorbed, moderately adsorbed, related reaction, catalytic poisonings. Related numericals.

Ref.-1:-Page Nos.:- 810-817, 819-827, 829

Reference Books:-

1. Fundamental of Physical Chemistry - Moron and Prutton-4th edition,Oxford and IBH Publishing Co.Pvt.Ltd.
2. Essential of physical chemistry – ArunBahl, B.S.Bahl,G.D.Tuli, S. Chand Publication revised edition-2008.
3. Chemical Kinetics-K.J.Laidler
4. Basic Chemical Kinetics - G.L.Agrawal (1990),Tata McGraw Hill Publishing Co.Ltd., NewDelhi.
5. Fundamental of molecular spectroscopy by C.N. Banwell and McCash, 4th edition/5th edition,Tata McGraw Hill Publishing Co.Ltd.
6. Essentials of Nuclear Chemistry – H.J. Arnikar 4th Edition.

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sem. – V

Course No. CH-352

Sub. : Inorganic Chemistry

Chapter - 1 : The Copper group Coinage Metals (L-8, M-6)

Introduction, Electronic structure, Extraction and uses of Cu, Ag and Au, Oxidation states, photography, Biological role of Cu.

Ref. - 1 : Page Nos. 816-820, 826,27, 832, 833.

Chapter - 2 : Solvents, solutions Acids and Bases. (L-16, M-10)

- a] Donar and Acceptor properties.
- b] Molten salts, solvents for electrochemical reactions, purity of solvents.
- c] Definition and approaches, solvent system concept, Lux-flood concept, Lewis concept, Generalized Acid-base concepts.
- d] Differentiating and Leveling solvents.
- e] Co-solvating agents.
- f] Strength of Hydracids and oxy acids.
- g] Strength of Lewis acids and bases
- h] Hard and soft acids and bases: definitions, Pearson HSAB concept, theories of Hardness and softness, application and limitation of HSAB concepts.

Ref. - 2 : Page Nos. 220, 221, 223-229, 234-236.

Ref. - 3 : Page Nos. 238-249, 255-258, 263, 266, 269, 270.

Ref. - 4 : Page Nos. 374-386.

Chapter - 3 : Basic concepts of coordination chemistry (L-12, M-8)

Double salts and coordination compounds, co-ordination complexes and complex ions, coordination number, Unidentate, bidentate and polydentate ligands, chelating ligand and chelates, physical methods used in study of complex, Nomenclature of coordination compounds.

Ref. - 5 : Page Nos. 729-735, 738-741.

Ref. - 1 : Relevent Pages.

Chapter - 4 : Werner's coordination theory (L-12, M-8)

Assumptions, Werner theory and isomerism, EAN, Stability of complex ion, Factors affecting stability of complex ion, stereochemistry of coordination compound with C.N. 4 and 6, isomerism in coordination compounds.

Ref. - 5 : Page Nos. 735-737, 742-745, 750, 751, 752-757.

Ref. - 1 : Relevent Pages.

Chapter - 5 : Corrosion and passivity (L-12, M-8)

Types of corrosion - Atmospheric corrossion, Immersed corrossion, microbiological corrossion, Thories of corrossion, Protection of metals from corrossion.

Passivity : Defination, types, causes.

Ref. - 6 : Page Nos. 609 to 619.

Reference Books :

- 1] Concise Inorganic Chemistry 5th edition by J.D. Lee., Page Nos. 816-820, 826, 827, 832, 833.
- 2] Basic Inorganic chemistry 3rd edition by F.A. cotton, G. Wilkinson, Paul Guss John Wiley and Sons., Page Nos. 220, 221, 223-229, 234-236.
- 3] Theoretical principals of Inorganic chemistry by G.S. Manku, Tata Mc. Graw Hill edition. Page Nos. 238-249, 255-258, 263, 266, 269, 270.
- 4] Advanced Inorganic chemistry by Gurudeep Raj., Vol. I, 23rd Edition, Goel publishing House Meerut., Page Nos. 374-386.
- 5] Principals of Inorganic Chemistry by B.R.Puri, L.R. Sharma, K.C. Kalia, Milestone publishers and distributors, Page Nos. 729-735, 738-741.
- 6] Advanced Inorganic Chemistry, Fifth Aug. edition by Dr. S.K. Agrawal and Dr. Keemtila Pragati Prakashan, Page Nos. 609 to 619.

T.Y.B.Sc. Chemistry

Sem. – VI

Course No. CH-362

Sub. : Inorganic Chemistry

Chapter - 1 : Modern Theories of M-L Bonds : V.B.T. (L-8, M-6)

The main points of V.B.T., Examples of square planar, tetrahedral and octahedral complexes, short coming of V.B.T.

Ref. 1: Page Nos. 760 - 779.

Chapter - 2 : Modern Theories of M-L Bonds : C.F.T. (L-14, M-10)

Assumptions, Degeneracy of 'd' orbitals, Application of CFT to square planer, tetrahedral and octahedral complexes. C.F.S.E., Calculation of C.F.S.E. in weak field and strong field complexes, Evidences of C.F.S.E., Factor's affecting $10 Dq$, CFT and magnetic properties, spin only magnetic moments, equation, Electron occupancy in CFT, Problems related to calculation of spin only magnetic moment for square planer, tetrahedral and octahedral complexes, (' ' for high spin and low spin complexes) spectro chemical series, John Teller distortion, limitations.

Ref.1 : Page Nos. 760 - 779.

Ref.2 : Page Nos. 194-236.

Chapter - 3 : Thermodynamic Properties of Coordination Complexes (L-16, M-10)

CFSE : High spin octahedral complexes.

CFSE : Tetrahedral complexes of site preferences.

Low spin octahedral complexes. Oxidation state of transition metal

CFSE : complexes in aqueous media.

Ref. 3: Page Nos.505-532.

Chapter - 4 : Modern Theories of M-L Bond - M.O.T. (L-6, M-4)

Molecular orbital theory of coordination complex, Introduction, Assumptions, Molecular orbital treatment of octahedral complexes, effect of pi

bonding, charge transfer spectra, comparison of VBT, CFT and MOT.

Ref. 2: Page Nos. 227-230.

Chapter -5: Some Transition and Inner Transition Elements.(L-16, M-10)

A] Occurrence, Extraction, properties and uses of Transition elements Ti, V and Cr.

B] Occurrence, Extraction, properties and uses of Inner transition elements Th, U and Plutonium.

