



MANONMANIAM SUNDARANAR UNIVERSITY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Chemistry

(Choice Based Credit System)

(with effect from the academic year 2021-2022 onwards)



Semester-V				
Part	Subject Status	Subject Title	Subject Code	Credit
III	Core	ORGANIC CHEMISTRY – II	CMCH51	4
III	Core	PHYSICAL CHEMISTRY – II	CMCH52	4
III	Major Elective I	POLYMER CHEMISTRY / BIO CHEMISTRY	CECH51/ CECH52	4
III	Major Elective II	MODERN INSTRUMENTAL ANALYTICAL TECHNIQUES/ APPLIED CHEMISTRY	CECH53/ CECH54	4
III	Major Practical V	ORGANIC ANALYSIS & PHYSICAL CONSTANT DETERMINATION	CMCHP5	4
III	Major Practical VI	GRAVIMETRIC ESTIMATION & INORGANIC PREPARATION	CMCHP6	
IV	Skill Based Common	PERSONALITY DEVELOPMENT/EFFECTIVE COMMUNICATION	CCSB51/ CCSB52	2



Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. Scheme for internal Assessment:

Maximum marks for written test: **20 marks**

3 internal tests, each of **1 hour** duration shall be conducted every semester.

To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks.

The break up for internal assessment shall be:

Written test- 20 marks; Assignment -5 marks Total - 25 marks

B. Scheme of External Examination

3 hrs. examination at the end of the semester

A – Part : 1 mark question two - from each unit

B – Part : 5 marks question one - from each unit

C – Part : 8 marks question one - from each unit

➤ **Conversion of Marks into Grade Points and Letter Grades**

S.No	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	O	10	Outstanding
2	80-89	A+	9	Excellent
3	70-79	A	8	Very Good
4	60-69	B+	7	Good
5	50-59	B	6	Above Average
6	40-49	C	5	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

➤ **Cumulative Grade Point Average (CGPA)**

$$CGPA = \frac{\sum (GP \times C)}{\sum C}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

➤ **Classification**

- First Class with Distinction : CGPA $\geq 7.5^*$
- First Class : CGPA ≥ 6.0
- Second Class : CGPA ≥ 5.0 and < 6.0
- Third Class : CGPA < 5.0



ORGANIC CHEMISTRY II

Course Objectives

The primary objectives of this course are to

- Learn about stereochemistry and conformational analysis
- Study amino acids and carbohydrates
- Understand aromaticity and study reactions of aromatic compounds
- Gain Knowledge on Heterocyclic compounds

UNIT I OPTICAL ISOMERISM

Representation of molecules in saw horse, Fischer, flying-wedge and Newman formulae and their inter translations.

Symmetry elements - chirality – asymmetric molecules and molecular dissymmetry-pseudo asymmetry.

Optical rotation – specific rotation –optical purity – racemisation (through cationic and anionic and radical intermediates), resolution of acids, bases and alcohols via diastereomeric salt formation.

Optical isomers - enantiomers – diastereomers – epimers - notation of optical isomers - Cahn-Ingold-Prelog rules, R and S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations - D and L representations
Optical activity in compounds without asymmetric carbon atoms namely biphenyls, allenes and spiranes. Stereo selectivity – stereo specificity – partial asymmetric synthesis. point,dipole moment – chemical method – dehydration and cyclisation.

UNIT II GEOMETRICAL ISOMERISM AND CONFORMATIONAL ANALYSIS

Geometrical isomerism – nomenclature of geometrical isomers – cis – trans ,E-Z notation and syn-anti for C=C,C=N compounds. Methods to assign configurations.

Stability of geometrical isomers and heats of hydrogenation.

Tautomerism: Keto – enol Tautomerism, Amido – imido Tautomerism, Amino – imino Tautomerism.

Conformational analysis of ethane, propane, n-butane, haloethane, 1,2-dihaloethane, 1,2-glycol and 1,2-halohydrin, cyclopentane. Relative stability of conformers on the basis of steric effect, dipole-dipole interaction, H-bonding.

UNIT III AMINOACIDS AND CARBOHYDRATES

Amino acids - classification, general methods of preparation and reactions of amino acids, zwitter ion - isoelectric point, action of heat.

Classification-Monosaccharides- constitution of glucose and fructose. Reactions of glucose and fructose – Osazone formation, Mutarotation, cyclic structure, pyranose



and furanose forms. Epimerisation- Interconversions of aldoses and ketoses.
 Disaccharides- sucrose- reactions (elucidation of structure not necessary).
 Polysaccharides – starch and cellulose (elucidation of structure not necessary).

