THIRUVALLUVAR UNIVERSITY

BACHELOR OF SCIENCE

DEGREE COURSE

B.Sc. INDUSTRIAL CHEMISTRY

(VOCATIONAL STREAM)

UNDER CBCS

(with effect from 2008-2009)

The Course of Study and the Scheme of Examinations

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. hrs/ Week	Credit	Exam hrs	Max. Marks		
								IA	Uni. Exam.	Total
I Year I Semester	I	Language	Paper I		6	3	3	25	75	100
	II	English	Paper I		6	3	3	25	75	100
	III	Core	Paper I	General Chemistry I	6	6	3	25	75	100
	III	Core Practical	-	Volumetric Analysis	3	-	-	-	-	-
	III	Allied Paper I		Industrial Chemistry I	4	4	3	25	75	100
		Allied Practical	-	Industrial Chemistry (Analytical methods)	3	-	-	-	-	-
	IV			Environmental Studies	2	2	3	25	75	100
I Year II Semester	I	Language	Paper II		6	3	3	25	75	100
	II	English	Paper II		6	3	3	25	75	100
	III	Core	Paper II	General Chemistry II	6	6	3	25	75	100
	III	Core Practical	Practical I	General Chemistry (Volumetric Analysis)	3	3	3	40	60	100
	III	Allied I	Paper II	Industrial Chemistry II	4	4	3	25	75	100
		Allied Practical	Practical I	Industrial Chemistry (Analytical methods)	3	2	3	20	30	50
	IV			**Value Education**	2	2	2	-	50	50

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. hrs/ Week	Credit	Exam hrs	Max. Marks		
								IA	Uni. Exam.	Total
II Year III Semester	I	Language	Paper III		6	3	3	25	75	100
	II	English	Paper III		6	3	3	25	75	100
	III	Core	Paper III	General Chemistry III	3	3	3	25	75	100
	III	Core Practical	-	Inorganic qualitative Analysis and Preparation	3	-	-	-	-	-
	III	Allied II	Paper III	Industrial Chemistry III	4	4	3	25	75	100
		Allied Practical	-	Industrial Chemistry (Instrumentation methods)	3	-	-	-	-	-
	IV	Skill based subject I	Paper I	Water treatment and Analysis	3	3	3	25	75	100
		Non-Major Elective I	Paper I	Medicinal Chemistry	2	2	3	25	75	100
II Year IV Semester	I	Language	Paper IV		6	3	3	25	75	100
	II	English	Paper IV		6	3	3	25	75	100
	III	Core	Paper IV	General Chemistry IV	3	3	3	25	75	100
	III	Core Practical	Practical II	Inorganic qualitative Analysis and Preparation	3	3	3	40	60	100
	III	Allied II	Paper IV	Industrial Chemistry IV	4	4	3	25	75	100
		Allied Practical	Practical II	Industrial Chemistry (Instrumentation methods)	3	2	3	20	30	50
	IV	Skill based subject II	Paper II	Food Chemistry and Nutrition	3	3	3	25	75	100
		Non-Major Elective II	Paper II	Chemistry in Every Day Life	2	2	3	25	75	100
III Year V Semester	III	Core	Paper V	Inorganic Chemistry I	5	5	3	25	75	100
	III	Core	Paper VI	Organic Chemistry I	5	5	3	25	75	100
	III	Core	Paper VII	Physical Chemistry I	5	5	3	25	75	100
	III	Core Practical	-	Physical Chemistry	2	-	-	-	-	-
	III	Core Practical	-	Gravimetric estimation	3	-	-	-	-	-
	III	Core Practical	-	Organic Qualitative Analysis and Preparation and Industrial Chemistry	2	-	-	-	-	-
		Elective I	Paper I	Industrial Chemistry V	3	5	3	25	75	100
		Elective Practical		Industrial Chemistry III	2	-	-	-	-	-
	IV	Skill based subject III	Paper III	Dairy Chemistry	3	3	3	25	75	100

Year / Semester	Part	Subject	Paper	Title of the Paper	Ins. hrs/ Week	Credit	Exam hrs	Max. Marks		
								IA	Uni. Exam.	Total
III Year VI Semester	III	Core	Paper VIII	Inorganic Chemistry II	4	4	3	25	75	100
	III	Core	Paper IX	Organic Chemistry II	4	4	3	25	75	100
	III	Core	Paper IX	Physical Chemistry II	4	4	3	25	75	100
	III	Core Practical	Practical III	Physical Chemistry	2	2	3	40	60	100
	III	Core Practical	Practical IV	Gravimetric estimation	3	3	3	40	60	100
	III	Core Practical	Practical V	Organic Qualitative Analysis and Preparation	2	2	3	40	60	100
		Elective II	Paper II	Industrial Chemistry IV	3	5	3	25	75	100
		Elective III	Paper III	Instrumental Analysis	3	5	3	25	75	100
		Elective Practical		Industrial Chemistry III	2	2	3	40	60	100
	IV	Skill based Subject IV		Agriculture and Leather Chemistry	3	3	3	25	75	100
	V	Extension Activities				1				50
				Total	**180**	**140**				**4000**

THIRUVALLUVAR UNIVERSITY

B.Sc. INDUSTRIAL CHEMISTRY

(VOCATIONAL STREAM)

SYLLABUS

UNDER CBCS

(with effect from 2008-2009)

I SEMESTER

PAPER I

GENERAL CHEMISTRY I

Objective

Basic concepts regarding atomic structure, periodic properties, bonding concepts, quantum chemistry, solids, liquids, gases, hydrocarbons, nomenclature, reactions, principles of volumetric analysis derivation of equations, related problems, applications wherever necessary are to be taught for I-Semester.

UNIT-I :

1.1 Atomic structure - Quantum numbers n, l, m and s - Pauli exclusion principle - Energy distribution and orbitals - Hund's rule of maximum multiplicity - Aufbau's principle - Electronic configurations of elements - Stability of half-filled and completely filled orbitals.

1.2 s, p, d and f block elements - classification and characteristic properties - Periodicity of properties- Definition and periodicity of the following properties- Atomic radii - factors affecting atomic radii - Ionic radii - factors affecting ionic radii.

1.3 Ionization potential - factors affecting ionization potential - Electron affinity - factors affecting electron affinity - Electronegativity – factors affecting electronegativity - Pauling scale - Mulliken electronegatvity scale - Allred and Rochow scale - Diagonal relationship with examples - Summary of horizontal, vertical and diagonal relationships in the periodic table.

UNIT-II:

2.1 Classification of organic compounds - Nomenclature of organic compounds - Functional groups - Homologous series - IUPAC recommendations for naming simple aliphatic - alicyclic and aromatic compounds - Polyfunctional compounds - Heterocyclic compounds.

2.2 Basic concepts of bonding in organic chemistry - Hybridisation - tetravalency of carbon - geometry of molecules - methane, ethane, ethylene, acetylene and benzene - Factors affecting covalent bond. Electron displacement effects - inductive - inductomeric - electromeric - resonance - hyperconjugation and steric effects.

2.3 Alkanes - Methods of preparation of alkanes - Physical and chemical Properties of alkanes - Mechanism of free radical substitution in alkanes - Alkenes - Properties of alkenes - Electrophilic and Free radical addition.

UNIT-III:

3.1 Quantum chemistry - Quantum theory of radiation - Planck's theory - photoelectric effect - Compton effect - Wave mechanical concept of the atom - de Broglie's relationship - wave nature of electron - Heisenberg's uncertainty principle - Schrodinger wave equation (without derivation) - significance of wave functions, ψ and ψ^2 - probability distribution of electrons - radial probability distribution curves.

3.2 Gaseous state - Kinetic gas equation - derivation - Gas laws from the kinetic gas equation - Kinds of velocities - mean, rms, most probable velocities - Calculation of molecular velocities - transport properties - viscosity - thermal conductivity - diffusion.

3.3 Maxwell's distribution of-molecular velocities (no derivation) - Effect of temperature on velocity distribution - equipartition of energy - heat capacity and molecular basis - Virial equation of state - Boyle temperature - coefficient of compressibility and thermal expansion.

UNIT-IV

4.1 Definitions of molarity - normality - molality and mole fraction - their calculations - definition and examples for primary and secondary standards. Calculation of equivalent weights.

4.2 Addition reactions of alkenes with hydrogen and Mechanism - halogens and Mechanism - hydrogen halide (Markownikoff's rule) and Mechanism - hydrogen bromide (peroxide effect) and Mechanism - sulphuric acid - water and Mechanism - hydroboration - ozonolysis - hydroxylation with KMnO4 - allylic substitution by NBS - Epoxidation and Mechanism - Oxidation - reduction - Self-addition or polymerization - Detection of c=c double bond

4.3. Liquid crystals - classification and molecular arrangements - Liquid state - density - diffusion - Viscosity - evaporation. Surface tension - effect of temperature on surface tension - parachor - definition and applications only - Coefficient of viscosity - effect of temperature - effect of pressure.

UNIT-V

5.1 Theories of acid-base - red-ox - complexometric and iodometric titrations. Theories of indicators - acid-base - redox - metal ion and adsorption indicators and choice of indicators.

5.2 Types of organic reactions - Cleavage of bonds - Homolytic and Heterolytic fission of carbon-carbon bond - Methods for determining reaction mechanism — Reaction intermediates - Structure and stability of Carbocations - Carboanions and Free radicals

5.3 Solid State - Crystal lattices - Laws of crystallography - Elements of symmetry - crystal systems - unit cell - space lattice - Bravais' lattices - structure of NaCl - structure of CsCl - Miller's indices.

ALLIED I

PAPER I

INDUSTRIAL CHEMISTRY I

OBJECTIVES:

High Polymers, Rubber, Plastics and Resins - Introduction - classification - preparation - properties - Mechanism - applications.

UNIT-I

1.1. HIGH POLYMERS - Introduction - Nomenclature - Functionality - Classification of Polymers - Homo and hetero chain polymers - Addition polymerization - Condensation polymerization.

1.2. Mechanism of Addition Polymerization - Cationic - Anionic polymerization - Free radical and Co-ordination or Ziegler-Natta polymerization - Effect of Heat on Polymers - Mechanical Properties of Polymers.

UNIT-II

2.1 Polymers in Medicine and Surgery - Conducting Polymers - Some Physical and Mechanical Properties of Polymers-Crystallinity in Polymers.

2.2 Effect of polymer structure and properties - Strength, plastic deformation - chemical resistance - Physical state of polymer - Glass Transition Temperature - Polymer Reaction.

UNIT-III

3.1 Introduction to Rubber - Latex - Processing Latex - Mastication - Compounding of Rubber - Vulcanizations of Rubber - Engineering Polymers Thermoforming - Degradation stability and environment.