Ref. 4: Page Nos. 305-312, 466-472.

References.

1. Principle of Inorganic Chemistry by B.R. Puri, L.R. Sharma, K.C. Kalia, Milestone Publisher and distributor, Page Nos. 760 - 779.
2. Concise Inorganic Chemistry, 5th Edition - J.D. Lee, Page Nos. 194-236.
3. Modern Aspect of Inorganic Chemistry - H.J. Emeleus, A.G. Sharpe, Page Nos.505-532.
4. Advanced Inorganic Chemistry, Vol - II, Satya Prakash, G.D. Tuli, S.K. Basu, R.D.Madan, Page Nos. 305-312, 466-472.

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sem. – V

Course No. CH-353

Sub. : Organic Chemistry

Chapter 1: Structural Effects (10 L, 6 M)

Inductive effect, Resonance effect, Steric effect, Hyper conjugation,
Application of all these effects in deciding the strength of acids and bases.

Ref.2-Relevant Pages.

Ref.3-Pages 21-28.

Chapter 2: Nucleophilic Substitution at Saturated Carbon (10 L, 8 M)

Introduction, Relation between kinetics and mechanism. The SN^1 , SN^2 and SN^i mechanism. Stereo chemical implications of mechanism SN^2 mechanism- Inversion of configuration SN^1 mechanism-Racemisation SN^i mechanism- Retention of configuration Effect of structure and solvent on SN^1 and SN^2 mechanism.

Ref.3- Pages 77-92 and 95-99.

Ref.2- Relevant Pages.

Chapter 3: Elimination Reactions (10 L, 6 M)

Introduction, $E1$, $E2$ and $E1cb$ mechanism, Stereochemistry of $E2$ reactions (Newman Projection formula is expected) Orientation: Saytsev's and Hofmann elimination.

Ref.3 -Pages 240-255 .

Ref.1,2- Relevant Pages.

Chapter 4: Electrophilic Addition to C=C

(10 L, 6 M)

Introduction, Addition of halogens, Addition of HX and orientation of addition, Other addition reactions-Hydration, Hydroxylation, Hydrogenation, Ozonolysis.

Ref.3 -Pages 175-190.

Ref.1,2- Relevant Pages.

Chapter 5: Nucleophilic Addition to C=O

(10 L, 8 M)

Structure and Reactivity, Addition of water, alcohol, thiol, hydride ion, derivatives of ammonia. Carbon nucleophilic addition-Aldol Condensation, Perkin reaction, Claisen ester condensation.

Ref.3 - Pages 202-226.

Ref.2,4,5- Relevant Pages.

Chapter 6: Aromatic Substitution

(10 L, 6 M)

Electrophilic Aromatic Substitution-Friedal Craft alkylation and its Limitations, Friedal Craft acylation, Diazo coupling reactions.

Nucleophilic Aromatic Substitution- Introduction,

Mechanisms: Addition – Elimination mechanism,

Elimination-Addition mechanism (Benzyne intermediate)

Ref. 4-Relevant Pages.

Reference Books:

1) Organic Chemistry by F.A. Carey (IIIrdEdn).

2) Organic Chemistry by Morrison and Boyd, VIthEdn.

3) A guide book to Mechanism in Organic Chemistry by Peter Sykes,VIthEdn.

4) Organic Chemistry by S. H.Pine,VthEdn.

5) Organic Chemistry by Jerry March.

T.Y.B.Sc. Chemistry

Sem. – VI

Course No. CH-363

Sub. : Organic Chemistry

Chapter-1: Spectroscopy

(4 L, 2 M)

A) Introduction

Meaning of spectroscopy, nature of electromagnetic radiations, wavelength, frequency, energy, amplitude, wave number, units of measurement. Different regions of electromagnetic radiations.

Interaction of radiation with matter, excitation of molecules to different energy levels i.e. rotational, vibrational and electronic.

Ref.-1,2,3-Relevant pages.

B) Ultraviolet spectroscopy

(10 L, 6 M)

Introduction, Nature of UV Curve, Electronic excitations and its types.

Effect of solvent on electronic transition

Terms used in UV spectroscopy, Chromophore, auxochrome, bathochromic shift and Hypsochromic shift.

Effect of conjugation on UV bands, Calculation of λ_{max} by using Woodward Fieser rules for diene and enone system.

Applications of Ultraviolet spectroscopy.

Ref.-1,2,3-Relevant pages.

C) Infrared Spectroscopy

(10 L, 6 M)

Introduction, Principles of IR spectroscopy, fundamental modes of vibrations, Types of vibration, fundamental group region.

Characteristic IR absorption of following groups-

Alkanes, alkenes, alkynes, alcohols and ethers, alkyl halides, amines, aldehydes, ketones, acids, esters, amides, Aromatic compounds and their substitution pattern.

Factors affecting IR spectroscopy - Inductive effect, Resonance effect, Hydrogen bonding.

Applications of IR spectroscopy - Structure determination, Study of chemical reactions, hydrogen bonding.

Ref.-1,2,3-Relevant pages.

D) NMR Spectroscopy (10 L, 6 M)

Introduction, Principles of NMR spectroscopy, magnetic and nonmagnetic nuclei, Nuclear resonance, chemical shift, molecular structure, shielding and deshielding, measurement of chemical shift, δ scale and τ scale, TMS as reference and its advantages. Peak area, spin-spin coupling, coupling constant, J values (only first order coupling) Applications of NMR spectroscopy.

Ref.-1,2,3-Relevant pages.

E) Problems based on UV, IR and NMR Spectroscopy (8 L, 8 M)

Spectral data such as λ max values, IR frequencies, chemical shift (δ values) and coupling constant should be provided to students.

Ref.-1,2,3-Relevant pages.

Chapter 2 : Designing Organic Synthesis (9 L, 6 M)

Introduction, Different terms used – Disconnection, Synthons, Synthetic equivalence, FGI, TM.

One group disconnection, Disconnection of simple alcohols, ethers and sulphides.

Ref-4. Relevant pages

Chapter 3: Stereochemistry of Cyclohexane

(9 L, 6 M)

Conformations of cyclohexane-chair and boat forms.

Factors affecting stability of conformations, Axial and equatorial bonds in cyclohexane.

Mono substituted cyclohexane, Locking of Conformations.

Ref.5,6,7- Relevant pages.