UNIT IV AROMATICITY AND AROMATIC SUBSTITUTION

Aromaticity – definition – Huckel's rule– stability, carbon-carbon bond lengths of benzene, resonance energy Benzenoid and Non-benzenoid aromatic compounds
 Aromatic electrophilic substitution – Mechanism of nitration, halogenation, sulphonation and Friedel-Crafts reaction. Activating and deactivating substituents, orientation in mono substituted benzenes, ortho/para ratio- Orientation- Korner's absolute method, dipole moment method – direct influence of substituents – rules of orientation - Aromatic Nucleophilic substitutions- unimolecular, bimolecular and benzyne mechanisms

UNIT V HETEROCYCLIC COMPOUNDS

Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Comparison of basicity of pyridine, piperidine and pyrrole.
 Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution and nucleophilic substitution reaction in pyridine derivatives.
 Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Nepieralski synthesis, mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Text Books

1. K.S. Tewari, N.K. Vishnoi, S.N. Mehrotra. A Text Book of Organic Chemistry, Vikas publishing house (P) Ltd. 2002.
2. Arun Bahl and B. S. Bahl Advanced Organic chemistry, S. Chand and Company Ltd., Reprint 2005
3. P.L. Soni, Text Book of Organic chemistry, Sultans chand, New Delhi, 1991

Reference Books

1. Ernest I. Eliel, Stereochemistry of Organic compounds, Tata McGraw –Hill Publication company Ltd., New Delhi, 1975
2. D. Nasipuri, Stereochemistry of Organic Compounds - Principles and Applications, New Age International Publishers, 1994
3. P. S. Kalsi, Stereochemistry -Conformation and Mechanism, New Age International Publishers, 1994
4. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th Edition, PHI Limited, New Delhi, 1992.
5. Bhupinder Mehta, Manju Mehta, Organic chemistry, PHI Learning pvt. Ltd., 2005.



PHYSICAL CHEMISTRY II

Course Objectives

The primary objectives of the course are to

- Understand the basic concept of thermodynamics
- Study about I, II, & III laws of thermodynamics and its importance
- Gain knowledge in Phase and Ionic equilibria
- Know about conductance and its applications
- Acquire knowledge in various molecular spectroscopy

UNIT I THERMODYNAMICS I

Extensive and intensive variables, state and path functions, open, closed and isolated systems - Zeroth law of thermodynamics-First law of thermodynamics : Concept of heat, q , work, w , internal energy, U or E , and Statement of first law – Enthalpy, H , relation between heat capacities – Calculation of q , w , U or E , and H for reversible, irreversible and free expansion of ideal gases under isothermal and adiabatic conditions -Joule Thomson effect-Joule-Thomson coefficient and its significance-Derivation of the expression for Joule-Thomson coefficient-Inversion temperature. Heats of reaction: Standard enthalpy – Effect of temperature (Kirchhoff's equation) and pressure on enthalpy of reactions-Hess's Law of constant heat summation and its applications.

UNIT II THERMODYNAMICS II

Second law of thermodynamics: concept of entropy, thermodynamic scale of temperature - Statement of second law of thermodynamics - Entropy changes in reversible and irreversible processes-Calculation of entropy change of an ideal gas with change in P , V and T –Entropy changes of an ideal gas in different processes-Physical significance of entropy. Nernst heat theorem- Statement of Third law of thermodynamics – calculation of residual entropy -Calculation of absolute entropy of molecules.

Free energy: Gibbs's and Helmholtz free energy- variation of free energy with temperature and pressure- Free energy change and spontaneity -Gibbs-Helmholtz equation. Partial molar properties-Chemical potential- Gibbs-Duhem equation-Variation of chemical potential with temperature and pressure.

UNIT III PHASE AND IONIC EQUILIBRIA

Phase Equilibria

Phase equilibria: concept of phases, components and degrees of freedom – equilibrium conditions – Derivation of Gibbs phase rule - Clapeyron and Clapeyron-Clausius Equation and its applications- Phase diagram for one component system : Water and



Sulphur systems- Reduced phase rule-Two component system: Simple eutectic systems-Lead-Silver system, Potassium iodide-Water system- Compound formation: (i) Congruent melting point: Zinc- Magnesium system. (ii) Incongruent melting point: Sodium chloride-water system.

Ionic Equilibria

Acids and Bases - Dissociation of weak acids and weak bases - Dissociation of water. pH scale - Common ion effect - Applications - Buffer solutions - Types of buffer solution- Calculation of pH value of buffer solution - Applications of buffer solution- Solubility product - Applications of solubility product principle.

UNIT IV ELECTRICAL CONDUCTANCE

Arrhenius theory of electrolytic dissociation – Conductivity: equivalent and molar conductivity –and their variation with dilution for weak and strong electrolytes –. Kohlrausch's law and its applications - Ionic mobility-Transport number - Determination of transport number: Hittorf's and Moving boundary methods - Applications of conductance measurements – Determination of degree of dissociation of weak electrolytes - Determination of solubility of sparingly soluble salts - Conductometric titrations - Ostwald's dilution law - Debye-Huckel theory of strong electrolytes – Debye-Huckel Onsager Equation – Debye-Falkenhagen and Wein effects –Debye-Huckel limiting law (elementary idea only).