3.2 Synthetic rubbers - Preparation and applications of SBR - Butyl rubber - Nitrile rubber - Neoprene and Silicone rubber.

UNIT-IV:

4.1 Plastic Materials - Classification of Plastics (or Resins) - Moulding Constituents of a Plastic - Fabrication techniques used for thermoplastic resin (Moulding process).

4.2 Important Thermoplastic Resins- Natural resins - Celluloses - Polyethylene - PVC

UNIT-V:

5.1 Important thermosetting resins- Phenol Formaldehyde Resin or Pheonolic Resin - Amino Resins and Plastics - Epoxy Resins - Acrylic Resins and Plastics - Polyester resins.

5.2 Silicone Resins - Silicone fluids - Silicone greases – Polyurethane's - Foamed or cellular plastics.

ENVIRONMENTAL STUDIES

(For all UG Degree Courses)

UNIT-I: INTRODUCTION TO ENVIRONMENTAL SCIENCES: NATURAL RESOURCES :

Environmental Sciences - Relevance - Significance - Public awareness - Forest resources - Water resources - Mineral resources - Food resources - conflicts over resource sharing - Exploitation - Land use pattern - Environmental impact - fertilizer - Pesticide Problems - case studies.

UNIT-II: ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION:

Ecosystem - concept - structure and function - producers, consumers and decomposers - Food chain - Food web - Ecological pyramids - Energy flow - Forest, Grassland, desert and aquatic ecosystem.

Biodiversity - Definition - genetic, species and ecosystem diversity - Values and uses of biodiversity - biodiversity at global, national (India) and local levels - Hotspots, threats to biodiversity - conservation of biodiversity - Insitu & Exsitu.

UNIT-III: ENVIRONMENTAL POLLUTION AND MANAGEMENT

Environmental Pollution - Causes - Effects and control measures of Air, Water, Marine, soil, solid waste, Thermal, Nuclear pollution and Disaster Management - Floods, Earth quake, Cyclone and Land slides. Role of individuals in prevention of pollution - pollution case studies.

UNIT-IV: SOCIAL ISSUES - HUMAN POPULATION

Urban issues - Energy - water conservation - Environmental Ethics - Global warming - Resettlement and Rehabilitation issues - Environmental legislations - Environmental production Act. 1986 - Air, Water, Wildlife and forest conservation Act - Population growth and Explosion - Human rights and Value Education - Environmental Health - HIV/AIDS - Role of IT in Environment and Human Health - Women and child welfare - Public awareness - Case studies.

UNIT-V: FIELD WORK

Visit to a local area / local polluted site / local simple ecosystem - Report submission

REFERENCES

1. KUMARASAMY, K., A.ALAGAPPA MOSES AND M.VASANTHY, 2004. ENVIRONMENTAL STUDIES, BHARATHIDSAN UNIVERSITY PUB, 1, TRICHY

2. RAJAMANNAR, 2004, ENVIRONEMNTAL STUDIES, EVR COLLEGE PUB, TRICHY

3. KALAVATHY,S. (ED.) 2004, ENVIRONMENTAL STUDIES, BISHOP HEBER COLLEGE PUB., TRICHY

II SEMESTER

PAPER II

GENERAL CHEMISTRY II

Objectives :

Basic concepts regarding ionic bond, covalent bond, M.O theory, cyclo alkanes, dienes, thermochemistry, thermodynamics, derivation of equations, related problems, s-block elements, group study, polymerisation, mechanism, applications are to be taught for II-Semester.

UNIT-I:

1.1 Ionic bond - Electronic theory of valence - Conditions for the formation of ionic bond - General properties - Radius ratio rule and its limitations - Energetics of formation of NaCl from Na and Cl - Hydration energy and lattice energy and their applications - Born - Haber cycle. Fajan's rules - Characteristics of electrovalent compounds - Valence bond theory - Conditions for the formation of covalent bond - General properties - Polarity of bonds - Orbital overlap - Bond lengths and bond energies - hybridization - sigma and pi bonds.

1.2 VSEPR theory - geometries of BO_3^{3-}, NH_4^+, ClF_3, PCl_5, IF_7, and XeF_6 molecules - partial ionic character of covalent bond - percentage of ionic character - Hanny and smyth equation.

1.3 Molecular Orbital theory - Bonding, anti-bonding orbitals - Relative order of energies of molecular orbitals - MO diagrams of H_2, He_2, O_2, O_2^+, O_2^- and CO - Bond order - stability and magnetic property of the molecules - Comparison of VB and MO theories.

UNIT-II:

2.1 Alkynes - Acidity of alkynes - Addition of hydrogen - Hydroboration - Hydrohalogenation-Addition of hypohalous acid Hydration- addition of water with $HgSO_4$ catalyst - Addition of alcohols and carboxylic acids.

2.2 Formation of acetylides - alkylation of alkynes with mechanism - oxidation with KMnO4 - ozonolysis - Polymerisation to benzene - Oxidative coupling - Isomerization. Cycloalkanes - preparation using Wurtz's reaction - Dieckmann's ring closure and reduction of aromatic hydrocarbons - Substitution and ring opening reactions - Rearrangements.

2.3 Bayer's strain theory - theory of strainless rings - Coulson and moffit's concept - Chemistry of decalin - Dienes - stability of dienes - conjugated, isolated and cumulative- stability and Chemical reactivity.

UNIT-III:

3.1 Thermodynamics - Definition and explanation of terms - System, boundary, surroundings - Homogeneous and heterogeneous system - Isolated system - Closed system - Open system - Intensive and extensive properties - State of a system - Independent state variables - Dependent state variables - Thermodynamic functions - State and path functions .

3.2 Thermodynamic processes - types of processes - cyclic - reversible - irreversible - isothermal - adiabatic. Exact and inexact differentials - Total differential - Cross derivative rule - Cyclic rule - concept of heat and work - Zeroth law of thermodynamics.

3.3 First law of thermodynamics - statement and equation - Cp, Cv relationship - calculation of W, Q, ΔE and ΔH for the expansion of ideal gases under reversible - isothermal and adiabatic conditions.

UNIT-IV:

4.1 Alkali metals - Li, Na, K, Rb and Cs - Occurrence - Comparative study of elements - oxides, halides, hydroxides and carbonates - Exceptional property of Lithium - Diagonal relationship of Li with Mg.

4.2 1:2and 1:4 additions with mechanism - Free radical addition -polymerization of dienes - Synthesis of dienes - 1:3 butadiene - Isoprene and chloroprene - Allenes.

4.3 Joule's law - Joule-Thomson effect - Joule-Thomson coefficient and its derivation - inversion temperature, its significance and its derivation.

UNIT-V:

5.1 Alkaline earth metals - Be, Mg, Ca, Sr and Ba - Occurrence - comparative study of the elements with respect to oxides, hydroxides, halides, sulphates and carbonates - Exceptional property of Beryllium - Diagonal relationship of Be with Al - Comparison of alkaline earth metals with alkai metals - Magnesium acting as bridge element between IIA and IIB groups - Magnesium resembles zinc.

5.2 Polymerization - Types of polymerization - Distinction between addition and condensation polymerization - free radical - cationic and anionic polymerizations - mechanism of preparation of polymers - addition polymers and condensation polymers with examples - Thermoplastic and thermosetting polymers

5.3 Thermochemistry - Heat of reaction - Exothermic and endothermic reaction - Calculation of ΔH from ΔE and vice versa - Thermochemical equations - bond dissociation energy - calculation from thermochemical data - variation of heat of a reaction with temperature - Kirchoff's equation and its significance.

CORE PRACTICAL I

VOLUMETRIC ANALYSIS

Acidimetry

1. Estimation of borax - Standard Sodium Carbonate
2. Estimation of Sodium Hydroxide - Standard Sodium Carbonate

Iodimetry

3. Estimation of Arsenious oxide

Iodometry

4. Estimation of Copper - Standard Copper sulphate
5. Estimation of Potassium dichromate - Standard Potassium dichromate

Complexometry

6. Estimation of Magnesium using EDTA.
7. Estimation Zinc using EDTA
8. Estimation of Nickel using EDTA
9. Estimation of Calcium using EDTA

Dichrometry

10. Estimation of ferrous iron using Diphenyl amine / N - Phenylanthranillic acid as indicator.

Precipitation titration

11. Estimation of Chloride in neutral medium (Demonstration - experiment)

Students must write short procedure for the given estimation in ten minutes during the examinations and submit the paper for evaluation

ALLIED I

PAPER II

INDUSTRIAL CHEMISTRY II

Objectives:

Elaborate study of Fuels Introduction - classification - preparation - properties - their sources of energy - storage - alternate fuels - applications

UNIT-I

1.1 FUELS AND COMBUSTION - Introduction - Classification of Fuels - Calorific Value - Gross calorific value and net calorific value - Characteristics of a Good Fuel. Theoretical Calculation of Calorific Value of a Fuel - Solid fuels - Wood.

1.2 Coal - Classification of Coal by Rank - Selection of Coal - Analysis of Coal and its significance

UNIT-II

2.1 Types of coking - Types of Carbonization of Coal - Role of Sulphur in Coal - Role of Ash in Coal. Gaseous fuels - Producer Gas - Water Gas - Natural Gas - Oil Gas - Biogas - Components - composition- preparation - advantages- disadvantages and applications of Coal gas-Gobar gas - LPG.

2.2 Liquid fuels - Petroleum - Cracking - Advantages of catalytic cracking over thermal cracking - Synthetic Petrol.

UNIT-III:

3.1 Refining of Gasoline - Reforming - Knocking - Octane number of Gasoline - Diesel Engine Fuels - Diesel - Octane number of Diesel Oil - Diesel index.

3.2 Non-petroleum Fuels - Combustion - Mass analysis from volume analysis and vice-versa - Flue gas-analysis - Efficiency of combustion.

UNIT-IV:

4.1 Residual fuel oils - Asphalt - Aviation fuel - advantages - Kerosene as a fuel.

4.2 Analysis and testing of liquid and gaseous fuels - Utilization of fuels - Nuclear fuels - Solar power.

UNIT-V:

5.1 Other sources of energy - Electricity Power - Modern Concept of Fuel - Fuels for Metallurgy.

5.2 Power Alcohol - Recent Advances In Fuel Technology. Alternative Fuels - Alcohols - Promising Biofuel: An Alternative Source to Diesel and Gasoline - Control of Pollution in Refineries.