Reference Books:

1. Spectroscopic Methods in Organic Chemistry by Willams Fleming, 4thEdn.
2. Spectroscopy of Organic Compounds by P.S.Kalsi, Wiley Eastern Publication.
3. Spectrometric Identification of Organic Compound by Silverstein, Bassler and Morrill 4thEdn.
4. Designing Organic Synthesis by Stuart Warren, 1983.
5. Organic Chemistry by Jerry March.
6. Stereochemistry of Organic Compounds by P.S.Kalsi, Wiley Eastern Publication.
7. Stereochemistry of Organic Compounds by E.L.Eliel.

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sem. – V

Course No. CH-354

Sub. : Analytical Chemistry

Chapter-1:-Gravimetric Analysis. (16L, 10M)

Unit Operations in Gravimetric Analysis,
Steps of a Gravimetric Analysis, Preparation of the Solution, Conditions of Analytical Precipitation, Digestion of Precipitates, Impurities in Precipitates, Washing and Filtering the Precipitates, Drying or Ignition of Precipitates, Precipitation from Homogeneous Solution, Gravimetric Calculations and Related numerical problems

Ref.1:-Pages 145 to 158.

Ref. 2,3,4,,: Relevant Pages

Chapter-2:-Solvent Extraction. (16L, 10M)

The Distribution Co-efficient, The Distribution Ratio, Percent Extracted, Solvent Extraction of Metals - Ion Association Complex and Metal Chelates, The Extraction Process, The Separation Efficiency of Metal Chelates, Analytical Separations, Multiple Batch Extractions, Counter current distribution, Simple numerical problems on Percent Extracted and Multiple Extraction

Ref.1:-Pages 484 to 498.

Ref. 2,3,4,,: Relevant Pages

Chapter-3:- Ion Exchange Chromatography (10L, 08M)

Introduction, Cation Exchange Resins, Anion Exchange Resins, Cross-linkage, Effect of pH on Separation of Amino Acids, Effect of Complexing Agents-

Separation of Metal ions on Anion Exchange Columns, Applications of Ion Exchange Chromatography

Ref.1:-Pages 517 to 522

Ref. 2,3,4,: Relevant Pages

Chapter-4:-Gas Chromatography (12L, 08M)

Introduction, Principles, Gas chromatography Columns, Gas Chromatography Detectors, Column Efficiency in Gas chromatography- 1) Theoretical Plates, 2) Van Deemter Equation,

3) Capacity Factor and 4) Resolution

Ref.1:-Pages 522 to 528, 511 to 515

Ref.2,3,4,: Relevant Pages

Chapter-5:-High-Performance Liquid Chromatography (06L, 04M)

Introduction, Principles, Equipment for HPLC, Choice of Column Materials for HPLC

Ref.1:-Pages 537 to 545

Ref.2,3,4,: Relevant Pages

Reference Books:-

1. Analytical Chemistry, by G.D. Christian, 5th Edition
2. Chemical Analysis by A.K. Shrivastava, P.C. Jain, S. Chand and company.
3. Quantitative Analytical Chemistry, 5th Edition, by James S. Fritz, George H.Schenk
4. Vogel's Text Book of Quantitative Chemical Analysis by J. Mandham, R.C.Denney, J. D. Barnes, M. Thomas, B. Shivashankar 6th Edition

T.Y.B.Sc. Chemistry

Sem. – VI

Course No. CH-364

Sub. : Analytical Chemistry

Chapter-1:-Potentiometry

(16L, 10M)

Potentiometer and pH meter, The Cell for Potential Measurements, The Glass pH Electrode Principle, Combination Electrode, Theory of Glass Membrane Potential, The Alkaline Error, The Acid Error, Standard Buffers, Accuracy of pH Measurements, Measurements with the pH-meter, Ion-selective Electrodes - Glass Membrane Electrodes, Precipitate Electrodes, Solid-State Electrodes, Liquid-Liquid Electrodes, Plastic Membrane/Ionophore Electrodes, Coated Wire electrodes, Enzyme Electrodes,

Ref.-1:-Page Nos.-312-313,316-325,327-333

Ref.-2 - 6:-Relevant Pages

Chapter-2:-Spectrometry

(20L, 14M)

Interaction of electro-magnetic radiation with matter, Electro-magnetic Spectrum, The Absorption of Radiation, Absorption by Inorganic Compounds, Solvents for Spectrometry, Quantitative Calculations, Beer's Law, Mixtures, Principles of instruments - Sources, Monochromators (prism, diffraction gratings, Optical filters), Cells, detectors, Slits Width, Single Beam Spectrometer, Spectrometric Errors, Deviation from Beer's Law - Chemical deviation, Instrumental deviation.

Ref.-1:-Pages 398-401, 410-411, 413--435, 439-443.

Ref. 2 -6:-Relevant Pages

Chapter-3 Emission Spectrometry

(6L, 4M)

Flame Emission Spectroscopy, Plasma Emission Spectrometry, Distribution between Ground and Excited States,

Ref.-1:-Pages 462 - 467

Ref. 2-6:-Relevant Pages

Chapter-4:-Atomic Absorption Spectrophotometry (10L, 6M)

Principles, Instrumentation – Sources, Burners, Flames, Interferences – Spectral Interferences, Ionization Interferences, Refractory Compound Formation, Physical Interferences, Use of Organic Solvents, Sample Preparation

Ref.-1:-Pages 467 - 475

Ref. 2-6:-Relevant Pages

Chapter-5:-Nephelometry and Turbidimetry:- (8L, 6M)

Introduction, Turbidimetry and Colorimetry, Nephelometry and Fluorimetry, Choice between Nephelometry and Turbidimetry, Theory, Instrumentation, Comparison of spectrometry, Turbidimetry and Nephelometry, Applications of Turbidimetry and Nephelometry

Ref.-3:-Pages 2.389 - 2.397.