UNIT - V SPECTROSCOPY- I

Spectroscopy: Definitions – Electromagnetic spectrum-various types of molecular spectra.

Rotational spectroscopy: Microwave active molecules- Moment of inertia- types of molecules- rotational spectra of diatomic molecules - selection rules -intensities of spectral lines- applications- effect of isotopic substitution.

Vibrational spectroscopy : Theory –molecular vibrations-simple harmonic oscillator - selection rule- anharmonicity- fundamental, overtone and combination bands – Fermi resonance – degrees of freedom of polyatomic molecules – modes of vibration – Vibration-Rotation spectroscopy : P,Q & R branch lines .

Raman spectroscopy: Principle -Rayleigh and Raman scattering - Raman effect – rule of mutual exclusion principle - differences between IR and Raman spectroscopy

Ultraviolet-visible spectroscopy: Theory – Born-Oppenheimer approximation – Franck- Condon Principle– electronic transitions: selection rule.

Text Books

1. Principles of Physical Chemistry – B.R.Puri, L.R. Sharma and M.S.Pathania, 47th Edition, Vishal Publishing Co,2020.



2. Textbook of Physical Chemistry, P.L.Soni- Sultan Chand 23rd edition 2007.
3. A textbook of Physical Chemistry - A.S Negi & S.C.Anand, Second Edition, New Age International(P) Limited, Publishers,2022.
4. A Textbook of Physical Chemistry, B.R.Puri, L.R. Sharma and M.S.Pathania, 47th Edition, Vishal Publishing Co,2018.
5. Principles and applications of Organic Spectroscopy, W.Kemp 3rd Edition 1993.
6. Fundamentals of Molecular Spectroscopy, C.N. Banwell, E.M. McCash, Tata McGraw-Hill Publishing Compoany Limited. NewDelhi, 2003.
7. Organic Spectroscopy, Principles and Chemical Applications, Y.R, Sharma,S,Chand & Company Limited, New Delhi,2013.

Reference Books

1. Physical Chemistry, Gordon M Barrow, Fifth Edition, Tata McGraw Hill Education Private Limited, 2007.
2. Textbook of Physical Chemistry, M.V.Sangaranarayanan, V Mahadevan, University Press (India Private Limited),2012.
3. Physical Chemistry- Ira. N. Levine, 6th Edition, Tata McGraw Hill Education Private Limited,2011.
4. An Introduction to Electrochemistry, Samuel Glasstone, Read Books Ltd,2011.
5. A Textbook of Physical chemistry Thermodynamics and Chemical Equilibrium, 6th edition, M.C.Graw Hill, K.L.Kapoor, Education, 2019.
6. Thermodynamics for Chemist, S.Glasstone, Reprint 2000.



POLYMER CHEMISTRY

Course Objectives

The primary objectives of this course are to

- Know types of polymer and molecular mass
- Acquire knowledge about the polymerization techniques.
- Know the details of organic and inorganic polymers.
- Understand the processing of polymer and polymer degradation.
- Familiarize about advances in polymers.

UNIT I INTRODUCTION TO POLYMERS AND MOLECULAR WEIGHT OF POLYMER

Basic concepts – Monomers – Functionality. Classification of polymers and characteristic features of each Natural and Synthetic polymers – Thermoplastic and Thermo-setting Plastic, Elastomers, Fibers and Liquid Resins – Addition and Condensation polymers – Linear, Branched and Cross – linked polymers – Homopolymers and Copolymers – Types of copolymers – Alternate, Graft, Block and Random copolymers. Tacticity in polymers – Isotactic, Syndiotactic and atactic polymers.

Importance of Molecular Weight: Degree of polymerization and molecular weight – Number average, Weight average and Viscosity average molecular weights .Glass transition temperature (T_g) – Definition – Factors affecting T_g – relationship between T_g and molecular weight and melting point. Important of T_g.

UNIT II CHEMISTRY OF POLYMERISATION AND POLYMERISATION TECHNIQUES

Chemistry of Polymerisation: Addition and Condensation polymerisation -Mechanism of polymerization – Free radical and ionic (anionic and cationic) polymerisation- Ring opening polymerization, Coordination polymerization – Zeigler Natta catalysts.

Bulk, solution, suspension, emulsion, melt condensation and interfacial polycondensation polymerization.

UNIT III ORGANIC AND INORGANIC POLYMERS

Preparation and Applications

Organic Polymers

Plastics :Polyethylene, Polyvinyl chloride, Polymethyl methacrylate, Polyethylene terephthalate, Teflon, Bakelite

Rubbers :Natural and synthetic rubbers – Polybutadiene, Polyisobutylene, Butyl rubber, Nitrile rubber, Buna – S, Buna-N, Neoprene rubber.