ALLIED PRACTICAL

INDUSTRIAL CHEMISTRY PRACTICAL I

WATER TESTING

1. Determination of dissolved oxygen present in the given water sample.
2. Determination of chemical oxygen demand (COD) in given water sample.
3. Determination of biological oxygen demand in the given water sample (BOD) (only for demonstration)
4. Estimation of total dissolved solids in the given water sample (TDS)
5. Estimation of total suspended solids in the given water sample (TSS)
6. Determination of total permanent and temporary hardness of water using EDTA.
7. Determination of acetic acid in commercial vinegar using NaOH.
8. Determination of alkali content in ant acid tablet using Hcl.
9. Estimation of calcium in chalk - Permangannometry.
10. Determination of saponification value of oil.

VALUE EDUCATION
(For all UG Degree Courses)

UNIT-I

Value Education - Definition - relevance to present day - Concept of Human Values - self introspection - Self esteem.

UNIT-II

Family values - Components, structure and responsibilities of family - Neutralization of anger - Adjustability - Threats of family life - Status of women in family and society - Caring for needy and elderly - Time allotment for sharing ideas and concerns.

UNIT-III

Ethical values - Professional ethics - Mass media ethics - Advertising ethics - Influence of ethics on family life - psychology of children and youth - Leadership qualities - Personality development.

UNIT-IV

Social values - Faith, service and secularism - Social sense and commitment - Students and Politics - Social awareness, Consumer awareness, Consumer rights and responsibilities - Redressal mechanisms.

UNIT-V

Effect of international affairs on values of life/ Issue of Globalization - Modern warfare - Terrorism. Environmental issues - mutual respect of different cultures, religions and their beliefs.

Reference Books

1. T. Anchukandam and J. Kuttainimathathil (Ed) Grow Free Live Free, Krisitu Jyoti Publications, Bangalore (1995)
2. Mani Jacob (Ed) Resource Book for Value Education, Institute for Value Education, New Delhi 2002.
3. DBNI, NCERT, SCERT, Dharma Bharti National Institute of Peace and Value Education, Secunderabad, 2002.
4. Daniel and Selvamony - Value Education Today, (Madras Christian College, Tambaram and ALACHE, New Delhi, 1990)
5. S. Ignacimuthu - Values for Life - Better Yourself Books, Mumbai, 1991.
6. M.M.M.Mascaronhas Centre for Research Education Science and Training for Family Life Promotion - Family Life Education, Bangalore, 1993.

WEBSITES AND e-LEARNING SOURCES:

www.rkmissiondhe/.org/education.html/

www.clallam:;org/lifestyle/education.html/

www.sun.com/../edu/progrmws/star.html/

www.infoscouts.com

www.secretofsuccess.com

www.1millionpapers.com

http://militarlyfinance.umuc.edu/education/edu-network.html/

III SEMESTER

PAPER II

GENERAL CHEMISTRY III

Objective :

Basic concepts regarding principles of inorganic analysis and applications of qualitative analysis, solvents, s- and p-block elements, group study, aromaticity, electrophilic and nucleophilic substitution reactions, elimination reactions, mechanism, thermodynamics, derivation of equations, related problems, applications wherever necessary

UNIT-I:

1.1 Principles of inorganic analysis - Reactions involved in the separation and identification of cations and anions in the analysis - Spot test reagents- Aluminon,Cupferon, DMG, Thiourea, Magneson, Alizarin and Nessler's reagent.

1.2 Semimicro techniques - Principles of acid-base equilibria - common ion effect - solubility product and their applications in qualitative analysis.

1.3 Types of solvents - Physical properties of solvent - Protic and aprotic solvents - Amphi-protic / amphoteric solvent - aqueous and non-aqueous solvents - Liquid ammonia and Liquid SO_2 as solvent.

UNIT-II:

2.1 Aromaticity - Modern theory of aromaticity - Huckel's (4n +2) rule and its simple applications - Aromatic hydrocarbons - Resonance in benzene - Delocalised cloud in benzene.

2.2 Electrophilic reagents - Electrophllic substitution reactions in aromatic compounds - general mechanisms - nitration - halogenation - sulphonation - Friedel-Craft's acylation and alkylation.

2.3 Aliphatic nucleophilic substitutions - Nucleophilic reagents - Mechanisms of SN_1, SN_2 and SNi reactions - effects of structure of substrate - solvent - nucleophile and leaving groups.

UNIT-III:

3.1 Second law of thermodynamics - Need for the II law - Spontaneous process - Criteria of spontaneity - different forms of statements of the second law - Cyclic process - Heat engines.

3.2 Carnot's cycle - Efficiency - Carnot's theorem (statement only) - Concept of entropy - Definition - Randomness and entropy - Numerical definition of entropy -.

3.3 Standard entropy -Derivation of entropy from carnot cycle - entropy change of an ideal gas during isothermal process - Entropy changes in cyclic - reversible and irreversible processes

UNIT-IV

4.1 'p'block elements - Boron family - group discussion - anomalous behavior of Boron - diagonal relationship between B and Si - Electron deficiency and electron acceptor behaviour of Boron trihalides - bonding (hydrogen-bridge structure) in diborane.

4.2 Directive influence - Orientation - Ortho/para ratio - Nuclear and side chain halogenations

4.3 Entropy changes in physical transformations - Calculation of entropy changes with changes in T, V and P - entropy of mixing of ideal gases.

UNIT-V:

5.1 Carbon family - Group discussion - catenation - Comparison of properties of carbon and silicon valencies - oxides - halides - hydrides and oxyacids. Classification - preparation - properties and uses of carbides .

5.2 Elimination reactions - Bimolecular elimination reaction (E_2) - Unimolecular elimination reaction (E_2) - mechanisms of E_1 and E_2 reactions - Hoffmann and Saytzeff's rules - Cis and trans eliminations

5.3 Free energy and work function - Gibb's free energy - Helmholtz work function - their variations with temperature - pressure and volume - Criteria for spontaneity

ALLIED II

PAPER III

INDUSTRIAL CHEMISTRY III

Objectives:

Cements, Ceramics, Refractories, Adhesives, abrasives, Pulp and Paper - Introduction - classification - preparation - Manufacture - properties - Requirements - Composition - Mechanism - applications.

UNIT-I

1.1 INORGANIC CEMENTING MATERIALS - Introduction - Lime and its manufacture - Gypsum Plaster - Cement - Types of cement. - Chemical Composition

1.2 Manufacture of Portland Cement - Chemical Composition of Portland Cement - Setting and Hardening of Portland Cement. Heat of Hydration of Cement - Special Cement - Concrete and RCC - Decay of Concrete.

UNIT-II

1.2 GLASS AND CERAMICS - Introduction - Manufacture of Glass - Varieties of Glasses.

2.2 Plasticity of Clay - White wares - Glazing - applications - Earthenware's and stoneware's - Optical Fibers.

UNIT-III

3.1 REFRACTORIES - Introduction - Classification - Manufacture of Refractories - Cermets - Insulating refractories - Requirements of a refractory.

3.2 ADHESIVES - Introduction - Classification of adhesives - Adhesive Action - Development of Adhesive Strength. Chemical Factors influencing Adhesive Action - Bonding Processes by Adhesives - Advantages and limitations - examples.

UNIT-IV

4.1 Solvent Responsive Adhesives - Uses of Solvent Responsive Adhesives. Chemically reactive adhesives .

4.2 Preparation of adhesives - Synthetic resin adhesives - Rubber based adhesives - Cellulose and silicate adhesives - Uses of adhesives.

UNIT-V

5.1 Abrasives - introduction - Natural Abrasives - Artificial Abrasives - Grinding Wheels.

5.2 Pulp and paper - Introduction - Manufacture of pulp - Sulphate or Kraft pulp - Soda pulp - Sulphite pulp - Rag pulp - Beating, refining, filling, sizing and coloring - manufacture of paper.

SKILL BASED SUBJECT I

PAPER I

WATER TREATMENT AND ANALYSIS

Objective:

To learn about various methods of Treatment and analysis of water.

UNIT-I

1.1 Introduction - characteristics of water - alkalinity - hardness - unit of hardness - Total solids - Oxidation - transparency - Silica content.

1.2 Purification of water for drinking purpose - potability of water - clarification - coagulation - contact & electro chemical coagulation - sterilization & disinfections of water - precipitation - aeration - ozonisation - Chlorination.

UNIT-II

2.1 Water softening methods - clark's process - lime soda proceess - modified lime soda process - permutit or zeolite process - Ion exchange process - demineralization of water.

2.2 Determination of hardness of water - Titration method - complexo metric method using EDTA - expressing hardness - equivalents of calcium carbonate - problems to determine temporary & permanent hardness.

UNIT-III

3.1 Hard water and industries - industrial water treatment - boiler feed water method of softening - prevention of plumbo solvency - scales in boilers - consequences - internal conditioning methods.

3.2 Desalination of brackish water - elecrodiaysis - Reverse osmosis - removal of Fe, Mn and Silicic acid - effluent treatment of water from paper industry, petrochemical, fertilizer industry and power station.

UNIT-IV

4.1 Water analysis - sampling of water for analysis - chemical substances affecting potability - colour, turbidity odour, taste, temperature, pH and electrical conductivity.

4.2 Analysis of solids present in water - suspended solids - dissolved solids - total acidity - alkalinity - free CO_2 - free chlorine - Ca, Mg, Fe, Mn, Ag & Zn.

UNIT-V

5.1 Analysis of chemical substances affecting health - NH_3, Nitrate, Nitrite, cyanide, sulphate, sulphide, chloride, fluoride - measurement of toxic chemical substances - analysis of chemical substances indicative of pollution - Dissolved oxygen - Bio Chemical oxygen demand (BOD) - Chemical oxygen demand (COD)

5.2 Bacteriological examination of water - total count test - E.coli test - E.coli index - most probable number method - Biological examination of water - physical examination of water - radioactivity of water - methods of removing radioactivity from water.

Reference Books :

1. Industrial chemistry (including chemical - engineering) - B.K. Sharma - Goel publishing house, Meerut.
2. Pollution control in process industries - S.P. Mahajan - Tata Megraw - hill Publishing company Ltd., New Delhi.
3. Water pollution and management - C.K. Varashney - wiley Eastern Ltd., Chennai - 20.

NON-MAJOR ELECTIVE I

PAPER I

MEDICINAL CHEMISTRY

UNIT-I: CLINICAL HEALTH AND BIOCHEMICAL ANALYSIS

Definition of Health, WHO standard, Sterilization of surgical instruments. Biochemical analysis of urine and serum. Blood - Composition, grouping and R_h factor.

UNIT-II: COMMON DRUGS:

Antibiotics, Antipyretics, Analgesics, Anti-inflammatory agents, Sedatives, Antiseptics, Antihistamines, Tranquilizers, Hypnotics and Antidepressant drugs - Definition, examples, uses and side effects

UNIT-III: VITAL AILMENTS AND TREATMENT

Blood pressure - hypertension and hypotension, Diabetes, Cancer, AIDS - Causes, symptoms and medicines.