Ref. 1,2,4,5,6,-:Relevant Pages

Reference Books:-

1. Analytical Chemistry by G.D. Christian, 5th Edition.
2. Analytical Chemistry, An Introduction: Skoog, West and Holler, 6th Edition
3. Instrumental method of Chemical Analysis by Chaitwal and Anand, 5th Edition.
4. Basic Concept of Analytical Chemistry- S.M. Khopkar
5. Instrumental Methods of chemical analysis- 6th edition Willard, Merritt, Dean and Settle
6. Introduction to instrumental analysis- R.D. Braun

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sem. – V

Course No. CH-355

Sub. : Industrial Chemistry

Chapter-1: General Aspects of industrial Chemistry (M-8, L-12)

Introduction, Scope of industrial chemistry, Basic requirements of industrial chemistry, chemical production, raw materials, unit process and unit operations, quality control, quality assurance, process control, research and development, pollution control, human resource, safety measures, classification of chemical reactions, batch and continuous process, Conversion, efficiency, yield, economic and technical feasibility, patent act and trade marks

Ref.1:- Chapter 2(pp. 26, 27, 31 to 36)

Ref. 2:-Chapter 2 (Relevant Pages)

Ref:Websites–www.wikipedia.org/wiki/patentactand.

www.wikipedia.org/wiki/trademarks

Chapter-2: Sugar Industry.

(M-8, L-12)

Introduction, Sugar Industry in India, Manufacture of cane sugar- Extraction of Juice, Purification of Juice, Sulphitation and Carbonation, Concentration / Evaporation, Crystallization Separation of crystals. Refining (with flow sheet), Grades, Baggase, Celotex.

Ref.3:-pp. 893-898,903.

Ref.2:-Chapter 30 (Relevant Pages)

Chapter-3: Fermentation Industry.

(M-8, L-12)

Introduction, Alcohol Fermentation, Uses of alcohol, Theory underlying process of making alcohols beverages, Manufacture of Beer, Manufacture of Spirit,

Alcohol from Cane Sugar Molasses, Theory of fractional distillation – Coffey's still, Rectified spirit, Absolute alcohol, Fusel oil, Proof spirit, Denatured alcohol.

Ref.2:-pp. 578-596.

Chapter-4:Fertilizers.

(M-8, L-12)

Plant Nutrients, Nutrient functions, Fertilizer types, Need for fertilizers, Essential requirements, Classification of fertilizers, Natural inorganic fertilizers, Artificial-fertilizers-

Nitrogenous fertilizers- Ammonium sulphate, Urea.(Manufacture of Urea & Ammonium Sulphate), Action of Ammonium Sulphate & Urea as Fertilizer, Phosphatic Fertilizers- Triple Super Phosphate (Manufacturing Process Only),Potassium fertilizer.

Ref. 4:-pp. 762-795, 800-801.

Chapter-5:Cement Industry.

(M-8, L-12)

Portland cement, Types of Portland cement, Chemical specifications of Portland cement,Raw-Materials, Manufacture of Cement-Dry and Wet Process, Clinker Compounds, and reactions during formation of Clinker, Setting & Hardening of Cement.

Ref.-2:-pp. 170-181.

Reference Books:-

- 1 Principles of Industrial Chemistry, by Chris A Clausen III and Guy Mattson A Wiley –Inter Science Publication .John Wiley and sons, New York
- 2 . Shreve's Chemical Process Industries 5 th Edition by George T. Austin
- 3 Industrial Chemistry by B.K.Sharma (GOEL Publishing house, Meerut),11 th

Edition,2000

4 Industrial Chemistry by B.K.Sharma, 14 th Edition, 2004.

T.Y.B.Sc. Chemistry

Sem. – VI

Course No. CH-365

Sub. : Industrial Chemistry

Chapter-1: Petroleum Industry.

(M-8,L-12)

- a) Occurrence, Petroleum producer countries in the world,
- b) Exploration Methods
- c) Composition of Petroleum
- d) Refining or Distillation of Petroleum
- e) Anti-Knock Compounds, Octane number, Cetane number, petrohol, power petrol.
- f) Manufacture of Petrol or Gasoline
- g) Cracking process- Thermal, Catalytic, Hydro cracking

Ref.1 pp 340 to352, 356 to358 and363 to 368.

Chapter-2: Industrial Organic Synthesis from Petroleum (M-8, L-12)

- a) Unsaturated Hydrocarbon –preparation of Acetylene (with flow sheet)
- b) Aromatic hydrocarbon- Preparation of toluene (with flow sheet)
- c) Manufacture of methanol from CO and H₂, isopropanol, Glycerol, Acetone (with flow sheet diagram)

Ref: 3 pp 307 to 310, 313 to 315,327,338 and 339 to 342

Chapter-3:Surface Coating Industry

(M-8, L-12)

Introduction, Paints- constituents, Manufacturing Procedure and applications.

Pigments: white pigments and their manufacture (Lithopone and Titanium Dioxide). Black pigments, Blue pigments, red pigments, yellow pigments, Green Pigments, Toners and Lakes

Varnishes: Types and uses

Ref:2 pp424 to 440

Chapter-4: Dyes.

(M-8, L-12)

Introduction, Sensation of Colour, Colour and Constitution, Classification of dyes according to their mode of application and Chemical Constitution.

Synthesis and Uses of dyes:- Congo red, Crystal Violet, Phenolphthalein, Eriochrome Black-T and Indigotin from aniline.

Ref.-3:-1001 to 1004 and 1011 to 1038

Ref.-4:-Relevant Pages.

Chapter-5: Rubber Industry

(M-08, L-12)

Introduction, Classification, Natural rubber- sources, Manufacture of Latex, Dry Rubber, Crepe Rubber, Chemistry of Natural Rubber and properties.

Synthetic Rubber- Common Types, Raw Materials-Chloroprene, isobutylene and isoprene, Preparation of butadiene-styrene synthetic rubber by emulsion process with flow sheet.

Ref: 1 pp 693 to 612 and 623 to 626

Ref: 5 pp. 212 to 214

Reference Books:

1. Industrial Chemistry – M.G.Arora and M.Singh Anmol Publication Pvt. Ltd.,New Delhi.
2. Shreve's Chemical Process Industries, Fifth Edition By George T. Austin, McGraw- Hill Book Company.
3. Industrial Chemistry – B.K.Sharma (11th edition) Goel Publishing House, Meerut.
4. Synthetic organic chemistry – by Gurudeep Chitawl 2nd Edition, Himalaya Publishing House.
5. Riegels's Hand Book of Industrial Chemistry by James A Kent 7th Edition, Van Nostrand Reinhold Company New York.

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sem. – V

Course No. CH-356(A)

Sub. : Biochemistry

Chapter 1 : Carbohydrates and their metabolism

(L16, M 10)

Introduction, definition, classification.

Monosaccharides – structure of glucose (open chain and ring structure), reactions of glucose – oxidation with bromine water and nitric acid, reduction, acetylation, addition of HCN, NH_2OH and phenyl hydrazine, mutarotation.