Synthetic fibers : Nylon 6,6, Nylon 6, Rayon.

Inorganic Polymers :Poly(sulphur nitride) (SN)_x, Borazine, Poly(boron nitride), Polyphosphazenes, Silicones.

UNIT IV POLYMER PROCESSING AND POLYMER DEGRADATION

Polymer Processing: Basic principles of processing – Shape and Size – Processing parameters – Polymer compounding – Additives – Fillers – Plasticizers –Antioxidants - Flame retardants – Stabilizers – Colourants .

Processing techniques :Injection moulding – Compression moulding-Blow moulding – Extrusion moulding – Calendaring – Casting – Roaming- Laminating – Coating.

Polymer Degradation – Types of degradation – Thermal degradation – Mechanical degradation. Ultrasonic degradation. Photo degradation – Oxidation degradation – Hydrolytic degradation.

UNIT V SPECIAL TOPICS IN POLYMER SCIENCE

Conducting Polymers: Definition, Types of conducting polymer- Mechanism of electrical conduction – Soliton- Polaron and Bipolaron- Polyacetylene – Polyaniline- Polyaniline nanowire.

Biopolymers: Biomedical polymers – Contact lens – Dental polymers – Polymers used in Artificial Heart, Kidney, Skin, and Blood cells.

Plastic Waste Management – Chemical recycling – Incineration – Pyrolysis – Mixed waste recycling – Types of recycling (10, 20 , 30 and quaternary) development for recycled material

Text books

1. V.R. Gowarikar, N.V.Viswanathan and J.Sreedhar. Polymer science, wiley Eastern, 1995.
2. F.N. Billmeyer, Text book of polymer science, Wiley Interscience, 1971.
3. Mcurie Morten, Rubber technology, Van Noshtrand, Reinold, Newyork
4. B.K. Sharma, Polymer Chemistry, Goel Publishing Home, Meerut, 2011.
5. Nabil Mustafa – “Plastic waste management” Marcel Dekker Inc – 1993.
6. Material Science 2nd edition , P.K.Palanisamy SCITECH Publications India Pvt.Limited Chennai 1st reprint ,March 2005

Reference Books

1. M. Jenkins, Biomedical polymers, University Birningham, U.K, Woodhead Publishing 2007
2. M.G. Arora, M.Singh and M.S Yadew, Polymer chemistry, 2nd Revised edition, Anmol Publications Ltd 2003.
3. Principles of Polymer Science, P.Bahadur, N.V.Sastry, Narosa Publications



- 2002.4. Physical chemistry polymers – A. Tager, Miv Publishers 1972.
4. Polymer chemistry – Properties and applications, Andrew Peacock, Allidon Calhoun, Hanser Publishers, Munich 2006
 5. Modern Chemistry , David, W. Oxtoby, H.P. Gills, Allan Campion Brooks Cenage .Learning India Private Limited, 1st reprint ,March 2008

BIO CHEMISTRY

Course Objectives

The primary objectives of this course are to

- Get knowledge about amino acids and protein
- Study about carbohydrates
- Know the lipids and its significance
- Understand basics of enzymes and its catalytic activity
- Acquire knowledge on nucleic acids and significance of blood.

UNIT I AMINO ACIDS AND PROTEINS

Living Cell: Plant and Animal Cells :Cell Membrane- Organells- Functions of major Cellular components- Anabolism and Catabolism and their relation to Metabolism

Amino acids :Classification- Abbreviated names (one letter- three letter)- Physical properties- Optical properties- Chemical Properties.

Peptides: Nomenclature- Properties of Peptide bond - Solid phase peptide Synthesis.

Proteins: Synthesis – Classification – properties - Structure of protein - Primary, Secondary, Tertiary and Quarternary structure- N-terminal and C-terminal aminoacid Structure analysis . Sequencing techniques-Edman degradation.

Catabolism of aminoacids: Transamination- Oxidative deamination- Urea cycle .

UNIT II CARBOHYDRATES AND METABOLISM

Monosacharides - Structure of aldoses and ketoses: Ring structure of sugars - Conformation of sugars- Mutarotation- Anomers- Epimers and Enantiomers; Structure of biologically important sugar derivatives - Oxidation and Reduction of sugars;

Disacharides and Polysaccharides: Formation of disaccharides- Reducing and Non-reducing

disaccharides-Polysaccharides: Homo polysaccharides (Starch- Cellulose- Glycogen)- Hetero polysaccharides (Mucopolysaccharides- Hyalunonic acid- chondroitin sulphate- Heparin)

Carbohydrate metabolism: Embden Meyerhof pathway- Citric acid cycle.