UNIT-IV: INDIAN MEDICINAL PLANTS:

Palak, Vallarai, Kizhanelli, Thumbai, Hibiscus, Adadodai, Thoothuvalai, Nochi, Thulasi, Aloe vera - Chemical constituent and medicinal uses.

UNIT-V: FIRST AID AND SAFETY:

Treatment of shock, haemorrage, cuts and wounds. Burns - classification and first aid. Asbestos, silica, lead paints, cement, welding fumes and gases - Hazard alert and precautions for safety.

Books For Reference:

1. Jayashree Ghosh - Applied Chemistry - S. Chand and Company Ltd., 2006
2. S.C Rastogi, Biochemistry, Tata McGraw Hill Publishing Co., 1993.
3. Rasheeduz Zafar - Medicinal Plants of India - CBs Publishers and Distributors, 2000
4. B.L Oser, Hawk's Physiological Chemistry, Tata-McGraw - Hill Publishing Co. Ltd.
5. A.H Beckett and J.B Stenlake - Practical Pharmaceutical Chemistry, Vol.I - CBS Publishers and Distributors, 2000.

IV SEMESTER

PAPER IV

GENERAL CHEMISTRY IV

Objective:

p-block elements & group study, aromatic nucleophilic substitution reactions, polyhydric alcohol, unsaturated alcohols, phenols, preparation, properties, important name reactions, mechanism, thermodynamics, derivation of equations, partial molar properties, chemical potential, related problems, , applications.

UNIT-I:

1.1 'p'block elements - Nitrogen family - Comparative study of N,P, As, Sb and Bi - elements - oxides - oxyacids - halides and hydrides - valency states.

1.2 Oxygen family - Comparative study of O, S, Se and Te-elements - catenation - oxides- halides - hydrides and oxy acids - anomalous behaviour of oxygen.

1.3 Oxy-acids of sulphur including Peroxy acids and Thionic acids.

UNIT-II:

2.1 Aromatic nucleophilic substitutions - Unimolecular nucleophilic substitution - mechanism - Bimolecular nucleophilic substitution - mechanism .

2.2 Polyhydric alcohols - glycerol - Unsaturated alcohols - preparation - Properties and uses of allyl alcohol.

2.3 Phenols - acidic character of phenols - Kolbe's reaction - Reimer - Tiemann reaction - Gattermann - Lederer - Manasse and Houben - Hoesh reactions.

UNIT-III:

3.1 Gibbs-Helmholtz equations - derivation and applications. Clausius-clapeyron equation - Derivation and Application .

3.2 Third law of thermodynamics - Entropy at absolute zero - Planck's formulation of third law - Nernst heat theorem - statement of III law of thermodynamics.

3.3 Evaluation of absolute entropy from heat capacity measurements - exceptions to III law - application of III law.

UNIT-IV:

4.1 Noble gases - Electronic configurations - Reasons for placing in zero group - position in the periodic table - Chemical inertness of noble gases - reasons - Applications - Clathrates.

4.2 Di - and tri-hydric phenols - alpha and beta naphthols - preparation and properties - uses.

4.3 partial molar properties - Chemical potential - Gibbs-Duhem equation - effect of temperature and pressure on chemical potential - chemical potential in systems of ideal gases.

UNIT-V:

5.1 compounds of xenon - hybridization and geometries of XeF_2 - XeF_4 - XeF_6 - $XeOF_4$.

5.2 Ring substitution in phenol - Mechanisms of esterification - nitration - sulphonation - halogenation - coupling with diazonium salts.

53. Chemical potential of solvent in Binary Ideal liquid solutions - Duhem - Margules equation & Applications

CORE PRACTICAL II

INORGANIC QUALITATIVE ANALYSIS AND PREPARATION:

Analysis of mixture containing two cations and two anions of which one will be an interfering ion. Semi micro methods using the conventional scheme to be adopted.

Cations to be studied.

Lead, Copper, Bismuth, Cadmium, Iron, Aluminium, Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

Anions to be studied

Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

II Preparation of Inorganic compounds.

Tetraammine Copper II sulphate
Tris (thiourea) Copper I chloride
Potassium trioxalato ferrate II
Chloropentammine cobalt III chloride
Ferrous ammonium sulphate
6. Microcosmic salt

ALLIED II

PAPER IV

INDUSTRIAL CHEMISTRY IV

Objective:

Corrosion, control of corrosion, surface coating, paints and pigments, varnishes semiconductors - Introduction - cause of corrosion - classification - preparation - properties - Need - Composition - Mechanism - applications.

UNIT-I

1.1 CORROSION AND ITS CONTROL – Introduction - Economic aspects of corrosion - Dry or Chemical Corrosion - Wet or electrochemical corrosion - Mechanism of Electrochemical Corrosion.

1.2 Galvanic Corrosion - Concentration Cell Corrosion - Differential aeration corrosion - Pitting Corrosion - Underground or soil corrosion.- Passivity.

UNIT-II

2.1 Factors Influencing Corrosion - Microbiological Corrosion - Galvanic Series - Atmospheric corrosion - Corrosion Control - Proper designing - Using pure metal - Using metal alloys - Cathodic protection.

2.2 Chemical conversion - Coating - Phosphating - Chromising - Treatment of metal surfaces hot dipping - Use of inhibitors.

UNIT-III

3.1 PROTECTIVE COATINGS - Introduction - Metallic Coatings - Various methods of cleaning articles before electrode position - Electroplate and - Electroplating methods.

3.2 Pretreatment of the surface - Metallic Coatings - Hot Dipping - Cementation or Impregnated Coatings - Sprayed Metal Coatings - Cladding - Vapour Deposition.

UNIT-IV

4.1 Paints - ingredients and their functions Required Properties of a Paint - Paint Constituents and Their Functions - Manufacture of Paint.

4.2 Types of Pigments - Characteristics of pigment - Oils - Uses in Paint - Emulsion Paints - Special Paints - Paint Remover. Varnishes - lacquers - enamels

UNIT-V:

5.1 Electrical Insulating Materials - Dielectric properties - Requirements of an Electrical Insulating Material - Classification of insulating material - Electrical Rigid Insulations.

5.2 Semiconductors - Introduction - Classification - Degenerate semiconductors - Super conductors.

ALLIED PRACTICAL

INDUSTRIAL CHEMISTRY PRACTICAL II

WATER TESTING - INSTRUMENTAL METHOD

1. Estimation of hexavalent chromium present in the given water sample - Photo colorimeter
2. Estimation of phenol present in the given water sample - Photo colorimeter
3. Estimation of copper present in the given water sample. Photo colorimeter

SOIL TESTING

1. Estimation of macro nutrients (K) - Photo colorimeter.
2. Determination of pH of given soil sample.
3. Determination of cell constant and conductivity of given soil sample.
4. Determination of optical rotation of cane sugar.
5. Determination of strength of given acid against strong base - Conduct metric.
6. Determination of strength of given acid against strong base - pH metric.
7. Determination of refractive index of liquids using Abbes's refract meter.
8. Determination of viscosity of oils - Ostwald viscometer

SKILL BASED SUBJECT II
PAPER II
FOOD CHEMISTRY & NUTRITION

Objective :

To obtain knowledge about different foods, their nutritive values and food preservation.

UNIT-I

1.1 Cereals definition - Classification, Processing - Structure of Cereals - Composition and nutritive value.

Pulses definition - Classification - Processing - Structure of Pulses - Composition and nutritive value - Toxic Constituents in pulses - medicinal value of cereals and pulses.

1.2 Sugar and related products.

Sugar Structure and Properties.

Nutritive value - Sugar composition in different food items.

Sugar related product - Classification & nutritive value.

Artificial sweeteners - example - advantages and disadvantages.

UNIT-II

2.1 Vegetables - classification - composition & nutritive values - Fruits- Classification - Composition & nutritive values.

2.2 Fungi and algae as food - enzymatic browning and non enzymatic browning - Nutritive value of some common foods - milk, egg., soyabeans

UNIT-III

3.1 Beverages - definition and examples - Classification of beverages

Fruit beverages - Milk based beverages - malted beverages - examples.

Alcoholic and non alcoholic beverages - examples.

3.2 Appetizers - definition - classification - examples - Water - functions and deficiency.

UNIT-IV

4.1 Food Preservatives - definition - classification - Food Spoilage - definition - Prevention.

4.2 Methods of preservation - classification - Low and high temperature - preservatives examples - Dehydration - osmotic pressure - food irradiation.

UNIT-V

5.1 Vitamins - their importance - classification - water soluble & fat soluble vitamins - vitamin A, Vitamin D, Vitamin E, Vitamin K, Vitamin B complex group - Vitamin C - sources and their importance - requirements - deficiency diseases.

5.2 Minerals and trace elements - sources and their importance - antioxidants.'

Reference - Books

1. Food Science - III Edition - B. Sri Lakshmi
   New Age International Publisher, 2005
2. Food Chemistry - Lilian Hoagland Meyer
   CBS Publishers & Distributors, 2004.
3. Food Science, Nutrition and Health - Brian.A.Fox, Allan G.Cameron Edward Arnold, London.
4. Fundamentals of foods and nutrition - Mudambi. R.Sumathi, and Raja gopal, M.V. - Willey Eastern Ltd., Madras.
5. Handbook of food and nutrition - M. Swaminathan - the Bangalore Printing and publishing co. Ltd., Bangalore.

NON-MAJOR ELECTIVE II
PAPER II
CHEMISTRY IN EVERY DAY LIFE

UNIT-I

1.1 General Survey of Chemicals used in every day life.

1.2 Cosmetics : Talcum Powder, Tooth pastes, Shampoos, Nail Polish, Perfumes, soaps, and detergents - General formulations and preparation - possible hazards of cosmetics use.

UNIT-II

2.1 Food and Nutrition: Carbohydrates, Proteins, Fats, Minerals and Vitamins, definitions, sources and their physiological importance - balanced diet.

2.2 Adulterants in milk, ghee, oil, coffee powder, tea, asafoetida, chilli powder, pulses and turmeric powder - identification.

UNIT-III

3.1 colour chemicals used in food - soft drinks - and its health hazards.

3.2 Chemicals in food production - fertilizers used in natural sources - Fertilizers urea, NPK and Super phosphates need - user and hazards.