- a) Disaccharides – structure of sucrose, lactose and maltose.
- b) Polysaccharides - Storage Polysaccharides, structure of starch, Structural polysaccharides, structure of cellulose.
- c) Carbohydrate metabolism

Definition of metabolism, Glycolysis and alcoholic fermentation, Glycolysis- reactions involved and energetics TCA cycle (Kreb cycle) - Reactions involved and energetics

Ref 1 and 2- Relevant pages

Chapter 2 Amino Acids , Proteins and amino acid metabolism(L12, M8)

- a) Introduction, Structure of amino acids with zwitterion structure, classification of amino acids based on nature of R group, amphoteric nature of amino acids, reaction of amino acids with FDNB and Dansyl chloride, Formation of peptide bond

b) Classification of proteins based on functions, based on shape, Structure of Proteins - Primary, Secondary, Tertiary and Quaternary structure. Study of proteins - Alpha Keratins, Haemoglobin.

c) Amino acid Metabolism Transamination, Deamination by enzymes - glutamic dehydrogenase, ammonia lyases, deaminases and deamidases, Decarboxylation.

Ref 1 and 2- Relevant pages

Chapter -3 Enzymes, Lipids and Lipid Metabolism (L12, M8)

a) Introduction, classification, Role of enzymes in biochemical reactions, Michaelis Menten equation (No derivation). Effect of substrate concentration, pH and temperature on enzyme catalyzed reaction.

b) Lipids: -Introduction, Fatty Acids, Nomenclature of Fatty Acids, Triacyl Glycerol, Waxes, Phospholipids, Sphingolipids.

c) Lipid Metabolism β -oxidation - Reactions involved in β -oxidation, energetics of β -oxidation of palmitic acid.

Ref 1 and 2- Relevant pages

Chapter 4: Nucleic Acids (L08, M 6)

a) Introduction, Components of nucleic acids - sugars, bases, nucleosides, nucleotides

b) Watson and Crick model of DNA, Types of RNA (Structure not expected)

Ref 1 and 2- Relevant pages

Chapter 5: Nutrition and Biochemical energetic (L 12, M 8)

a) Nutrition: Requirements of human nutrition, balanced diet.

b) Study of energy rich compounds - pyrophosphates, acyl phosphates, enolic phosphates and thiol esters.

Ref 3 and 4- Relevant pages

Reference Books

1. Outlines of Biochemistry - Conn and Stumpf (4th Edition)
2. Principles of Biochemistry - A L Lehninger (2nd Edition)
- 3 A hand book of Nutrition –Blank F C Ed.
- 4 Food and Nutrition- Jas P K

T.Y.B.Sc. Chemistry

Sem. – V

Course No. CH-356(B)

Sub. : Environment Chemistry

Chapter-1 Atmosphere and Air pollution

(M-12, L-18)

Atmosphere composition, Atmosphere structure, Air pollution, Air pollutants, primary pollutants, carbon monoxide, source and control of CO pollution, NO_x-sources and sinks, control of NO_x, SO_x- Sources and sinks, control of hydrocarbon and photochemical smog, Particulates- sources, effect on human and materials.

Ref-1 P 18-20, 143-160.

Chapter-2 Hydrosphere

(M-6, L-6)

Water resources, Physical chemistry of sea water: composition, equilibria, pH, pE , Aquatic environment and stratification of water bodies, Complexation in natural and waste water, Humic substances, Microbially mediated aquatic reactions, nitrogen cycle, iron and manganese bacteria.

Ref-1 P 51-70.

Chapter-3 Water Pollution

(M-10, L-16)

Classification of water pollutants, Organic pollutants, Pesticides : Classification, persistence, biodegradation , Detergents, Eutrophication, Marine pollution, Oil pollution, Inorganic pollutants: Acid mine drainage, remedial measures, sediments and radioactive material , Thermal pollution, Water quality parameters for drinking, surface and irrigation , Sampling and monitoring water quality parameters: pH, D.O. (Winkler Method), Ammonia, Nitrate and Nitrite, Chloride, Fluoride, Cyanide, Sulphide, Sulphate, Phosphate, metals and metalloids, As , Se, Be, Cd.

Ref-1 P 197-207, 211-214, 228-232, 234-245, 247-251.

Chapter-4 Lithosphere

(M-4, L-4)

Composition of lithosphere / soil, inorganic and organic components in soil, micro and macro nutrients in soil, Nitrogen pathway and NPK- in soil, waste and pollutants in soil.

Ref-1 P 71-77.

Chapter-5 Green House Effect and Global Warming

(M-8, L-16)

Introduction, Greenhouse gases, radioactive forcing, Sources and sinks of CO₂, Causes of fluctuations in global temperature, Global warming and climate changes, Implications of climate changes.

Creation of ozone layer, Mechanism of ozone depletion, Probing the ozone hole, Effects of ozone depletion, Chlorofluorocarbons (CFCs), Stability and reactions of CFCs, Harmful effects of CFCs, CFCs substitutes, Remedial steps.

Ref-3 90-99, 107-123

Reference Books

- 1: Environmental Chemistry- A. K. De, 7th Edition (New Age International Publishers)
- 2: Environmental Chemistry- A. K. Bhagi and C.R. Chatwal (Himalaya Publishing House)
- 3: Environmental Chemistry- H. Kaur 2nd Edition 2007, Pragati Prakashan , Meerut, India.

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sem. – VI

Course No. CH-366(C)

Sub. : Polymer Chemistry

Chapter-1 Basic concepts of polymers

(M-7, L-10)

Brief history, definition, functionality and reactivity, degree of polymerisation, monomers, polymers, homopolymers copolymers, types of copolymers classification of polymers based on origin, native backbone chain (organic and inorganic), thermal response, applications and physical properties. (Plastics, elastomers, fibres and liquid resins), conducting polymers.

Ref-1: 1-14, 142, 143

Ref-2: Relevant pages

Chapter-2 Chemistry of polymerisation

(M-7, L-10)

Introduction, chain polymerisation, free radical polymerisation, ionic polymerisation, step polymerisation, ring opening polymerisation.

Ref-1: 15-44, 52-64

Ref - 2: Relevant pages

Chapter-3 Polymerisation techniques

(M-5, L-8)

Bulk polymerisation, solution polymerisation, suspension polymerisation, emulsion polymerisation, interfacial condensation polymerisation.