UNIT III LIPIDS

Definition and classification of lipids- Classification of Fatty acids – Glycerids - Physical and Chemical properties - Analysis of Oils and Fats (Saponification number,



Iodine number, Polenske number, Richert –Meissel number, Acetyl value).

Phospholipids- Glycerophospholipids: Lecithin- Cephalin- Phosphatidylserine- Phosphatidylinositol- Plasmalogens.

Sphingophospholipid: Sphingomyelin- Glycolipid-Cholesterol and Bile acids (structural elucidation not required).

UNIT IV ENZYMES

Classification and Nomenclature of enzymes - General Characteristics of enzymes - Nature of enzymes – Protein and Non-protein- Cofactor and Prosthetic group, Apoenzyme, Holoenzyme - TPP, NAD, NADP, FAD, FADH₂, ATP and their importance in enzyme actions.

Enzyme activity and specific activity- Features of enzyme catalysis, Factors affecting the rate of chemical reaction- Catalytic power and specificity of enzymes (concept of active sites), Fischer lock and key model, Koshland's induced fit model.

UNIT V NUCLEIC ACIDS AND CLINICAL CHEMISTRY

Nucleic Acid: RNA-DNA- Nucleosides & Nucleotides – Structure of DNA and RNA – Ribosomal RNA (r-RNA) - Transfer RNA (t-RNA) – Messenger RNA (m-RNA)

Blood & Analysis of Blood :Components of blood and their functions- Difference between plasma and serum- Blood groups : Rh factors – Blood analysis: Fasting blood sugar, Random blood sugar, Post prandial blood sugar – HbA_{1c} – Albumin – Urea - Cholesterol: HDL & LDL.

Text Books

1. Fundamentals of Biochemistry by J.L.Jain, Sanju Jain & Nitin Jain Publishers Chand and Co Ltd, ISBN 81-219-2453-7, 2008
2. Lehninger: Principles of Biochemistry 6th ed., Nelson, D.L. and Cox, M.M., W.H. Freeman and company (New York), ISBN: 0-7167-1453-1, ISBN : 10: 1-4292-3414-8., 2013.
3. Textbook of Biochemistry with clinical correlations, 7th ed., T.M. Devlin, John Wiley & Sons, Inc (New York), ISBN: 978-0-470-28173-4, 2011.
4. Robert L. Carey, Katherine J. Denniston, Joseph J. Topping, Principles and application of organic and biological chemistry, WBB Publishers, USA, 1993.

Reference Books

1. Principles of protein structure, G.E. Schulz, and R.H. Schirmer. Springer, 1st edition 1996.
2. Medical Laboratory Technology, Volume I, Kanai, L. Mukerjee, CBS Publishers, 2002.
3. Medical Laboratory Technology- Ramnik sood, JPB Publishers, 2009
4. J.L.Jain, Biochemistry, Sultan Chand and Co. 1999



5. A.Mazur and B. Harrow, Textbook of biochemistry, 10th edition W.B. Saunders Co., Philadelphia, 1971.
6. Paula Yurkanis Bruice, Organic Chemistry, 3rd edition, Pearson education, Inc.(Singapore), NewDelhi, reprint, 2002.
7. P.W. Kuchel and G.B. Ralston, Schaum series. Theory and Problems of Biochemistry, Mc Graw- hill Nool company, Newyork 1988.

MORDERN INSTRUMENTAL ANALYTICAL TECHNIQUES

Course Objectives

The main objectives of this course are

- Understand the Principles of chromatography and its practical applications.
- Study various thermo analytical techniques.
- Acquire knowledge in electro analytical techniques.
- Gain the knowledge on the basis of spectrophotometry and analytical applications.
- Study on radio analytical techniques.

UNIT I CHROMATOGRAPHY

Chromatography- Classification-Principles of adsorption- adsorbents.

Thinlayer Chromatography-Choice of adsorbents and solvents- Preparation-Rf values

Paper Chromatography- Principle-Solvent used –Factors affecting Rf values

Applications of Thinlayer and Paper Chromatography.

Ion-Exchange Chromatography-Principle –Type of resins- Requirements of good resin-Action of resins-Experimental techniques and applications.

Gas Chromatography : Principle –Experimental techniques and applications

High Performance Liquid Chromatography: Principle - Instrumentation-Applications.

UNIT II THERMOANALYTICAL METHODS

Thermogravimetric Analysis(TGA): Principle, Instrumentation-Working-Function of each component, Applications of TGA, Study of Oxalates, Sulphates and Nitrates by TGA .

Differential Thermal Analysis(DTA): Principle- Instrumentation- Methodology- Applications, DTA of Calcium Oxalate Monohydrate and Manganese Phosphine Monohydrates.

Differential Scanning Calorimetry (DSC): Principle –Instrumentation - Methodology-Applications-Determination of glass transition temperature(Tg).