UNIT-IV

4.1 Plastics, polythene, PVC, bakelite, polyesters, resins, and their applications.

4.2 Natural Rubber-Synthetic rubbers-Vulcanization - definition and its applications

UNIT-V

5.1 Pharmaceutical drugs - Analgesics and antipyretics - antibiotics - definitions examples and applications.

5.2. Antiseptics - disinfect ants - definitions examples and application.

5.3 Explosives : Classifications - Examples.

Reference :

1. Chemical process industries - Norris Shreve Joseph A.Brine .Jr.
2. Perfumes, Cosmetics and soaps - W.A. Poucher (Vol 3).
3. Environmental Chemistry - A .K. DE
4. Industrial Chemistry, B.K. Sharma- Goel publishing house, Meerut.
5. Food Science - III Edition - B. Srilakshmi - New age international publishers 2005.
6. Food chemistry Lillian Hoagland Meyer - CBS publishes & distributors - 2004.
7. Fundamental concepts of applied chemistry - Jayashree ghosh - S.Chand & Co Ltd., New Delhi.
8. Applied chemistry - K.Bagavathi Sundari - MJP Publishers

V SEMESTER

PAPER V

INORGANIC CHEMISTRY I

Objectives :

1. To understand the principle of gravimetry.
2. To give students a firm grounding in Co-ordination chemistry.
3. To study about the halogens and related compounds .

UNIT-I :

1.1 Principles of gravimetric analysis - Characteristics of precipitating agents - choice of precipitants - conditions of precipitation - specific and selective precipitants - DMG, cupferron, salicylaldehyde, ethylene diamine - use of sequestering agents - Co-precipitation - post precipitation - differences - reduction of error - peptisation - precipitation from homogeneous solution - calculation in gravimetric methods - use of gravimetic factor.

1.2 Thermoanalytical methods - principle involved in thermogravimetic analysis and differential thermal analysis - characteristics of TGA and DTA - thermograms – factors affecting TGA and DTA curves - discussion of various components of the instrument with block diagrams - Applications of thermogravimetry - Applications of DTA - thermometric titration. Electrogravimetry - principle and applications.

UNIT-II : CO - ORDINATION COMPOUNDS

2.1 Definition of terms used - classification of ligands - chelation and effect of chelation - applications of EDTA - Co-ordination number and stereo chemistry of complexes - Nomenclature. Detection and structure determination of complexes

2.2 Bridged (or) polynuclear complexes - inner metallic complexes - Isomerism in complexes - Ionisation Isomerism, hydrate Isomerism, linkage Isomerism, ligand Isomerism, Co-ordination Isomerism, polymerization Isomerism, geometrical and optical Isomerism in 4 and 6 co - ordinated complexes.

UNIT-III :

3.1 Werner theory - EAN rule - theory of bonding - valence bond theory - hybridisation - geometry and magnetic properties - failure of VBT

3.2 Crystal field theory - spectrochemical series - splitting of d - orbitals in octahedral, tetrahedral and square planar complexes - crystal field stabilisation energy - calculation of CFSE in octahedral and square planar complexes.

3.3 Low spin and high spin complexes-explanation of magnetic properties, colour and geometry using CFT - Trans effect and Jahn Teller effect

UNIT-IV :

4.1 Comparison of VBT and CFT. Application of Co-ordination compounds in qualitative and quantitative analysis - Detection of potassium ion, separation of Cu and Cd ions, Estimation of Ni using DMG and Al using oxine.

4.2 Pi-acceptor ligands - bonding, hybridisation, structures and properties of carhonyls of Ni, Cr, Fe, Co, Mn, W and V - compounds of P and As as acceptor ligands.

UNIT-V :

5.1 Halogen-comparative study of F, Cl, Br, I and At - elements - reactivities - comparison of F and O - hydracids - oxides - classification of halides - fluorides of oxygen - exceptional properties of fluorine.

5.2 oxy acids of halogens - preparation properties and structure - interhologen compounds - pseudohaologens - basic properties of halogens - positive iodine - evidences.

PAPER VI

ORGANIC CHEMISTRY I

Objective :

1. To effectively impart knowledge about Carbohydrate chemistry, , Stereochemistry, Heterocyclic chemistry and polynuclear hydrocarbons
2. To make the students more inquisitive in learning the mechanistic details in Organic Chemistry through the teaching of the named reactions
3. To learn the synthetic applications of certain organic compounds

UNIT- I

1.1. Carbohydrates : classifications - reactions of glucose and fructose - ozasone formation, muta rotation and its mechanism - structural elucidation of glucose and fructose - pyranose and furanose forms.

1.2 Determination of ring size - Haworth projection formula - configuration of glucose and fructose - epimerization - chain lengthening and chain shortening of aldoses - inter conversion of aldoses and ketoses

1.3 Disaccharides and poly saccharides: reactions and structural elucidation of sucrose and maltose. Structural elucidation and properties of starch and cellulose

UNIT- II

2.1 Stereoisomerism : definition - classification into optical and geometrical isomerism. Projection formulae : Fischer, Flying Wedge, Sawhorse and Newmann projection formulae - rotation of optical isomers - Cahn - Ingold - Prelog rules - R, S notation of optical isomers with one and two asymmetric carbon atoms - D, L notations. Optical activities in compounds not containing asymmetric carbon atoms : biphenyl, allenes and spiranes

2.2. Geometrical isomerism : cis - trans, syn - anti and E, Z notations - geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes - methods of distinguishing geometrical isomers using melting points, dipole moment, solubility, dehydration, cyclisation, heat of hydrogenation and combustion.

2.3 Conformational analysis : introduction of terms - conformers, configuration, dihedral angle, torsional strain, conformational analysis of ethane and n-butane including energy diagrams - conformers of cyclohexane - axial and equatorial bonds - ring flipping - conformers of mono and dimethylcyclohexane -1,2 and 1,3 interactions

UNIT- III

3.1 Carbonyl polarization - reactivity of carbonyl group - acidity of alpha hydrogen; Malonic, acetoacetic and cyano acetic esters - Characteristic reactions of active methylene group - synthetic uses of malonic, acetoacetic and cyano acetic esters.

3.2. Tautomerism: definition - keto-enol tautomerism - identification, acid and base catalyzed mechanisms, evidences - amido-imidol, nitro-acinitro tautomerisms

3.3 Mechanism of aldol, Perkin and benzoin condensations and Knoevenagel, Claisen, Wittig, Cannizzaro, Reformatsky and Michael reactions.

UNIT- IV

4.1 Heterocyclic compounds - Huckel's rule - Preparation, properties and uses of furan, pyrrole, and thiophene.

4.2 Preparation, properties and uses of, pyridine and piperidine. Methods of opening of heterocyclic rings - oxidation, reduction, Hoffman's exhaustive methylation, Van Braun's methods. Comparative study of basicity of pyrrole, pyridine and piperidine with amines.

4.3 Synthesis and reactions of quinoline, isoquinoline and indole with special reference to Skraup, Bisler Napieralskii and Fischer Indole syntheses

UNIT- V

5.1 polynuclear hydrocarbons - synthesis, properties and uses of naphthalene, anthracene and phenanthrene - structural elucidation of naphthalene - chemistry of naphthaquinones.

5.2 Dyes - Theory of colour and constitution - classification according to the structure and method of application. Preparation and uses of 1) Azo dye - methyl orange and Bismark brown 2) Triphenyl methane dye - Malachite green

3) Phthalein dye - phenolphthalein and flourescein 4) Vat dye - Indigo 5) anthraquinione dye - Alizarin

5.3 Diazo methane and diazo acetic ester - preparations, structure and synthetic uses.

PAPER VII

PHYSICAL CHEMISTRY I

Objectives

1. To study about the solutions and collogative properties
2. To know about Chemical Equilibrium.
3. To study phase rule.
4. To promote interest in surface chemistry, catalysis & chemical kinetics.

UNIT-I

1.1 Solutions of gases in liquids - Henry's law - solution of liquids in liquids - Raoult's law - vapour pressure of ideal solutions - activity of a component in an ideal solution - Gibbs - Duhem - Margules equation - Thermodynamics of ideal solutions - Free energy change of mixing for an ideal solution - volume change and enthalpy changes of mixing for an ideal solution - vapour pressures of real or non-ideal solutions - vapour pressure - composition and Boiling point- composition curves of completely miscible binary solutions-Fractional distillation of binary liquid solutions.

1.2 Azeotropic mixtures - Distillation of immiscible liquids - solubility of partially miscible liquids - phenol water system - CST and effect of impurities on CST.

UNIT-II: Colligate properties and chemical equilibrium:

2.1 Lowering of vapour pressure - osmosis and osmotic pressure - relation between osmotic pressure and vapour pressure lowering of an ideal solution - theories of semipermeability - reverse osmosis - elevation of boiling point - depression of freezing point - derivations and determination - vant Hoff factor.

2.2 Chemical equilibrium: law of mass action - law of Chemical equilibrium- thermodynamic derivation of law of Chemical equilibrium - Vant Hoff reaction isotherm - standard free energy change - standard free energy change and equilibrium constant - temperature dependence of equilibrium constants - Vant Hoff isochore - Le chatelier principle.

UNIT-III : Phase Equilibria

3.1 Gibb's phase rule - statement and definition of terms - Application to one component systems - Water and sulphur system - Reduced phase rule - Two component systems - simple eutectic system - lead - silver system - Freezing mixtures .

3.2 Thermal analysis and cooling curves - compound formation with congruent melting point - Zn-Mg system, Ferric chloride - water system - compound formation with incongruent melting point Na-K system

UNIT- IV : Surface Chemistry

4.1 Adsorption - Physisorption and Chemisorptions - Applications of adsorption - Adsorption of gases by solids - Freundlich adsorption isotherm - Langmuir's theory of adsorption - BET theory of multilayer adsorption - determination of surface area - adsorption isotherms.

4.2. General characteristics of catalytic reactions Acid-base catalysis- Enzyme catalysis Mechanism and kinetics of enzyme catalyzed reactions - Michaelis-Menten equation - Effect of temperature on enzyme catalysis - Heterogeneous catalysis - Surface reactions-kinetics of surface reactions.

UNIT-V: Chemical Kinetics

5.1 The rate equation - order & molecularity of a reaction - first order reactions - second order reactions - third order reactions - zero order reactions - Half life time of a reaction - methods of determining order of a reaction - order and molecularity of simple reactions - experimental methods in the study of kinetics of reaction - volumetry, manometry, polarimetry , dilatometry and colorimetry - effect of temperature on reaction rates - concept of activation energy - energy barrier - Effect of catalyst.

5.2 Collision theory and derivation of rate constant for bimolecular reactions - theory of absolute reaction rates - thermodynamic derivation for the rate constant for a bimolecular reaction from it - comparison of collision theory and ARRT - significance of entropy , enthalpy and free energy of activation.