Ref-1: 71-79.

Ref -2: Relevant pages

Chapter-4 Polymer degradation(M-4, L-6)

Introduction, types of degradation- chain end degradation and random degradation, thermal degradation, mechanical degradation, photo degradation, biodegradable polymers.

Ref-1:263-268, 271- 275

Ref -2: Relevant pages

Chapter-5 Study of some important polymers (M-8, L-12)

Preparation, properties and uses of following polymers- Polyethylene, Polypropylene, Polyvinyl chloride, Polystyrene, Polyacrylonitrile, Polycarbonates, Phenol-formaldehyde resins, Polyester.

Ref-1: 217-256,

Ref - 2: Relevant pages.

Chapter-6 Glass transition temperature(M-5, L-8)

Glass transition temperature - Definition and explanation, factors affecting glass transition temperature, effect of molecular weight on glass transition

temperature, importance of glass transition temperature.

Ref-1: 150-172

Ref -2: Relevant pages.

Chapter-7 Polymer processing techniques(M-4, L-6) S

Calendaring, die casting, film casting, compression moulding.

Ref-1: 451-457,

Ref -2: Relevant pages.

Reference Books :

1. Polymer Science - V. R. Govarikar.
2. Text books of Polymer Science – F. W. Billmeyer.

T.Y.B.Sc. Chemistry

Sem. – VI

Course No. CH-366(D)

Sub. : Chemistry in Everyday Life

Chapter-1 Chemistry in Biological Process (P 10)

Vitamins: Vitamin-A, Vitamin-B2, Vitamin-C, Vitamin-D, Vitamin-E and Vitamin-K- Name, Source, Function and deficiency diseases.

Enzymes- Classifications, characteristics, role, examples.

Hormones- Sex hormones- Androgens, oestrogens, progesterone, Example, function. Cortical hormones.

Chapter- 2 Soaps and Detergents (P 10)

Soaps – Introduction, detergent action of soap. Toilet soap, bathing bars, washing soaps, liquid soap manufacture – Batch process, cold process, hot process –semi boiled process, boiled process. Additives, fillers and flavours. Significances of acidity and alkalinity.

Detergents – Introduction, Detergent action, types of detergents – cationic, anionic, amphiphilic detergents. Common detergent chemicals. Additives, excipients colours and flavours. Enzymes used in commercial detergents. Environmental Hazards.

Chapter-3. Synthetic Drugs and Dyes: (P 10)

A] Synthetic Drugs:

a) Introduction.

b) Definition: i) Pharmacy ii) Pharmacology iii) Chemotherapy iv) Metabolites and anti- metabolites v) Bacteria vi) Gram positive and Gram negative.

c) Classification on the basis of:

(1) Chemotherapeutics: (Antimalerials, Antiseptic, Antibacterial, Antibiotics, Antifungal.)

(2) Functional: (Analgesics, Antipyretics, Sedatives, Anaesthetics)

B] Synthetic Dyes:

- a) Introduction
- b) Classification of dyes on the basis of structure.

Chapter-5 Cosmetic Chemistry

(P 10)

Unit I - Hair Care Products

Shampoos – principal constituents – thickeners and foam stabilizers – perfumes – preservatives – conditioning agents – antidandruff shampoos.

Hair cream – composition – hair dyes – types – constituents – dye removals

Unit II - Skin Care Product

Skin cleansers – classifications – cold cream – cleansy milk – moisturizers – hand and body lotions – sun screen lotions – constituents

Unit III - Colour Cosmetics

Lipstick – constitutions – manufacturing method – lip glosses – nail polish – formulation – manufacture – face powder – constitution

Unit IV - Dental Product

Oral care product – product categories – toothpaste – toothpowder – oral rinses – mouth washes.

Unit V - Bath Preparation

Bath powders – soap and detergents – constituents – manufacture

Unit VI Synthetic Perfumes :

Definition, Vehicle, Fixative, Odorous substances, Classification, Synthesis of (1) Methyl anthranilate (2) Phenyl alcohol (3) Linalool (4) Musk Ketone (5) α and β -Ionones (6) Vanilline

Chapter-6 Chemistry in day-to-day life

(15 L)

Types of water, desalination, Fresh water, Dissolved Oxygen and water quality. Milk: Definition, Chemical composition of milk of different species such as cow, buffalo and goat. Adulteration in milk like Sugar, Urea, Starch. Essential nutrients for plants, Classification, Major, minor & trace their

sources and forms. Importance of Inorganic Compounds as Medicine- Antacid products Na_2CO_3 , $\text{Al}(\text{OH})_3$, AlPO_4 , $\text{Mg}(\text{OH})_2$, Cis-Platin.

References

1. T.P. Coultate, Food – The Chemistry of its components. Royal Society of Chemistry London, (paperback)
2. Shashi Chowls, Engineering Chemistry, Darpat Rai Publication.
3. B.K. Sharma, Industrial Chemistry.
4. CNR Rao, Understanding Chemistry, Universities Press.
5. A text book of Pharmaceutical Chemistry –II : Dr. A V Kasture & Dr. S G Wadodkar : Nirali Prakashan (2) Organic Pharmaceutical Chemistry : Harkishan Singh & V K Kapoor : Vallabh Prakashan, Delhi
6. Synthetic Organic Chemistry: O.P. Agarwal
7. Modern Technology of Cosmetics, Asia Pacific Business Press Inc., New Delhi, 2004

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc Chemistry

Course No:- CH-307

Subject: Physical Chemistry Practical.

Instructions

1. During preparation of solutions use molar solutions where ever possible.
2. Take minimum volume of solution (10 ml for titrations) and dilute concentration as per as possible.
3. Take at least 10 experiments from each section.

Section-I

Colorimeter / Spectrophotometer

1. To obtain the calibration curve of KMnO_4 using Colorimeter and determine λ_{max} for of KMnO_4 and concentration of KMnO_4 unknown solution. Hence verify the beers law.
2. Determination of λ_{max} and concentration of unknown Cu^{2+} solution and verify the beers law.
3. To determine the amount of Fe^{3+} ion present in the given solution by using salicylic acid by colorimetric titration($\lambda_{\text{max}}= 525$)

Polorimeter

4. To study the kinetics of inversion of cane sugar by polarimeter.
5. Determine the concentration of given solution of an optically active substance (cane sugar) by polrimetric measurement

Potentiometer

6. Determine Ecal and pH of buffer solution ($\text{Citric acid} + \text{Na}_2\text{HPO}_4$) using quinhydrone electrode.
7. Determine the pKa and Ka of dibasic acid by potentiometric titration.
8. Determine formal redox potential of Fe^{2+} to Fe^{3+} by potentiometric titration.