Thermometric Titrations: Principle-Experimental Techniques- Types of Thermometric reaction and Applications.



UNIT III ELECTRO ANALYTICAL TECHNIQUES

Introduction to electroanalytical techniques – types of electroanalytical techniques.

Electrogravimetry – Principle of electrogravimetric analysis –Determination of copper – Electolytic separation of copper and nickel.

Coulometry Analysis : Principle of coulometric analysis-Coulometric Titrations-Applications

Voltametry : Polarography-Principle-Experimental assembly-Importance of polarographic curves- Applications to qualitative and quantitative analysis.

Amperometric titrations: Principles and applications

Cyclic Voltametry : Principles and applications.

UNIT IV SPECTROPHOTOMETRY

UV-Visible spectrophotometry: Beer-Lamberts law, Instrumentation-Applications.

Fluorometry: Principles – Instrumentation –Applications.

Flame Photometry: Theory- Instrumentation and Applications.

Atomic Absorption Spectrometry: Theory – Instrumentation and Applications.

Turbidimetry and Nephelometry: Principle- Instrumentation and Applications.

UNIT V RADIOANALYTICAL METHODS

Radio active nuclides, Instrumentation, measurement of α, β & γ radiations.

Radio tracers and Tracer techniques-Application of tracer techniques

Neutron activation analysis: Neutron sources, Interaction of neutrons with matter. Theory of activation methods, Experimental considerations, Non-destructive and destructive methods, Applications.

Isotopic dilution Analysis-Principle –Theory and Applications

Radiometric Titrations: Principle- Procedure, Advantages and Disadvantages, Applications to various types of titrations. Application of radiochemical methods in Biology, Agriculture and Environment.

Text Books

1. Fundamentals of Analytical Chemistry, Skoog, West and Hollers, Saunders college, publishing, edition, 6th 1991, VII edition, 1996.
2. Vogel's , Text book of Quantitative Chemical Analysis – A.I. Vogel, Pearson Education Ltd, 6th edition, 2001.
3. Hand book of Instrumental Techniques for Analytical Chemistry – F. Settle, Printice Hall Inc.,
4. 1997.
5. Radioanalytical Chemistry 2007, B. Khan, Springer, 220-231, New York , 2007



Reference Books

1. Analytical Methods, R. Gopalan and K.S.Visvanathan, University Press, I edition, 2018.
2. Quantitative Chemical Analysis, DC. Harris, W.H. Freeman Publication, IV edition, 1995.
3. W. D. Ehmann, .D, E.Vance, D. Radio Chemistry and Nuclear Methods of Analysis 1st edition, Wiley-Inter Science, US 1991
4. Analytical Chemistry – Gray D. Christion, John Wiley & Sons, INC, 5th edition, 2001.

APPLIED CHEMISTRY

Course Objectives

The Primary objectives of this course are to

- Gain knowledge on fuels.
- Study about industrially important compounds.
- Acquire knowledge about basic needs of Agriculture developments.
- Learn the substances useful for human life.
- Study on Match and Silicate Industries.

UNIT I FUEL CHEMISTRY

Fuels- Definition-Classification – Combustion and Chemical Principles - Calorific value- Characteristics of a good fuel.

Solid fuel: Coal – Types – Gross and Net calorific values- Proximate and Ultimate analysis of coal – High and low temperature of carbonization – Uses.

Liquid fuels : Petroleum and its Chemical Composition- Cracking of heavy oil residues- Thermal and catalytic cracking, Knocking, Anti-knocking and Chemical structure, Octane and Cetane numbers – Significance - Petroleum products and their applications.

Gaseous fuels: Preparation and Specific uses of Producer gas, Water gas. LPG and Gobar gas.

Advantages and Disadvantages of Solid, Liquid and Gaseous fuels.

Rocket fuels- Classification of Solid Propellants, Liquid Propellants- Combustion - Spontaneous ignition temperature(SIT) - Combustion calculation.

UNIT II : PAINTS, LUBRICANTS, ADHESIVES AND PIGMENTS

Paints :Classification- Primary constituents, Manufacturing of paints, Emulsion paint- Constituent and advantages-Latex paints and Fire retardant paints, Solvents and



Thinners.

Lubricants: Functions of lubricants-Properties and Classifications -Additives for lubricating oil, Lubricants of mineral origin. Lubricating grease and Solid lubricants.

Adhesives: Classification and preparation of adhesives. Synthetic resin adhesives and Rubber based adhesives –Uses of adhesives.

Pigments: Characteristics and uses of TiO_2 , Ultramarine Blue and Red lead.

UNIT III AGRICULTURAL CHEMISTRY

Fertilizers: Raw material, manufacture (flow chart)- Chemical process (with equation) of ammonium nitrate, ammonium sulphate, urea, ammonium phosphate, super phosphate, triple super phosphate, NPK fertilizers.