ELECTIVE I

PAPER I

INDUSTRIAL CHEMISTRY V

Objective:

Lubricants, Explosives, Propellants, metals, Sugar, Leather, Soap, Detergents, and Dyes - Introduction - cause - classification - preparation - properties - Manufacture - Need - Composition - Mechanism - applications.

UNIT-I

1.1 LUBRICANTS - Friction and Wear - Mechanism of Lubrication - Classification of Lubricants - Lubricating Oils.

1.2 Greases or Semi Solid Lubricants - Solid Lubricants - Synthetic Lubricants - Lubricating Emulsions -Properties of Lubricating Oils - Properties of Greases.

UNIT-II

2.1 Cutting Fluids - Selection of Lubricants - Lubricants of Mineral Origin - Vegetable Oils and Fatty Acids as Lubricants-Additives for Lubricating oils.

2.2 EXPLOSIVE AND PROPELLANTS - Explosives - Classification of Explosives - Primary Explosive - High explosives - Low explosives - Secondary High Explosive.

UNIT-III

3.1 Blasting Fuels - Manufacture of important Explosives - Propellants and Rocket Fuels - Classifications of Propellants - uses - classification - requirements - Rocket Propellants.

3.2 METALS - Introduction - Physical Properties of Metals - Principles and Processes of Metallurgy - Cast Iron - Wrought Iron.

UNIT-IV

4.1 SUGAR CHEMISTRY - Introduction - Manufacture of cane sugar - Recovery of sugar from molasses - Preparation of celotex - Manufacture of sucrose from beat root - Testing and estimation of sugar.

4.2 LEATHER CHEMISTRY - Introduction - Manufacture of leather - Preparation of hides for tanning - Vegetable, chrome and oil tanning - Byproduct.

UNIT-V

5.1 Soap and detergents - Cleaning action of soap - Metal soaps - Oils used for soaps - Classification of surface active agents - Anionic detergents - Bio-degradability of surfactants - Eco-friendly detergents.

5.2 Dyes - Introduction - Methods of Dyeing - Classification of dyes - Methods of application of dyes - Fluorescent brightening agent - Non-textile uses of dyes.

SKILL BASED SUBJECT III

PAPER III

DAIRY CHEMISTRY

Objective :

To understand the chemical composition of milk and milk processing.
To learn about the various milk product.

UNIT-I

Definition, Composition, Milk lipids, Milk proteins, vitamins and minerals. Factors affecting the composition of milk - adulterants, preservatives, and neutralizer - examples and their - detection.

UNIT-II

Properties of milk - Flavour and aroma, acidity, specific gravity, viscosity and conductivity. Estimation of fat, acidity and total solids in milk.

UNIT-III

Processing of milk - effect of heat on milk, chemical changes taking place in milk due to processing, sterilization, homogenization and pasteurization, vacuum pasteurization and Ultra high temperature pasteurization

UNIT-IV

Milk Products: Cream - definition, chemistry of creaming process, Butter - definition, composition, theory of churning, desibutter, salted butter. Ghee - major constituents, common adulterants and their detection.

UNIT-V

Fermented milk products - fermentation of milk - definition and conditions. ICE creams - definition, composition, types, manufacture of ice - cream, stabilizers, emulsifiers, and their role, milk powder - definition, process of making milk powder.

Reference :

1. Applied Chemistry-K.Bagavathi Sundari MJP Publishers Chennai. 2006.
2. Principles of dairy technology - Robert Jenness
3. Indian Dairy Products - Rangappa and Acharya, K.T.
4. Fundamentals of Dairy chemistry - Wond. F.P. Springer.
5. Outlines of Dairy Technology - Sukumar De. – Oxford University Press.
6. Applied chemistry for home science & allied science - T.Jacob, Mcmillan.

VI SEMESTER

PAPER VIII

INORGANIC CHEMISTRY II

Objectives :

1. To impart knowledge about radioactivity and nuclear chemistry.
2. To understand the metallic bond and bio-inorganic chemistry.
3. To learn about f and d block elements.
4. To provide knowledge about the industrial chemistry.

UNIT-I :NUCLEAR CHEMISTRY

1.1 Introduction - composition of nucleus - nuclear forces operating between the nucleons - N/P ratio, curves, stability belts - the whole number rule and packing fraction - isotopes, isobars, isotones and isomers.

1.2 Nuclear binding energy - Mass defect - simple calculations involving mass defect and binding energy per nucleon - magic numbers - liquid drop model - shell model .

UNIT-II :

2.1 Natural radioactivity - Detection and measurement of radioactivity - radioactive series including neptunium series - group displacement law - Rate of disintegration and half - life period - Average life period.

2.2 Artificial radioactivity - induced radioactivity - uses of radioisotopes - hazards of radiations - nuclear fission - nuclear energy - nuclear reactors - nuclear fusion - thermo nuclear reactions - energy source of the sun and stars.

UNIT-III :

3.1 Metallic bond - theories - electron pool theory - valence bond theory - MO theory - semiconductors - n and p type semiconductors.

3.2 Bioinorganic chemistry - Biological aspects of Fe, Zn, Mg, Co and Mo - Role of Na, K, Ca, and P - Biological functions and toxicity of some elements.

UNIT-IV :

4.1 Chemistry of d block elements - characteristics of d block elements - variable valency - magnetic properties and colour - comparative study of Ti, V, Cr, Mn and Fe group metals - occurrence, oxidation states, magnetic properties and colour - preparation and uses of ammonium molybdate, V_2O_5 and UF_6

4.2 Chemistry of f block elements - comparative account of lanthanides and actinides, occurrence, elements, oxidation states, magnetic properties, colour and spectra - lanthanide contraction - causes, consequences and uses - comparison between 3d and 4f block elements - comparison between lanthanides and actinides.

UNIT-V :

5.1 Industrial chemistry - Fuel gases - calorific value - composition and sources / formation of water gas, semi water gas, carburetted water gas, producer gas, oil gas, natural gas, LPG and bio gas (manufacture not required)

5.2 Composition and setting of cement - manufacture of cement - examples for pigments - constituents of paints and their functions - type of glasses - manufacture of glass.

PAPER IX

ORGANIC CHEMISTRY II

Objectives:

1. To understand the basic concepts organic photochemistry.
2. To kindle interest in students in learning bio-organic chemistry through the introduction of topics such as Proteins, Nucleic acids, Terpenes, Alkaloids etc
3. To generate keen interest and thinking in understanding the mechanisms of Molecular Rearrangements

UNIT- I

1.1 Organic photochemistry : Types of photochemical reactions- photo dissociation- gas phase photolysis - isomerisations- cyclisation- dimerisation and oxetane formation.

1.2 Norrish-I and II reactions. Barton reaction- photo Fries rearrangement -photochemical formation of smog- photochemistry of vision.

1.3 Mechanism of reduction with sodium borohydride, lithium aluminium hydride, Wolf Kishner reaction, MPV reduction and Rosenmunds reduction.

UNIT-II

2.1 Amino acids : Classification of amino acids - preparations and properties of alpha amino acids - with special reference to Gabriel phthalimide synthesis, Strecker synthesis, Erlenmeyer synthesis- zwitter ion , isoelectric point

2.2 Poly peptides and proteins :. Classification of proteins based on physical and chemical properties and physiological functions -peptide synthesis - Bergman synthesis , Curtius synthesis and Sheehan synthesis.

2.3 Primary structure of proteins - end group analysis - Akabori method, reduction method, Edman method, Sanger's method, Dansyl method - secondary structure of protein - helical and sheet structures - denaturation of proteins.

UNIT- III

3.1 Nucleic acids: Nucleoside, nucleotide, degradation of nucleotide chain - stucture of nucleic acids - RNA and DNA - elementary idea about protein synthesis

3.2 Synthesis of pyramidine and purine bases - guanine, adenine, uracil, cytosine and thymine.

3.3 Terpenes - isoprene rule - structural elucidation of menthol, alpha terpeniol and alpha pinene

UNIT- IV

4.1 Vitamins : Classification - structural elucidation of pyridoxin and ascorbic acid

4.2 Antibiotics : Classification and structural elucidation of penicillin G and chloroamphenicol

4.3. Alkaloids : General methods of Isolation and structural elucidation of piperine and nicotine

UNIT- V

5.1 Molecular rearrangements: Classification - anionotropic and cationotropic, inter molecular and intra molecular rearrangements .- Mechanisms, evidences, migratory aptitude, inter or intra molecular of the following rearrangements :,Pinocol-pinocolone, Benzilic acid, Cope, oxy Cope, rearrangements.

5.2 Mechanisms, evidences, migratory aptitude, inter or intra molecular of the following rearrangements Beckmann, Hoffmann, Curtius, Baeyer-Villiger, Claisen (sigmatropic) and Fries (Two mechanisms) rearrangement.

PAPER X

PHYSICAL CHEMISTRY II

Objectives

1. To study photo chemistry, laser and distribution law.
2. To learn about Electro chemistry and its applications.

UNIT- I

1.1 Laws of photochemistry - Fluorescence and phosphorescence - primary and secondary reactions - Kinetics of hydrogen - bromine reaction - photosentisation - chemiluminescence - Lasers - uses of lasers.

1.2 Nernst distribution law - thermodynamic derivation - modification of law in case of association or dissociation of the solute - applications.

UNIT-II: Electrochemistry

2.1 Introduction: Transport number and its determination by Hittorff's and moving boundary method - effect of temperature and concentration on ionic mobility and ionic conductance - Kohlrausch's law and its applications salt hydrolysis and pH of a salt solution, buffer action and explanation

2.2 Applications of conductivity measurements - degree of hydrolysis, solubility product and conductometric titrations.

UNIT-III

3.1. Theory of strong electrolytes - Debye - Huckel - Onsager theory - verification of Onsager equation - Wein effect and Debye Falkenhagen effect - ionic strength - activity and activity coefficients of strong electrolytes.

3.2 Galvanic cells - reversible and irreversible electrodes and cells - standard cell - emf and its measurement - types of electrodes - electrode reactions - electrode potentials - reference electrodes - Standard electrode potentials. Derivation of Nernst equation for electrode potential and cell emf. - sign conventions.

UNIT-IV

4.1 Electrochemical series and its applications - formation of cells - electrode and cell reactions - cell emf - chemical cells and concentration cells with and without transference - examples and derivation of expressions for their emfs - liquid junction potential.

4.2 Applications of emf measurement - calculation of ΔG, ΔH, ΔS and equilibrium constant Determination of pH using quinhydrone and glass electrodes - potentiometric titrations.

UNIT-V

5.1 Polarization - decomposition potential over voltage - storage cells - lead acid battery - mechanism of discharging and recharging - fuel cells.