Kinetics

9. To investigate the reaction between H_2O_2 and KI.

10. Study the hydrolysis of methyl acetate in presence of hydrochloric acid.
11. Determine the energy of activation of the reaction between $K_2S_2O_8$ and KI.

Non-Instrumental

12. Molecular weight determination by steam distillation.

Flame Photometry.

13. Estimation of Na, K, Li and Ca by flame photometer in given sample (any two metals).

Turbidimetry

14. Determine the molecular weight of a given polymer by turbidimetry.

Section-II

Conductometry

1. Conductometric titration of mixture of acid and hence determine the strength of acid.
2. Determine the relative strength of monochloro acetic acid and acetic acid conductometrically.
4. Determine the basicity of organic acid by conductometric measurement.

Radioactivity

5. Determine the E_{\max} of Beta particle.

Refractometer

6. Determine of the refractive index of four liquids, hence specific and molar refraction.
7. Determine the molar refraction of homologous methyl, ethyl and propyl alcohol and show that constancy configuration to molar refraction by $-\text{CH}_2$ group.
8. Determination of unknown concentration of A and B by using mixture law.

Viscosity

9. Determine the molecular weight of high polymer using its solution of different concentration.
10. Determine the radius of glycerol molecule by viscosity measurement.

Adsorption

11. Investigate the adsorption of acetic acid in aqueous solution by using activated charcoal.

Partition coefficient

12. Study molecular condition of benzoic acid in toluene and water by determining its partition between toluene and water.

Thermochemistry.

13. Determine the integral heat of dilution of H_2SO_4 starting with solution of different concentration.
14. Determine the integral heat of dilution of KNO_3 and NaCl in water using Dewar vacuum bottles as calorimeter.

15. To determine the heat of hydration of CuSO_4
16. ΔG , ΔH , ΔS of silver benzoate by solubility product and by conductometry.

pHmetry.

17. Determine the pK_a and K_a of weak monobasic acid by pH metric titration.
18. Determine the degree of hydrolysis of aniline hydrochloride pH metrically.
19. Determine the pK_a of various mixtures of sodium acetate and acetic acid in aqueous solution and hence to find the dissociation constant.

Reference Books:-

1. Advanced Practical Physical Chemistry by J.B. Yadav (Goel publishing House Meerut)
 2. Systematic experimental Physical Chemistry by Rajboj & Chondekar (Anjali publication.)
 3. Experimental Physical Chemistry by R.C. Das & B.Behra (Tata McGraw Hill)
 4. Experiments in Of Physical Chemistry by Wilson, NewCombe, Denaro Pergaman Press Rickett.
 5. Findlay's Practical Physical Chemistry. Revised By J.A.Kitchener and B.P.Lavitt.
-

STRUCTURE OF PRACTICAL EXAMINATION (Annual Pattern)

Time:6 ½ hours

Marks:80

Course No:- CH-307

Subject: Physical Chemistry Practical.

Q. 1 :- Experiment No-1	35 Marks
Q. 2 :- Experiment No-2	35 Marks
Q. 3 :-Journal –	05 Marks
Q. 4 :-Oral (General)–	05 Marks
	Total 80 Marks

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B.Sc. Chemistry

Sub: Inorganic Chemistry Practical

Course No. CH-308

Section I

1] Inorganic qualitative analysis:

Separation of binary mixture containing two basic and two acidic radicals (Six mixtures, Excluding phosphate and borates).

2] Volumetric Estimation (any 3)

1] To determine Calcium in a given CaCl_2 solution by EDTA method.

2] Mn by Volhard's method.

3] Cobalt by Complexometric method.

4] To determine the strength of NaOH and Na_2CO_3 present together in solution.

3] Colorimetric analysis (any one)

1] Estimation of Titanium using H_2O_2 .

2] Estimation of iron using thiocyanate method.

Section II

1] Gravimetric estimation (any two)

- 1] Fe as Fe_2O_3
- 2] Cu as CuO
- 3] Zn as $\text{Zn}_2\text{P}_2\text{O}_7$
- 4] Pb as PbSO_4

2] Alloy analysis (any two)

- 1] Estimation of Zinc from brass alloy by EDTA method.
- 2] Estimation of tin gravimetrically by oxide method from solder alloy.
- 3] Estimation of Antimony volumetrically from type metal.

3] Paper chromatography (Any two mixtures)

Separation and identification of binary mixture of cations.

(Fe^{2+} , Co^{2+} , Ni^{2+} , Cu^{2+})

4] Preparation (Any 3)

- 1] Tris (ethlene diamine) nickel(II) Thiosulphate.
- 2] Bis (acetyl-acetonato) Copper(II)
- 3] Chloropentammine cobalt(III) chloride.

5] Colourimetric Analysis.

- 1] Spectrophotometric titration of Cu(II) against EDTA.

Practical reference books:

- 1] A Text Book of a Quantitative Inorganic Analysis - A.I. Vogel.
- 2] A Qualitative Inorganic Analysis - A.I. Vogel.
- 3] Practical Chemistry - O.P. Pandey, D.N. Bajpai, S.Giri, S.Chand and company Ltd., Ramnagar, New Delhi.

- 4] Post Graduate Practical Chemistry - H.N. Patel, S.P. Turakhia, S.S. Kelker, S.R. Puniyani, Third and fourth revised edition 2005, Himalaya publishing House.
- 5] College Practical Chemistry-H.N. Patel, S.P. Turakhia, S.S. Kelkar, N.S. Raney, S.R. Puniyani, Himalaya publishing House.
- 6] Practical Chemistry- K.K. Sharma, D.S. Sharma (Vikas Publication)
- 7] Vogel Textbook of Quantitative Chemical Analysis - G.H. Jaffery J. Basset.
-

STRUCTURE OF PRACTICAL EXAMINATION (Annual Pattern)

Time:6 ½ hours

Marks:80

Course No:- CH-308

Subject: Inorganic Chemistry Practical.