Pesticides: Classification of pesticides, examples.

Insecticides: Stomach poisons, Contact insecticides, Fumigants, Manufacture and uses of Insecticides: DDT, BHC, Pyrethrin, Aldrin and Pentachlorophenol.

Fungicides: Bordeaux mixture, Lime sulphur, Creosote oil.

UNIT IV OILS, SOAPS AND DETERGENTS

Oils: Definition : Fats and Oils- Constituents- Sources-Difference between oils and fats, Manufacture of Cotton seed oil, Sunflower oil and Soyabean oil.

Soaps : Definition, Manufacture of soaps- Types of soaps -Specific uses.

Detergents: Difference between soaps detergents, Synthetic detergents- Surface active agents and their classification- Anionic, Cationic and Non –ionic detergents – Applications including cleaning action.

UNIT V MATCH AND SILICATE INDUSTRIES

Match Industry

Types of Matches- Composition of match head and strikining surface- Manufacture of safety matches-Coloured matches- Pyrotechniques and explosives, Classification of good explosives TNT, RDX ,Gun powder, Ammonium nitrate.

Silicate industry

Cement :Types of cements, composition , manufacture of Portland cement and Setting of cement.

Ceramics: Introduction, Types, Manufacture, and Applications, Refractory materials.

Glass :Definition, Composition, Types, Manufacturing of glass products, Physical and Chemical properties, Applications.

Text Books

1. B.K. Sharma, Industrial Chemistry, Goel Publishing House, Meerut, 2003.
2. James A. Kent, Riegel"s Hand book of Industrial Chemistry, Springer Science,



2013.

Reference Books

1. C.E. Dryden, Outlines Chemical Technology, Gopala Rao, East west Press, New Delhi
2. S. Johnson, N .Saikia, Fatty acids Profile of edible oils and fats in India, Centre for Science and Environment, New Delhi, India.

MAJOR PRACTICAL V ORGANIC ANALYSIS & PHYSICAL CONSTANT DETERMINATION

Course Objectives

- To enable the students to understand the various procedures in organic analysis
- To create an awareness on microscale experiments in organic chemistry practicals
- To determine physical constants of organic liquid & solid substances

I Organic analysis

Qualitative analysis of the given organic compound

- a. Test for aliphatic and aromatic nature of substances
- b. Test for saturation and unsaturation
- c. Identification of functional groups (carboxylic acids, phenols, aldehydes, ketones, esters, amines, amides, anilides, nitrocompounds and carbohydrates)
- d. Preparation of solid derivative to confirm the presence of functional group

II Physical constant determination

- (i) Determination of boiling point of organic liquid substances.
- (ii) Determination of melting point of organic substances.

Internal – 50 marks

25 marks - Regularity

25 marks – Average of best five experiments of organic analysis & three physical constants determination in regular class work

External -50 marks

10 marks – Record (atleast five experiments in organic analysis & three physical constants determination)*

10 marks – procedure for any two functional groups asked by the examiner

25 marks – Analysis

5 marks – Physical constant determination

*Experiments done in the class alone should be recorded



(Students having a bonafide record only should be permitted to appear for the practical examination)

Text Books

1. N.S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Lab manual, S. Viswanathan Co. Pvt., 1998.
2. J.N. Gurthu and R. Kapoor, Advanced Experimental Chemistry (Organic), S. Chand and Co., 1987.
3. B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry. 5th Edn., Pearson Education, 2005.

Reference Books

1. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part III), S. Viswanathan Co. Pvt., 1996.
2. P.R.Singh, D.C.Gupta, K.S.Bajpal Experimental Organic Chemistry Vol.I and II, 1980.

MAJOR PRACTICAL VI GRAVIMETRIC ESTIMATION & INORGANIC PREPARATION

Course Objectives

- To enable the students to understand the various techniques in gravimetric estimations
- To make the students thorough in preparations of inorganic compounds

I. Gravimetric Estimation

1. Estimation of lead as lead chromate
2. Estimation of barium as barium chromate
3. Estimation of nickel as nickel dimethylglyoximate
4. Estimation of zinc as zinc oxinate
5. Estimation of copper as copper thiocyanate

II. Inorganic preparation

1. Preparation of potash alum
2. Preparation of chrome alum
3. Preparation of Prussian blue
4. Preparation of sodium ferrioxalate
5. Preparation of tetrammine copper(II) sulphate
6. Preparation of trithiourea copper(I)chloridedihydrate
7. Preparation of potassium trisoxalatoferrate(III)
8. Preparation of hexathiourea lead(II) nitrate



Internal – 50 marks

25 marks - Regularity

25 marks – Average of best (estimation-3 and preparation-3) six experiments in regular class work

External -50 marks

10 marks – Record (atleast 3 estimations and 4 preparations)*

10 marks – Procedure

30 marks – Result (Estimation -20 and preparation-10)

*Experiments done in the class alone should be recorded

(Students having a bonafide record only should be permitted to appear for the practical examination)

Text Books

1. Vogel's Text Book of Quantitative Chemical Analysis. 5th Edition., ELBS/Longman England, 1989
2. V.K.Ahluwalia, Sunitha Dhingra, Adarsh Gulate College Practical Chemistry, Universities Press (India) Pvt Ltd Reprint 2008.
3. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part III), S. Viswanathan Co. Pvt., 1996.