5.2 Polarography - principle - concentration polarization - dropping mercury electrode - advantages and disadvantages - convection, migration and diffusion currents - Ilkovic equation (derivation not required) and significance - experimental assembly electrodes - current voltage curve - oxygen wave - influence of temperature and agitation on diffusion layer - polarography as an analytical tool in quantitative and qualitative analysis.

CORE PRACITICAL III

PHYSICAL CHEMISTRY EXPERIMENTS

1. Distribution law

   a). Partition coefficient of benzoic acid between water and

   benzene (or) Partition Coefficient of Iodine between water and CCl_4

2. Kinetics

   Determination of the order of the following reactions.

   a). Acid catalysed hydrolysis of an ester (methyl or ethyl acetate)

   b). Saponification of an ester (methyl or ethyl acetate)

   c). Iodination of acetone.

3. Molecular weight of a solute - Rast's method using naphthalene, or diphenyl as solvents.

4. Heterogeneous equilibria :

   a). *Phenol-water system – CST

   b) Effect of impurity – 2% NaCl or succinic acid solutions on phenol water system - determination of the concentration of the given solution

5. Determination of the transition temperature of the given salt

   hydrate. $Na_2S_2O_3$, 5 H_2O, CH_3COONa, $3H_2O$, $SrCl_2$, $6H_2O$,

   $MnCl_2$, 4H2O

6. Electrochemistry

   Conductivity

   a) Determination of cell constant and equivalent conductivities of solutions of two different concentrations.

   b) Conductometric titration of a strong acid against a strong base.

7. Potentiometric titration of a strong acid against a strong base.

8. Colorimetry - determination of unknown concentration using

   Photoelectric colorimeter.

9. Determination of pKa of acetic acid using pH Meter.

   *need not be given in examination.

   Students must write short procedure / formula with explanations in ten minutes for evaluation

CORE PRACTICAL IV

GRAVIMETRIC ESTIMATION.

1. Estimation of sulphate as barium sulphate.
2. Estimation of barium as barium sulphate.
3. Estimation of barium as barium chromate.
4. Estimation of lead as lead chromate.
5. Estimation of calcium as calcium oxalate monohydrate.

CORE PRACTICAL V

(ORGANIC CHEMISTRY)

(Qualitative analysis and organic preparation)

I. Analysis of organic compounds containing one functional group and Characterization with a derivative.

Reactions of the following functional groups:

Aldyhyde, ketone, carboxylic acid (mono and di), ester, carbohydrate (reducing and non reducing), phenol, aromatic primary amine, amide, nitro compound, diamide and anilide.

II. Organic Preparations

Acylation

(a) Acetylation of salicylic acid or aniline.

(b) Benzoylation of aniline or phenol.

Nitration

(c) Preparation of m-dinitrobenzene

(d) Preparation of p- nitroacetanilide

Halogenation

(e) Preparation of p-bromoacetanilide

(f) Preparation of 2,4,6-tribromophenol

Diazotisation / coupling

(g) Preparation of methyl orange

Oxidation

(h) Preparation of benzoic acid from toluene

Hydrolysis:

(i) Hydrolysis of ethyl benzoate (or) methyl salicylate.

Reference Book for Practicals :

1. Vogel's text book of chemical analysis
2. Practical chemistry - A.O. Thomas - Scientific book center, Cannanore.
3. Practical chemistry-S. Sundaram - 3 Volumes - S. Viswanthan
4. Vogel's text book of practical organic chemistry - Longman

ELECTIVE II

PAPER II

INDUSTRIAL CHEMISTRY VI

Objective:

Pharmaceutical chemistry, Blood and cardiovascular drugs, Sulphonamides, Diabetes and anesthetics - Introduction - cause - classification - Need - Composition - Mechanism - applications.

UNIT-I

1.1 Pharmaceutical Chemistry - Introduction - Nature and sources of drugs - study of drugs - Classification and nomenclature of drugs - Mechanism of drug action and metabolism of drugs.

1.2 Clinical chemistry - determination of sugar in serum - estimation of glucose in urine - detection of cholesterol in urine - detection of diabetes - estimation of hemoglobin - red cell count.

UNIT-II

2.1 Cause of common diseases and their treatment by drugs - Insect borne, air-borne and water borne diseases - disorder of digestive systems - diseases of respiratory system - disorder of nervous system.

2.2 Medicinally important inorganic compounds - compounds of aluminum, phosphorous, arsenic, iron and mercury - biological role of inorganic compounds - role of sodium, potassium, calcium, iodine, copper and their compounds.

UNIT-III

3.1 Blood - composition of blood - blood grouping and matching - physiological function of plasma protein - role of blood as oxygen carrier - blood pressure and hypertension - clotting of blood.

3.2 Cardio vascular drugs - cardiac glycosides - antiarythmic drugs - antihypertensive drugs - aldomet - guanethitine drugs - reserpine - antianginal agents.

UNIT-IV:

4.1 Sulphonamides - introduction - mechanism of action of sulpha drugs - Cancer - introduction to cancer - common causes of cancer - spread of cancer - treatment of cancer.

4.2 Diabetes and Hypoglycemic drugs - introduction to diabetes - control of diabetes - chemical structure of insulin - oral hypoglycemic agents - Sulphonyl urea and Biquanides.

UNIT-V

5.1 Anesthetics - general anaesthics only - Analgesics, Antipyretic and Anti inflammatory agents - analgesic action of morphine - synthetic analgesics

5.2 First aid: Treatment of shock- hemorrhage, cuts and wounds, burns- classification and first aid.

ELECTIVE III

PAPER III

INSTRUMENTAL ANALYSIS

Objective:

To impart knowledge about different spectroscopy techniques, Chromatography & data analysis.

UNIT-I

1.1 **Data Analysis** - Theory of errors - idea of significant figures and its importance with examples - precision - accuracy - methods of expressing accuracy - error analysis - minimizing errors method of expressing precision - average deviation - standard deviation and confidence limit.

1.2 **Mass spectroscopy**: basic principles of mass spectrum - molecular peak - base peak - isotopic peak - meta stable peak - factors influencing the fragmentation - nitrogen rule - ring rule - determination of molecular formulae with examples - instrumentation

UNIT-II

2.1 **Infra red spectroscopy**: molecular vibrations - Hooke's law - vibrational frequencies - factors affecting vibrational frequencies - instrumentation - block diagram - source - monochromator - cell sampling echniques - detector and recorders - solvent shift.

2.2 **Raman spectroscopy**: Rayleigh and Raman scattering - Stokes and Anti Stokes lines - instrumentation - block diagram - differences between IR and Raman spectroscopy - mutual exclusion principle - applications.

UNIT-III

NMR spectroscopy : Principle of Nuclear magnetic Resonance - basic instrumentation - shielding mechanism - chemical shift - number of signals - spin-spin coupling and coupling constants - splitting of signals.

NMR spectrum of simple organic compounds such as ethyl bromide, 1,1,2-tribromoethane, ethanol, acetaldehyde,

UNIT-IV

4.1 **UV - Visible spectroscopy -** Absorption laws. Calculations involving Beer Lamberts Law - instrumentation photo colorimeter and spectrophotometer- block diagrams with description of components - theory - types of electronic transitions - chromophore and auxochromes - Absorption bands and intensity - factors governing absorption maximum and intensity.

separation techniques: principle of adsorption and partition chromatography **columm chromatography** - principle - adsorbents used - preparation of column - adsorption - elution - recovery of substances - Applications

UNIT - V

5.1 **Thin layer chromatography** - principle - choice of adsorbent and solvent - preparation of chromatogram - R_f value - applications. Paper chromatography- solvents used - principle - Rf value factors influencing Rf value - applications - separation of amino acid mixture - radial paper chromatography. Paper electrophoresis - principle and applications

5.2 **Ion exchange chromatography** - principle - resins - action of resins - experimental techniques - applications - separation of metal ions, separation of chloride and Bromide ions - removal of interfering radicals.

SKILL BASED SUBJECT IV

PAPER IV

AGRICULTURAL AND LEATHER CHEMISTRY

Objective :

To learn about Agricultural and Leather chemistry

AGRICULTURE CHEMISTRY

UNIT-I: Soil Chemistry

Introduction - Formation of Soil. Classification of soil and properties of soil - soil Acidity - Causes of acidity - soil alkalinity - determination of soil pH - Buffering of soils - Amending the soil - Reclamation of acid soil - Liming agents.

UNIT-II: Soil fertility and productivity

Organic Manures - Farmyard Manure - Compost - Oil cakes - Bone meal - Meat meal - Fish meal - Blood meal and green Manures - Fertilizers - Classification of fertilizers - Requisites of a good fertilizers - Nitrogenous fertilizers - Phosphatic fertilizers - super Phosphate of lime - Triple super phosphate - NPK fertilizers - ill effects of fertilizers - effect of mixed fertilizers on soil pH - Micronutrients - role of micronutrients sources - Need for nutrient balance - Soil management and Micronutrients needs.

UNIT-III: Pesticides

Classification of Insecticides - Stomach poisons - Contact poisons and Fumigants - Insecticides - Organic Insecticides - DDT - Gammexane - Malathion - Parathion - Fungicides - Herbicides - Rodenticides - Pesticides in India - Adverse environmental effects of pesticides.

UNIT-IV: Leather Chemistry

Introduction - Constituents of Animal Skin - Preparing skins and hides - Cleaning and soaking - Liming and degreasing - Manufacture of Leather - Leather Tanning - Vegetable Tanning - Chrome Tanning and Mineral Tanning - Dyeing and Fat liquoring - Leather finishing - oil tanning - by products.

UNIT-V

Tannery effluents - Pollution and its control - Water pollution and Air pollution - waste management - primary, secondary - tertiary treatment - pollution prevention.