Q. 1 :- Experiment No-1	35 Marks
Q. 2 :- Experiment No-2	35 Marks
Q. 3 :-Journal –	05 Marks
Q. 4 :-Oral (General)–	05 Marks
	Total 80 Marks

NORTH MAHARASHTRA UNIVERSITY JALGAON

T.Y.B. Sc. - Chemistry

Organic Chemistry Practical (CH-309)

Section -I

A) Separation of Binary Mixtures and Qualitative Analysis

(Minimum 6 Mixtures)

- a) Solid-Solid (4 Mixtures)
- b) Solid-Liquid (1 Mixture)
- c) Liquid-Liquid (1 Mixture)

At least one Mixture from each of the following should be given - Acid-Base, Acid-Phenol, Acid-Neutral, Phenol-Base, Phenol-Neutral, Base-Neutral, Neutral- Neutral.

- i) Separation of the Mixture should be done by chemical method only, ether separation should not be exercised.
- ii) Name and structure of the separated components of the binary mixture is not necessary.
- iii) Students are expected to record the - Type, Preliminary tests, Physical constants, elements and functional groups only.

b) Green Chemistry Preparation (Any 2):-

- a) Synthesis of Acetanilide from Aniline by using Zn dust / Acetic acid.
- b) Synthesis of Dibenzal propanone from Benzaldehyde and Acetone using $\text{LiOH.H}_2\text{O}$.
- c) Nitration of Salicylic Acid by Calcium nitrate tetrahydrate (CaNO_3).

d) Synthesis of Dihydro pyrimidinone from Ethyl acetoacetate, Benzaldehyde and Urea.

Note:-

- 1) The Preparation or derivative should be carried out on small scale and the starting compound should not be given more than one gram.
- 3) Purity of the product in Preparation and derivative should be checked by thin layer Chromatography (TLC).

Section-II

A) Organic Estimations (Any Four)

- a) Estimation of acetamide.
- b) Estimation of Ethyl benzoate.
- c) Estimation of Vitamin C.
- d) Estimation of Glucose.
- e) Determination of saponification value of the given oil.

B) Organic Preparations (Any Four)

- a) Preparation of Quinone from Hydroquinone.
- b) Preparations of Sudan
- c) Preparation of p-Nitro acetanilide from acetanilide.
- d) Preparation of dibenzylidene acetone from acetone.
- e) Preparation of β -naphthymethyl ether from β -naphthol.
- f) Preparation of Benzhydrol from Benzophenone.

C) Preparation of Derivatives (Any Two)

- a) Preparation of Semicarbazone derivative of aldehydes or Ketones.
- b) Preparation of Oxime derivative of Ketones.

c) Preparation of Aryloxyacetic acid of Phenol.

Note:-

- 1) The Preparation or derivative should be carried out on small scale and the Starting compound should not be given more than one gm.
- 2) Probably double burette method is used for titration where ever it is possible.
- 3) Purity of the sample in Preparation and derivative should be checked by thin layer Chromatography (TLC).
- 4) The Head of the Department must see that the industrial tour will be arranged collectively by the department staff members.

Reference Books

- 1) Practical Organic Chemistry by – A.I. Vogel.
- 2) Practical Organic Chemistry by – O.P. Agarwal.

STRUCTURE OF PRACTICAL EXAMINATION (Annual Pattern)

Time Allowed -6 ½ hours

Marks:80

- | | |
|--|-----------------|
| 1. Binary Mixture separation and qualitative Analysis | 35 Marks |
| 2. Organic Estimation/ Preparation/ Derivative/Green Chemistry expt- | 25 Marks |
| 2. Journal | 05 Marks |
| 3. Oral | 05 Marks |
| 4. Industrial Visit | <u>10 Marks</u> |

Total Marks 80

Pattern of Question Paper

T. Y. B. Sc. Chemistry (Theory)

Q.1 10 Objective questions will be asked the students will have to solve **any 8**

(8 x 1 Mark each = 8 Marks)

Q.2 6 Questions of 2 Marks each will be asked the students will have to solve

any 4

(4 x 2 Marks each = 8 Marks)

Q.3 3 Questions of 4 Marks each will be asked the students will have to solve

any 2.

(2 x 4 Marks each = 8 Marks)

Q.4 A. 3 Questions of 3 Marks each will be asked the students will have to solve

any 2.

(2 x 3 Marks each = 6 Marks)

B. One question of 2 marks will be compulsory. (1 x 2 Marks = 2 Marks)

Q.5 2 Questions of 8 Marks each will be asked the students will have to solve

any 1.

(1 x 8 Marks = 8 Marks)

Job opportunities for B.Sc. (Chemistry) students

- The course helps the students in improving their diverse skills in various areas such as laboratory skills, numerical and computing skills, ability to approach to the problems both analytically and logically, time management skills, etc.
- As a Chemist in the Sugar, Pharmaceutical, Chemical, Soap, Detergent, Surfactant, Cement, Fermentation, Textile Dyeing and Printing, Rubber, Petroleum, Pesticide, Food industries.
- As a Chemist in Municipal Corporation, Water treatment plant.
- For Research and Development department of Pharmaceutical, Chemical, Soap, Detergent, Surfactant, Cement, Fermentation, Textile Dyeing and Printing, Rubber, Petroleum, Pesticide, Food, Plastic, Ceramic, Perfumery, Agrochemical industries.
- In the Q.C. department of pharmaceutical, chemical, soap, detergent, surfactant, cement, fermentation, dye, rubber, petroleum and pesticides industries.
- In the Q.A. Executive in Pharmaceutical, Chemical, Soap, Detergent, Surfactant, Cement, Fermentation, Textile Dyeing and Printing, Rubber, Petroleum, Pesticide, Food industries.
- In the Production section and plant operator in Pharmaceutical, Chemical, Soap, Detergent, Surfactant, Cement, Fermentation, Textile Dyeing and Printing, Paper Rubber, Petroleum, Pesticide, Food industries.
- As an analyst in synthetic labs, Forensic Science Department, etc.
- As a Marketing Representative (M.R.) for the Pharmaceutical, Chemical, Soap, Detergent, Surfactant, Cement, Fermentation, Textile Dyeing and Printing, Paper, Rubber, Petroleum, Pesticide, Food products.
- As a Analytical Chemist, Biomedical Chemist, Chemical Engineering Assistant, Industrial Research Scientist, Lab Chemist, Materials Technologist, Production Chemist, Production Officer, Quality Controller, R&D Chemist, Research & Development, Safety Health And Environment Specialist, Teacher.