Reference Books

1. P.R.Singh, D.C.Gupta, K.S.Bajpal Experimental Organic Chemistry Vol.I and II, 1980.
2. O.P. Pandey, D.N Bajpai, S. Gini, Practical Chemistry, for I, II & III BSc. Students. S.Chand & Company Ltd, Reprint 2009

PERSONALITY DEVELOPMENT

UNIT I: INTRODUCTION

Concept of personality - Dimensions of personality – Significance & Stages of personality development - Elements of Success

UNIT II POSITIVE ATTITUDE & SELF-MOTIVATION

Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages –Negative attitude- Disadvantages - Ways to develop positive attitude - Differences between personalities having positive and negative attitude. Concept of motivation - Significance – Internal and external motives - Importance of self-motivation-Factors leading to de-motivation

UNIT III SELF DEVELOPMENT SKILLS



Emotional Adjustment - Self-Awareness – Self-esteem - Self-Confidence - Stress Coping Ability – Time Management

UNIT IV SOCIAL SKILLS DEVELOPMENT

Assertiveness - Interpersonal Relationship – Problem Solving - Decision Making - Conflict Resolution

UNIT V SERVICE ORIENTATION & EMPLOYABILITY QUOTIENT

Social Concern - Value System and Culture; Resume building- Developing Group Discussion Skills – Facing the Mock Interview Sessions

Text Books:

1. Hurlock, E.B (2006). Personality Development, 28th Reprint. New Delhi: Tata McGraw Hill.
2. Bhatia, R. C. (2010). Personality Development, Ane Books Pvt. Ltd., Chennai.
3. Aurther, J. (2006). Personality Development. Lotus Press, New Delhi.

Reference Books:

1. Andrews, Sudhir. How to Succeed at Interviews. 21st (rep.) New Delhi. Tata McGraw-Hill 1988.
2. Stephen P. Robbins and Timothy A. Judge (2014), Organizational Behavior 16th Edition: Prentice Hall.
3. Hindle, Tim. Reducing Stress. Essential Manager series. Dk Publishing, 2003
4. Mile, D.J Power of positive thinking. Delhi. Rohan Book Company, (2004).
5. Pravesh Kumar. All about Self- Motivation. New Delhi. Goodwill Publishing House. 2005.
6. Seven Habits Of Highly Effective People – Stephen Covey
7. You Can Win – Shiv Khera



EFFECTIVE COMMUNICATION

Objectives:

- To impart effective communication skills to enrich students' personality development and self confidence
- To enhance the students' employability skills
- The courses will help to bridge the gap between the skill requirements of the employer or industry and the competency of the students

Teaching Methodology:

Lectures, Practical classes, Video, Public speaking, Group Discussion and Case Studies

Unit – I Introduction

Introduction to Communication, Flow of Communication, Elements of Communication and their characteristics - Models of Communication - Barriers to Communication, How to overcome barriers of communication.

Unit – II Understanding Human Communication

Types of Communication transactions, Culture and communication- Signs, symbols and codes in communication, Tools of communication (Oral, written, one way, two way, verbal and nonverbal, vertical and horizontal and lateral) Business communication-Body language.

Unit – III Effective Communication

Concept, nature and relevance to communication process: - Empathy - Persuasion - Perception - Listening - Learning and Audio-Visual Aids- concept and classification

Unit – IV Language and Communication

Listening skills– Etiquette (Personal, social, telephone, email and global), Types of Listening, Barriers to Effective Listening & Traits of a Good Listener, Language for Communication: Language and Communication; General Principles of Writing; Improving Writing Skills, Essentials of good style, Expressions and words to be avoided

Unit – V Employment Communication

Soft Skills: Empathy - Intrapersonal skills - Interpersonal skills - Problem solving – Reflective thinking - Critical thinking - Negotiation skills, Employment Communication – Resume:Contents of Good Resume; Job Interview- Job Interview Techniques- Manners and etiquettes to be maintained during an interview; and Presentation skills.



References:

- SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications.
- Barker, L. (1990). "Communication", New Jersey: Prentice Hall, Inc; 171.
- Devito, J. (1998) Human Communication. New York: Harper & Row.
- Patri and Patri (2002); Essentials of Communication. Greenspan Publications