Reference *:*

1. Industrial chemistry by B.K. Sharma. Goel Publishing House, Meerut.
2. Applied chemistry by K.Bagavathi - Sundari, MJP Publishers.
3. Fundamental concept of Applied chemistry by Jayashree Ghosh, S. Chand & Company Ltd.,
4. Chemical treatment of hides a leather by J. Partridge Noyes, Park Ridge, N.J
5. Agricultural Chemistry Vol I & Vol II edited by B.A. Yagodin - New Century books (P) Ltd.,
6. The nature and properties of soils - IX Edition - Nyle.C.Bready - S.Chand and Company Ltd.,
7. Soils and soil fertility - Louis M.Thompson - and Frederick. R.Troch - Tata Mc. Graw hill.
8. Text book of soil science - T.D. Biswas and S.K. Mukerijee - II Edition.
9. Soil Science - A.Sankara.
10. Fundamental of leather science - wood roffe.
11. Publications of CLRI - Chennai.
12. Nature and propertie of soils - Harry, O. Buckman

ELECTIVE PRACTICAL

INDUSTRIAL CHEMISTRY PRACTICAL III

1. Limit test for Sulphate
2. Limit test for Chloride
3. Limit test for Iron
4. Limit test for Lead
5. Percentage of Sulphated ash in Aspirin tablet
6. Percentage of purity of Sodium bicarbonate
7. Percentage of purity of Boric acid
8. Loss of moisture from any drug
9. Assay of Hydrogen peroxide
10. Assay of Sodium chloride or Potassium chloride
11. Assay of Zinc oxide
12. Neutralizing capacity of any Antacid tablet

REFERENCE BOOK FOR PRACTICALS:

1. Vogel's text book of chemical analysis
2. Practical chemistry - A.O. Thomas - Scientific book center, Cannanore.
3. Practical chemistry - S. Sundaram - 3 Volumes - S. Viswanathan
4. Vogel's text book of practical organic chemistry - Longman

REFERENCE BOOKS :

INORGANIC CHEMISTRY :

1. Inorganic chemistry - P.L. Soni - Sultan Chand (2006).
2. Inorganic chemistry - B.R. Puri, L.R. Sharma and K.C. Kallia - Vallabh Publications (2003).
3. Selected topics in inorganic chemistry - W.U. Malik, G.D. Tuli and R.D. Madan - S. Chand Publications (2003).
4. Inorganic chemistry - J.E. Huheey, Harper and Collins - NY IV edition (1993).
5. Concise Inorganic chemistry - J.D. Lee - III edition - Von Nostrand
6. Industrial chemistry - B.K Sharma - Goel Publications (1983).
7. Industrial chemistry R.K. Das - Kalyani Publications, New Delhi (1982).
8. Coordination chemistry - S.F.A. Kettle - ELBS (1973).
9. Coordination chemistry - K. Burger - Butterworthy (1973).
10. Vogel's handbook of quantitative inorganic enalysis - Longman.
11. Text book of qualitative inorganic analysis - A.I. Vogel - III edition (1976).
12. Source book on atomic energy - Van Nostrand Co., (1969).
13. Nuclear and radiochemistry - John wiley and sons (1964).
14. Nuclear chemistry - H.J. Arnikar - Wiley Eastern Co., - II edition (1987).
15. Advanced Inorganic chemistry - Cotton and Wilkinson - V Edition - Wiley and Sons (1988).

ORGANIC CHEMISTRY :

1. Organic Chemistry - R. T. Morrison and Boyd - Pearson Education
2. Organic Chemistry - I. L Finar - Volume I and II - Pearson Education
3. Text Book of Organic Chemistry - P.L.Soni - Sultan Chand
4. Advanced Organic Chemistry - Bahl and Arun Bahl - S. Chand
5. Stereochemistry, conformations and mechanisms - Kalsi - New Age
6. Organic Chemistry of Natural Products - Volume I and II- O.P. Agarwal - GOEL Publishing House
7. A guide book to mechanism in Organic Chemistry - Peter Skyes - Pearson Education
8. Stereo Chemistry of Organic Compounds - D. Nasipuri - New Age
9. Chemistry of Natural Products - Gurdeep Chatwal- Himalaya Publishing House

10. Reactions and Reagents - O.P. Agarwal- GOEL Publishing House
11. Organic reaction mechanisms - Gurdeep Chatwal- Himalaya Publishing House.
12. A text book of Organic Chemistry K.S.Tewari,N.K.Vishol,S.N.Mehrotra- Vikas Publishing House.
13. Organic Chemistry - M.K.Jain and S.C.Sharma-Shoban Lal and Nagin Chand
14. Reaction, Mechanism and Structure - Jerry March - John Wiley and Sons
15. Organic Chemistry - Bruice - Pearson Education

PHYSICAL CHEMISTRY :

1. Principles of physical chemistry - B.R. Puri and Sharma - shobanlal nagin Chand & Co.,
2. Text Book of physical chemistry - P.L. Soni - Sultan Chand.
3. Physical chemistry - Negi and Anand - New Age.
4. Physical chemistry - Kundu and Jain - S. Chand.
5. Physical chemistry - K.L kapoor - Macmillan - 4 volumes.
6. Elements of physical chemistry - Glasstone and Lewis - Macmillan.
7. Text book of physical chemistry - S.Glasstone, Macmilan.
8. Fundamentals of physical chemistry - maron and Landor - Colier - Macmillan.
9. Physical chemistry - G.W. Castellan - Narosa publishing house.
10. Physical chemistry - Walter J. Moore - Orient Longman.
11. Numerical problems on physical chemistry Gashal, Books and Allied (P) Ltd.,
12. Universal General Chemistry, C.N.R. Rao, Macmillan.
13. Group theory and its chemical applications - P.K.Bhattacharya - Himalaya publishing House.

INSTRUMENTAL ANALYSIS :

1. Elements of analytical chemistry - R. Gopalan, P.S. Subramanian, K. Rengarajan - S. Chand and sons (1997).
2. Fundamentals of analytical chemistry - D.A. Skoog and D.M. West - Holt Reinhard and Winston Publication - IV Edition (1982).
3. Principles of instrumental methods of analysis - D.A. Skoog and Saunders - College publications - III edition (1985).
4. Analytical chemistry - S.M. Khopkar - New Age International.
5. Instrumental methods of chemical analysis - Chatwal - Anand - Himalaya Publishing house - (2000).
6. Analytical chemistry - R.Gopalan - Sultan Chand
7. Analytical Chemistry S.Usharani, Macmillan.
8. Instrumental methods of Analysis - Willard et al - c x B S .
9. Physico chemical techniques of analysis - P.B. Janarthanam - Vol- I & II - Asian Publishing.
10. Instrumental methods of Chemical analysis - B.K. Sharma - Goel publications.

REFERENCE BOOKS FOR INDUSTRIAL CHEMISTRY:

1. ENGINEERING CHEMISTRY

A. RAVIKRISHNAN,
SRI KRISHNA PUBLICATIONS
SAVARAPOONDI (POST), POLUR (T.K), T.V. MALAI (DT) 606 902

2. ENGINEERING CHEMISTRY

V.SRINIVASAN,
SD. UMA MAGESWARI,
M. MEENA
SCITECH PUBLICATIONS (INDIA) P LTD.,
7/3C, MADLEY ROAD, T.NAGAAR, CHENNAI 600 017

3. CHEMISTRY IN ENGINEERING AND TECHNOLOGY

DR. P.KAMARAJ
DR. R. JEYALAKSHMI
DR. V. NARAYANAN
SUDHANDHIRA PUBLICATIONS
NO.17, YADHAVAL STREET, KOTTUR
CHENNAI – 600 085

4. ENGINEERING CHEMISTRY

R. GOPALAN
D. VENKKKAPPAYYA
S. NAGARAJAN
VIKAS PUBLISHING HOUSE PVT LTD
576 MASJID ROAD, JANGPURA, NEW DELHI 110 014

5. APPLIED CHEMISTRY (SECOND EDITION)

N.KRISHNAMURTHY
P. VALLINAYAGAM
K. JEYASUBRAMANIAN
TATA MCGRAW-HILL PUBLISHING COMPANY LIMITED, NEW DELHI.

6. ENGINEERING CHEMISTRY

DANIEL YESUDIAN
HI-TECH PUBLICATIONS.,
22, NORTH RAMMALILNGA STREET, MAYILADUTHURAI –609 001.

7. CHEMISTRY IN ENGINEERING AND TECHNOLOGY (VOLUME 2)

J.C. KURIACOSE
J. RAJARAM
TATA MCGRAW-HILL PUBLISHING COMPANY LIMITED, NEW DELHI.

8. INDUSTRIAL CHEMISTRY (INCLUDING CHEMICAL ENGINEERING)

B.K. SHARMA
GOEL PUBLISHING HOUSE, MEERUT.

9. ENVIRONMENTAL CHEMISTRY

B.K. SHARMA
GOEL PUBLISHING HOUSE, MEERUT.

10 APPLIED CHEMISTRY (FOR B.E/B. TECH)

SRI DEVI BHASKARAN
CHARULATHA PUBLICATIONS
24, THAMBAIAH REDDY STREET, WEST MAMBALAM,
CHENNAI - 33.

11. WATER POLLUTION AND MANAGEMENT,

C.K. VARSHNEY
WILEY EASTERN LIMITED,
NO.6, FIRST MAIN ROAD, GANDHI NAGAR ,
CHENNAI -20.

12. A TEXT BOOK ON ENGINEERING CHEMISTRY

BALARAM PANI
GALGOTIA PUBLICATIONS PVT LTD.
5, ANSARI ROAD, DARYAAGANJ, NEW DELHI – 110 002.

13. ENGINEERING CHEMISTRY

JAIN AND JAIN
DHANPAT RAI PUBLISHING COMPANY
487/23. ANSARI ROAD, DARYA GANJ
NEW DELHI 110 002.

14. POLLUTION CONTROL IN PROCESS INDUSTRIES

S.P. MAHAJAN
TATA MCGRAW-HILL PUBLISHING COMPANY LIMITED, NEW DELHI.

15. ENGINEERING CHEMISTRY (A TEXT BOOK)

DR. M.R. BALASUBRAMANIAN
DR. S. KRISHNAMOORTHY
DR. V. MURUGESAN
ALLIED PUBLISHERS LTD.,
751, MOUNT ROAD, CHENNAI - 29.

16. FUELS AND PETROLEUM PROCESSING

(INCLUDING PETROCHEMICALS AND INDUSTRIAL ORGANIC SYNTHESIS)
B.K. SHARMA
GOEL PUBLISHING HOUSE, MEERUT.

17. BASIC APPLIED CHEMISTRY

(INCLUDING PRACTICALS)
P.C. JAIN, MONIKA JAIN
DHANPAT RAI AND SONS
1682, NAI SARAK, NEW DELHI - 110 006.

18. AIR POLLUTION

M.N. RAO
H..V.N RAO
TATA MCGRAW-HILL PUBLISHING COMPANY LIMITED, NEW DELHI.

19. FUNDAMENTAL CONCEPTS OF APPLIED CHEMISTRY

JAYASREE GHOSH
S,.CHAND & COMPANY, RAM NAGAR, NEW DELHI - 110055.

20. TEXT BOOK OF ORGANIC CHEMISTRY

2ND REVISED EDITION
K.S.TEWARI
N.K/VISHNOI
S.N.MEHROTRA
VIKAS PUBLISHING HOUSE PVT LTD.

21. TEXT BOOK OF PHARMASEUTICAL CHEMISTRY

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